

## INTRODUCTION

Although Minnesota is a well-studied state, biologically, few records of Minnesota fleas have been published. Probably the first to study the fleas of the state was Pass (1929) who recorded Nosopsyllus fasciatus from Rattus norvegicus in Minneapolis and St. Paul during the numerous rat-flea surveys induced by the discovery that plague existed in the United States. Liu (1935) described two new species of bird fleas from Minnesota: Ceratophyllus swansonii from the long-eared owl, Asio otus, now considered a subspecies of an Old World species, C. rossitensis swansonii; and C. rileyi, which proved to be synonymous with C. diffinis Jordan, 1925. The Oriental rat flea, Xenopsylla cheopis, was reported from the state by Riley (1937), and Jordan (1937) recorded Megabothris quirini from the meadow jumping mouse, Zapus hudsonius. Erickson (1937) added Monopsyllus wagneri, Orchopeas leucopus and Ctenophthalmus pseud-agyrtes to the state list.

By 1940, Fox was able to list 17 species from Minnesota, including Ctenocephalides felis and C. canis, which were said to be "generally distributed throughout the inhabited areas of the east." This included Minnesota, even though he had no specific records from the state. Additional species listed from Minnesota, and not included in the previous records noted above, were Echidnophaga gallinacea, Foxella ignota, Opisocrostitis bruneri, Oropsylla arctomys, Orchopeas howardii, Monopsyllus vison, Nearctopsylla genalis, Corrodopsylla curvata and Epitedia wenmanni.

From 1940 to 1970, the state list grew slowly, although the specimens in the Entomology Collection at the University of Minnesota increased to more than 2,600. The late Dr. James R. Beer of that institution was an assiduous collector and obtained many specimens for the collection. Rysgaard (1942) added Myodopsylla insignis, a bat flea, to the state list.

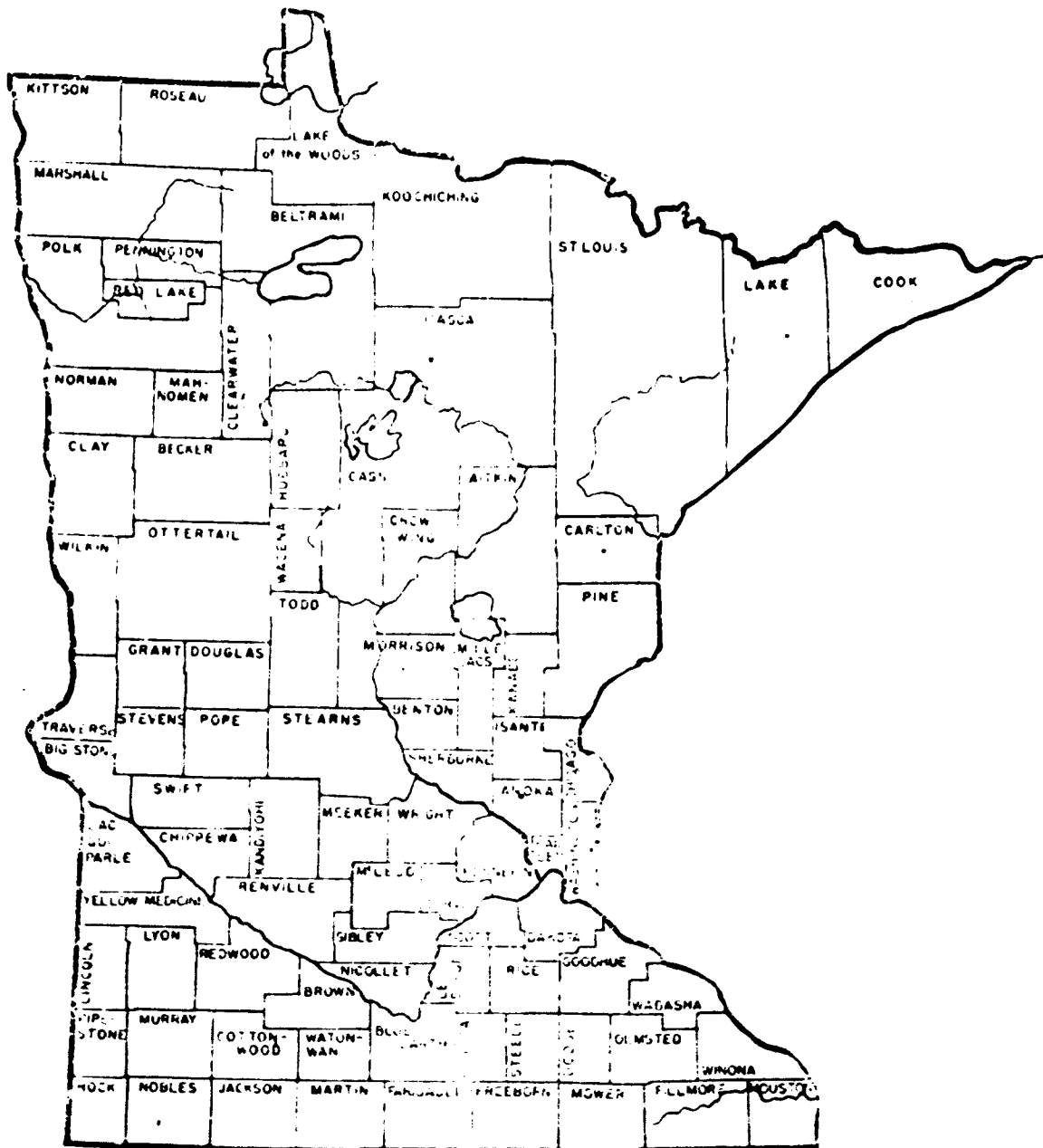
Our interest in the fleas of Minnesota began when the senior author collected fleas in the Itasca State Park area of Clearwater and Hubbard counties in 1970. There and other specimens from the

same area were reported upon by Benton, Larson and Ven Huizen (1971), and included eight species not previously reported from the state: Hystrihopsylla dipptei, Catallagia borealis, Peromyscopsylla catatina, Ceratophyllus styx riparius, Opisodasys pseudarctomys, Megabothris acerbus and Monopsyllus eumolpi. Thus as of 1971, the total list of fleas from Minnesota included 28 species.

In 1971, the junior author began collections in various parts of the state, particularly in Cook county, as part of a faunal study of mammals of the county (Timm, 1975). He reported 23 species of fleas from Cook county, including four species new to the state: Stenoponia americana, Atyphloceras bishopi, Tamiohyla grandis, and Peromyscopsylla hamifer, as well as two species, Peromyscopsylla catatina and Megabothris quirini, from the rock vole, Microtus chrotorrhinus, from which no fleas had previously been collected in Minnesota, (Timm, 1974). Lewis (1978) described a new species, Myodopsylla borealis, based on specimens from Iowa and Minnesota, and the first known females of Rhadinopsylla media were described (Benton and Timm, 1976) based on specimens from northern Minnesota and Isle Royale, Michigan.

The present paper is based largely on recent collections by the junior author, and on previously unreported specimens in the collection of the University of Minnesota. Added to recent reports from Wisconsin (Haas and Wilson, 1973), Isle Royale, Michigan (Wilson and Johnson, 1971) and North Dakota, (Larson et al., 1969; Woods and Larson, 1969; Kinzel et al., 1973; Baesler, 1975) we now have a reasonable understanding of the distribution of Siphonaptera in the north central states, while areas which would most repay further study have now been well defined.

Nomenclature of the Siphonaptera follows Hopkins and Rothschild (1953 et seq.) as far as published, and Lewis (1972 et seq.). Mammalian nomenclature follows Jones, et al. (1975). Nomenclature of avian hosts follows the "Checklist of the American Ornithologists' Union: 5th edition" (1957) and more recent supplements.



Minnesota, in the heart of the north central United States, is bordered on the north by the Canadian provinces of Ontario and Manitoba, on the east by Lake Superior and Wisconsin, on the south by Iowa, and on the west by North Dakota and South Dakota. It is situated between  $89^{\circ} 30'$  and  $97^{\circ} 13'$  west longitude, and between  $43^{\circ} 30'$  and  $49^{\circ} 23'$  north latitude. The topography of the state was shaped by four separate glaciations during the Pleistocene: the Nebraskan, Kansan, Illinoian and Wisconsin. The southwestern part of the state is typically rolling prairie. The northwest, an extremely flat area, is a remnant of the bed of glacial Lake Agassiz, while much of the rest of the state is hilly. The extremes in relief are found in the northeast varying from 602 feet (183 meters) at the shore of Lake Superior to 2,301 feet (700 meters) at Eagle Mountain.

Soils over much of the state are dark brown to black sandy loams of glacial drift origin. These soils are well suited for agriculture in southern and western Minnesota, but in the north and northeast edaphic conditions are best suited to forest production. The entire state is drained by three drainage systems. About half of the state drains into the Mississippi River, which has its origin in north central Minnesota at Lake Itasca, and flows generally southeast across the state. Northeastern Minnesota drains into Lake Superior, and thence through the Great Lakes to the St. Lawrence watershed. North central Minnesota drains to the north, and is a part of the Hudson Bay watershed.

The climate is best described as "northern midcontinental". The winters are generally long and cold, while the summers are cool. Average annual precipitation decreases from east to west, ranging from 40 inches (1 m) in Houston county to less than 15 inches (37 cm.) in Kittson county. The period of greatest rainfall is May through August. Average temperature is inversely correlated with latitude. The Lake Superior area is an exception to this, as the lake has a moderating effect upon the climate of the adjacent north shore. Mean January temperature at Minneapolis is  $12^{\circ}\text{F}$  ( $-11^{\circ}\text{C}$ ) while mean August temperature is  $70^{\circ}\text{F}$  ( $21^{\circ}\text{C}$ ). The corresponding figures for Internat-

ional Falls, on the Canadian border, are 3° F (-16° C) and 65.6° F (18.5° C). (U. S. Weather Bur., Climatol. Data, 79:215-225, 1972).

Prior to settlement by Europeans, the northeastern two thirds of Minnesota was completely forested, while the western and southwestern third was prairie. The forested region was broadly divided into two major habitat types: the coniferous forest and the deciduous forest. The coniferous forest was more extensive, covering the northeastern third of the state. It originally extended from the Canadian border south to Pine county, west to Todd and Ottertail counties and north to Roseau county. Kuchler (1964) subdivided the coniferous forest into three communities: the Great Lakes spruce-fir forest, the Great Lakes pine forest and the conifer bog. The first was characterized by balsam fir and white spruce as dominants. It also contained red pine and white pine, white cedar, paper birch, quaking aspen and maples. The pine forest was dominated by jack pine, red pine and white pine, and also included poplar, aspen and oaks. In the conifer bogs, tamarack, black spruce and white cedar were dominant, with sedge (Carex) and moss (Sphagnum) common secondary components. To the south and west of the coniferous forest was a long continuous deciduous forest belt which separated the coniferous forests from the prairie. The deciduous forest was divided into two major community types: the maple-basswood forest and the oak-savanna. The maple-basswood forest included sugar maple and basswood as dominant trees, while box elder, elms, oaks, green ash, ironwood and bitternut were also common. The oak savanna was described as "tall-grass prairie with broadleaf deciduous trees scattered singly or in groves," with dominants of big blue stem, little blue stem, switch grass and Indian grass. Kuchler included Minnesota's prairie in the "bluestem prairie" of the midwest, and characterized it as having "dense vegetation of tall grasses and many forbs". Mixed deciduous forests, including cottonwood, black willow and American elm were generally found in riparian habitats, especially along the floodplain of the Minnesota River.

With the advent of Europeans, the vegetational picture changed markedly. Most of the original coniferous forest has been logged or burned, or both. Today various second growth successional stages

are found throughout the northeastern section of the state. Birch and aspen are especially abundant. In the deciduous forest zone, lumbering and farming have altered the vegetational patterns. Most of the prairie areas, also, have been given over to agriculture, and only scattered remnants remain in anything resembling the original conditions.

Correspondingly, the distribution of some mammals and their ectoparasites has been affected by the vegetational changes. The northeast, previously inhabited by boreal forms, has been invaded by some mammals of deciduous or prairie affinities. Northward range extensions in the state have been noted for the gray squirrel, Sciurus carolinensis; the fox squirrel, Sciurus niger; the thirteen-lined ground squirrel, Spermophilus tridecemlineatus, and the gray fox, Urocyon cinereoargenteus. The abundance of many species has, of course, been affected by the vegetational changes.

#### SPECIES ACCOUNTS

##### FAMILY PULICIDAE

##### Echidnophaga gallinacea (Westwood)

During the plague surveys in the early part of this century, this flea was recorded from many places for which there are no subsequent records. This record, listed by Fox (1940) is one of these cases. It is doubtful that there is any population of this flea in the state.

Minnesota distribution: Unknown; may occur in southern counties.

Minnesota county: Ramsey. Minnesota host: Rattus norvegicus

##### Pulex irritans Linnaeus

##### Pulex simulans Baker

Fox reported Pulex irritans from Minnesota, but all of the early specimens in the University of Minnesota collection are P. simulans. A single specimen of P. irritans was collected in 1961.

Minnesota distribution: Both species apparently are rare, but may occur almost anywhere in the state.

Minnesota counties: P. irritans, Ottertail

P. simulans, Beltrami, Cass, Ottertail, Ramsey

Minnesota hosts: P. irritans: Urocyon cinereoargenteus

P. simulans: Canis familiaris, Vulpes vulpes

Ctenocephalides canis (Curtis)

The dog flea occurs more commonly on wild carnivores than does the cat flea. It is particularly common on foxes.

Minnesota distribution: The southern two thirds of the state

Minnesota counties: Becker, Goodhue, Ramsey, Rock

Minnesota hosts: Canis familiaris, Vulpes vulpes

Ctenocephalides felis felis (Bouche')

Like other common species, the cat flea is so omnipresent as to be ignored, so that the few records quite certainly do not reflect its true distribution in Minnesota.

Minnesota distribution: Probably throughout the state

Minnesota counties: Anoka, Hennepin, Lyon, Ramsey, Waseca

Minnesota hosts: Canis familiaris, Felis domestica, Homo sapiens

Cediopsylla simplex (Baker)

This rabbit flea occurs on most leporids within its range. We have no records from Lepus townsendii, which may indicate that ecological factors inhibit its occurrence in prairie regions. In the east it occurs on Lepus americanus and L. europaeus, and Sylvilagus spp.

Minnesota distribution: Probably throughout the state; possibly rare or absent in the prairie regions

Minnesota counties: Anoka, Blue Earth, Carver, Cass, Cook,

Cottonwood, Dakota, Fillmore, Hennepin, Morrison,

Pine, Ramsey, Rice, St. Louis, Wright

Minnesota hosts: Sylvilagus floridanus, Lepus americanus

Xenopsylla cheopis (Rothschild)

The primary carrier of bubonic plague, this species is rare in the northern states, with most records coming from urban centers.

Minnesota distribution: Taken only in Minneapolis and St. Paul

Minnesota counties: Hennepin, Ramsey

Minnesota host: Rattus norvegicus

Euhoplopsyllus glacialis affinis (Baker)

This species is a very widespread parasite of hares and rabbits, occurring on almost all leporids within its range.

Minnesota distribution: Probably throughout the state

Minnesota counties: Becker, Big Stone, Cass, Hennepin, Lyon,

Morrison, Wilkin

Minnesota hosts: Sylvilagus floridanus, Lepus americanus, L. townsendii

## FAMILY VERMIPSYLLIDAE

Chaetopsylla lotoris (Stewart)

This flea occurs on wild canids as well as on the raccoon. It is quite certainly more common in Minnesota than the one record indicates.

Minnesota distribution: Probably throughout the state

Minnesota county: Olmsted      Minnesota host: Procyon lotor

## FAMILY HYSTRICHOPSYLLIDAE

Hystrichopsylla dippiei dippiei Rothschild

A parasite of the red squirrel, this species occurs across Canada and the northern edge of the United States.

Minnesota distribution: The northern half of the state

Minnesota counties: Itasca, St. Louis

Minnesota hosts: Tamiasciurus hudsonicus, Peromyscus maniculatus

Atyphloceras bishopi Jordan

This is a vole flea which occurs in the adult stage only during the fall and winter months. Despite the abundance of its hosts, it is relatively rare in collections. Probably ecological factors limit its distribution.

Minnesota distribution: Unknown

Minnesota county: Cook      Minnesota host: Clethrionomys gapperi

Stenoponia americana (Baker)

This large flea is not host specific, occurring on a variety of small mammals, including both rodents and insectivores.

Minnesota distribution: Probably throughout the forested area of the state

Minnesota counties: Anoka, Cook, St. Louis

Minnesota hosts: Peromyscus leucopus, Clethrionomys gapperi

Catallagia borealis Ewing

The red-backed vole, Clethrionomys gapperi, is the true host of this cold-weather flea. Minnesota records range from late September to February.

Minnesota distribution: Most forested areas of the state

Minnesota counties: Anoka, Cook, Hubbard, St. Louis

Minnesota hosts: Clethrionomys gapperi, Blarina brevicauda



Epitedia wenmanni wenmanni (Rothschild)

All specimens which we have seen from Minnesota are referable to the nominate subspecies. Some Iowa specimens have been referred to E. w. testor, and it is possible that this subspecies may occur in the southernmost counties.

Minnesota distribution: Probably throughout the state

Minnesota counties: Anoka, Chisago, Clearwater, Cook, Itasca, Lake, Ottertail

Minnesota hosts: Blarina brevicauda, Tamiasciurus hudsonicus, Peromyscus leucopus, P. maniculatus, Clethrionomys gapperi, Microtus pennsylvanicus

Tamiofila grandis (Rothschild)

This large species is primarily a parasite of the eastern chipmunk.

Minnesota distribution: Eastern and northern counties

Minnesota counties: Becker, Cook, Itasca, Lake

Minnesota hosts: Tamias striatus, Eutamias minimus, Tamiasciurus hudsonicus, Lepus americanus

Nearctopsylla genalis hygini (Rothschild)

This is a cold-weather flea of moles and shrews. Minnesota records range from September 21 to March 25.

Minnesota distribution: Throughout forested areas of the state

Minnesota counties: Anoka, Carlton, Cass, Cook, Dakota, Ramsey, St. Louis

Minnesota hosts: Blarina brevicauda, Scalopus aquaticus, Condylura cristata, Mustela erminea

Rhadinopsylla media Smit

The Minnesota records were reported by Benton and Timm (1976).

This parasite of red squirrels is probably primarily a nest flea.

Minnesota distribution: Probably throughout the range of its host

Minnesota county: Itasca Minnesota host: Tamiasciurus hudsonicus

Corrodopsylla curvata curvata (Rothschild)

This is a parasite of shrews; records from rodents are accidental.

Minnesota distribution: Probably throughout the state

Minnesota counties: Anoka, Baker, Carlton, Clearwater, Cook, Houston, Lake, Ramsey

Minnesota hosts: Sorex cinereus, S. arcticus, S. palustris,  
Blarina brevicauda, Tamias striatus, Peromyscus manic-  
ulatus, Clethrionomys gapperi

Ctenophthalmus pseudagyrtis pseudagyrtis Baker

Of all the Minnesota fleas, this species is the least host specific, as well as one of the most abundant.

Minnesota distribution: Throughout the state

Minnesota counties: Anoka, Becker, Carlton, Chisago, Clearwater,  
Cook, Houston, Itasca, Lake, Ottertail, Polk, Ramsey, St.  
Louis

Minnesota hosts: Sorex cinereus, Blarina brevicauda, Scalopus  
aquaticus, Tamias striatus, Eutamias minimus, Spermophilus  
tridecimlineatus, Sciurus carolinensis, Glaucomys sp.,  
Peromyscus maniculatus, P. leucopus, Clethrionomys gapperi,  
Microtus pennsylvanicus, Synaptomys cooperi, Zapus hudson-  
ius, Spilogale putorius

FAMILY CERATOPHYLLIDAE

Ceratophyllus diffinis Jordan

This rarely taken bird flea is to be sought in bulky nests on or near the ground. It does not appear to have any host preference. Specimens from Pine county were described as C. rileyi Liu (1935) and later synonymized.

Minnesota distribution: Unknown

Minnesota counties: Hubbard, Pine

Minnesota hosts: Bonasa umbellus, Turdus migratorius

Ceratophyllus gallinae Schrank

Although this species is recorded only once in Minnesota, it seems quite certain that it occurs elsewhere in hen houses and in nests of bluebirds, house sparrows, starlings and house wrens.

Minnesota distribution: Unknown

Minnesota county: Carlton

Minnesota host: Homo sapiens

Ceratophyllus garei Rothschild

In the University of Minnesota collection, we discovered one specimen of this species. It should be sought in nests of waterfowl and in other bulky nests.

Minnesota distribution: Unknown

Minnesota county: Koochiching

Minnesota host: Probably Troglodytes aedon

Ceratophyllus idius Jordan and Rothschild

In the east, this species is usually found in nests of tree swallows and purple martins, but in the midwest it occurs frequently in nests of the bank swallow, often in company with C. styx riparius.

Minnesota distribution: Throughout the state

Minnesota counties: Clearwater, Ramsey, Houston, Washington

Minnesota hosts: Nests of Megaceryle alcyon, Progne subis,

Riparia riparia, Petrochelidon pyrrhonota

Ceratophyllus rossitensis swansoni (Liu)

This is the American subspecies of an Old World flea of Corvids. Its type locality is Fertile, Polk county. Its true host is probably the eastern crow, Corvus brachyrhynchos.

Minnesota distribution: Unknown

Minnesota county: Polk

Minnesota host: Asio otus

Ceratophyllus styx riparius (Jordan and Rothschild)

This is the common flea of bank swallows in North America.

Minnesota distribution: Throughout the state

Minnesota counties: Clearwater, Goodhue, Houston, Lake, Ottertail,  
Pine

Minnesota hosts: Nests of Riparia riparia, Megaceryle alcyon;

Peromyscus maniculatus

Megabothris acerbus (Jordan)

This flea is primarily a parasite of eastern chipmunks, although there are occasional records from other sciurids.

Minnesota distribution: Wherever the true host occurs

Minnesota counties: Anoka, Clearwater, Cook, Hubbard

Minnesota hosts: Tamias striatus, Eutamias minimus, Sciurus carolinensis

Megabothris asio megacolpus (Jordan)

This is the most abundant flea on meadow voles. One female was found clinging to a weasel skin in the University of Minnesota, which had been collected in 1879. The flea, when cleared, was quite recognizable.

Minnesota distribution: Probably throughout the state

Minnesota counties: Anoka, Carlton, Clearwater, Cook, Lake, Nobles, Ottertail, Pine, Ramsey

Minnesota hosts: Microtus pennsylvanicus, Clethrionomys gapperi, Blarina brevicauda, Mustela erminea

Megabothris atrox (Jordan)

There are few records of this northern flea from the contiguous United States. It is commonly taken from mustelids.

Minnesota distribution: Probably only the northern counties

Minnesota county: Beltrami

Minnesota host: Mustela vison

Megabothris quirini (Rothschild)

This is typically a flea of voles, but a surprising number of the Minnesota records are from sciurids. It seems unlikely that this is anything other than accidental interchange of ecological associates.

Minnesota distribution: The forested areas of the state

Minnesota counties: Anoka, Carlton, Chisago, Clearwater, Cook, Hubbard, Itasca, Lake, Morrison, Polk

Minnesota hosts: Clethrionomys gapperi, Microtus pennsylvanicus, M. chrotorrhinus, Zapus hudsonius, Peromyscus leucopus, P. maniculatus, Tamiasciurus hudsonicus, Tamias striatus, Eutamias minimus, Lepus americanus

Monopsyllus eumolpi eumolpi (Rothschild)

The least chipmunk is the true host of this flea. Other occurrences are accidental on ecological associates of the true host.

Minnesota distribution: Northeastern counties in the range of  
its true host

Minnesota counties: Carlton, Cass, Clearwater, Cook, Itasca, Lake,  
Lake of the Woods, St. Louis

Minnesota hosts: Eutamias minimus, Tamiasciurus hudsonicus,  
Peromyscus maniculatus

Monopsyllus vison (Baker)

This species is most commonly taken from the red squirrel, but it  
occurs on other squirrels outside the range of the red squirrel, in-  
cluding the chipmunk and the two species of flying squirrels.

Minnesota distribution: Throughout the forested areas

Minnesota counties: Carlton, Cass, Clearwater, Cook, Dodge,  
Grant, Houston, St. Louis

Minnesota hosts: Tamiasciurus hudsonicus, Tamias striatus, Glau-  
comys sabrinus, Spermophilus franklinii, Mustela vison,  
M. erminea

Monopsyllus wagneri systaltus (Jordan)

This is the common deer mouse flea of the prairies, found as far  
east as Wisconsin.

Minnesota distribution: Probably throughout the state

Minnesota counties: Anoka, Chisago, Cook, Dakota, Houston, Isanti,  
Itasca, Lake, Ottertail, Ramsey

Minnesota hosts: Peromyscus maniculatus, P. leucopus, Microtus  
pennsylvanicus, Tamiasciurus hudsonicus

Nosopsyllus fasciatus (Bosc)

Although this common rat flea has been taken only from the Minnea-  
polis-St. Paul area, it should be expected elsewhere.

Minnesota distribution: Unknown

Minnesota counties: Hennepin, Ramsey

Minnesota host: Rattus norvegicus

Opisocrostitis bruneri (Baker)

This abundant flea may be expected wherever ground squirrels are  
found. It does not appear to be host specific.

Minnesota distribution: Everywhere except the extreme northeast

Minnesota counties: Blue Earth, Hennepin, Clearwater, Kittson,  
Lac Qui Parle, Polk, Ramsey, Rice, Rock

Minnesota hosts: Spermophilus franklinii, S. tridecemlineatus,  
S. richardsoni, Tamias striatus, Eutamias minimus, Peromyscus maniculatus, Microtus pennsylvanicus, Vulpes vulpes

Opisodasys pseudarctomys (Baker)

Although this flea is primarily a parasite of flying squirrels, several Minnesota records are from red squirrels.

Minnesota distribution: Throughout forested areas of the state

Minnesota counties: Carlton, Clearwater, Cook, Hubbard, Itasca

Minnesota hosts: Glaucomys sabrinus, Tamiasciurus hudsonicus

Orchopeas caedens caedens (Jordan)

Benton et al. (1971) erroneously reported O. c. durus from Minnesota. All specimens we have seen from the state are referable to the nominate subspecies. This is primarily a parasite of red squirrels.

Minnesota distribution: Throughout forested areas of the state

Minnesota counties: Anoka, Cass, Clearwater, Cook, Faribault,

Isanti, Itasca, Koochiching, Lake, Morrison, Ramsey, St. Louis

Minnesota hosts: Tamiasciurus hudsonicus, Eutamias minimus, Lepus townsendii, Mus musculus, Mustela erminea, M. vison

Orchopeas howardii howardii (Baker)

The gray squirrel and fox squirrel are true hosts of this common flea. Considering its abundance in most of its range, there are surprisingly few records from Minnesota.

Minnesota distribution: The southeastern counties

Minnesota counties: Anoka, Blue Earth, Hennepin, Isanti, Meeker

Minnesota hosts: Sciurus carolinensis, Clethrionomys gapperi,

Mustela vison

Orchopeas leucopus (Baker)

Throughout the eastern states, this deer mouse flea is one of the most abundant of all flea species. However, it occurs so frequently on other mice that it apparently is not an obligate parasite of Peromyscus.

Minnesota distribution: Throughout the state

Minnesota counties: Anoka, Becker, Carlton, Clearwater, Cook, Houston, Isanti, Lake, Lake of the Woods, Pine, St. Louis

Minnesota hosts: Peromyscus leucopus, P. maniculatus, Clethrionomys gapperi, Zapus hudsonius, Tamias striatus, Eutamias minimus, Glaucomys volans, Spilogale putorius

Oropsylla arctomys arctomys (Baker)

This flea occurs only on the woodchuck and its ecological associates and predators.

Minnesota distribution: Throughout the state where the host occurs

Minnesota counties: Anoka, Carlton, Clearwater, Lake, Marshall, Ramsey, St. Louis

Minnesota hosts: Marmota monax, Tamiasciurus hudsonicus

Foxella ignota ignota (Baker)

This widespread flea occurs on pocket gophers across the country. The species has been divided into eleven subspecies, and it is likely that specimens from northwestern counties might be referable to F. i. albertensis, which occurs in Manitoba.

Minnesota distribution: The western and southern counties where pocket gophers occur

Minnesota counties: Anoka, Clearwater, Faribault, Hennepin, Houston, Isanti, Kittson, Ramsey, Rice

Minnesota hosts: Thomomys talpoides, Geomys bursarius, Scalopus aquaticus, Vulpes vulpes, Taxidea taxus, Bubo virginianus

Thrassis bacchi bacchi (Rothschild)

A common ground squirrel flea in the prairie areas, this species occurs as far east as Wisconsin.

Minnesota distribution: The prairie regions of the state

Minnesota counties: Lac Qui Parle, Ramsey

Minnesota hosts: Spermophilus richardsoni, S. tridecemlineatus

## FAMILY LEPTOPSYLLIDAE

Odontopsyllus multispinosus (Baker)

This rabbit flea should occur in southern counties of the state, although we have only one record.

Minnesota distribution: Unknown

Minnesota county: Dakota                      Minnesota host: Sylvilagus floridanus

Peromyscopsylla catatina (Jordan)

This is a flea of microtines in forested areas.

Minnesota distribution: Northeastern counties

Minnesota counties: Anoka, Carlton, Cook, Lake

Minnesota hosts: Clethrionomys gapperi, Microtus chrotorrhinus,

M. pennsylvanicus, Peromyscus maniculatus, Synaptomys cooperi,  
Napeozapus insignis, Blarina brevicauda

Peromyscopsylla hamifer hamifer (Rothschild)

This is a winter flea of voles, quite scarce in collections.

Minnesota distribution: Unknown

Minnesota counties: Anoka, Cook

Minnesota hosts: Microtus pennsylvanicus, Clethrionomys gapperi

(Peromyscopsylla scotti (I. Fox); Hypothetical)

We have no records for this species from Minnesota, but it occurs in nearby Iowa (Fox, 1940) and Wisconsin (Haas and Wilson, 1973). It should be sought in fall and winter in the extreme southern counties.

Myodopsylla insignis (Rothschild)

This bat flea is often abundant in breeding colonies.

Minnesota distribution: Throughout the state

Minnesota counties: Benton, Clearwater, Cook, Fillmore, Houston, Lake,  
 Ramsey, Winona

Minnesota hosts: Myotis lucifugus, Eptesicus fuscus

Myodopsylla borealis Lewis

Specimens in the University of Minnesota collection were among those used by Lewis (1978) in describing this eastern relative of the western M. palposa. It is a parasite of the big brown bat, and most or all of the records are from wintering populations.

Minnesota distribution: The known records are from the Twin Cities area, but the species should be sought in winter colonies of the host in other parts of the state.

Minnesota counties: Hennepin, Ramsey, Washington

Minnesota host: Eptesicus fuscus

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