



Ectoparasites and other ectosymbiotic arthropods of vertebrates in the Great Smoky Mountains National Park, USA

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Abstract

We review previously published accounts of ectoparasites and other ectosymbiotic arthropods of vertebrates and report on the collections from 4 species of reptiles, 54 species of birds, and 47 species of mammals from the Great Smoky Mountains National Park, or immediately adjacent lands in North Carolina and Tennessee, USA. Our list includes 1 species of beetle, 2 hemipteran bugs, 9 flies, at least 42 species of lice, 23 species of fleas, and at least 75 species of Acari (11 ticks/64 mites). We discuss the potential for transmission of pathogens by these ectoparasites and the relevance of disjunct populations of boreal species at high elevations in the Great Smoky Mountains.

Key words: Ectoparasites, Ectodytes, Vertebrates, Great Smoky Mountains, Tennessee, North Carolina

Introduction

Vertebrates are infested with a diverse assemblage of symbiotic macroinvertebrates that range from obligate parasites to transient commensal mites phoretically attached to hair or feathers. Wild and domestic animals harbor ectoparasites, which can serve as reservoirs or vectors of pathogens to humans. Ectoparasites are vectors or intermediate hosts of bacteria, rickettsiae, viruses, and helminths. Monitoring of ectoparasites is important from both a conservation standpoint and for the protection of public and wildlife health. Ectoparasite-borne pathogens have decimated troops in almost every major war and threaten survivors of natural and man-made disasters (Szybalski 1999; Raoult et al. 2004). For example, an epidemic of louse-borne relapsing fever killed more than 50,000 people during World War II (Borgnolo et al. 1993).

The Great Smoky Mountains National Park (GSMNP) is one of the largest and most visited National Parks in the eastern USA. Previous biological surveys of vertebrates (e.g. Linzey 1995) have reported some ectoparasites and other ectosymbiotic arthropods. Some ectoparasites have been described in annotated lists of arthropods from the Park (e.g. Reeves et al., 2004a), and novel species of ectoparasites have been described from the GSMNP (e.g. Linzey & Crossley 1971). However, no attempt has been made to catalog all of the ectoparasitic and ectosymbiotic arthropods of vertebrates from the GSMNP. Our checklist is intended to function as a review of all previous published work on ectoparasites and ectosymbiotic arthropods and to include new records from animals in the Park.

Methods

We reviewed primary literature on the ectoparasites and ectosymbiotic arthropods of vertebrates of North Carolina and Tennessee. All records from the GSMNP are summarized below. In addition, ectoparasites and ectosymbiotic arthropods were removed from vertebrates or collected throughout the GSMNP. Animals that had been killed by a car were later examined on site. When possible they were washed with ethanol, sealed in a plastic bag, and examined under a dissecting microscope. Preserved vertebrates from the GSMNP, University of Tennessee, and Clemson University museums were carefully examined with a microscope and ectoparasites or ectosymbiotic arthropods were removed. Specimens from the GSMNP museum, University of Tennessee Veterinary Parasitology Collection, Georgia Museum of Natural History, Clemson University Arthropod Collection, National Tick Collection, and Georgia Southern University Parasitology Collection were examined and unpublished records of ectoparasites were added to our checklist. Published records or specimens from the GSMNP that did not report a specific collection locality are listed as "GSMNP" in the records that follow. When records were reported or specimens were collected from areas directly adjacent to the Park (Foothills and Blue Ridge Parkways and communities that border the Park) these were included in our checklist for the sake of completeness. Our nomenclature for mammals follows that of Wilson & Reeder (2005).

When possible we deposited voucher specimens in the Great Smoky Mountains National Park Museum. The following abbreviations denote accession numbers for specimens deposited in, or identified for, certain collections:

L: General ectoparasite collections in the Department of Biology, Georgia Southern University—maintained by L. A. Durden.

RML: U.S. National Tick Collection, Georgia Southern University—RML denotes 'Rocky Mountain Laboratory' the original depository for this collection.

Collector names are reported as they are on collection labels. When possible the life stages and numbers of specimens are included (at the beginning of a collection entry), the following abbreviations are used: L = Larva(e), N = Nymph(s),

DN = Deutonymph(s), M = Male(s), F = Female(s), P = Pupa(e).

Many species in this paper should not be considered true parasites. The life histories of most ectoparasites or ectosymbiotic arthropods are poorly documented. In most cases there is little or no data to document the health and fitness effects of infestations by these arthropods. As a result we can not differentiate true parasites from harmless mutualists and commensalists. Some taxa can be detrimental to individual hosts are harmless to others. We denote phoretic or presumably non-parasitic species with an asterisk (*).

Class Insecta

Order Phthiraptera—lice

Lice are wingless hemimetabolous insects that are ectoparasitic on birds and mammals. The sucking louse fauna of Tennessee was reviewed by Durden et al. (1997a). Lice are vectors of disease agents or intermediate hosts of parasites of both wildlife and humans. Lice are known or suspected of transmitting helminths, viruses, rickettsiae, bacteria, and protozoa (Durden 2002, Reeves et al., 2006a).

Family Haematopinidae

***Haematopinus suis* (L.)—hog louse**

Ex *Sus scrofa* (feral hog): 1F, NC, Haywood Co., Cataloochee, 1995, L-2931; TN, Blount & Sevier Cos., 1979–1980 (Smith et al. 1982, Durden et al. 1997a); TN, Blount Co., 16 Oct. 1986, S. Patton; TN, Sevier Co., 1 Apr. 1980, S. Patton (Durden et al. 1997a).

The hog louse occurs almost worldwide as a host-specific parasite of domestic and feral hogs (Durden & Musser 1994). Feral hogs are not native to the Smoky Mountains but they are established there (Linzey 1995). *Haematopinus suis* is a vector of Swinepox Virus and *Eperythrozoon parvum* (Durden 2002).

Family Hoplopleuridae

***Hoplopleura hesperomydis* (Osborn)**

Ex *Ochrotomys nuttalli* (golden mouse): TN, Sevier Co., near Cosby, D. W. Linzey, 1964–1966 (Linzey 1968, Linzey & Linzey 1968, Durden et al. 1997a).

Ex *Peromyscus leucopus* (white-footed mouse): 1F, TN, Sevier Co., Twin Creeks, 11 Mar. 2002, K. Walters, L-2987.

Ex *Peromyscus maniculatus* (deer mouse): 1M, 5F, NC, Haywood Co., Purchase Knob, 20 Nov. 2002, K. Walters, L-3037; 1F, TN, Cocke Co., Rabbit Creek, 17 Feb. 2002, K. Walters, L-3043; TN, Sevier Co., Alum Cave Bluff Trail, Oct. 1953, P. T. Johnson, M. L. Morrow & G. Rust (Durden et al. 1997a); TN, Sevier Co., Moss Forest, Oct. 1953, P. T. Johnson, M. L. Morrow & G. Rust (Durden et al. 1997a); 4M, 1F, TN, Sevier Co., Roaring Fork Creek, 19 Feb. 2002, K. Walters, L-2999.

This louse has been recorded across much of North America and Mexico as a parasite of *Peromyscus* spp. and *Ochrotomys nuttalli* (Durden & Musser 1994). *Hoplopleura hesperomydis* appears to be fairly common on these rodents in the Park.

***Hoplopleura hirsuta* Ferris**

Ex *Sigmodon hispidus* (cotton rat): 1L, TN, Sevier Co., near Wear Cove, 9 Dec. 1991, Collector unknown.

Hoplopleura hirsuta is an ectoparasite of *Sigmodon* spp. in the Nearctic and Neotropical regions (Durden & Musser 1994).

***Hoplopleura sciuricola* Ferris**

Ex *Sciurus carolinensis* (gray squirrel): 1F, NC, Swain Co., Cherokee, Sep. 2000, K. Walters, L-3008; 1F, 1M, TN, Sevier Co., Sugarlands on US 441, 19 Dec. 2005, W. K. Reeves, L-3329.

Ex *Tamiasciurus hudsonicus* (red squirrel): GSMNP, 20 Sep. 1936, E. V. Komarek (Durden et al. 1997a).

This tree squirrel-associated sucking louse is widely distributed in North, Central, and South America (Durden & Musser 1994). Durden et al. (1997a) reported *H. sciuricola* from Tennessee and the GSMNP. This louse has been implicated in the transmission of *Rickettsia prowazekii*, the agent of epidemic typhus (Bozeman et al., 1981). In addition an undescribed genotype of *Bartonella* was detected in this louse (Durden et al. 2004).

***Hoplopleura trispinosa* Kellogg & Ferris**

Ex *Glaucomys volans* (southern flying squirrel): 3F, NC, Haywood Co., Purchase Knob, 20 Oct. 2002, K. Walters, L-3036.

This louse parasitizes both northern and southern flying squirrels across much of North America including Tennessee (Kim et al. 1986, Durden & Musser 1994, Durden et al. 1997a). Our collection is the first recorded for this louse from North Carolina and the GSMNP.

Family Linognathidae

***Solenopotes ferrisi* (Fahrenheit)**

Ex *Odocoileus virginianus* (white-tailed deer): TN, Blount Co., Cade's Cove, 1983–1984 (Hribar et al. 1986, Durden et al. 1997a).

This sucking louse is widely distributed in North America as an ectoparasite of cervids, especially *Odocoileus* spp. (Kim et al. 1986, Durden & Musser 1994).

Family Polyplacidae

***Neohaematopinus sciuri* Jancke**

Ex *Sciurus carolinensis* (gray squirrel): 1F, TN, Cocke Co., Cosby, 29 May 2001, W. K. Reeves, L-2979.

In eastern North America, this louse is a host specific parasite of the gray squirrel (Kim et al. 1986, Durden & Musser 1994). Durden (1980) found this louse to be abundant on *S. carolinensis* in central Tennessee but the above record is the first one for the GSMNP. Several genotypes of undescribed *Bartonella* have been isolated from this louse (Durden et al. 2004).

***Neohaematopinus sciuropteri* (Osborn)**

Ex *Glaucomys volans* (southern flying squirrel): 3M, 5F, 4N, NC, Haywood Co., Purchase Knob, 20 Oct. 2002, K. Walters, L-3036.

This louse is widely distributed in North America as an ectoparasite of both the northern and southern flying squirrel (Kim et al. 1986, Durden & Musser 1994) but the above record is the first for both North Carolina and the Park. *Neohaematopinus sciuropteri* might be involved with the enzootic transmission of *Rickettsia prowazekii* (Sonenshine et al 1978).

***Neohaematopinus semifasciatus* Ferris**

Ex *Tamiasciurus hudsonicus* (red squirrel): TN, Sevier Co., Greenbrier, 2 Apr. 1931, R. L. Boke (Durden et al. 1997a); 1F, TN, Sevier Co., Clingman's Dome, 17 Jul. 2001, K. Walters, L-3009.

The primary hosts of this louse are *Tamiasciurus douglasii* and *T. hudsonicus* in North America; but it is known to infest several other species of tree squirrels in Panama and Venezuela (Durden & Musser 1994).

***Polyplax auricularis* Kellogg & Ferris**

Ex *Peromyscus maniculatus* (deer mouse): 1N, NC, Haywood Co., Purchase Knob, 20 Oct. 2002, K. Walters, L-3047; 1F, TN, Sevier Co., Walker Prong, 15 Jun. 1953, R. Traub & D. Pfitzer (Durden et al. 1997a); 1M, TN, Sevier Co., Brushy Mount, 7 Apr. 2002, K. Walters, L-3006.

This louse is a widespread ectoparasite of sigmodontine rodents (some species of *Onychomys*, *Peromyscus* and *Reithrodontomys*) in North and Central America (Durden & Musser 1994). *Polyplax auricularis* appears to be more common in northern latitudes or at higher elevations in southern latitudes.

***Polyplax serrata* (Burmeister)—house mouse louse**

Ex *Mus musculus* (house mouse): 1N, TN, Blount Co., Elkmont, 6 Jul. 1937, R.D.V.

The house mouse louse has a cosmopolitan distribution as an ectoparasite of *M. musculus*. *Polyplax ser-rata* is a mechanical vector for the bacterium, *Eperythrozoon coccoides* (Berkenkamp & Wescott 1988).

***Polyplax spinulosa* (Burmeister)—spined rat louse**

Ex *Rattus norvegicus* (Norway rat): 3F, TN, Sevier Co., Little River Rd., 0.8 miles West of Elkmont turnoff, 27 Dec. 2003, K. Langdon, L-3285.

The spined rat louse parasitizes domestic rats (*Rattus* spp.) throughout the world (Durden & Musser 1994) but this is the first record of it from the Park. This louse is vector of *Rickettsia typhi* and *Haemobartonella muris* (Durden 2002, Roberts & Janovy 2000) and might be a vector of “*Bartonella rattimassiliensis*” to rats (Reeves et al 2006a).

Family Pthiridae

***Pthirus pubis* (L.)—crab louse**

Ex *Homo sapiens* (human): 1F, TN, Sevier Co., Sugarlands Visitor Center, 2003, L-3098.

The crab louse has a cosmopolitan distribution as an ectoparasite of humans (Kim et al. 1986, Durden & Musser 1994). The specimen listed above was presented by a Park visitor as something that had bitten her.

Family Menoponidae

All menoponids are ectoparasites of birds (Price et al. 2003).

***Colpocephalum brachysomum* Kellogg & Chapman**

Ex *Bubo virginianus* (great horned owl): 1F, TN, Blount Co., Cades Cove, 1 Apr. 1937, Unknown.

Price et al. (2003) lists *C. brachysomum* as a typical ectoparasite of *B. virginianus*.

***Kurodaia magna* Emerson**

Ex *Strix varia* (barred owl): GSMNP (no other data).

Strix varia is the type host of *K. magna* (Price et al. 2003).

***Menacanthus aurocapillus* Carriker**

Ex *Seiurus motacilla* (Louisiana waterthrush): 2F, TN, Blount Co., Tremont, 3 Aug. 2001 and 3 Jun. 2001, P. Super.

Price et al. (2003) listed *S. motacilla* as a typical host of *Menacanthus aurocapillus*.

***Menacanthus chrysophaeus* (Kellogg)**

Ex *Melospiza melodia* (song sparrow): TN, Blount Co., Cades Cove, 19 Jun. 2001, P. Super.

A subspecies of the song sparrow, *Melospiza melodia samuelis*, is the type host for *M. chrysophaeus* (Price et al. 2003).

***Menacanthus pricei* Wiseman**

Ex *Colinus virginianus* (northern bobwhite): NC, Haywood Co., Big Creek, 25 May 1959, Unknown.

Colinus virginianus is the type host for *M. pricei* (Price et al. 2003) and is infested with this louse in the southeastern USA (Doster et al. 1980).

***Menacanthus stramineus* (Nitzsch)—chicken body louse**

Ex sticky trap below *Gallus gallus* (domestic chicken) roost: NC, Swain Co., Oconaluftee, Frontier Farm, 11 Jun. 2003, W. K. Reeves.

This louse is distributed almost globally on chickens (Emerson 1956, Durden 2002) but this is the first record from the Park.

***Menopon gallinae* (L.)—shaft louse**

Ex *Gallus gallus* (domestic chicken): 1M, NC, Swain Co., Oconaluftee, Frontier Farm, 15 Jul. 2003, W. K. Reeves, L-3092.

Like the previous species, this louse has an almost cosmopolitan distribution (Emerson 1956, Durden 2002), but this appears to be the first record from the Park.

***Myrsidea melanorum* (Kellogg)**

Ex *Pipilo erythrophthalmus* (eastern towhee): NC, Haywood Co., Purchase Knob, 18 Jun. 2002, P. Super.

The eastern towhee is the type and principle host for *M. melanorum* (Price et al. 2003).

***Pseudomenopon pilosum* (Scopoli)**

Ex *Fulica americana* (American coot): TN, Sevier Co., Gatlinburg Trail, 19 Feb. 2006, P. Super.

Pseudomenopon pilosum is a louse of rallids (Price et al. 2003).

Family Philopteridae

All philopterid chewing lice are ectoparasites of birds and some are vectors of filarial nematodes (Seegar et al. 1976).

***Brueelia brunneinucha* Cicchino**

Ex *Dumetella carolinensis* (gray catbird): NC, Haywood Co., Purchase Knob, 10 Jul. 2004, P. Super; NC, Haywood Co., Purchase Knob, 14 May 2005, P. Super; NC, Swain Co., Oconaluftee, 4 Jul. 2001, P. Super.

Price et al. (2003) list eight hosts for *B. brunneinucha* including *D. carolinensis*.

***Brueelia pallidula* (Piaget)**

Ex *Pheucticus ludovicianus* (rose-breasted grossbeak): NC, Haywood Co., Purchase Knob, 23 Jun. 2006, P. Super.

Pheucticus ludovicianus is the type host for *B. pallidula* (Price et al. 2003).

***Brueelia vulgata* (Kellogg)**

Ex *Junco hyemalis* (dark-eyed junco): NC, Haywood Co., Purchase Knob, 16 Jul. 2002, P. Super.

Junco hyemalis is the type host for *B. vulgata* (Price et al. 2003).

***Brueelia* sp.**

Ex *Catharus fuscescens* (veery): NC, Haywood Co., Purchase Knob, 6 Jul. 2002, P. Super.

According to Price et al. (2003), *Brueelia* spp. are not known to parasitize *C. fuscescens*. These specimens represent either stragglers (short-term infestation of an atypical host species) or undescribed species.

***Chelopistes meleagridis* (L.)—large turkey louse**

Ex *Meleagris gallopavo* (wild turkey): TN, Blount Co., Cades Cove, 23 Jun. 2001, P. Super.

The large turkey louse can be common on both domestic and wild turkeys (Durden 2002).

***Cuculicola coccygii* (Osborn)**

Ex *Coccyzus americanus* (yellow-billed cuckoo): TN, Sevier Co., Gatlinburg, 11 Jul. 1963, Unknown.

Coccyzus americanus is the type host for *C. coccygii* (Price et al. 2003).

***Fulicoffula longipila* (Kellogg)**

Ex *Fulica americana* (American coot): TN, Sevier Co., Gatlinburg Trail, 19 Feb. 2006, P. Super.

Fulica americana is the type host of *F. longipila* (Price et al. 2003).

***Oxylipeurus clavatus* (McGregor)**

Ex *Colinus virginianus* (northern bobwhite): NC, Haywood Co., Big Creek, 25 May 1959, Unknown.

Colinus virginianus is the type host for *O. clavatus* (Price et al. 2003).

***Philopterus fuscoventralis* (Osborn)**

Ex *Contopus virens* (eastern wood-pewee): TN, Blount Co., Tremont, 7 Jun. 2002, P. Super.

The eastern wood-pewee is the type host for this louse (Price et al. 2003).

***Philopterus sialli* (Osborn)**

Ex *Sialia sialis* (eastern bluebird) nest box: 2M, 1F, NC, Haywood Co., Purchase Knob, 29 May 2003, W. K. Reeves, L-3076; TN, Blount Co., Cades Cove, 19 Jul. 2001, P. Super.

This louse is a host-specific ectoparasite of the eastern bluebird in North America (Price et al. 2003).

***Philopterus* spp.**

Ex *Cardinalis cardinalis* (Cardinal): NC, Swain Co., Oconaluftee, 14 May 2005, P. Super; TN, Blount Co., 9 Jun. 2001, Tremont P. Super.

Ex *Baeolophus bicolor* (tufted titmouse): TN, Blount Co., Cades Cove, 19 Jun. 2001, P. Super.

Ex *Junco hyemalis* (dark-eyed junco): NC, Haywood Co., Purchase Knob, 3 Jun. 2004, P. Super.

Ex *Thryothorus ludovicianus* (Carolina wren): TN, Blount Co., Tremont, 11 Jul. 2002, P. Super.

According to Price et al. (2003), *Philoaterus* spp. are not known to parasitize these birds. These specimens represent either stragglers (short-term infestation of an atypical host species) or undescribed species. Peters (1928) reported *Philoaterus subflavescens* (Geoffroy) from both *Junco hyemalis* and *Cardinalis cardinalis*, but *Philoaterus subflavescens* was not included in the world checklist by Price et al. (2003).

***Picicola foedus* (Kellogg and Chapman)**

Ex *Sayornis phoebe* (eastern phoebe): TN, Blount Co., Tremont, 7 Jul. 2002, P. Super; TN, Blount Co., Tremont, 19 Jul. 2002, P. Super.

Picicola foedus has been recorded from several species of tyrannid birds in the New World including *Sayornis phoebe* (Price et al. 2003).

***Sturnidoecus simplex* (Kellogg)**

Ex *Turdus migratorius* (American robin): NC, Haywood Co., Purchase Knob, 29 May 2006, P. Super; NC, Haywood Co., Purchase Knob, 14 Apr. 2006, P. Super; NC, Haywood Co., Purchase Knob, 11 Jul. 2006, P. Super

Sturnidoecus simplex is an ectoparasite of the American robin (Price et al. 2003).

Family Ricinidae

All ricinid lice parasitize birds (Durden 2002)

***Ricinus* sp.**

Ex *Junco hyemalis* (dark-eyed junco): NC, Haywood Co., Purchase Knob, 3 Jun. 2004, P. Super.

Junco hyemalis is a host to at least 2 species of *Ricinus* (Price et al. 2003).

***Trochiliphagus lineatus* (Osborn)**

Ex *Archilochus colubris* (ruby-throated hummingbird): NC, Haywood Co., Cataloochee, 6 Jul. 2001, P. Super.

Trochiliphagus lineatus is a host-specific ectoparasite of the ruby-throated hummingbird (Price et al. 2003).

Family Trichodectidae

Trichodectid lice are ectoparasites of mammals including carnivores, hyraxes, rodents, ungulates, and some primates (Lyal 1985).

***Neotrichodectes mephitidis* (Packard)**

Ex *Mephitis mephitis* (striped skunk): NC, Swain Co., Oconaluftee, 25 Nov. 2003, W. K. Reeves; GSMNP (Komarek & Komarek 1938) (as *Neotrichodectes* sp.).

Few skunks have been examined for ectoparasites in the Park. This louse parasitizes both striped and hooded (*Mephitis macroura*) skunks (Price et al. 2003).

***Neotrichodectes minutus* (Paine)**

Ex *Mustela frenata noveboracensis* (long tailed weasel): 4L, TN, Sevier Co., Mt. LeConte, 15 Sep. 1959, P. Huff.

Neotrichodectes minutus is an ectoparasite of both the long tailed weasel and black-footed ferret (*Mustela nigripes*) (Price et al. 2003).

***Neotrichodectes osborni* Keler**

Ex *Spilogale putorius* (eastern spotted skunk): 1M, TN, Sevier Co., unnamed service rd., 20 Dec. 1950, Pfizer and Conaway.

Neotrichodectes osborni is a host-specific ectoparasite of the eastern spotted skunk) (Price et al. 2003).

***Stachiella mustelae* (Schrunk)**

Ex *Mustela nivalis* (least weasel): NC, Jackson Co., Balsam Gap, 24 Jul. 1959, A. L. Atchison.

This louse is host-specific to the least weasel (Price et al. 2003). Balsam Gap is adjacent to the GSMNP on the Blue Ridge Parkway.

***Trichodectes pinguis euarctidos* Hopkins**

Ex *Ursus americanus* (black bear): 1F, TN, Sevier Co., Park Headquarters, 1999, L-2930.

Few black bears in the Park have been examined for ectoparasites, but we assume that this bear-specific louse (Price et al. 2003) is common. This is the first record of this louse from the Park.

***Tricholipeurus lipeuroides* (Mégnin)**

Ex *Odocoileus virginianus* (white-tailed deer): TN, Blount Co., Cade's Cove, 1983–1984 (Hribar et al. 1986).

This louse parasitizes mule deer (*Odocoileus hemionus*) and white-tailed deer in North America (Price et al. 2003). Additional examinations of deer in the Park will determine the abundance of *T. lipeuroides*.

***Tricholipeurus parallelus* (Osborn)**

Ex *Odocoileus virginianus* (white-tailed deer): TN, Blount Co., Cade's Cove, 1983–1984 (Hribar et al. 1986).

The comments stated above for *T. lipeuroides* also apply to this species.

Order Hemiptera—true bugs

Family Cimicidae—bedbugs, batbugs, & birdbugs

***Cimex adjunctus* Barber**

Ex *Myotis lucifugus* (little brown myotis): TN, Blount Co., Abrams Creek shed, 19 Jun. 2002, J. J. Bellwood, L-2923.

This batbug is an ectoparasite of several species of bats mainly in the eastern United States including North Carolina (Usinger 1966). This record appears to be the first for *C. adjunctus* from Tennessee and from the Park. *Cimex adjunctus* might be a vector of a *Bartonella* sp. of bats (Reeves et al. 2005a).

Family Reduviidae—assassin & conenose bugs

***Triatoma sanguisuga* (Le Conte)—eastern conenose bug**

Ex *Homo sapiens* (human): TN, Sevier Co., Twin Creeks, 15 Jun. 2002, I. Stocks, L-3024; TN, Sevier Co., Park Headquarters, 4 May 1994, D. DeFoe

Triatoma or kissing bugs are blood feeding ectoparasites of vertebrates. *Triatoma sanguisuga* feed on rodents, raccoons, opossums, and humans (Ryckman 1986). This bug is a potential vector of *Trypanosoma cruzi*, the agent of Chagas' disease (Beard et al. 1988).

Order Siphonaptera—fleas

Family Ceratophyllidae

***Ceratophyllus gallinae* (Schrank)—chicken flea**

Ex *Peromyscus maniculatus* (deer mouse) nest: 1M, 2F, NC, Haywood Co., Purchase Creek, 23 Jul. 2002, W. K. Reeves, L-3002 (Nelder et al. 2005).

Although the chicken flea has been introduced from Europe to various parts of the world along with its domesticated host, in North America, it is primarily found in the northern United States and the above record represents a significant range extension (Benton 1980, Nelder et al. 2005).

***Ceratophyllus vison* Baker**

Ex *Tamiasciurus hudsonicus* (red squirrel): 1F, TN, Sevier Co., Clingman's Dome, 4 Nov. 2000, E. B. Pivovrun, L-2956; 1M, 3F, TN, Sevier Co., Mount Le Conte, 14 Jun. 2002, K. Walters, L-3048; 1F, TN, Sevier Co., Indian Gap, 1 Oct. 2001, K. Walters.

Ex squirrel nest: 2M, 1F, TN, Sevier Co., Greenbrier, 5 May 1946, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997).

Ex *Tamias striatus* (eastern chipmunk): 1F, NC, Swain Co., Oconaluftee, 5 Jun. 2002, W. K. Reeves, L-2932.

This flea is a relatively host-specific ectoparasite of the red squirrel and it mainly occurs in boreal North America (Durden & Kollars 1997). Nevertheless, it occurs in the Park at higher elevations where the climate and vegetation resemble those of more northern regions. The above record from an eastern chipmunk is atypical.

***Opisodasys pseudarctomys* (Baker)**

Ex *Glaucomys volans* (southern flying squirrel): 1F, NC, Haywood Co., Purchase Knob, 20 Oct. 2002, K. Walters, L-3036.

Although this is a largely boreal flea species associated with sciurids (flying squirrels), there are a few records from southern U.S. states including Tennessee and Florida (Benton 1980, Durden & Kollars 1997). This is the first record of this flea from NC and the Park. Soneshine et al (1978) did not examine *O. pseudarctomys* as a potential vector of the agent of epidemic typhus to flying squirrels, but this flea could be involved with transmission of *Rickettsia*.

***Orchopeas howardi* (Baker)—squirrel flea**

Ex bird nest: 1F, NC, Haywood Co., Purchase Knob, 23 May 2003, W. K. Reeves, L-3071; 1F, NC, Haywood Co., Cataloochee, 3 May 2002, W. K. Reeves, L-2935.

Ex *Sciurus carolinensis* (gray squirrel): TN, Sevier Co., Route 441, 2,000 ft., “Dec.” (Linzey & Linzey 1973, Durden & Kollars, 1997); 2F, TN, Sevier Co., Sugarlands on US 441, 19 Dec. 2005, W.K. Reeves, L-3329.

Ex *Tamiasciurus hudsonicus* (red squirrel): 1F, TN, Sevier Co., Clingman’s Dome, 4 Nov. 2000, E. B. Pivorun, L-2956.

Ex pitfall trap: 1F, TN, Cocke Co., Snakeden Ridge, 4–21 Dec. 2001, Parker, Stocks, Petersen.

Ex squirrel nest: “Many inds.,” TN, Sevier Co., Greenbrier, 5 May 1946, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997).

Orchopeas howardi is a widespread flea associated with Nearctic tree squirrels that is especially common in the eastern United States (Durden & Kollars 1997). As one of the above records indicates, *O. howardi* can infest bird nests. This flea has been implicated in the transmission of *Rickettsia prowazekii* from flying squirrels to humans (Soneshine et al. 1978; Bozeman et al. 1981) and was recently associated with uncultured *Rickettsia* sp. and *Bartonella* sp. genotypes (Reeves et al. 2005b). Durden et al. (2004) reported two additional genotypes of *Bartonella* from this flea.

***Orchopeas leucopus* (Baker)**

Ex *Microtus* sp. (listed as *M. montanus* which might have been *M. gapperi*): 1F, TN, Sevier Co., Mount Le Conte, 12 Apr. 1931, R. L. Boke (Fox 1940, Benton 1980, Durden & Kollars 1997).

Ex *Ochrotomys nuttalli* (golden mouse): TN, Sevier Co., near Cosby, 1964–1966 (Linzey 1968; Linzey & Linzey 1968, Durden & Kollars 1997).

Ex *Peromyscus leucopus* (white-footed mouse): 2F, NC, Swain Co., Oconaluftee, no date given, R. L. Boke (Fox 1940, Benton 1980, Durden & Kollars 1997); 1M, TN, Sevier Co., Greenbrier, 18 Apr. 1931 (Fox 1940, Benton 1980, Durden & Kollars 1997); TN, Sevier Co., Greenbrier, C.C.C. Barracks, 15 May 1949, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997); 8F, TN, Sevier Co., Chilhowee Mountains, Hickman cabin, 16 Oct. 1949, A. C. Cole & D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997); 1F, TN, Blount Co., Abrams Creek, 12 Dec. 2001, E. B. Pivorun, L-3289.

Ex *Peromyscus leucopus* (white-footed mouse) nest: “Many inds.,” TN, Sevier Co., Greenbrier, Hiking Club cabin, 5 May 1946, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997).

Ex *Peromyscus maniculatus* (deer mouse): GSMNP (Linzey & Linzey 1968, Durden & Kollars 1997); 1F,

NC, Haywood Co., Cataloochee, 8 May 2000, E. B. Pivorun, L-2962; 1F, NC, Haywood Co., Purchase Knob, 7 Apr. 2001, E. B. Pivorun, L-2960; 1M, NC, Swain Co., Indian Gap, 7 Apr. 2001, E. B. Pivorun, L-2961; 1M, NC, Haywood Co., Purchase Knob, 12 May 2001, E. B. Pivorun, L-2943; 2F, NC, Haywood Co., Purchase Creek, 12 May 2001, E. B. Pivorun, L-2944; 2F, NC, Haywood Co., Purchase Knob, 20 Nov. 2002, K. Walters, L-3037; 1F, NC, Haywood Co., Cataloochee, 12 May 2001, E. B. Pivorun, L-2945, RML123123; 4F, NC, Haywood Co., Purchase Creek, 13 May 2001, E. B. Pivorun, L-2947; 1F, NC, Haywood Co., Purchase Knob, 15 May 2001, E. B. Pivorun, L-2946; 1F, NC, Haywood Co., Purchase Knob, 21 Apr. 2002, K. Walters, L-2998; 1M, NC, Swain, Oconaluftee, 28 Feb. 2000, E. Pivorun; NC, Swain Co., Mingus Creek, 23 Feb. 2000, E. Pivorun; 1M, 2F, TN, Sevier Co., Chimneys Tops Trail, 2 Jun. 2001, K. Walters, L-2951; 1F, TN, Blount Co., Long Branch, 13 Jan. 2000, E. Pivorun; 1M, TN, Blount Co., Tremont, 9 Jan. 2000, E. Pivorun; 1F, TN, Cocke Co., Snakeden Ridge, 24 Aug. 2002, K. Walters; 1F, TN, Sevier Co., Mt. Le Conte, date not provided, E. B. Pivorun, L-2954; 1M, TN, Sevier Co., Mt. Le Conte, 14 Jun. 2002, K. Walters, L-3044; 1M, 1F, TN, Sevier Co., Goshen Prong, 18 Nov. 2001, K. Walters.

Ex pitfall trap: 1F, NC, Swain Co., Andrews Bald, 3–18 Jul. 2002, Parker, Stocks, Petersen; 1F, TN, Cocke Co., Albright Grove, 24 Aug.–13 Sep. 2002, Parker, Stocks, Petersen; 1F, 1M, TN, Cocke Co., Snakeden Ridge, 4 Oct.–18 Nov. 2002, Parker, Stocks, Petersen; 1M, TN, Cocke Co., Snakeden Ridge, 27 Sep.–16 Oct. 2001, Parker, Stocks, Petersen; 1F, 1M, TN, Sevier Co., Goshen Prong, 15 Oct.–21 Nov. 2001, Parker, Stocks, Petersen; 1F, TN, Sevier Co., Indian Gap, 27 Apr.–10 May 2001, Parker, Stocks, Petersen.

This widely distributed Nearctic flea of *Peromyscus* spp. and *O. nuttalli* (Durden & Kollars 1997) is widespread in the Park. The record from a vole is atypical.

***Orchopeas pennsylvanicus* (Jordan)**

Ex *Neotoma magister* (Allegheny woodrat): 1F, TN, Blount Co., Gregory's Cave, 2 Feb. 2001, E. B. Pivorun, L-2953.

Ex *Neotoma magister* (Allegheny woodrat) nest: 2M, 3F, TN, Blount Co., the Sinks, 17 Oct. 1949, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997).

This flea parasitizes woodrats (*Neotoma*) in the eastern and central United States including Tennessee (Durden & Kollars 1997, Durden et al. 1997b).

Family Ctenophthalmidae

***Catallagia borealis* Ewing**

Ex *Myodes gapperi* (southern red-backed vole): GSMNP (Linzey & Linzey 1968, Durden & Kollars 1997).

This is a vole flea with boreal affinities in North America although its range extends southwards at higher elevations along the Appalachians (Durden & Kollars 1997).

Catallagia new species

Ex *Myodes gapperi* (southern red-backed vole): 3M, NC, Swain Co., Noland Divide, 16 Nov. 2002, K. Walters, L-3038.

This undescribed flea has been collected from voles at high elevations in the Park. It will be described in a separate paper by R. P. Eckerlin (who has collected additional specimens) and L. A. Durden.

***Corrodopsylla curvata* (Rothschild)**

Ex pitfall trap: 2M, TN, Sevier Co., Clingman's Dome, 1–30 Aug. 2002, Parker, Stocks, & Petersen.

Corrodopsylla curvata is primarily a flea of shrews. This is a new Park and state record.

***Ctenophthalmus pseudagyrtus* Baker**

Ex *Blarina brevicauda* (northern short-tailed shrew): 2M, TN, Sevier Co., Goshen Prong, K. Walters, Nov. 2001, L-2984.

Ex *Myodes gapperi* (southern red-backed vole): GSMNP (Linzey & Linzey 1968, Durden & Kollars 1997); 1F, NC, Swain Co., Clingman's Dome, 14 May 2002, K. Walters, L-2996; 1F, TN, Sevier Co., Andrews Bald, 10–12 Sept. 1999, D. Linzey.

Ex *Microtus chrotorrhinus* (rock vole): NC, Swain Co., Kanati Fork, along Route 441, 2800 ft., "Dec." (Linzey & Linzey 1973, Benton 1980); 1F, TN, Sevier Co., Clingman's Dome, 3 Jun. 2001, E. B. Pivorun, L-2950.

Ex *Microtus* sp. (listed as *M. montanus* which may have been *M. gapperi*): 3F, NC, Swain Co., Oconaluftee, 18 Apr. 1931, R. L. Boke (Fox 1940, Benton 1980).

Ex *Ochrotomys nuttalli* (golden mouse): TN, Sevier Co., near Cosby, 1964–1966 (Linzey 1968; Linzey & Linzey 1968, Benton 1980, Durden & Kollars 1997).

Ex *Parascalops breweri* (hairy-tailed mole): 1F, 1M, TN, Blount Co., Tremont, 18 May 2001, P. Super; 1F, TN, Sevier Co., Goshen Prong, 16 Nov. 2001, K. Walters, L-2980.

Ex pitfall trap: 1M, TN, Sevier Co., Twin Creeks, 30 Sep.–5 Nov. 2002, Parker, Stocks, Petersen.

Ex *Rattus norvegicus* (Norway rat): TN, Sevier Co., Little River Rd., 0.8 miles West of Elkmont turnoff, 27 Dec. 2003, K. Langdon, L-3285.

This small-mammal flea is common and widely distributed in the Park and in most eastern U.S. states (Benton 1980, Durden & Kollars 1997).

***Doratopsylla blarinae* Fox**

Ex *Blarina brevicauda* (northern short-tailed shrew): 1F, TN, Sevier Co., Goshen Prong, K. Walters, Nov. 2001, L-2984.

Ex *Ochrotomys nuttalli* (golden mouse): TN, Sevier Co., near Cosby, 1964–1966 (Linzey 1968; Linzey & Linzey 1968, Durden & Kollars 1997).

Host not stated: TN, Sevier Co. (Benton 1980, Durden & Kollars 1997).

This flea is a relatively host-specific ectoparasite of *Blarina* spp., short-tailed shrews, in the eastern United States (Whitaker et al. 1994, Durden & Kollars, 1997). The above record from a golden mouse represents an atypical host.

***Eptedia cavernicola* Traub**

Ex *Neotoma magister* (Allegheny woodrat) nest: 5M, 7F, TN, Blount Co., the Sinks, 17 Oct. 1949, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997).

This nidicolous (nest-associated) flea is a parasite of woodrats in the eastern U.S. and is typically collected during the cooler months (Durden & Kollars 1997, Durden et al. 1997b).

***Eptedia wenmanni* (Rothschild)**

Ex *Blarina brevicauda* (northern short-tailed shrew): 2M, TN, Sevier, Greenbrier, 18 Apr. 1931, R. L. Boke (Fox 1940, Benton 1980, Durden & Kollars 1997); 1F, TN, Sevier Co., Trillium Gap, 27 Oct. 1946, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997); GSMNP (Linzey & Linzey 1968, Durden & Kollars 1997).

Ex *Myodes gapperi* (southern red-backed vole): 1F, NC, Haywood Co., Noland Divide, 22 Apr. 2001, E. B. Pivorun, L-2958; 1F, NC, Haywood Co., Cataloochee, 8 May 2000, E. B. Pivorun, L-2962; 1F, NC, Haywood Co., Purchase Knob, 7 Apr. 2001, E. B. Pivorun, L-2960; 1F, NC, Haywood Co., Purchase Creek, 12 May 2001, E. B. Pivorun, L-2944; 2F, NC, Swain Co., Indian Gap, 2 Jun. 2001, E. B. Pivorun, L-2949; 1M, NC, Swain Co., Indian Gap, E. B. Pivorun, 7 Apr. 2001, L-2961.

Ex *Napaeozapus insignis* (woodland jumping mouse): 1M, NC, Swain Co., Indian Gap, 3 Jun. 2001, E. B. Pivorun, L-2948.

Ex *Ochrotomys nuttalli* (golden mouse): TN, Sevier Co., near Cosby, 1964–1966 (Linzey 1968; Linzey & Linzey 1968, Benton 1980, Durden & Kollars 1997).

Ex *Ochrotomys nuttalli* (golden mouse) nest: 1F, TN, Sevier Co., Greenbrier, 27 Oct. 1946, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997).

Ex *Peromyscus maniculatus* (deer mouse): GSMNP (Linzey & Linzey 1968, Durden & Kollars 1997); 1F, TN, Blount Co., Long Branch, 13 Jan. 2000, E. Pivorun; 4F, 2M, TN, Sevier Co., Goshen Prong, 19 Nov. 2001, K. Walters; 1F, TN, Sevier Co., Little Laurel Branch, 7 Apr. 2000, E. B. Pivorun, L-2959; 1F, TN, Long

Branch, 13 Dec. 2001, E. B. Pivorun, L-3287; 1M, TN, Sevier Co., Mt. Le Conte, 15 Jun. 2002, K. Walters, L-3045. pitfall trap: 1F, NC, Haywood Co., Cataloochee, 15 Mar.–10 May 2003, Parker, Stocks, Petersen; 1F, NC, Haywood Co., Purchase Knob, 1–15 Mar, 2003, Parker, Stocks, Petersen; 1M, TN, Cocke Co., Brushy Mtn., 15–30 Nov. 2000, Parker, Stocks, Petersen; 1F, TN, Cocke Co., Albright Cove, Aug.–Sep. 2001, Parker, Stocks, Petersen, L-2934; 1F, TN, Cocke Co., Albright Gove, 6–19 Nov. 2001, Parker, Stocks, Petersen; 3F, 1M, TN, Cocke Co., Snakeden Ridge, 6 Nov.–21 Dec 2001, Parker, Stocks, Petersen; 1F, TN, Cocke Co., Snakeden Ridge, 1–13 Dec. 2000, Parker, Stocks, Petersen; 1F, TN, Cocke Co., Snakeden Ridge, 17–31 Dec. 2002, Parker, Stocks, Petersen; 1M, TN, Cocke Co., Snakeden Ridge, 6 May–5 Jun. 2002, Parker, Stocks, Petersen; 1M, TN, Cocke Co., Snakeden Ridge, 3–25 Apr. 2001, Parker, Stocks, Petersen; 1F, 1M, TN, Sevier Co., Goshen Prong, 19 Feb.–28 Mar. 2001, Parker, Stocks, Petersen; 4M, TN, Sevier Co., Goshen Prong, 11 Dec. 2000–31 Jan 2001, Parker, Stocks, Petersen; 2M, TN, Sevier Co., Twin Creeks, 18 Feb.–16 Mar. 2001, Parker, Stocks, Petersen.

Ex mouse nest: “many inds.,” TN, Sevier Co., Greenbrier, 5 May 1946, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997); TN, Sevier Co., Greenbrier, 4 Jul. 1946, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997).

Eptedia wenmanni was the most frequently collected flea in the Park; it is widely distributed in the eastern USA (Durden & Kollars 1997).

***Stenoponia americana* (Baker)**

Ex *Peromyscus maniculatus* (deer mouse): 1M, TN, Sevier Co., Greenbrier, 18 Apr. 1931, R. L. Boke (Fox 1940, Benton 1980, Durden & Kollars 1997); GSMNP (Linzey & Linzey 1968, Durden & Kollars 1997).

This large Nearctic flea parasitizes small mammals, especially *Peromyscus* and *Microtus* spp., east of the Great Plains (Lewis 1974).

Family Hystrichopsyllidae

***Hystrichopsylla tahavuaana* Jordan**

Ex shrew nest: 1M, NC, Swain Co., Indian Gap, 25 Jul. 1948, D. W. Pfitzer (Pfitzer 1950, Lewis 1974, Benton 1980, Durden & Kollars 1997).

This relatively large flea parasitizes small mammals (Durden & Kollars 1997). It is most common on insectivores, especially moles, in the northeastern United States and eastern Canada. The GSMNP record and the additional Tennessee records are from high elevations along the Appalachians; the next closest records are from Pennsylvania (Lewis 1974, Benton 1980, Durden & Kollars 1997).

Family Ischnopsyllidae—bat fleas

***Myodopsylla insignis* (Rothschild)**

Ex *Myotis lucifugus* (little brown myotis): 2F, TN, Blount Co., Dry Valley (in cave), 21 Nov. 1949, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997); 23M, 75F, TN, Blount Co., Abram’s Creek, 19 Jun. 2002, TN Tech. Univ. group, L-2922; 3M, 7F, TN, Blount Co., Abram’s Creek, 19 Jun. 2002, TN Tech. Univ. group, L-2923; 2M, 9F, TN, Blount Co., Abram’s Creek, 19 Jun. 2002, TN Tech. Univ. group, L-2924.

Myodopsylla insignis parasitizes the little brown myotis in the eastern USA and other bat species in the western USA (Durden & Kollars 1997).

Family Leptopsyllidae

***Peromyscopsylla catatina* (Jordan)**

Ex *Myodes gapperi* (southern red-backed vole): GSMNP (Linzey & Linzey 1968, Durden & Kollars 1997); 1F, Sevier Co., Mt. Le Conte, 14 Jun. 2002, K. Walters, L-3040; 1M, NC, Swain Co., Indian Gap, 7 Apr. 2001, E. B. Pivorun, L-2955.

Ex *Microtus chrotorrhinus* (rock vole): 1F, TN, Sevier Co., Clingman’s Dome, 3 Jun. 2001, K. Walters, L-

2950; 2M, 2F, TN, Sevier Co., Andrews Bald, 10–12 Sept. 1999, D. Linzey.

Ex *Peromyscus maniculatus* (deer mouse): TN, GSMNP (Johnson & Traub 1954, Durden & Kollars 1997); 1F, TN, Sevier Co., Clingman's Dome, 1 Oct. 2001, K. Walters.

Ex *Synaptomys cooperi* (southern bog lemming): 1F, NC, Swain Co., Andrew's Bald, 9 Sep. 2002, K. Walters, L-2989.

The vole flea is a northern species in the USA that extends its range southwards along the Appalachian mountains (Durden & Kollars 1997). The record from the deer mouse represents an atypical host association.

***Peromyscopsylla hamifer* (Rothschild)**

Ex *Myodes gapperi* (southern red-backed vole): 1M, TN, Sevier Co., Chimney Tops Trail, 13 May 2002, K. Walters, L-2995.

Ex pitfall trap: 1M, TN, Sevier Co., Brushy Mountain, 27 Mar.–11 Apr. 2002, Parker, Stocks Petersen; 1F, TN, Sevier Co., Twin Creeks, 24 Oct.–6 Nov. 2000, Parker, Stocks, Petersen.

Our records of this northern vole-associated flea represent the southern most collection and are both a new Tennessee and new Park record (Benton 1980, Durden & Kollars 1997). While *P. hamifer* is primarily a northern flea, the collection at Twin Creeks was from a low elevation of approximately 724 m.

***Peromyscopsylla hesperomys* (Baker)**

Ex *Peromyscus gossypinus* (cotton mouse): GSMNP (Linzey & Linzey 1968, Durden & Kollars 1997).

Ex *Peromyscus leucopus* (white-footed mouse): 2M, 2F, TN, Sevier Co., Chilhowee Mountains, Hickman Cabin, 9 Aug. 1949, A. C. Cole (Pfitzer 1950, Benton 1980, Durden & Kollars 1997); 1F, TN, Sevier Co., Twin Creeks, 11 Mar. 2002, K. Walters, L-2987; 1M, TN, Sevier Co., Ramsey Cascades, 12 Mar. 2002, K. Walters.

Ex *Peromyscus maniculatus* (deer mouse): TN, GSMNP (Johnson & Traub 1954, Durden & Kollars 1997); GSMNP (Linzey & Linzey 1968, Durden & Kollars 1997); 1F, 1M, TN, Sevier Co., Clingman's Dome, 2 Oct. 2001, K. Walters; 1F, TN, Sevier Co., Heath Bald, 21 Apr. 2001, E. B. Pivorun, L-2957; 2M, TN, Blount Co., Long Branch, 12 Dec. 2001, E. Pivorun, L-3288; 1F, TN, Sevier Co., Little Briar Branch, 5 Feb. 2002, K. Walters, L-3004; 1M, TN, Sevier Co., Goshen Prong, 19 Nov. 2001, K. Walters; 1M, TN, Sevier Co., Trillium Gap, 8 Apr. 2002, K. Walters; 1M, NC, Haywood Co., Purchase Creek, 13 May 2001, E. B. Pivorun, L-2947.

Ex *Peromyscus* nest: 1F, TN, Sevier Co., Greenbrier, 4 Jul. 1946, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997).

This relatively commonly collected flea of *Peromyscus* spp. has a boreal distribution in North America with most southern records being from higher elevations along the Appalachian Mountains (Benton 1980, Durden & Kollars 1997).

***Peromyscopsylla scotti* Fox**

Ex *Peromyscus maniculatus* (deer mouse): 1F, TN, Cocke Co., Snake Den Ridge, 2 Jul. 2001, E. B. Pivorun, L-2952.

Peromyscopsylla scotti, a *Peromyscus*-associated flea is widely distributed in much of eastern North America including Tennessee (Durden & Kollars 1997), but the above record is the first one for the Park.

Family Pulicidae

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

Ex *Sylvilagus floridanus* (eastern cottontail): 3F, GSMNP, 30 Mar. 1931, R. L. Boke (Fox 1940); 4F, TN, Sevier Co., Greenbrier, 1 Apr. 1931, R. L. Boke (Fox 1940); 1F, TN, Blount Co., 20 Nov. 1947, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997).

As indicated by its vernacular name, the rabbit flea mainly parasitizes lagomorphs (Durden & Kollars 1997). This flea also forms short-term associations with predators of lagomorphs, such as foxes and dogs (Durden et al. 2005).

***Ctenocephalides canis* Curtis—dog flea**

Ex *Canis lupus* (domestic dog): 3M, 16F, NC, Haywood Co., Purchase Knob, W. K. Reeves, 31 Jul. 2003, L-3089.

The above record appears to be the first from the Park for this cosmopolitan flea of domestic dogs and some other canids (Durden & Kollars 1997). The dog flea is an intermediate host for the double pored dog tapeworm (Durden & Traub 2002). Parola et al. (2003) reported novel genotypes of *Rickettsia*, from the dog flea.

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

Ex *Felis silvestris* (*catus*) (domestic/feral cat): TN, Blount Co., 23 Nov. 1947, D. W. Pfitzer (Pfitzer 1950, Benton 1980, Durden & Kollars 1997).

Ex *Homo sapiens* (human): TN, Blount Co., near Elkmont, 15 Jan. 2005, M. McCaroll.

Like the previous species, this flea has a cosmopolitan distribution. *Ctenocephalides felis* is more common than *C. canis* in most regions and parasitizes several mammalian species such as cats, dogs, humans, and Virginia opossums (Durden & Kollars 1997). The cat flea is a potential vector or intermediate host of *Acanthocheilonema reconditum*, *Bartonella henselae*, *Bartonella koehlerae*, *Bartonella quintana*, *Dipylidium caninum*, *Rickettsia felis*, *Rickettsia* sp. RF2125, *Rickettsia* sp. RF31, and *Rickettsia typhi* (Durden & Traub 2002; Reeves et al. 2005b; Rolain et al. 2005).

Order Coleoptera—beetles

Family Leptinidae—mammal nest beetles

Leptinus orientamericanus* Peck

Ex *Blarina brevicauda* (short tailed shrew): 3M, 3F, TN: Sevier Co., Indian Gap, 25 Nov. 1999, R. Eckerlan.

Ex *Sorex fumeus* (smoky shrew): 1M, TN, Sevier Co., Brushy Mount, 8 Apr. 2002, K. Walters, L-2983.

This mammal nest beetle lives in the fur and nests of small mammals, especially insectivores, in eastern North America (Peck 1982). The above records are the first for the Park.

Order Diptera—true flies

Blood feeding flies of the Park were reported by Reeves et al. (2004a). Most of these flies are short term ectoparasites that take a blood meal and are not permanently associated with their hosts. For the sake of completeness and to make this checklist useful for parasitologists working in the Park we include only two families of ectoparasites in this checklist.

Family Calliphoridae

***Protocalliphora aenea* Shannon & Dobroscky**

Ex *Sayornis phoebe* (eastern phoebe) nest: 3P, NC, Haywood Co., Cataloochee, 3 May 2002, W. K. Reeves; 1P, NC, Swain Co., Twentymile Creek ranger station, 15 Aug. 2002, W. K. Reeves.

Reeves et al. (2004a) reported *P. aenea* for the first time from the Park and noted the northern distribution of this species.

***Protocalliphora bennetti* Whitworth**

Ex *Sayornis phoebe* (eastern phoebe) nest: 3P, TN, Sevier Co., Twin Creeks, 9 May 2002, W. K. Reeves.

Reeves et al. (2004a) reported *P. bennetti* for the first time from the Park, and noted the range extension for the species.

***Protocalliphora braueri* (Handel)**

ex Malaise trap: 1F, NC, Swain Co., Oconaluftee/Ravensford, 7–13 Apr. 2001, coll. B. Wiegmann & B.K. Cassel.

Ex *Hirundo rustica* (barn swallow) nest: NC, Swain Co., Oconaluftee, 7 Aug. 2002, coll. W. K. Reeves. Reeves et al. (2004a) reported *P. braueri* from the Park. Unlike most other *Protocalliphora* this species regularly causes subcutaneous infestations in nestling birds (Sabrosky et al. 1989).

***Protocalliphora deceptor* Sabrosky, Bennett, & Whitworth**

Ex *Hylocichla mustelina* (wood thrush) nest: 3F, TN, Sevier Co., Twin Creeks, 24 Jun. 1996, coll. G. W. Farnsworth.

These adult *P. deceptor* were reared from pupae; the specimens are in the Park museum.

***Protocalliphora sialia* Shannon & Dobrosky**

Ex *Sialia sialis* (eastern bluebird) nest: 9P, NC, Haywood Co., Purchase Knob, 23 Jul. 2002, W. K. Reeves.

Ex *Turdus migratorius* (American robin) nest: 1P, Swain Co., Smokemont sewage treatment building, 22 Aug. 2002, W. K. Reeves.

Reeves et al. (2004a) reported *P. sialia* from the Park.

Family Hippoboscidae—louse flies/flat flies/keds

***Icosta americana* (Leach)**

Ex *Bubo virginianus* (great horned owl): 1F, NC, Swain Co., Big Cove, 23 Sep. 1943, A. Stupka; 1F, TN, Sevier Co., Dudley Creek, 1 Sep. 1943, A. Stupka; 1F, TN, Sevier Co., Elkmont, 12 Mar. 1940, A. Stupka (Reeves et al. 2004a).

Ex *Otus asio* (eastern screech-owl): 1F, Park Headquarters, 26 Mar. 1976, D. DeFoe (Reeves et al. 2004a).

Ex *Homo sapiens* (human): NC, Swain Co., Lakeshore Trail, 28 Jun., 2005, P. Super.

Icosta americana was previously reported by Reeves et al. (2004a), and it typically infests accipitrid, phasianid, and strigid birds.

***Ornithoica vicina* (Walker)**

Ex *Carpodacus mexicanus* (house finch): 1M, NC, Swain Co., near Oconaluftee River, 25 Jun. 2001, P. Super (Reeves et al. 2004a).

Ex *Junco hyemalis* (dark-eyed junco): NC, Haywood Co., Purchase Knob, 24 Jul. 2000, P. Super; NC, Gregory's Bald, 23 Jul. 2001, P. Super (Reeves et al. 2004a).

Ex *Melospiza melodia* (song sparrow): NC, Haywood Co., Purchase Knob, 1 Aug. 2002, P. Super (Reeves et al. 2004a); NC, Swain Co., Oconaluftee, 6 Jul. 2005, P. Super.

Ornithoica vicina is the smallest hippoboscid reported from the Park (Reeves et al. 2004a).

***Ornithomyia anchineuria* Speiser**

Ex *Bombycilla cedrorum* (cedar waxwing): NC, Haywood Co., Purchase Knob, 23 Jun. 2005, P. Super.

Ex *Certhia americana* (brown creeper): NC, Swain Co., Indian Gap, 5 Aug. 2005, P. Super.

Ex *Carpodacus mexicanus* (house finch): NC: Swain Co., near Oconaluftee River, 25 Jun. 2001, P. Super (Reeves et al. 2004a).

Ex *Junco hyemalis* (dark-eyed junco): NC, Haywood Co., Purchase Knob, 5 Jul. 2002, P. Super; NC, Swain Co., Newfound Gap, 15 Jun. 2000, P. Super; TN, Blount Co., Gregory's Bald, 23 Jul. 2001, P. Super (Reeves et al. 2004a).

Ex *Melospiza melodia* (song sparrow): NC, Haywood Co., Purchase Knob, 8 Jul. 2002, P. Super (Reeves et al. 2004a).

Ex *Pipilio erythrophthalmus* (eastern towhee): NC, Haywood Co., Purchase Knob, 8 Jul. 2002, P. Super (Reeves et al. 2004a).

Ex *Sayornis phoebe* (eastern phoebe): NC, Haywood Co., Purchase Knob, 23 Jun. 2002 and 26 Jun. 2002, P. Super (Reeves et al. 2004a).

Ex *Sturnus vulgaris* (European starling): NC, Swain Co., Oconaluftee, 11 Jul. 2006, P. Super

Ex *Thryothorus ludovicianus* (Carolina wren): NC, Swain Co., Newfound Gap, 16 Jul. 2002, P. Super (Reeves et al. 2004a).

Ex *Turdus migratorius* (American robin): TN, Tremont Institute, 26 May 2001 and 6 Jun. 2001, P. Super (Reeves et al. 2004a).

Ornithomyia anchineuria and *Ornithomyia bequaerti* Maa are members of a cryptic species complex previously reported from a wide variety of bird in the Park (Reeves et al. 2004a).

***Ornithomyia bequaerti* Maa**

Ex *Carpodacus mexicanus* (house finch): NC, Swain Co., near Oconaluftee River, 25 Jun. 2001, P. Super (Reeves et al. 2004a).

Ex *Hylocichla mustelina* (wood thrush): TN, Blount Co., Tremont Institute, 19 Jun. 2002, P. Super (Reeves et al. 2004a).

Ex *Melospiza melodia* (song sparrow): NC, Haywood Co., Purchase Knob, 18 Jul. 2002, P. Super (Reeves et al. 2004a).

Ornithomyia bequaerti and *Ornithomyia anchineuria* are members of a cryptic species complex previously reported from a wide variety of bird in the Park (Reeves et al. 2004a).

Class Arachnida

Subclass Acari—mites and ticks

Family Acaridae

Rhizoglyphus sp.*

Ex *Felis silvestris* (domestic/feral cat): 1DN, NC, Swain Co., 16 Aug. 2002, W. K. Reeves, L-3007.

A deutonymph of an unidentified *Rhizoglyphus* sp. was found attached to the hair of a feral cat in the Park. *Rhizoglyphus* sp. are not typically considered ectoparasites and this association could be accidental. Fain & Beaucournu (1972) reported *Rhizoglyphus* as phoretic parasites of fleas from moles in Europe.

Family Analgidae—analgid feather mites

Analges n. spp.

Ex *Carduelis tristis* (American goldfinch): TN, Blount Co., Cades Cove, 23 Jun. 2006, P. Super.

Ex *Certhia americana* (brown creeper): TN, Sevier Co., Newfound Gap, 24 Apr. 2002, P. Super.

Ex *Hylocichla mustelina* (wood thrush): TN, Blount Co., Tremont, 19 Jun. 2002, P. Super.

Ex *Melospiza melodia* (song sparrow): TN, Blount Co., Cades Cove, 19 Jun. 2001, P. Super.

Several new species of *Analges* were collected in the Park. These mites live on the downy feathers of birds.

Family Cheyletidae

Cheyletus eruditus (Shrank)*

Ex *Sciurus carolinensis* (gray squirrel): 1F, TN, Sevier Co., Sugarlands on US 441, 19 Dec. 2005, W.K. Reeves, L-3329

Cheyletus eruditus is a predatory mite that commonly occurs in house dust and stored food products. It can infest mammals and probably feeds on other small arthropods mainly in mammal fur and nests (Whitaker & Wilson 1974, Nutting 1985, McGarry 1989).

Family Demodicidae—follicle mites

Demodicidae live in sebaceous glands and hair follicles of mammals (Nutting 1985). The species diversity

for the Park is poorly represented by the two species below.

***Demodex phylloides* Czokor**

Ex *Sus scrofa* (feral hog): NC, Swain Co. 1979–1980 (Smith et al. 1982).

Demodex phylloides is a host specific parasite of hogs and can cause skin lesions (Nutting 1976, 1985)

Demodex folliculorum (Simon)

Ex *Homo sapiens* (human): NC, Swain Co., Oconaluftee Visitor Center, 3 Jan. 2002, W. K. Reeves, L-3025.

Demodex folliculorum is one of two species of *Demodex* of humans.

Family Dermanyssidae

***Dermanyssus gallinae* (DeGeer)—chicken mite**

Ex *Gallus gallus* (domestic chicken): 1F, NC, Swain Co., Oconaluftee, Frontier Farm, 15 Jul. 2003, W. K. Reeves, L-3092.

The chicken mite is a blood-feeding parasite of birds that will also feed on small mammals and humans (Whitaker & Wilson 1974, Kwochka 1987).

***Dermanyssus hirundinis* (Hermann)**

Ex *Hirundo rustica* (barn swallow) nest: “Several,” NC, Swain Co., Oconaluftee, 7 Aug. 2002, W. K. Reeves, L-2991.

Ex *Hirundo rustica* (barn swallow): NC, Haywood Co., Oconaluftee, Purchase Knob, 23 Apr. 2006, P. A. Super.

Dermanyssus hirundinis infests a wide variety of birds in North America and will also infest human habitations (Moss et al. 1970).

***Dermanyssus prognephilus* Ewing**

Ex *Sialia sialis* (eastern bluebird) nestbox: ~50 F and N, NC, Haywood Co., Purchase Knob, 29 May 2003, W. K. Reeves, L-3076.

Dermanyssus prognephilus is a nest dwelling ectoparasite of birds.

Family Glycyphagidae—glycyphagid fur mites*

***Glycyphagus hypudaei* (Koch)**

Ex *Blarina brevicauda* (northern short-tailed shrew): 1DN, TN, Sevier Co., Fish Camp Prong, 18 Nov. 2001, K. Walters, L-2985.

Ex *Myodes gapperi* (southern red-backed vole): 10DN, NC, Swain Co., Noland Divide, 16 Nov. 2002, K. Walters, L-3038; 20 DN, NC, Swain Co., Clingman’s Dome, 14 May 2002, L-2996; 1DN, NC, Swain Co., Clingman’s Dome, 16 Nov. 2002, K. Walters, L-3041; 12 DN, NC, Swain Co., Indian Gap, 3 Jun. 2001, E. B. Pivorun, L-2975; 19 DN, TN, Sevier Co., Brushy Mount, 9 Apr. 2002, K. Walters, L-2993; 3DN, TN, Sevier Co., Chimney Tops Trail, 13 May 2002, K. Walters, L-2995.

Ex *Microtus chrotorrhinus* (rock vole): 3DN, TN, Sevier Co., Clingman’s Dome, 16 Nov. 2002, K. Walters, L-3039.

Ex *Peromyscus leucopus* (white-footed mouse): 1DN, TN, Sevier Co., Twin Creeks, 11 Mar. 2002, K. Walters, L-2987.

Ex *Peromyscus maniculatus* (deer mouse): 1DN, NC, Haywood Co., Purchase Knob, 20 Nov. 2001, K. Walters, L-2998; 1DN, NC, Haywood Co., Purchase Knob, 20 Nov. 2002, K. Walters, L-3037.

Ex *Rattus norvegicus* (Norway rat): 1DN, TN, Sevier Co., Elkmont, 27 Dec. 2003, K. Langdon.

Ex *Sorex cinereus* (masked shrew): 1 DN, NC, Swain Co., Clingman’s Dome, 16 Nov. 2002, K. Walters, L-3033; 1DN, NC, Swain Co., Noland Divide Trail, 16 Nov. 2002, K. Walters, L-3042.

Deutonymphs of *G. hypudaei* have been collected from the hair and fur of rodents throughout the Nearctic region (Fain & Whitaker 1973, Whitaker & Wilson 1974). The records from *Sorex* are unusual and might rep-

resent contaminants if rodent traps were not washed prior to resetting.

***Glycyphagus* sp.**

Ex *Ochrotomys nuttalli* (golden mouse): TN, Sevier Co., near Cosby, 1964-1966 (Linzey 1968; Linzey & Linzey 1968).

Phoretic hypopi of *Glycyphagus* were reported as *Labidophorus* by Linzey (1968) and Linzey & Linzey (1968). The family Labidophoridae was synonymized with Glycyphagidae.

***Marsupialichus brasiliensis* Fain**

Ex *Didelphis virginiana* (Virginia opossum): 2DN (hypopus), TN, Cocke Co., Cosby, 10 Jan. 2003, W. K. Reeves, L-3049.

Marsupialichus brasiliensis is host specific to *Didelphis* spp. and in North America they infest *D. virginiana* (Fain & Whitaker 1973, Whitaker & Wilson 1974)

***Orycteroxenus canadensis* Fain, Kok, Lukoschus, & Clulow**

Ex *Mus musculus* (house mouse): 1DN, TN, Blount Co., 6 Jul. 1937.

Orycteroxenus canadensis is primarily an ectoparasite of the star-nosed mole and this record could indicate some cross contamination or is a rare association. The mite was removed from the hair of a museum specimen collected in the 1930s. The history of this animal is not known.

***Orycteroxenus soricis* (Oudemans)**

Ex *Microtus chrotorrhinus* (rock vole): 1DN, TN, Sevier Co., Clingman's Dome, 16 Nov. 2002, K. Walters, L-3039.

Ex *Sorex cinereus* (masked shrew): 1DN, NC, Swain Co., Noland Divide Trail, 16 Nov. 2002, K. Walters, L-3042.

Orycteroxenus soricis has been reported to infest insectivores and some voles (Fain & Whitaker 1973, Whitaker & Wilson 1974).

Family Ixodidae - hard ticks

***Amblyomma americanum* (L.) - lone star tick**

Ex *Carpodacus mexicanus* (house finch): 6L, NC, Swain Co., Oconaluftee, 25 Jun. 2001, P. Super, L-2967.

Ex *Procyon lotor* (raccoon): 2L, GSMNP, 28 Sep. 1986, R. Thompson, RML119896; 1N, 2L, GSMNP, 4 Sep. 1988, R. Thompson, RML119894; 1N, 2L, GSMNP, 4 Sep. 1988, R. Thompson, RML119895; 5N, 3L, GSMNP, date not given, R. Thompson, RML119899.

The lone star tick is common and widespread in the eastern United States and occurs as far north as Maine (Keirans & Lacombe 1998). However, the relatively small number of records from the Park suggests that it is not common there. Immature ticks parasitize a variety of birds and mammals whereas adults typically parasitize larger mammals including humans (Bishopp & Trembley 1945, Strickland et al. 1976, Durden & Kollars 1992). This tick is a vector of *Ehrlichia chaffeensis*, *Ehrlichia ewingii*, *Rickettsia* spp., *Coxiella burnetii*, and "*Borrelia lonestarii*" a putative agent of southern tick associated rash illness (STARI) also known as "Lyme-like disease" (Childs & Paddock 2003). A new *Ehrlichia* sp., similar to the agent of heartwater, was recently reported from *A. americanum* in Georgia (Loftis et al. 2006).

***Dermacentor albipictus* (Packard)—winter tick**

Ex *Cervus elaphus* (elk) (re-introduced): 14N, NC, Haywood Co., Cataloochee, 9 Jan. 2003, W. K. Reeves, L-3020, RML123523.

This one-host tick primarily parasitizes large ungulates especially during the cooler months (Strickland et al. 1976) as reflected by its vernacular name. *Dermacentor albipictus* is widespread in North America (Bishopp & Trembley 1945) and probably parasitizes white-tailed deer in the Park.

***Dermacentor variabilis* (Say)—American dog tick**

Ex *Canis rufus* (red wolf—introduced): 1F, TN, Sevier Co., Sugarland Mountain, 25 Jul. 1997, R. D. Keller, RML122539; 2M, TN, Sevier Co., Sugarland Mountain, 7 May 1998, R. D. Keller, RML122662; 16M, 4F,

TN, Sevier Co., Sugarland Mountain, 15 May 1998, R. D. Keller, RML122664.

Ex *Myodes gapperi* (northern red-backed vole): 1N, TN, Sevier Co., 30 Sep. 2001, K. Walters.

Ex *Equus caballus* (horse): 1F, NC, Swain Co., Deep Creek horse stable, 23 May 2001, W. K. Reeves.

Ex *Homo sapiens* (human): 1F, NC, Swain Co., Payne Creek, 8 Jul. 2001, W. K. Reeves, L-2963; 1M, 1F, NC, Swain Co., 20 Mile Ranger Stn., 8 Jul. 2001, W. K. Reeves, L-2964; 1M, NC, Swain Co., Sweet Branch, 8 Jul. 2001, W. K. Reeves, L-2965, 1F, TN, Blount Co., Cade's Cove, 25 May 2001, W. K. Reeves;

Ex *Procyon lotor* (raccoon): TN, Blount Co., Cades Cove, 1979-1980 (Rabinowitz et al. 1983); 1M, 1F, GSMNP, 18 Aug. 1988, R. Thompson, RML119897; 5N, 3L, GSMNP, date not given, R. Thompson.

Ex *Lama glama* (lama) (introduced): 1F, TN, Blount Co., Cade's Cove, 4 Aug. 2003, W. K. Reeves, L-3099.

Ex *Marmota monax* (woodchuck): 1F, NC, Swain Co., Smokemont, 22 Aug. 2002, W. K. Reeves, L-2988.

Ex *Ochrotomys nuttalli* (golden mouse): TN, Sevier Co., near Cosby, D. W. Linzey, 1964-1966 (Linzey 1968, Linzey & Linzey 1968).

Ex *Peromyscus leucopus* (white-footed mouse): 1L, TN, Sevier Co., Sugarland Mountain, 26 May 1997, R. D. Keller; 1L, TN, Sevier Co., Sugarland Mountain, 29 May 1997, R. D. Keller; 1N, TN, Sevier Co., Sugarland Mountain, 29 May 1997, R. D. Keller; 1L, TN, Sevier Co., Sugarland Mountain, 30 May 1997, R. D. Keller; 1N, TN, Sevier Co., Sugarland Mountain, 3 Jun. 1997, R. D. Keller; 1N, TN, Sevier Co., Sugarland Mountain, 13 Jun. 1997, R. D. Keller; 1N, TN, Sevier Co., Sugarland Mountain, 15 Jun. 1997, R. D. Keller; 1N, TN, Sevier Co., Sugarland Mountain, 18 Jul. 1997, R. D. Keller; 1N, TN, Sevier Co., Sugarland Mountain, 21 Jul. 1997, R. D. Keller; 1N, TN, Sevier Co., Sugarland Mountain, 21 Jul. 1997, R. D. Keller; 1N, TN, Sevier Co., Sugarland Mountain, 23 Jul. 1997, R. D. Keller; 1N, TN, Sevier Co., Sugarland Mountain, 23 Jul. 1997, R. D. Keller; 3N, TN, Sevier Co., Sugarland Mountain, 23 Jul. 1997, R. D. Keller, RML 122540; 4N, TN, Sevier Co., Sugarland Mountain, 2 Aug. 1997, R. D. Keller.

Ex *Peromyscus maniculatus* (deer mouse): 1L, NC, Haywood Co., Cataloochee, 12 May 2001, E. B. Pivorun, L-2945, RML123123; 1L, NC, Haywood Co., Purchase Creek, 12 May 2001, E. Pivorun, L-2944, RML123124.

Ex *Sus scrofa* (feral hog): 1F, TN, Sevier Co., Sugarland Mountain, 15 Apr. 1998, R. D. Keller, RML 122663.

Ex *Synaptomys cooperi* (southern bog lemming): 1N, 4L, GSMNP, 2001, R. P. Eckerlin, L- 2976, M-Scoop-2-2001; 2L, GSMNP, 2001, R. P. Eckerlin, L- 2977, M-Scoop-1-2001.

Dermacentor variabilis was the most frequently collected tick in the Park. Immature stages mainly parasitize small mammals whereas adults parasitize larger mammals including humans, dogs, raccoons, and opossums (Durden & Kollars 1992). *Dermacentor variabilis* is the principal vector of the agent of Rocky Mountain spotted fever (*Rickettsia rickettsii*) in eastern North America and toxins released by certain individual attached females can cause tick paralysis especially in dogs and humans (Strickland et al. 1976, Durden & Kollars 1992).

***Haemaphysalis leporispalustris* (Packard)—rabbit tick**

Ex *Melospiza melodia* (song sparrow): 4L, NC, Swain Co., Oconaluftee, 7 Aug. 2002, W. K. Reeves, L-2992; 6N, 6L, NC, Swain Co., Oconaluftee, 13 Jul. 2004, P. Super, L-3295.

Ex *Passerina cyanea* (indigo bunting): 1L, TN, Blount Co., Cade's Cove, 1 Aug. 2000, P. Super, RML123068.

Ex *Sylvilagus floridanus* (eastern cottontail): GSMNP (Komarek & Komarek 1938); 1M, 3F, 2N, TN, Blount Co., 27 Feb. 1938, W. W. Stanley, RML14018.

Ex *Thryothorus ludovicianus* (Carolina wren): 4N, Sugarland, 4 Jul. 2001, P. Super, L-2966.

This tick is widely distributed in North America and there are records of it from across Tennessee (Durden & Kollars 1992). Adult rabbit ticks typically parasitize rabbits whereas larvae and nymphs parasitize birds and rabbits (Durden & Kollars 1992).

***Ixodes angustus* Neumann**

Ex *Blarina brevicauda* (northern short-tailed shrew): 2F, TN, Sevier Co., Chimneys Picnic Area, 19 May 1951, R. Traub & D. Pfitzer, RML30234; 2L, TN, Sevier Co., Chimneys Picnic Area, 4 Oct. 1953, P. T. Johnson & M. L. Morrow, RML118622; 2L, GSMNP, 5 Oct. 1953, P. T. Johnson, M. L. Morrow & G. Rust, RML66123; 2L, TN, Sevier Co., Goshen Prong, K. Walters, Nov. 2001, L-2984.

Ex *Myodes gapperi* (northern red-backed vole): GSMNP (Linzey & Linzey 1968); 1N, 1L, NC, Swain Co., Indian Gap, 31 May 2001, E. B. Pivorun, L-2974; 1N, TN, Sevier Co., Heath Bald on the Chimney Tops Trail, 3 Jun. 2001, E. B. Pivorun; 4N, TN, Sevier Co., Brushy Mount, 9 Apr. 2002, E. B. Pivorun, L-2993; 1F, 1N, TN, Sevier Co., near Chimney Tops Trail, 12 May 2002, E. B. Pivorun, L-2971.

Ex *Parascalops breweri* (hairy-tailed mole): 1N, TN, Sevier Co., Goshen Prong, 16 Nov. 2001, K. Walters, L-2980.

Ex *Peromyscus leucopus* (white-footed mouse): 1F, 2N, NC, Haywood Co., Cataloochee, 21 Apr. 2002, E. B. Pivorun, L-2978.

Ex *Peromyscus maniculatus* (deer mouse): 1F, NC, Haywood Co., Purchase Knob, 9 Apr. 2002, E. B. Pivorun; 1F, NC, Haywood Co., Purchase Knob, 19 Apr. 2002, E. B. Pivorun, L-2968; 1N, NC, Haywood Co., Purchase Knob, 20 Apr. 2002, E. B. Pivorun, L-2969; 1N, TN, Sevier Co., Chimney Tops Trail, 12 May 2002, E. B. Pivorun, L-2926; 1F, TN, Cocke Co., Snake Den Ridge, 24 Aug. 2002, K. Walters, L-2997; 1N, TN, Sevier Co., Heath Bald, 15 Jul. 2001, E. B. Pivorun; 1N, TN, Sevier Co., Chimney Tops Trail, 15 Jul. 2001, E. B. Pivorun, L-2970.

Ex *Sorex cinereus* (masked shrew): 2L, NC, Swain Co., Indian Gap, 12 May 2002, K. Walters, L-2982.

Ex *Synaptomys cooperi* (southern bog lemming): 1L, NC, Swain Co., Andrew's Bald, 9 Sep. 2002, K. Walters, L-2989; 1F, TN, Sevier Co., Greenbrier, 4 Apr. 1931, R. L. Boke.

This is a commonly collected tick in the Park that primarily parasitizes small mammals in moist or montane habitats (Robbins & Keirans 1992). All of the southern U.S. records are from higher elevations in the Appalachians. This tick might be an enzootic vector of *Borrelia burgdorferi*, the Lyme disease agent (Durden & Keirans 1996).

***Ixodes brunneus* Koch**

Ex *Melospiza melodia* (song sparrow): 1F, NC, Haywood Co., Cataloochee, 19 Apr. 2004, P. Super.

This tick is exclusively a parasite of birds. This is the first record for the park. Goddard et al. (2003) reported evidence of both *Rickettsia* and ehrlichiae from *I. brunneus*.

***Ixodes cookei* Packard**

Ex *Canis lupus* (domestic dog): 2F, NC, Haywood Co., Purchase Knob, W. K. Reeves, 31 Jul. 2003, L-3089.

Ex *Canis rufus* (red wolf—introduced): 2N, TN, Sevier Co., Sugarland Mountain, 25 Jul. 1997, R. D. Keller, RML122539;

Ex *Marmota monax* (woodchuck): 1L, NC, Swain Co., Smokemont, 22 Aug. 2002, W. K. Reeves, L-2988.

Ex *Procyon lotor* (raccoon): 3F, TN, Blount Co., Cades Cove, 1979, V. Major & A. Rabinowitz, RML64584; TN, Blount Co., Cades Cove, 1979-1980 (Rabinowitz et al. 1983); 1N, GSMNP, 28 Sep. 1986, R. Thompson, RML119896; 2F, 8N, 1L, GSMNP, 26 Feb. 1987, R. Thompson, RML119898; 3N, GSMNP, 4 Sep. 1988, R. Thompson, RML119894; 1N, 1L, GSMNP, 4 Sep. 1988, R. Thompson, RML119895; 3N, GSMNP, date not given, R. Thompson, RML119899.

This tick mainly parasitizes carnivores such as raccoons, foxes, and mustelids across North America (Bishop & Trembley 1945, Durden & Keirans 1996). *Ixodes cookei* is a vector of Powassan encephalitis virus in the northeastern US (Main et al. 1979), but the vector potential of this tick and status of the virus in the GSMNP has not been studied.

***Ixodes dentatus* Marx**

Ex *Zonotrichia albicollis* (white throated sparrow): 1 L, NC, Haywood Co., Purchase Knob, 28 Oct. 2006, P.

Super, L-3371.

Ixodes dentatus is primarily known as a rabbit tick but the larvae feed on birds and other small mammals. *Ixodes dentatus* has been associated with *Borrelia burgdorferi* the agent of Lyme disease, *Anaplasma phagocytophilum* an agent of human granulocytic anaplasmosis, and *Babesia divergens* the agent of European red-water (Anderson et al. 1996, Goethert & Telford 2003 a,b).

***Ixodes marxi* Banks**

Ex *Glaucomys volans* (southern flying squirrel): 6L, TN, Sevier Co., Trillium Gap, 9 Apr. 2002, K. Walters, L-2936.

Ex *Tamiasciurus hudsonicus* (red squirrel): 2F, NC, Swain Co., Ravensford, 4 Jul. 2002, W. K. Reeves, L-2925.

This tick parasitizes sciurid rodents in eastern North America (Bishopp & Trembley 1945, Durden & Keirans 1996). There are few records from the southern United States and the above records represent the first ones for Tennessee and the Park.

***Ixodes scapularis* Say—blacklegged tick**

Ex *Terrapene carolina* (eastern box turtle): 1N, NC, Swain Co., 20 Mile Creek Ranger Stn., 15 Aug. 2002, W. K. Reeves, L-2942.

The blacklegged tick is widespread in eastern North America (Strickland et al. 1976, Dennis et al. 1998). It is not common at high elevations which might explain the apparent rarity in the Park. Immature stages of this tick typically feed on reptiles (mainly lizards), birds, and small mammals, whereas adults feed on larger mammals such as white-tailed deer, raccoons, humans, and feral hogs (Durden & Oliver 1999, Durden et al. 2002). All stages can also feed on humans and this tick is the principal vector of *Borrelia burgdorferi* the agent of Lyme disease, *Anaplasma phagocytophilum* an agent of human granulocytic anaplasmosis, and *Babesia* spp. in many parts of eastern North America (Durden & Keirans 1996). The collection of a nymph from a box turtle represents the first record of *I. scapularis* from this host. This tick has not been reported from white-tailed deer in the Park but adults should be present in the cooler months.

***Ixodes texanus* Banks—raccoon tick**

Ex *Procyon lotor* (raccoon): TN, Blount Co., Cades Cove, 1979-1980 (Rabinowitz et al. 1983); 1F, GSMNP, 18 Aug. 1988, R. Thompson, RML119897.

This tick parasitizes carnivores, especially the raccoon, across North America (Durden & Keirans 1996). *Rickettsia rickettsii*, the agent of Rocky Mountain spotted fever, has been isolated from *I. texanus* (Anderson et al. 1986).

***Ixodes* sp.**

Ex *Didelphis virginiana* (opossum): LL, GSMNP (Komarek & Komarek 1938).

Ex *Mephitis mephitis* (striped skunk): GSMNP (Komarek & Komarek 1938).

Ex *Microtus chrotorrhinus* (rock vole): GSMNP (Linzey & Linzey 1968).

Ex *Neotoma magister* (Allegheny woodrat): 1N, TN, Blount Co., the Sinks, 21 May 1951, R. Traub & D. W. Pfitzer, RML31648 (specimen not in vial—if located, it could be identified to species).

Ex *Procyon lotor* (raccoon): GSMNP (Komarek & Komarek 1938).

These ticks were not identified beyond genus in the various reports cited above so no more can be stated about these records.

Family Laelapidae

***Androlaelaps casalis* (Berlese)**

Ex *Ochrotomys nuttalli* (golden mouse): TN, Sevier Co., near Cosby, 1964-1966 (Linzey 1968; Linzey & Linzey 1968).

Androlaelaps casalis is a facultative ectoparasite of Nearctic mammals (Whitaker & Wilson 1974, Radovsky 1985).

***Androlaelaps fahrenheiti* (Berlese)**

Ex *Blarina brevicauda* (northern short-tailed shrew): 1F, TN, Sevier Co., Goshen Prong, Nov. 2001, L-2984; 1F, TN, Sevier Co., Fish Camp Prong, 18 Nov. 2001, L-2985.

Ex *Myodes gapperi* (southern red-backed vole): 1F, NC, Swain Co., Indian Gap, 3 Jun. 2001, E. B. Pivron, L-2975.

Ex *Marmota monax* (woodchuck): ~70 M/F, NC, Swain Co., Smokemont, 22 Aug. 2002, W. K. Reeves, L-2988.

Ex *Parascalops breweri* (hairy-tailed mole): 1F, TN, Sevier Co., Goshen Prong, 16 Nov. 2001, K. Walters, L-2980.

Ex *Peromyscus maniculatus* (deer mouse): 1PN, NC, Haywood Co., Purchase Knob, 20 Nov. 2002, K. Walters, L-3037; 1F, TN, Sevier Co., Goshen Prong, 20 Nov. 2001, K. Walters, L-3000; 1F, TN, Sevier Co., Little Briar Branch, 5 Feb. 2002, K. Walters, L-3004; 1F, TN, Sevier Co., Twin Creeks, 10 Mar. 2002, K. Walters, L-3005.

Ex *Ochrotomys nuttalli* (golden mouse): TN, Sevier Co., near Cosby, 1964-1966 (as *A. glasgowi*) (Linzey 1968; Linzey & Linzey 1968).

Ex *Sorex cinereus* (masked shrew): 1F, NC, Swain Co., Clingman's Dome, 16 Nov. 2002, K. Walters, L-3033.

Ex *Synaptomys cooperi* (southern bog lemming): GSMNP (Linzey & Linzey 1968, 1973).

Androlaelaps fahrenheiti is a facultative ectoparasite of Nearctic mammals but unlike the previous species it seems more commonly collected in the Park (Whitaker & Wilson 1974, Radovsky 1985).

***Echinonyssus talpae* (Zemskaya)**

Ex *Parascalops breweri* (hairy-tailed mole): 1F, TN, Sevier Co., Goshen Prong, 16 Nov. 2001, K. Walters, L-2980.

This mite was primarily collected from insectivores in North America (Whitaker & Wilson 1974).

***Eulaelaps stabularis* (Koch)**

Ex *Ochrotomys nuttalli* (golden mouse): TN, Sevier Co., near Cosby, 1964-1966 (Linzey 1968; Linzey & Linzey 1968).

Eulaelaps stabularis parasitizes numerous mammals, especially rodents, in North America (Whitaker & Wilson 1974).

***Eulaelaps* sp.**

Ex *Cervus elaphus* (elk) (introduced): 1F, NC, Haywood Co., Cataloochee, 9 Jan. 2003, W. K. Reeves, L-3020.

Eulaelaps spp. are generally not associated with elk and this is an unusual host association. Some *Eulaelaps* live preys on other small arthropods and could have been hitchhiking on the elk.

***Haemogamasus longitarsus* (Banks)**

Ex *Rattus norvegicus* (Norway rat): 1M, 3F, TN, Sevier Co., 27 Dec. 2003 Elkmont, 27 Dec. 2003, K. Langdon.

Haemogamasus longitarsus is a widely collected ectoparasite of rodents in North America (Whitaker & Wilson 1974).

***Laelaps alaskensis* Grant**

Ex *Ochrotomys nuttalli* (golden mouse): TN, Sevier Co., near Cosby, 1964-1966 (Linzey 1968; Linzey & Linzey 1968).

The record of *Laelaps alaskensis* from *Ochrotomys* is suspect, since this species is only found on arvicoline rodents and *Ochrotomys* is a neotomin rodent.

***Laelaps kochi* Oudemans**

Ex *Microtus chrotorrhinus* (rock vole):): GSMNP (as *Laelaps microti*) (Komarek & Komarek 1938); NC, Swain Co., Kanati Fork, along Route 441, 2800 ft., "Dec." (Linzey & Lin-

zey 1973); 1F, NC, Swain Co., Clingman's Dome, 13 May 2002, K. Walters, L-2990; 3M, 3N, TN, Sevier Co., Clingman's Dome, 16 Nov. 2002, K. Walters, L-3039.

Whitaker & Wilson (1974) queried the North Carolina and Tennessee records of this mite and we confirm that it occurs in both states.

***Laelaps stupkai* Linzey & Crossley**

Ex *Synaptomys cooperi* (southern bog lemming): 3F, NC, Swain Co., US 441 at Kanati Fork, 16 Dec. 1965, D.W. & A.V. Linzey (Linzey & Crossley 1971).

Laelaps stupkai was originally described from the Park (Linzey & Crossley 1971).

***Myonyssus jamesoni* Ewing & Baker**

Ex *Blarina brevicauda* (short-tailed shrew): 2F, TN, Sevier Co., Greenbrier, 18 Apr. 1931, R.L. Boke (Ewing & Baker 1947).

Myonyssus jamesoni is a widely distributed ectoparasite of *B. brevicauda* and some other shrews ranging from Canada (Ontario) to the southern USA (Tennessee) (Ewing & Baker 1947, Whitaker & Wilson 1974).

Family Listrophoridae - listrophorid fur mites

***Listrophorus dozieri* Radford**

Ex *Didelphis virginiana* (Virginia opossum): 1F, TN, Cocke Co., Cosby, 10 Jan. 2003, W. K. Reeves, L-3049.

This record appears to represent a case of straggling because *L. dozieri* typically parasitizes the muskrat, *Ondatra zibethica*, which also occurs in the Park (Fain & Hyland 1974, Linzey 1995).

***Listrophorus mexicanus squamiferus* Fain**

Ex *Microtus chrotorrhinus* (rock vole): 2F, TN, Sevier Co., Clingman's Dome, 16 Nov. 2002, K. Walters, L-3039.

Listrophorus mexicanus has been recorded from several species of voles in North America and Mexico (Fain & Hyland 1974). *Listrophorus mexicanus squamiferus* is almost certainly a distinct species.

***Prolistrophorus bakeri* (Radford)**

Ex *Sigmodon hispidus* (hispid cotton rat): 2M, 2F, TN, Sevier Co., near Wear Cove, Collector unknown, 17 Nov. 1991.

Prolistrophorus bakeri mainly occurs on the hispid cotton rat but it has also been recorded from the rice rat, *Oryzomys palustris*, as recorded by Fain & Hyland (1974). This appears to be the first record of this mite from the Park.

Family Macrochelidae

***Macrocheles* sp.**

Ex *Didelphis virginiana* (Virginia opossum): 1F, TN, Cocke Co., Cosby, 10 Jan. 2003, W. K. Reeves, L-3049.

Some species of macrochelid mites are known to be phoretic on mammals including *Macrocheles mesochthonius* on *D. virginiana* in North America (Krantz & Whitaker 1988).

Family Macronyssidae

***Macronyssus crosbyi* (Ewing & Stover)**

Ex *Corynorhinus rafinesquii* (Rafinesque's big-eared bat): 2N, TN, Sevier Co., Porter's Creek, 20 Jun. 2002, TN Tech. Univ. group, L-3001.

Ex *Myotis lucifugus* (little brown myotis): 1N, TN, Sevier Co., Porter's Creek, 6 Jun. 2002, TN Tech. Univ. group, L-2938; 1M, 1F, 1N, TN, Blount Co., Abram's Creek, 19 Jun. 2002, TN Tech. Univ. group, L-2924.

Ex *Myotis septentrionalis* (northern myotis): 3N, TN, Sevier Co., Porter's Creek, Jun. 2002, L-2940; 6N, TN, Blount Co., Gregory's Cave, 18 Jun. 2002, TN Tech. Univ. group, L-2933.

Macronyssus crosbyi has been recorded from several species of bats, mainly *Myotis* spp., across much of

North America (Whitaker & Wilson 1974).

***Ornithonyssus bacoti* (Hirst)—tropical rat mite**

Ex *Rattus* sp.: TN, Blount Co. (Pratt & Good 1954).

The tropical rat mite is widely distributed in the tropical, subtropical and mild temperate regions of the world together with its domestic rat hosts (Radovsky 1985). However, it also parasitizes several other mammals and Whitaker & Wilson (1974) list records from 37 species of mammals in North America alone. This hematophagous mite will bite humans and can cause “tropical rat mite dermatitis” (Durden et al. 1997b).

***Ornithonyssus sylviarum* (Canestrini & Fanzago)—northern fowl mite**

Ex *Iridoprocne bicolor* (tree swallow) nest: 34F, 1N, GSMNP, no other data, W. K. Reeves, L-3051.

Despite its vernacular name, this blood-feeding mite parasitizes many species of wild birds (Garvin et al. 2004) and some mammals (Whitaker & Wilson 1974).

Ornithonyssus wernecki (Fonseca)

Ex *Didelphis virginiana* (Virginia opossum): 1F, NC, Swain Co., US 441, 1 Feb. 2006, W. K. Reeves.

Ornithonyssus wernecki mainly parasitizes the Virginia opossum in North America (Whitaker & Wilson 1974).

Family Myobiidae - myobiid fur mites

***Amorphacarus hengererorum* Jameson**

Ex *Sorex cinereus* (masked shrew): 1F, NC, Swain Co., Clingman’s Dome, 16 Nov. 2002, K. Walters, L-3033.

Whitaker & Wilson (1974) reported *A. hengererorum* from four species of shrews (including *S. cinereus*) and one species of rodent in North America but this is the first record of this mite from North Carolina and the Park.

***Myobia musculi* (Koch)**

Ex *Mus musculus* (house mouse): 1F, TN, Blount Co., Elkmont, 6 Jul. 1937, W. King; 3F, TN, Blount Co., Cades Cove School House, 4 Sep. 1936, R. V. D.; 1F, TN, Sevier Co., Park Headquarters, 6 Jul. 1937, E. R.

Myobia musculi has an almost cosmopolitan distribution as an ectoparasite of the house mouse although Whitaker & Wilson (1974) also recorded it in North America from two additional rodent species.

***Radfordia affinis* (Poppe)**

Ex *Mus musculus* (house mouse): 1M, TN, Blount Co., Elkmont, 6 Jul. 1937, W. King.

Like the previous species, *R. affinis* mainly parasitizes the house mouse (Whitaker & Wilson 1974).

***Radfordia ensifera* (Poppe)**

Ex *Rattus rattus* (black rat): 1F, TN, Sevier Co., Park Headquarters, 6 Jan. 1939; 1F, TN, Blount Co., Cades Cove School House, 4 Sep. 1936, R. V. D.

Radfordia ensifera mainly occurs on domestic rats but Whitaker & Wilson (1974) also list records from some other species of mammals in North America.

***Radfordia subuliger* Ewing**

Ex *Peromyscus leucopus* (white-footed mouse): 1F, TN, Sevier Co., Twin Creeks, 11 Mar. 2002, K. Walters, L-2987.

Ex *Peromyscus maniculatus* (deer mouse): 1F, NC, Haywood Co., Purchase Knob, 21 Apr. 2002, K. Walters, L-2998; 1M, NC, Haywood Co., Purchase Knob, 19 Oct. 2002, K. Walters, L-3046; 1N, NC, Haywood Co., Purchase Knob, 20 Nov. 2002, K. Walters, L-3037.

This mite has been recorded from several species of sigmodontine rodents in North America (Whitaker & Wilson 1974).

***Radfordia zibethicalis* (Radford)**

Ex *Ondatra zibethicus* (muskrat): 1F, TN, Blount Co., Cades Cove, 24 Apr. 1935, R. J. Fleetwood.

Radfordia zibethicalis has not been previously reported in the Park, but this mite is known to infest musk-

rats from Indiana and Texas (Bauer and Whitaker 1981).

Family Myocoptidae (myocoptid fur mites)

***Myocoptes japonensis* Radford**

Ex *Myodes gapperi* (southern red-backed vole): 2F, NC, Swain Co., Indian Gap, 3 Jun. 2001, E. B. Pivorun, L-2975.

Whitaker & Wilson (1974) reported *M. japonensis* from three species of voles (including *M. gapperi*) and one species of sciurid (*Marmota monax*) in North America but this is the first record for North Carolina and the Park.

***Myocoptes musculus* (Koch)**

Ex *Mus musculus* (house mouse): 1F, TN, Sevier Co., Keener House (Hdq. area), 6 Jul. 1937.

Ex *Ochrotomys nuttalli* (golden mouse): TN, Sevier Co., near Cosby, 1964-1966 (Linzey 1968; Linzey & Linzey 1968).

Ex *Peromyscus maniculatus* (deer mouse): 2F, NC, Haywood Co., Purchase Knob, 19 Oct. 2002, K. Walters, L-3046; 4F, NC, Haywood Co., Purchase Knob, 20 Nov. 2002, K. Walters, L-3037.

Although *M. musculus* primarily infests the house mouse, Whitaker & Wilson (1974) provide records from six species of native North American rodents including *O. nuttalli* from the Park. However, our record from *P. maniculatus* represents the first for North Carolina.

Family Proctophyllodidae—proctophyllodid feather mites*

Proctophyllodid mites are often very numerous on the flight feathers of passeriform birds and hummingbirds. Host specificity is variable. Like most wing-inhabiting feather mites, they feed on preening oil, fungi, and other debris on the feathers. There are many undescribed species in North America. Gaud & Atyeo (1996) stated that, unlike the situation in most other groups of feather mites, proctophyllodid genera often occur on a particular bird species (or a group of species) as single species (i.e., multi-species associations on a single host species are rare). All of the following entries for proctophyllodids represent new records for the Park.

***Allodectes* n. sp.**

Ex *Archilochus colubris* (ruby-throated hummingbird): NC, Swain Co., Oconaluftee, 8 Jul. 2005, P. Super.

This is the first record of this genus from the United States. Other species of *Allodectes* occur on Neotropical hummingbirds.

***Proctophyllodes ateri* Fritsch**

Ex *Parus carolinensis* (Carolina chickadee): NC, Swain Co., Oconaluftee, 22 Oct. 2005, P. Super.

Proctophyllodes breviquadratus Atyeo & Braasch

Ex *Vireo solitarius* (blue-headed vireo): NC, Haywood Co., Purchase Knob, 7 Jul. 2006, P. Super.

Proctophyllodes canadensis Fritsch

Ex *Sitta canadensis* (red-breasted nuthatch): NC, Haywood Co., Purchase Knob, 4 Nov. 2005, P. Super.

Proctophyllodes glanderinus (Koch)

Ex *Bombycilla cedrorum* (cedar waxwing): NC, Haywood Co., Purchase Knob, 26 Jun. 2002, P. Super; NC, Haywood Co., Purchase Knob, 23 Jun. 2005, P. Super; NC, Swain Co., Oconaluftee, 8 Jul. 2005, P. Super; TN: Blount Co., Cades Cove, 4 Jul. 2006, P. Super.

***Proctophyllodes musicus* Vitzthum**

Ex *Turdus migratorius* (American robin): TN, Blount Co., Tremont, 21 May 2001, P. Super; NC, Haywood Co., Purchase Knob, 5 Jul. 2002, P. Super; NC, Swain Co., Oconaluftee, 15 May 2003, P. Super; TN, Sevier Co., Sugarlands Visitor Center, 31 Mar. 2004, P. Super.

***Proctophyllodes polyxenus* Atyeo & Braasch**

Ex *Junco hyemalis* (dark-eyed junco): NC, Haywood Co., Purchase Knob, 21 Jul. 2002, P. Super; NC, Haywood Co., Purchase Knob, 21 Jul. 2002, P. Super; NC, Swain Co., Newfound Gap, 24 Apr. 2002, P. Super;

NC. Swain Co., Newfound Gap, 24 Apr. 2003, P. Super.

Ex *Melospiza melodia* (song sparrow): NC. Haywood Co., Purchase Knob, 26 Jul. 2003, P. Super; NC. Haywood Co., Cataloochee, 19 Apr. 2004, P. Super; NC. Swain Co., Oconaluftee, 15 May 2003, P. Super; NC. Swain Co., Oconaluftee, 11 Jul. 2003, P. Super; NC. Swain Co., Oconaluftee, 20 Apr. 2004, P. Super.

Ex *Pipilo erythrophthalmus* (rufus-sided towhee): NC. Haywood Co., Purchase Knob, 9 May 2003, P. Super; NC. Haywood Co., Purchase Knob, 2 Aug. 2003, P. Super.

Ex *Spizella passerina* (chipping sparrow): NC. Haywood Co., Purchase Knob, 5 Jun and 8 Jul. 2002, P. Super; NC. Haywood Co., Purchase Knob, 8 Jun. 2002, P. Super; NC. Haywood Co., Purchase Knob, 9 May 2003, P. Super; NC. Haywood Co., Purchase Knob, 5 Jul. 2002, P. Super.

***Proctophyllodes quadrisetosus* Atyeo & Braasch**

Ex *Dendroica coronata* (yellow-rumped warbler): NC. Swain Co., Oconaluftee, 22 Oct 2005, P. Super.

***Proctophyllodes reguli* Gaud**

Ex *Regulus satrapa* (golden-crowned kinglet): NC. Haywood Co., Purchase Knob, 4 Nov. 2005, P. Super.

***Proctophyllodes spini* Atyeo & Braasch**

Ex *Carduelis pinis* (pine siskin): NC. Haywood Co., Purchase Knob, 21 May 2006, P. Super.

Ex *Carduelis tristis* (American goldfinch): TN: Blount Co., Cades Cove, 4 Jul. 2006, P. Super.

***Proctophyllodes* n. spp.**

Ex *Catharus fuscescens* (veery): NC, Haywood Co., Purchase Knob, 24 May 2002, P. Super.

Ex *Certhia americana* (brown creeper): NC, Swain Co., Newfound Gap, 5 Aug. 2005, P. Super.

Ex *Dendroica caerulescens* (black-throated blue warbler): NC, Haywood Co., Purchase Knob, 17 Jun. 2006, P. Super.

Ex *Dendroica pennsylvanica* (chestnut-sided warbler): NC, Haywood Co., Purchase Knob, 17 Jun. 2006, P. Super.

Ex *Helmitheros vermivorus* (worm-eating warbler): NC, Haywood Co., Purchase Knob, 6 Jul. 2006, P. Super.

Ex *Mniotilta varia* (black and white warbler): NC, Swain Co., Oconaluftee, 8 Jul. 2005, P. Super.

Ex *Sayornis phoebe* (eastern phoebe): NC, Haywood Co., Purchase Knob, 14 Apr. 2006, P. Super.

Ex *Setophaga ruticilla* (American redstart): NC, Swain Co., Oconaluftee, 14 May 2005, P. Super.

Ex *Toxostoma rufum* (brown thrasher): NC, Haywood Co., Purchase Knob, 15 May 2003, P. Super; NC, Haywood Co., Purchase Knob, 11 Jul. 2003, P. Super; NC, Haywood Co., Purchase Knob, 26 Jun. 2004, P. Super.

Ex *Troglodytes aedon* (house wren): NC, Swain Co., Oconaluftee, 25 Apr. 2006, P. Super.

Ex *Wilsonia canadensis* (Canada warbler): NC, Haywood Co., Purchase Knob, 2 Aug. 2005, P. Super.

***Pterodectes sialiarum* (Stoll)**

Ex *Sialia sialis* (eastern bluebird): NC. Haywood Co., Purchase Knob, 17 Jun. 2003, P. Super.

***Pterodectes* n. spp.**

Ex *Bombycilla cedrorum* (cedar waxwing): NC, Haywood Co., Purchase Knob, 24 May 2002, P. Super.

Ex *Catharus fuscescens* (veery): NC, Haywood Co., Purchase Knob, 24 May 2003, P. Super; NC, Haywood Co., Purchase Knob, 28 Jun. 2003, P. Super; NC, Haywood Co., Purchase Knob, 29 May 2004, P. Super; NC, Haywood Co., Purchase Knob, 12 Jun. 2004, P. Super.

Ex *Catharus minimus/bicknelli* (gray-cheeked thrush/ Bicknell's): TN, Blount Co., Tremont, 3 Aug. 2003, P. Super.

Ex *Dendroica caerulescens* (black-throated blue warbler): NC, Haywood Co., Purchase Knob, 2 Aug. 2003, P. Super; NC, Swain Co., Indian Gap, 5 Aug 2005, P. Super.

Ex *Dendroica pensylvanica* (chestnut-sided warbler): NC, Haywood Co., Purchase Knob, 18 Jun. 2002, P. Super; NC, Haywood Co., Purchase Knob, 1 Aug. 2002, P. Super; ; NC, Haywood Co., Purchase Knob, 19 Jun. 2003, P. Super; NC, Haywood Co., Purchase Knob, 3 Jun. 2004, P. Super; NC, Haywood Co., Purchase

Knob, 4 May 2006, P. Super; NC, Swain Co., Newfound Gap, 12 May 2006, P. Super.

Ex *Dumetella carolinensis* (catbird): NC, Haywood Co., Purchase Knob, 8 Jun. 2002, P. Super; NC, Haywood Co., Purchase Knob, 26 Jun. 2002, P. Super; NC, Swain Co., Oconaluftee, 15 May 2003, P. Super; NC, Swain Co., Oconaluftee, 8 May 2004, P. Super; NC, Swain Co., Oconaluftee, 14 May 2004, P. Super; NC, Swain Co., Oconaluftee, 13 May 2005, P. Super; NC, Swain Co., Indian Gap, 5 Aug. 2005, P. Super.

Ex *Empidonax minimus* (least flycatcher): NC, Haywood Co., Purchase Knob, 8 Jun. 2002, P. Super; NC, Haywood Co., Purchase Knob, 27 May 2005, P. Super.

Ex *Hylocichla mustelina* (wood thrush): TN, Blount Co., Tremont, 19 Jun. 2002, P. Super; TN, Blount Co., Tremont, 11 Jul. 2002, P. Super; NC, Haywood Co., Purchase Knob, 17 Jun 2006, P. Super.

Ex *Geothlypis trichas* (common yellowthroat): NC, Swain Co., Oconaluftee, 14 May 2005, P. Super.

Ex *Helmitheros vermivorus* (worm-eating warbler): NC, Haywood Co., Purchase Knob, 6 Jul. 2006, P. Super.

Ex *Mniotilta varia* (black and white warbler): NC, Haywood Co., Purchase Knob, 6 Jun. 2005, P. Super; NC, Swain Co., Oconaluftee, 8 Jul. 2005, P. Super.

Ex *Pheucticus ludovicianus* (rose-breasted grosbeak): NC, Haywood Co., Purchase Knob, 11 Jun. 2005, P. Super.

Ex *Seiurus aurocapillus* (ovenbird): NC, Haywood Co., Purchase Knob, 24 May 2002, P. Super; NC, Haywood Co., Purchase Knob, 8 Jul. 2002, P. Super; NC, Haywood Co., Purchase Knob, 24 May 2003, P. Super; NC, Haywood Co., Purchase Knob, 2 Aug. 2003, P. Super.

Ex *Seiurus motacilla* (Louisiana waterthrush): TN, Blount Co., Tremont, 20 Jul. 2004, P. Super.

Ex *Spizella passerina* (chipping sparrow): NC, Haywood Co., Purchase Knob, 8 Jun. 2002, P. Super; NC, Haywood Co., Purchase Knob, 5 Jul. 2002, P. Super; NC, Haywood Co., Purchase Knob, 9 May 2003, P. Super; NC, Haywood Co., Purchase Knob, 19 Jul. 2003, P. Super.

Ex *Toxostoma rufum* (brown thrasher): NC, Haywood Co., Purchase Knob, 18 Jun. 2002, P. Super; NC, Swain Co., Oconaluftee, 15 May 2003, P. Super; NC, Swain Co., Oconaluftee, 11 Jul. 2003, P. Super.

Ex *Vireo griseus* (white-eyed vireo): NC, Swain Co., Oconaluftee, 8 May 2004, P. Super; NC, Swain Co., Oconaluftee, 14 May 2005, P. Super.

At least ten new species of *Pterodectes* were collected from birds in the Park.

Family Pteronyssidae—pteronyssid feather mites

***Neopteronysus pici* (Scopoli)**

Ex *Picoides pubescens* (downy woodpecker): NC, Haywood Co., Purchase Knob, 7 Jun. 2006, P. Super.

This is the first record of this species from this host.

***Scutulanyssus delichonum* (Mironov)**

Ex *Hirundo rustica* (barn swallow): NC, Haywood Co., Purchase Knob, 16 Jul 2005, P. Super; NC, Haywood Co., Purchase Knob, 23 Jun. 2006, P. Super.

This species was described originally from the Old World house martin, *Delichon urbica* and represents a new host and geographic record. Several species of *Scutulanyssus* are known to occur on barn swallows, but only *S. obscurus* (Berlese) and *S. hirundicolus* (Mironov) were previously reported from North America (Mironov and Galloway 2006)

***Stenopteronysus proctorae* Mironov & Galloway**

Ex *Colaptes auratus* (northern flicker): NC, Swain Co., Oconaluftee, 255 Apr. 2006, P. Super.

This species was recently described from this host in Canada (Mironov and Galloway 2006). This is the first record from the United States.

Family Spinturnicidae

***Spinturnix americanus* (Banks)**

Ex *Myotis lucifugus* (little brown myotis): 1N, TN, Blount Co., Parson Branch, 17 Jun. 2002, TN Tech. Univ. group, L-2937; 1M, TN, Blount Co., Abram's Creek, 19 Jun. 2002, TN Tech. Univ. group, L-2922.

Spinturnix spp. are obligate ectoparasites of bats (Radovsky 1985). A partially characterized *Spiroplasma* sp. and a bacterium nearly identical to *Anaplasma phagocytophilum* were detected in a related species, *Spinturnix psi* (Reeves et al., 2006b).

Family Trombiculidae—chiggers

***Euschoengastia jamesoni* (Brennan)**

Ex *Sorex fumeus* (smoky shrew): NC, Swain Co., Long Branch, 12 Nov. 2001, K. Walters, L-3032.

Euschoengastia jamesoni is a parasite of insectivores in the Appalachians and the attachment sites of this mite often appear as depressed lesions (Reeves et al 2004b).

***Euschoengastia peromysci* (Ewing)**

Ex *Blarina brevicauda* (northern short-tailed shrew): 18L, TN, Sevier Co., Fish Camp Prong, 18 Nov. 2001, K. Walters, L-2985.

Ex *Myodes gapperi* (northern red-backed vole): NC, Swain Co., Clingman's Dome, 14 May 2002, K. Walters, L-2996; 1L, NC, Swain Co., Indian Gap, 3 Jun. 2001, E. B. Pivorun, L-2975; 2L, TN, Sevier Co., Chimney Tops Trail, 13 May 2002, K. Walters, L-2995; NC, Swain Co., Noland Divide, 16 Nov. 2002, K. Walters, L-3035; 1L, TN, Sevier Co., Brushy Mount, 9 Apr. 2002, K. Walters, L-2993; ~50L, TN, Sevier Co., Mt. Collins, 22 Apr. 2001, E. B. Pivorun & S. M. Miller, L-2973.

Ex *Glaucomys sabrinus* (northern flying squirrel): TN, Sevier Co., Little Pigeon, West Prong, 22 Aug. 1953, E. V. Komarek, L-3011.

Ex *Microtus chrotorrhinus* (rock vole): GSMNP (as *Neoschoengastia signator*) (Komarek & Komarek 1938); 4L, TN, Sevier Co., Clingman's Dome, 13 May 2002, K. Walters, L-2990; TN, Sevier Co., Clingman's Dome, 16 Oct. 2001, K. Walters, L-3034. Ex *Synaptomys cooperi* (southern bog lemming): ~30L, NC, Swain Co., Andrew's Bald, 9 Sep. 2002, K. Walters, L-2989.

Ex *Peromyscus leucopus* (white-footed mouse): 12L, TN, Sevier Co., Twin Creeks, 11 Mar. 2002, K. Walters, L-2987.

Ex *Peromyscus maniculatus* (deer mouse): TN, Cocke Co., Cosby, 21 Jan. 2002, K. Walters, L-3010; 2L, TN, Sevier Co., Roaring Fork Creek, 19 Feb. 2002, K. Walters, L-2999; TN, Sevier Co., Twin Creeks, 10 Mar. 2002, K. Walters, L-3005; TN, Sevier Co., 20 Nov. 2002, K. Walters.

Ex *Sorex cinereus* (masked shrew): NC, Swain Co., Clingman's Dome, 16 Nov. 2002, K. Walters, L-3033.

Ex *Tamiasciurus hudsonicus* (eastern red squirrel): NC, Swain Co., Indian Gap, 30 Sep. 2001, K. Walters, L-3031.

Euschoengastia peromysci has a wide host distribution and this chigger ranges from high elevations in the Appalachians to the coastal plain (Reeves et al. 2004b).

***Euschoengastia pipistrelli* Brennan**

Ex *Myotis septentrionalis* (northern myotis): 12L, TN, Blount Co., Gregory's Cave, Jun. 2002, L-2933 (Reeves 2000); ~40L, TN, Blount Co., Whiteoak Sinks, 21 Jun. 2002, TN Tech Univ. group, L-2939.

Ex *Pipistrellus subflavus* (eastern pipistrelle): 1L, TN, Blount Co., Gregory's Cave, Sep. 1999, W. K. Reeves, L-3021 (Reeves 2000); 1L, TN, Blount Co., Whiteoak Saltpeter Cave, Sep. 1999, W. K. Reeves, L-3022 (Reeves 2000).

These chiggers were primarily removed from the ears and faces of bats that were roosting in caves (Reeves 2000).

***Euschoengastia setosa* (Ewing)**

Ex *Peromyscus maniculatus* (deer mouse): 1L, TN, Sevier Co., 20 Nov. 2002, K. Walters.

Ex *Tamiasciurus hudsonicus* (eastern red squirrel): 1L, NC, Swain Co., Indian Gap, 30 Sep. 2001, K. Walters, L-3031.

Euschoengastia setosa is primarily an ectoparasite of small rodents, such as *Peromyscus* spp., and lagomorphs (e.g. Whitaker & Loomis 1978).

***Eutrombicula* sp.**

Ex *Sceloporus undulatus* (eastern fence lizard): 1L, TN, Sevier Co., Greenbrier, 8 Jul. 1986, W. King, L-3028.

***Eutrombicula alfreddugesi* (Oudemans)**

Ex *Eumeces fasciatus* (5-lined skink): 5L, TN, Blount Co., Parson Branch, 8 Sep. 1987, W. King, L-3029.

Ex *Sceloporus undulatus* (eastern fence lizard): 5L, TN: Sevier Co., Greenbrier, 8 Jul. 1986, W. King, L-3027.

Eutrombicula alfreddugesi infests birds, reptiles, and mammals throughout the southeastern United States (Crossley & Proctor 1971, Reeves et al 2004b)

***Eutrombicula splendens* (Ewing)**

Ex *Homo sapiens* (human): 1L, NC, Swain Co., Oconaluftee/Ravensford, 1 Sep. 2002, W. K. Reeves, L-3026.

Like the previous species, this chigger parasitizes several species of vertebrates and can be a pest to humans (Reeves et al. 2004b).

***Fonsecia palmella* Brennan & Loomis**

Ex *Eumeces laticeps* (broad-headed skink): Several L, TN, Sevier Co., Pittman Ctr., 8 Sep. 1997. G. D. Shultz. L-3030.

Larvae of *F. palmella* are ectoparasites of birds and occasionally reptiles and mammals (Reeves et al. 2004b).

***Leptotrombidium peromysci* Vercammen-Grandjean & Langston**

Ex *Microtus chrotorrhinus* (rock vole): 2L, NC, Swain Co., Clingman's Dome, 13 May 2002, K. Walters, L-2990.

This is a common chigger of small mammals, especially rodents, in the southeastern United States (Durden et al. 1997b). In Asia and the Pacific region, chiggers in the genus *Leptotrombidium* transmit the causative agent of scrub typhus.

***Neotrombicula whartoni* (Ewing)**

Ex *Glaucomys volans* (southern flying squirrel): 1L, NC, Haywood Co., Purchase Knob, 20 Oct. 2002, K. Walters, L-3036.

Larvae of *Neotrombicula whartoni* primarily parasitize birds, rodents and lagomorphs in North America (Crossley & Proctor 1971, Whitaker & Loomis 1978, Reeves et al. 2004b).

Trouessartiidae—trouessartiid feather mites

Trouessartiid mites are typically found on the head and upper wing covert feathers of a wide variety of bird hosts. The family is not well studied in North America, and all of the records reported here represent undescribed species.

***Trouessartia* n. spp.**

Ex *Dendroica pensylvanica* (chestnut-sided warbler): NC, Haywood Co., Purchase Knob, 7 Jun. 2006, P. Super.

Ex *Parula americana* (northern parula): TN, Blount Co., Tremont, 19 Jun. 2002, P. Super.

Ex *Passerina cyanea* (indigo bunting): NC, Haywood Co., Purchase Knob, 12 Jun. 2004, P. Super.

Ex *Setophaga ruticilla* (American redstart): NC, Swain Co., Oconaluftee, 14 May 2005, P. Super.

Ex *Spizella passerina* (chipping sparrow): TN, Blount Co., Tremont, 7 Jun. 2002, P. Super

Ex *Turdus migratorius* (American robin): TN, Blount Co., Tremont, 26 May 2001, P. Super.

Host-associate list

Reptiles

Eumeces fasciatus (5-lined skink): *Eutrombicula alfreddugesi*

Eumeces laticeps (broad-headed skink): *Fonsecia palmella*

Sceloporus undulatus (eastern fence lizard): *Eutrombicula alfreddugesi*, *Eutrombicula* sp.

Terrapene carolina (eastern box turtle): *Ixodes scapularis*

Birds

Archilochus colubris (ruby-throated hummingbird): *Allodectes* new species, *Trochiliphagus lineatus*

Bird nest: *Orchopeas howardi*

Baeolophus bicolor (tufted titmouse): *Philopterus* sp.

Bombycilla cedrorum (cedar waxwing): *Ornithomyia anchineuria*, *Pterodectes* new species, *Proctophyllodes glanderinus*

Bubo virginianus (great horned owl): *Colpocephalum brachysomum*, *Icosta americana*

Carduelis pinis (pine siskin): *Proctophyllodes spini*

Carduelis tristis (American goldfinch): *Analges* n. sp., *Proctophyllodes spini*

Catharus fuscescens (veery): *Brueelia* sp., *Proctophyllodes* new species, *Pterodectes* new species

Catharus bicknelli or *Catharus minimus* (Bicknell's/gray-cheeked thrush): *Pterodectes* new species

Cardinalis cardinalis (Cardinal): *Philopterus* sp.

Carpodacus mexicanus (house finch): *Amblyomma americanum*, *Ornithoica vicina*, *Ornithomyia anchineuria*, *Ornithomyia bequaerti*

Certhia americana (brown creeper): *Analges* new species, *Ornithomyia anchineuria*, *Proctophyllodes* new species

Coccyzus americanus (yellow-billed cuckoo): *Cuculicola coccygii*

Colaptes auratus (northern flicker): *Stenopteronysus proctorae*

Colinus virginianus (northern bobwhite): *Menacanthus pricei*, *Oxylipeurus clavatus*

Contopus virens (eastern wood-pewee): *Philopterus fuscoventralis* (Osborn)

Dendroica caerulescens (black-throated blue warbler): *Proctophyllodes* new species, *Pterodectes* new species.

Dendroica coronata (yellow-rumped warbler): *Proctophyllodes quadrisetosus*

Dendroica pensylvanica (chestnut-sided warbler): *Proctophyllodes* new species, *Pterodectes* new species, *Trouessartia* new species

Dumetella carolinensis (gray catbird): *Brueelia brunneinucha*, *Pterodectes* new species

Empidonax minimus (least flycatcher): *Pterodectes* new species

Fulica americana (American coot): *Fulicoffula longipila*, *Pseudomenopon pilosum*

Gallus gallus (domestic chicken): *Dermanyssus gallinae*, *Menacanthus stramineus*, *Menopon gallinae*

Geothlypis trichas (common yellowthroat): *Pterodectes* new species

Helmitheros vermivorus (worm-eating warbler): *Proctophyllodes* new species, *Pterodectes* new species

Hirundo rustica (barn swallow): *Dermanyssus hirundinis*

Hirundo rustica (barn swallow) nest: *Dermanyssus hirundinis*, *Protocalliphora braueri*, *Scutulanysus delichonum*

Hylocichla mustelina (wood thrush): *Analges* new species, *Ornithomyia bequaerti*, *Pterodectes* new species

Hylocichla mustelina (wood thrush) nest: *Protocalliphora deceptor*

Iridoprocne bicolor (tree swallow) nest: *Ornithonyssus sylviarum*

Junco hyemalis (dark-eyed junco): *Brueelia vulgata*, *Ornithoica vicina*, *Ornithomyia anchineuria*,

Philopterus spp., *Proctophyllodes polyxenus*, *Ricinus* sp.
Meleagris gallopavo (wild turkey): *Chelopistes meleagridis*
Melospiza melodia (song sparrow): *Analges* new species, *Haemaphysalis leporispalustris*, *Ixodes brunneus*,
Menacanthus chrysophaeus, *Ornithoica vicina*, *Ornithomyia anchineuria*, *Ornithomyia bequaerti*,
Proctophyllodes polyxenus
Mniotilta varia (black and white warbler): *Proctophyllodes* new species, *Pterodectes* new species
Otus asio (eastern screech owl): *Icosta americana*
Parula americana (northern parula): *Trouessartia* new species
Parus carolinensis (Carolina chickadee): *Proctophyllodes ateri*
Passerina cyanea (indigo bunting): *Haemaphysalis leporispalustris*, *Trouessartia* new species
Pheucticus ludovicianus (rose-breasted grosbeak): *Brueelia pallidula*, *Pterodectes* new species
Picoides pubescens (downy woodpecker): *Neopteronysus pici*
Pipilio erythrophthalmus (eastern towhee): *Myrsidea melanorum*, *Ornithomyia anchineuria*, *Proctophyllodes polyxenus*
Regulus satrapa (golden-crowned kinglet): *Proctophyllodes reguli*
Sayornis phoebe (eastern phoebe): *Ornithomyia anchineuria*, *Picicola foedus*, *Proctophyllodes* new species
Sayornis phoebe (eastern phoebe), nest: *Protocalliphora aenea*, *Protocalliphora bennetti*
Seiurus aurocapillus (ovenbird): *Pterodectes* new species
Seiurus motacilla (Louisiana waterthrush): *Menacanthus aurocapillus*, *Pterodectes* new species
Setophaga ruticilla (American redstart): *Proctophyllodes* new species, *Trouessartia* new species
Sialia sialis (eastern bluebird): *Philopterus sialli*, *Pterodectes sialiarum*
Sialia sialis (eastern bluebird), nest box: *Dermanysus prognepphilus*, *Protocalliphora sialia*
Sitta canadensis (red breasted nuthatch): *Proctophyllodes canadensis*
Spizella passerina (chipping sparrow): *Proctophyllodes polyxenus*, *Pterodectes* new species, *Trouessartia* new species
Strix varia (barred owl): *Kurodaia magna*
Sturnus vulgaris (European starling): *Ornithomyia anchineuria*
Thryothorus ludovicianus (Carolina wren): *Haemaphysalis leporispalustris*, *Ornithomyia anchineuria*,
Philopterus sp.
Toxostoma rufum (brown thrasher): *Proctophyllodes* new species, *Pterodectes* new species
Troglodytes aedon (house wren): *Proctophyllodes* new species
Turdus migratorius (American robin): *Ornithomyia anchineuria*, *Proctophyllodes musicus*, *Sturnidoecus simplex*, *Trouessartia* new species
Turdus migratorius (American robin), nest: *Protocalliphora sialia*
Vireo griseus (white-eyed vireo): *Pterodectes* new species
Vireo solitarius (blue-headed vireo): *Proctophyllodes breviquadratus*
Wilsonia canadensis (Canada warbler): *Proctophyllodes* new species
Zonotrichia albicollis (white throated sparrow): *Ixodes dentatus* Marx

Mammals

Blarina brevicauda (northern short-tailed shrew): *Androlaelaps fahrenheitzi*, *Ctenophthalmus pseudagyrtis*,
Doratopsylla blarinae, *Epitedia wenmanni*, *Euschoengastia peromysci*, *Glycyphagus hypudaei*, *Ixodes angustus*, *Leptinus orientamericanus*
Canis lupus (domestic dog): *Ctenocephalides canis*, *Ixodes cookei*
Canis rufus (red wolf): *Dermacentor variabilis*, *Ixodes cookei*
Cervus elaphus (elk): *Dermacentor albipictus*, *Eulaelaps* sp.
Corynorhinus rafinesquii (Rafinesque's big-eared bat): *Macronyssus crosbyi*

Didelphis virginiana (Virginia opossum): *Ixodes* sp., *Listrophorus dozieri*, *Macrocheles* sp., *Marsupialichus brasiliensis*

Equus caballus (horse): *Dermacentor variabilis*

Felis silvestris (catus) (domestic/feral cat): *Ctenocephalides felis*, *Rhizoglyphus* sp.

Glaucomys sabrinus (northern flying squirrel): *Euschoengastia peromysci*

Glaucomys volans (southern flying squirrel): *Hoplopleura trispinosa*, *Ixodes marxi*, *Neohaematopinus sciuropteri*, *Neotrombicula whartoni*, *Opisodasys pseudarctomys*

Homo sapiens (human): *Ctenocephalides felis*, *Demodex folliculorum*, *Dermacentor variabilis*, *Eutrombicula splendens*, *Icosta americana*, *Pthirus pubis*, *Triatoma sanguisuga*

Lama glama (lama): *Dermacentor variabilis*

Marmota monax (woodchuck): *Androlaelaps fahrenheitzi*, *Dermacentor variabilis*, *Ixodes cookei*

Mephitis mephitis (striped skunk): *Neotrichodectes mephitidis*, *Ixodes* sp.

Microtus chrotorrhinus (rock vole): *Ctenophthalmus pseudagyrtis*, *Euschoengastia peromysci*, *Glycyphagus hypudaei*, *Ixodes angustus*, *Ixodes* sp., *Leptotrombidium peromysci*, *Listrophorus mexicanus*, *Laelaps kochi*, *Orycterxenus soricis*, *Peromyscopsylla catatina*

Microtus sp. (reported as “*M. montanus*”): *Ctenophthalmus pseudagyrtis*, *Orchopeas leucopus*

“Mouse nest”: *Epitedia wenmanni*

Mus musculus (house mouse): *Myobia musculi*, *Myocoptes musculusinus*, *Orycterxenus canadensis*, *Radfordia affinis*

Mustela frenata noveboracensis (long tailed weasel): *Neotrichodectes minutus*

Mustela nivalis (least weasel): *Stachiella mustelae* (Schrunk)

Myodes gapperi (southern red-backed vole) (formerly *Clethrionomys gapperi*): *Androlaelaps fahrenheitzi*, *Catallagia borealis*, *Catallagia* new species, *Ctenophthalmus pseudagyrtis*, *Dermacentor variabilis*, *Epitedia wenmanni*, *Euschoengastia peromysci*, *Glycyphagus hypudaei*, *Myocoptes japonensis*, *Ixodes angustus*, *Peromyscopsylla catatina*, *Peromyscopsylla hamifer*

Myotis lucifugus (little brown myotis): *Cimex adjunctus*, *Myodopsylla insignis*,

Macronyssus crosbyi, *Spinturnix americanus*

Myotis septentrionalis (northern myotis): *Euschoengastia pipistrelli*, *Macronyssus crosbyi*

Napaeozapus insignis (woodland jumping mouse): *Epitedia wenmanni*

Neotoma magister (Allegheny woodrat): *Orchopeas pennsylvanicus*, *Ixodes* sp.

Neotoma magister (Allegheny woodrat), nest: *Epitedia cavernicola*, *Orchopeas pennsylvanicus*

Ochrotomys nuttalli (golden mouse): *Androlaelaps casalis*, *Androlaelaps fahrenheitzi*, *Ctenophthalmus pseudagyrtis*, *Dermacentor variabilis*, *Doratopsylla blarinae*, *Epitedia wenmanni*, *Eulaelaps stabularis*, *Glycyphagus* sp., *Hoplopleura hesperomydis*, *Laelaps alaskensis*, *Myocoptes musculusinus*, *Orchopeas leucopus*

Ochrotomys nuttalli (golden mouse), nest: *Epitedia wenmanni*

Odocoileus virginianus (white-tailed deer): *Solenopotes ferrisi*, *Tricholipeurus lipeuroides*, *Tricholipeurus parallelus*

Ondatra zibethicus (musk rat): *Radfordia zibethicalis*

Parascalops breweri (hairy-tailed mole): *Androlaelaps fahrenheitzi*, *Ctenophthalmus pseudagyrtis*, *Echinonyssus talpae*, *Ixodes angustus*

Peromyscus gossypinus (cotton mouse): *Peromyscopsylla hesperomys*

Peromyscus leucopus (white-footed mouse): *Dermacentor variabilis*, *Euschoengastia peromysci*, *Glycyphagus hypudaei*, *Hoplopleura hesperomydis*, *Ixodes angustus*, *Orchopeas leucopus*, *Peromyscopsylla hesperomys*, *Radfordia subuliger*

Peromyscus leucopus (white-footed mouse), nest: *Orchopeas leucopus*

Peromyscus maniculatus (deer mouse): *Androlaelaps fahrenheitzi*, *Dermacentor variabilis*, *Epitedia wen-*

manni, *Euschoengastia peromysci*, *Euschoengastia setosa*, *Glycyphagus hypudaei*, *Hoplopleura hesperomydis*, *Ixodes angustus*, *Myocoptes musculus*, *Orchopeas leucopus*, *Peromyscopsylla catatina*, *Peromyscopsylla hesperomys*, *Peromyscopsylla scotti*, *Polyplax auricularis*, *Radfordia subuliger*, *Stenoponia americana*

Peromyscus maniculatus (deer mouse), nest: *Ceratophyllus gallinae*

Peromyscus sp., nest: *Peromyscopsylla hesperomys*

Pipistrellus subflavus (eastern pipistrelle): *Euschoengastia pipistrelli*

Procyon lotor (raccoon): *Amblyomma americanum*, *Dermacentor variabilis*, *Ixodes* sp., *Ixodes cookei*, *Ixodes texanus*

Rattus norvegicus (Norway rat): *Ctenophthalmus pseudagyrtis*, *Glycyphagus hypudaei*, *Haemogamasus longitarsus*, *Polyplax spinulosa*

Rattus rattus (black rat): *Radfordia ensifera*

Rattus sp.: *Ornithonyssus bacoti*

Sciurus carolinensis (gray squirrel): *Cheyletus eruditus*, *Hoplopleura sciuricola*, *Neohaematopinus sciuri*, *Orchopeas howardi*

Shrew, nest: *Hystrichopsylla tahavuaana*

Sigmodon hispidus (hispid cotton rat): *Prolistrophorus bakeri*

Sorex cinereus (masked shrew): *Amorphacarus hengerorum*, *Androlaelaps fahrenheitzi*, *Euschoengastia peromysci*, *Glycyphagus hypudaei*, *Ixodes angustus*, *Orycteroxenus soricis*

Sorex fumeus (smoky shrew): *Euschoengastia jamesoni*, *Leptinus orientamericanus*

Spilogale putorius (eastern spotted skunk): *Neotrichodectes osborni*

Squirrel, nest: *Ceratophyllus vison*, *Orchopeas howardi*

Sus scrofa (feral hog): *Demodex phylloides*, *Dermacentor variabilis*, *Haematopinus suis*

Sylvilagus floridanus (eastern cottontail): *Cediopsylla simplex*, *Haemaphysalis leporispalustris*

Synaptomys cooperi (southern bog lemming): *Androlaelaps fahrenheitzi*, *Dermacentor variabilis*, *Euschoengastia peromysci*, *Ixodes angustus*, *Laelaps stupkai*, *Peromyscopsylla catatina*

Tamias striatus (eastern chipmunk): *Ceratophyllus vison*

Tamiasciurus hudsonicus (red squirrel): *Ceratophyllus vison*, *Euschoengastia peromysci*, *Euschoengastia setosa*, *Hoplopleura sciuricola*, *Ixodes marxi*, *Neohaematopinus semifasciatus*, *Orchopeas howardi*

Ursus americanus (black bear): *Trichodectes pinguis euarctidos*

Discussion

The following “northern” ectoparasite species were recorded in the Park and presumably represent southern extensions limited (or nearly so, in some cases) to higher elevations of the Appalachians (similar to boreal habitats and climates further north):

Sucking lice: *Neohaematopinus semifasciatus*, *Polyplax auricularis*

Fleas: *Ceratophyllus gallinae*, *Ceratophyllus vison*, *Opisodasys pseudarctomys*, *Catallagia borealis*, *Epitedia cavernicola*, *Hystrichopsylla tahavuaana*, *Peromyscopsylla catatina*, *Peromyscopsylla hamifer*, *Peromyscopsylla hesperomys*

Flies: *Ornithomyia bequaerti*, *Protocalliphora aenea*

Tick: *Ixodes angustus*

At least one species of ectoparasites, *Catallagia* n. sp. (Siphonaptera: Ctenophthalmidae) might be endemic to the southern Appalachians and possibly even to the Park. Some ectoparasites such as the *Allo-dectes* n. sp. were new records for North America.

Our checklist of ectoparasites is far from complete. Only a portion of the vertebrate fauna of the Park has

been sampled. Even some species that have been examined are represented by only a few specimens from a single season. As a result, we expect that further research will uncover several times the number of ectoparasites reported here. The majority of these will be mites (Acari). The Nantahala Mountains are south of the Great Smoky Mountains and Whitaker et al. (1975) reported at least 51 species of ectoparasites from small mammals including: *Amorphacarus hengererorum*, *Androlaelaps fahrenheitzi*, *Asiochirus blarina*, *Cheladonta ouachitensis*, *Corrodopsylla curvata*, *Ctenophthalmus pseudagyrtis*, *Dermacarus hypudaei*, *Dermacarius newyorkensis*, *Dermacentor variabilis*, *Doratopsylla blarinae*, *Echinomyssus talpa*, *Echinonyssus utahensis*, *Epitedia wenmanni*, *Eulaelaps stabularis*, *Euschongastia jamesoni*, *Euschoengastia jonesi*, *Euschoengastia ouachitensis*, *Euschoengastia peromysci*, *Euschoengastia rubra*, *Euschoengastia setosa*, *Glycyphagus hypudaei*, *Haemogamasus ambulans*, *Haemogamasus liponyssoides*, *Hoplopeura hesperomydis*, *Hypoaspis* sp., *Ixodes angustus*, *Laelaps alaskensis*, *Leptotrombidium* sp., *Listrophorus mexicanus*, *Miyatrombicula jonesae*, *Myocoptes* sp., *Myocoptes japonensis*, *Myonyssus jamesoni*, *Neotrombicula carterae*, *Neotrombicula cavicola*, *Notoedres lasionycteris*, *Orycterxenus soricis*, *Ornithonyssus bacoti*, *Orchopeas leucopus*, *Polyplax auricularis*, *Polyplax spinulosa*, *Protomyobia brevisetosa*, *Protomyobia claparedei*, *Pygmephorus* sp., *Radfordia ensifera*, *Radfordia subuliger*, *Steatonyssus furmani*, *Steatonyssus* sp., *Stenoponia americana*, *Xenoporus latiporus*, and *Xenoryctes nudus*. We expect that all of these species will eventually be reported in the Park. We identified 11 species of ticks and do not expect that there are many undetected species in the Park. We expect that a few species of fleas are still unreported from the Park, including *Pulex simulans* and *Ceratophyllus celsus*. At least two or three additional species of parasitic Hemiptera such as, *Cimex lectularius*, *Oeciacus vicarius*, and *Triatoma lecticularia*, are expected to eventually be collected in the Park.

Ectoparasites are vectors of parasites and microbial diseases. Most of the ectoparasites from the Smokies have not been studied as vectors of pathogens. The public health risk of these pathogens to humans is largely unknown. Some ectoparasites, such as lice of squirrels, are vectors of *Rickettsia prowazekii* (Sonenshine et al 1978). Others such as ticks, transmit numerous rickettsial pathogens (Childs & Paddock 2003). Further research into vector borne pathogens and ectoparasites of the GSMNP are needed to determine if wildlife or humans are involved with the maintenance of parasite-borne pathogens.

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