

A synopsis of the fleas (Insecta: Siphonaptera) parasitizing New World species of Soricidae (Mammalia: Insectivora)

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Abstract

A synopsis of the 57 species and 24 genera of New World fleas parasitizing species of Soricidae is provided, with synonymical lists, and distributional and host data. Species analyzed belong to the families Ceratophyllidae (10 genera), Ctenophthalmidae (10 genera), Hystrichopsyllidae (two genera), and Leptopsyllidae (two genera). Three subspecies are elevated to species: *Corrodopsylla lira*, *C. obtusata*, and *Nearctopsylla hygini*. Soricid hosts include 17 species of *Sorex*, four species of *Cryptotis*, two species of *Blarina*, and one species of *Crocidura*. The species hosting the highest number of flea species is *Blarina brevicauda* (19 flea species), followed by *Sorex cinereus* (16), *S. pacificus* (9), *S. trowbridgii* (8), *S. fumeus* (7), *S. palustris* (7), and *Cryptotis parva* (7). Most of the flea species analyzed are polyxenous, and belong mainly to genera associated to small rodents and marginally present on Soricidae. The association with Soricidae seems to be more evident in species of *Corrodopsylla*, *Corypsylla*, *Ctenophthalmus*, *Doratopsylla*, *Hystrichopsylla*, and *Nearctopsylla*. Only *Corrodopsylla lira*, *C. barrerae*, *Ctenophthalmus cryptotis*, *C. expansus*, *C. myodosus*, *Hystrichopsylla cryptotis*, *H. guatemalensis*, *Nearctopsylla georgiana*, *N. pfizeri*, and *N. princei* are apparently stenoxenous or monoxenous. Taxa analyzed belong to the Nearctic biotic element and are specially diversified in the Mexican Transition Zone.

Key words: fleas, parasites, Soricidae, Insectivora, Nearctic, Holarctic

Introduction

Fleas (Insecta: Siphonaptera) are parasites of mammals and birds. They have adapted physiologically to survive as bloodsucking parasites and they have probably also adapted to their specific hosts. The siphonapteran modifications occur generally in response to some physical or behavioral attributes of the hosts, but coevolution does not necessarily imply comparable rates of evolution by fleas and hosts (Traub, 1985). There are currently recognized *ca.* 2,500 species and subspecies of fleas, classified in 220 genera and 15

families (Lewis, 1998).

Among the taxa that have been reported as hosts of fleas, the family Soricidae (Mammalia: Insectivora) represents a particularly interesting taxon (Grenyer & Purvis, 2003). It is the most speciose family of Insectivora, with species particularly diversified in the Holarctic realm. In the New World, they have diversified mainly in Canada, USA, and Mexico, with a few species in Central and South America (George, 1988; Churchfield, 1990).

Our objective is to provide a synopsis of the flea species that parasitise Soricidae in the New World, detailing their geographical distribution and hosts.

Material and methods

Data were obtained from the literature and specimens deposited in the collection of the Museo de Zoología, Facultad de Ciencias, UNAM, Mexico, D.F. In order to discuss the degree of host specificity of fleas and their mammal hosts, we considered five basic categories (Herrin & Tipton, 1975): (1) monoxenous: occurs in a single host species; (2) stenoxenous: occurs in species of a single genus; (3) oligoxenous: occurs on species of two or more genera; (4) polyxenous: very low host specificity; and (5) synoxenous: species of parasites of the same genus occurring on the same host.

The polytypic species concept, which has led to recognition of subspecies whenever a low degree of differentiation seemed to not justify a species status for allopatrid populations, has come under strong criticism and is progressively being abandoned. For this reason, we generally considered subspecies names as synonyms. In three cases (*Corrodopsylla lira*, *C. obtusata*, and *Nearctopsylla hygini*) we found that there was enough morphological evidence to treat them as distinct species.

Results

Family Ceratophyllidae

Subfamily Ceratophyllinae

Aetheca Smit, 1983

Aetheca Smit, 1983: 42.

A. wagneri (Baker, 1904)

Ceratophyllus wagneri Baker, 1904: 405.

Ceratophyllus peromysci Stewart, 1928: 148.
Ceratophyllus wagneri wagneri; Jordan, 1929: 35.
Monopsyllus wagneri; Jordan, 1933a: 78.
Monopsyllus wagneri wagneri; Wagner, 1936a: 2000.
Megabothris wagneri; I. Fox, 1940: 71.
Aetheca wagneri; Smit, 1983: 42.

Distribution. Canada and USA.

Hosts. *Sorex cinereus*, *S. t. trowbridgii*, and *Sorex* sp. **Other hosts.** Carnivora: *Mustela frenata* and *Spilogale putorius olympica*. Rodentia: *Clethrionomys gapperi*, *Dipodomys ordii*, *Eutamias* sp., *Onychomys leucogaster missouriensis*, *Peromyscus leucopus*, *P. maniculatus*, *Spermophilus lateralis*, *S. richardsoni*, *Thomomys talpoides rufescens*, and *Zapus princeps idahoensis* (Jellison & Good, 1942; Hubbard, 1947; Holland, 1949; Rapp Jr. & Gates, 1957; Morales & Llorente, 1986; Ayala-Barajas *et al.*, 1988; Whitaker, 2004).

***Jellisonia* Traub, 1944**

***Jellisonia (Pleochaetoides)* Augustson, 1944**

Jellisonia (Pleochaetoides) Augustson, 1944: 366; Hastriter, 2004 (revision).

***J. ironsi* (Eads, 1947)**

Trichopsylla ironsi Eads, 1947: 545.
Jellisonia ironsi; Randolph & Eads, 1946: 599.

Distribution. USA, Mexico, Guatemala, and Costa Rica.

Hosts. *Cryptotis parva*, *Cryptotis* sp., and *Sorex* sp. **Other hosts.** Rodentia: *Baiomys musculus*, *B. taylori*, *Baiomys* sp., *Dipodomys elator*, *Microtus* sp., *Mus musculus*, *Peromyscus leucopus*, *P. maniculatus*, *Peromyscus* sp., *Reithrodontomys montanus*, and *Reithrodontomys* sp. (Hastriter, 2004).

***Kohlsia* Traub, 1950**

Kohlsia Traub, 1950: 45.

***K. pelaezi* Barrera, 1956**

Kohlsia pelaezi Barrera, 1956: 13.

Distribution. Mexico.

Hosts. *Sorex veraepacis*. **Other hosts.** Rodentia: *Peromyscus furvus*, *P. megalops*, *P. mexicanus*, and *Peromyscus* sp. (Traub *et al.*, 1983; Morales & Llorente, 1986; Ayala-Barajas *et al.*, 1988).

***Malaraeus* Jordan, 1933**

Malaraeus Jordan, 1933a: 76; Traub *et al.*, 1983.

***M. telchinum* (Rothschild, 1905)**

Ceratophyllus telchinus Rothschild, 1905: 153.
Malaraeus telchinum; Jordan, 1933a: 76.

Distribution. Canada and USA.

Hosts. *Sorex arcticus*, *S. pacificus*, and *Sorex* sp. **Other hosts.** Carnivora: *Mustela frenata*. Rodentia: *Microtus californicus*, *M. montanus*, *Microtus* sp., *Peromyscus boylii*, *P. eremicus*, *P. maniculatus*, *P. truei*, *Peromyscus* sp., and *Reithrodontomys megalotis* (Hubbard, 1947; Holland, 1949; Traub *et al.*, 1983; Carraway, 1985; Ayala-Barajas *et al.*, 1988).

***Megabothris* Jordan, 1933**

Megabothris Jordan, 1933a: 77; Traub *et al.*, 1983.

***M. abantis* (Rothschild, 1915)**

Ceratophyllus abantis Rothschild, 1915a: 164.
Megabothris abantis; Jordan, 1933a: 77.
Megabothris adversus Wagner, 1936a: 654.

Distribution. Canada and USA.

Hosts. *Sorex palustris*. **Other hosts.** Carnivora: *Mustela* sp. Rodentia: *Clethrionomys gapperi*, *Microtus longicaudus*, *M. montanus*, *M. oregoni*, *M. pennsylvanicus*, *M. richardsoni*, *M. townsendii*, *Peromyscus* sp., *Synaptomys* sp., and *Zapus* sp. (Traub *et al.*, 1983; Beneski, Jr. & Stinson, 1987).

***M. asio* (Baker, 1904)**

Ceratophyllus asio Baker, 1904: 388.
Megabothris asio; I. Fox, 1939: 47.
Trichopsylla (Trichopsylla) asio asio; Baker, 1946: 47.

Distribution. Canada and USA.

Hosts. *Blarina brevicauda* and *Sorex cinereus*. **Other hosts.** Carnivora: *Mustela erminea* and *Vulpes vulpes*. Lagomorpha: *Sylvilagus floridanus*. Rodentia: *Clethrionomys gapperi*, *Microtus chrotorrhinus*, *M. pennsylvanicus*, *Synaptomys cooperi*, *Peromyscus maniculatus*, and *Zapus hudsonius* (Benton & Kelly, 1975; Traub *et al.*, 1983; Eckerlin & Painter, 2000; Whitaker, 2004).

***M. quirini* (Rothschild, 1905)**

Ceratophyllus quirini Rothschild, 1905: 163.
Ceratophyllus querini Jordan, 1929: 171.
Megabothris quirini; Jordan, 1933a: 77.

Distribution. Canada and USA.

Hosts. *Sorex cinereus*. **Other hosts.** Insectivora (Talpidae): *Condylura cristata*. Lagomorpha: *Sylvilagus n. nuttallii*. Rodentia: *Clethrionomys gapperi*, *Microtus chrotorrhinus*, *M. longicaudus*, *M. ochrogaster*, *M. oeconomus*, *M. pennsylvanicus*, *Napaeozapus insignis*, *Peromyscus leucopus*, *P. maniculatus*, *P. m. artemisiae*, *P. m. borealis*, *Spermophilus* sp., *Tamias minimus borealis*, *Tamiasciurus h. hudsonicus*, and *Zapus* sp. Carnivora: *Urocyon cinereoargenteus* (Holland, 1949; Benton & Kelly, 1975; Traub *et al.*, 1983; Whitaker, 2004).

***Monopsyllus Kolenati*, 1857**

Monopsyllus Kolenati, 1857: 65; Traub *et al.*, 1983.
Trichopsylla Ewing & Fox, 1943: 55.

***M. vison* (Baker, 1904)**

Ceratophyllus lucidus Baker, 1904: 388.
Ceratophyllus vison Baker, 1904: 388.
Monopsyllus vison; Jordan, 1933a: 78.

Distribution. Canada and USA.

Hosts. *Blarina brevicauda talpoides*. **Other hosts.** Carnivora: *Martes americana*, *Mephitis m. mephitis*, and *Mustela frenata*. Rodentia: *Peromyscus maniculatus gracilis* and *Tamiasciurus hudsonicus* (Holland, 1949; Traub *et al.*, 1983; Ayala-Barajas *et al.*, 1988).

***Nosopsyllus* Jordan, 1933**

Nosopsyllus Jordan, 1933a: 76; Traub *et al.*, 1983.

***N. fasciatus* (Bosc d'Antic, 1801)**

Pulex fasciatus Bosc d'Antic, 1801: 156.
Ceratophyllus fasciatus; Wagner, 1898: 559.
Ceratophyllus californicus Baker, 1904: 387.
Ceratophyllus oculatus Baker, 1904: 387.
Ceratophyllus canadensis Baker, 1904: 388.
Nosopsyllus fasciatus; Jordan, 1933a: 76.
Neopsylla fasciata; Spencer, 1936: 14.

Distribution. Cosmopolitan (Lewis, 1998).

Hosts. *Crocidura* sp. and *Sorex* sp. **Other hosts.** Carnivora: *Martes* sp., *Mustela frenata*, and *Vulpes fulva*. Didelphimorphia: *Didelphis virginiana*. Insectivora (Erinaceidae): *Erinaceus* sp. Rodentia: *Apodemus* sp., *Glaucomys* sp., *Micromys* sp., *Microtus pennsylvanicus*, *Otomys* sp., *Peromyscus maniculatus labecula*, *Rattus norvegicus*, *Sciurus* sp., *Spalax* sp., *Spermophilus* sp., and *Tamiasciurus hudsonicus* (Holland, 1949; Rapp Jr. & Gates, 1957; Benton & Kelly, 1975; Benton, 1980; Traub *et al.*, 1983; Morales & Llorente, 1986).

***Opisocrostis* Jordan, 1933**

Opisocrostis Jordan, 1933a: 76; Traub *et al.*, 1983.

***O. bruneri* (Baker, 1895)**

Pulex bruneri Baker, 1895: 130.
Opisocrostis bruneri; Jordan, 1933a: 73.
Oropsylla (Opisocrostis) bruneri; Brown, 1944: 209.

Distribution. Canada and USA.

Hosts. *Sorex cinereus*. **Other hosts.** Carnivora: *Felis* sp., *Mustela* sp., and *Vulpes* sp. Rodentia: *Geomys* sp., *Peromyscus* sp., *Spermophilus franklinii*, *S. richardsoni*, *S. tridecemlineatus*, *Tamias minimus borealis*, and *Thomomys talpoides* (Traub *et al.*, 1983; Ayala-Barajas *et al.*, 1988; Whitaker, 2004).

***Orchopeas* Jordan, 1933**

Orchopeas Jordan, 1933a: 71; Lewis, 2000 (revision).

***O. agilis* (Rothschild, 1905)**

Ceratophyllus sexdentatus agilis Rothschild, 1905: 30.
Ceratophyllus sexdentatus nevadensis Rothschild, 1905: 30.
Orchopeas sexdentatus nevadensis; Wagner, 1936b: 199.
Orchopeas agilis; Lewis, 2000: 169.

Distribution. USA.

Hosts. *Sorex* sp. **Other hosts.** Rodentia: *Neotoma albigula*, *N. cinerea*, and *N. mexicana* (Holland, 1949; Lewis, 2000).

***O. leucopus* (Baker, 1904)**

Ceratophyllus leucopus Baker, 1904: 401.
Ceratophyllus aeger Rothschild, 1905: 167.
Orchopeas leucopus; Jordan, 1933a: 72.

Distribution. Canada, USA, and Mexico.

Hosts. *Blarina brevicauda* and *Sorex cinereus*. **Other hosts.** Carnivora: *Spilogale putorius*. Rodentia: *Clethrionomys gapperi*, *Glaucomys sabrinus*, *G. s. macrotis*, *G. volans*, *Microtus c. chrotorrhinus*, *M. ochrogaster*, *M. p. pennsylvanicus*, *Microtus* sp., *Mus musculus*, *Neotoma* sp., *Onychomys* sp., *Peromyscus leucopus*, *P. maniculatus*, *P. mexicanus*, *Peromyscus* sp., *Reithrodontomys* sp., *Sigmodon hispidus*, *S. ochrognathus*, *Tamias minimus*, *T. striatus*, and *Zapus hudsonius* (Jellison *et al.*, 1943; Holland, 1949; Rapp Jr. & Gates, 1957; Benton *et al.*, 1969; Benton, 1980; Traub *et al.*, 1983; Morales & Llorente, 1986; Ayala-Barajas *et al.*, 1988; Salceda-Sánchez & Hastriter, 2006).

***Plusaetis* Smit, 1983**

Plusaetis Smit, 1983: 19.

***P. aztecus* Barrera, 1954**

Plusaetis apollinaris aztecus Barrera, 1954: 138.

Plusaetis aztecus; Traub *et al.*, 1983: 153.

Distribution. Mexico.

Hosts. *Sorex milleri*, *S. saussurei*, and *Sorex* sp. **Other hosts.** Rodentia: *Microtus m. mexicanus*, *Neotomodon alstoni*, *Peromyscus difficilis*, *P. maniculatus labecula*, *P. melanotis*, *P. truei gratus*, *Rattus norvegicus*, *Reithrodontomys chrysopsis*, *R. megalotis*, and *R. m. saturatus* (Traub *et al.*, 1983; Morales & Llorente, 1986; Ayala-Barajas *et al.*, 1988).

***P. mathesoni* Traub, 1950**

Plusaetis mathesoni Traub, 1950: 26.

Distribution. Mexico, Guatemala and Costa Rica.

Hosts. *Sorex milleri* and *S. s. saussurei*. **Other hosts.** Rodentia: *Microtus m. mexicanus*, *Neotoma mexicana*, *Neotomodon alstoni*, *Peromyscus difficilis*, *P. hylocetes*, *P. maniculatus*, *P. m. labecula*, *P. melanotis*, *P. truei gratus*, *Reithrodontomys c. chrysopsis*, *R. megalotis*, and *R. m. saturatus* (Traub *et al.*, 1983; Morales & Llorente, 1986; Ayala-Barajas *et al.*, 1988).

Family Ctenophthalmidae**Subfamily Ctenophthalminae****Tribe Ctenophthalmini*****Ctenophthalmus* Kolenati, 1856*****Ctenophthalmus (Alloctenus)* Traub & Barrera, 1966**

Ctenophthalmus (Alloctenus) Traub & Barrera, 1966: 128; Morrone *et al.*, 2000 (revision).

Ctenophthalmus (Nearctoctenophthalmus) Hopkins & Rothschild, 1966: 529.

***C. caballeroi* Barrera & Machado, 1960**

Ctenophthalmus caballeroi Barrera & Machado, 1960: 549.

Distribution. Mexico.

Hosts. *Sorex* sp. **Other hosts.** Rodentia: *Microtus mexicanus*, *Microtus* sp., *Peromyscus difficilis*, and *Reithrodontomys* sp. (Barrera, 1968; Morrone *et al.*, 2000).

***C. cryptotis* Traub & Barrera, 1966**

Ctenophthalmus cryptotis Traub & Barrera, 1966: 128.

Distribution. Mexico.

Hosts. *Cryptotis* sp. (Ayala-Barajas *et al.*, 1988; Morrone *et al.*, 2000).

***C. expansus* Traub, 1950**

Ctenophthalmus expansus Traub, 1950: 70.

Distribution. Mexico.

Hosts. *Cryptotis parva*. **Other hosts.** Rodentia: *Reithrodontomys c. chrysopsis* (Traub, 1950; Morrone *et al.*, 2000).

***C. myodosus* Traub & Barrera, 1966**

Ctenophthalmus expansus myodosus Traub & Barrera, 1966: 138.

Ctenophthalmus myodosus; Morrone *et al.*, 2000: 10.

Distribution. Mexico.

Hosts. *Cryptotis* sp. (Traub & Barrera, 1966; Morrone *et al.*, 2000).

***C. pseudagyrtis* Baker, 1904**

Ctenophthalmus pseudagyrtis pseudagyrtis Baker, 1904: 420.

Ctenophthalmus pseudagyrtis; Morrone *et al.*, 2000: 5.

Distribution. Canada, USA, and Mexico.

Hosts. *Blarina brevicauda*, *B. carolinensis*, *Cryptotis parva*, *Sorex cinereus*, and *S. fumeus*. **Other hosts.** Carnivora: *Mephitis mephitis*, *Mustela erminea*, *Spilogale putorius*, and *Vulpes fulca*. Insectivora (Talpidae): *Condylura cristata*, *Parascalops breweri*, and *Scalopus aquaticus*. Lagomorpha: *Sylvilagus floridanus*. Rodentia: *Clethrionomys gapperi*, *Erethizon dorsatum*, *Geomys bursarius*, *Glaucomys sabrinus*, *G. volans*,

Glaucomys sp., *Microtus chrotorrhinus*, *M. mexicanus subsimus*, *M. minor*, *M. ochrogaster*, *M. pennsylvanicus*, *M. pinetorum*, *Napaeozapus insignis*, *Ondatra zibethica*, *Peromyscus d. difficilis*, *P. leucopus*, *P. maniculatus*, *Peromyscus melanotis*, *Rattus norvegicus*, *Sciurus coralinensis*, *Sigmodon hispidus*, *Spermophilus tridecemlineatus*, *Synaptomys cooperi*, *Tamias minimus*, *T. striatus*, *Tamiasciurus hudsonicus*, and *Zapus hudsonius* (Holland, 1949; Rapp Jr. & Gates, 1957; Wilson, 1957; Hopkins & Rothschild, 1966; Benton *et al.*, 1969; Miller & Benton, 1973; Whitaker, 1974; Benton & Kelly, 1975; Wassel *et al.*, 1978; Benton, 1980; Owen, 1984; Morales & Llorente, 1986; Whitaker & Cudmore, 1987; Ayala-Barajas *et al.*, 1988; Durden & Wilson, 1991; McCay & Durden, 1996; Morrone *et al.*, 2000; McCay, 2001; Whitaker, 2004).

***C. tecpin* Morrone *et al.*, 2000**

Ctenophthalmus tecpin Morrone *et al.*, 2000: 7.

Distribution. Mexico.

Hosts. *Cryptotis mexicana*. **Other hosts.** Rodentia: *Microtus* sp., *Oryzomys melanotis rostratus*, and *Peromyscus furvus* (Morrone *et al.*, 2000; Salceda-Sánchez & Hastriter, 2006).

Subfamily Doratopsyllinae

Tribe Doratopsyllini

***Corrodopsylla* Wagner, 1929**

Corrodopsylla Wagner, 1929: 317; Hopkins & Rothschild, 1966.

***C. barrerai* Traub & Evans, 1967**

Corrodopsylla barrerai Traub & Evans, 1967: 603.

Distribution. Mexico

Hosts. *Sorex* sp. (Traub & Evans, 1967).

***C. curvata* (Rothschild, 1915)**

Doratopsylla curvata Rothschild, 1915a: 28.

Doratopsylla (Corrodopsylla) curvata; Wagner, 1929: 317.

Corrodopsylla curvata; Wagner, 1936b: 205.

Corrodopsylla curvata curvata; Ewing & Fox, 1943: 81.

Distribution. Canada, USA, and Mexico.

Hosts. *Blarina brevicauda*, *Sorex arcticus*, *S. cinereus*, *S. fumeus*, *S. haydeni*, *S. milleri*, *S. monticolus*, *S. m. monticolus*, *S. palustris*, *S. p. navigator*, *S. saussurei*, *S. tenellus*, *S. vagrans monticola*, *S. v. vancouverensis*, *S. v. yanquinae*, and *Sorex* sp. **Other hosts.** Rodentia: *Clethrionomys gapperi*, *Peromyscus maniculatus*, *Tamias striatus*, and *Zapus* sp. (Jellison *et al.*, 1943; Hubbard, 1947; Holland, 1949; Rapp Jr. & Gates, 1957; Hopkins & Rothschild, 1966; Benton & Kelly, 1975; Benton, 1980; Kirkland & Schmidt, 1996; Owen, 1984; Beneski, Jr. & Stinson, 1987; Whitaker & Cudmore, 1987; McCay & Durden, 1996; Lakkonen *et al.*, 2002; Whitaker, 2004).

***C. lira* Traub, 1950, stat. nov.**

Corrodopsylla curvata lira Traub, 1950: 81.

Distribution. Mexico.

Hosts. *Sorex milleri* and *S. saussurei* (Traub, 1950; Hopkins & Rothschild, 1966; Morales & Llorente, 1986).

***C. obtusata* (Wagner, 1929), stat. nov.**

Doratopsylla curvata obtusata Wagner, 1929: 318.

Corrodopsylla curvata obtusata; Wagner, 1936b: 205.

Doratopsylla jellisoni Hubbard, 1940: 8.

Corrodopsylla jellisoni; Ewing & Fox, 1943: 81.

Distribution. Canada and USA.

Hosts. *Blarina brevicauda*, *Sorex bairdii*, *S. dispar*, *S. fumeus*, *S. monticolus*, *S. pacificus*, *S. p. pacificus*, *S. palustris navigator*, *S. trowbridgii*, *S. t. trowbridgii*, *S. v. vagrans*, *S. vagrans vancouverensis*, and *Sorex* sp. **Other hosts.** Insectivora (Talpidae): *Condylura cristata* and *Parascalops breweri*. Rodentia: *Clethrionomys gapperi*, *Microtus longicaudus angusticeps*, *M. o. oregoni*, *M. o. serpens*, *M. pinetorum*, *M. townsendii*, *Napaeozapus insignis*, *Peromyscus leucopus*, *P. maniculatus sonoriensis*, and *Tamiasciurus hudsonicus* (Hubbard, 1947; Holland, 1949; Hopkins & Rothschild, 1966; Benton & Kelly, 1975; Carraway, 1985).

***C. hamiltoni* (Traub, 1944)**

Doratopsylla hamiltoni Traub, 1944: 219.
Corrodopsylla hamiltoni; Traub, 1950: 84.

Distribution. USA.

Hosts. *Blarina brevicauda*, *Cryptotis parva*, and *Sorex cinereus*. **Other hosts.** Rodentia: *Microtus pennsylvanicus* (Traub, 1944; Hopkins & Rothschild, 1966; Whitaker, 1974; Benton & Kelly, 1975; Benton, 1980; Whitaker, 2004).

***Doratopsylla* Jordan & Rothschild, 1912**

Doratopsylla Jordan & Rothschild, 1912: 62.

***D. blarinae* Fox, 1914**

Doratopsylla blarinae Fox, 1914: 11.

Distribution. Canada and USA.

Hosts. *Blarina brevicauda*, *Cryptotis parva*, *Sorex cinereus*, *S. fumeus*, *S. palustris*, and *Sorex* sp. **Other hosts.** Rodentia: *Microtus pinetorum* and *Peromyscus leucopus* (Holland, 1949; Hopkins & Rothschild, 1966; Miller & Benton, 1973; Whitaker, 1974; Benton, 1980; Owen, 1984; Beneski, Jr. & Stinson, 1987; Whitaker & Cudmore, 1987; Whitaker *et al.*, 1994; McCay & Durden, 1996; McCay, 2001; Whitaker, 2004).

Subfamily Neopsyllinae**Tribe Neopsyllini*****Catallagia* Rothschild, 1915**

Catallagia Rothschild, 1915b: 41; Lewis & Haas, 2001 (revision).

***C. borealis* Ewing, 1929**

Catallagia borealis Ewing, 1929: 126.
Catallagia onaga Jordan, 1929: 172.

Distribution. Canada and USA.

Hosts. *Blarina brevicauda*. **Other hosts.** Rodentia: *Clethrionomys gapperi*, *Clethrionomys* sp., *Microtus chrotorrhinus*, *M. p. pennsylvanicus*, *Napaeozapus insignis*, and *Peromyscus maniculatus* (Jellison & Good, 1942; Hopkins & Rothschild, 1962; Benton & Kelly, 1975; Lewis & Haas, 2001).

***C. charlottensis* (Baker, 1898)**

Typhlopsylla charlottensis Baker, 1898: 56.
Ceratophyllus charlottensis; Baker, 1904: 386.
Odontopsyllus charlottensis; Baker, 1905: 131.
Catallagia charlottensis; Rothschild, 1915b: 43.
Catallagia motei Hubbard, 1940: 4.

Distribution. Canada and USA.

Hosts. *Sorex bendirii*, *Sorex b. palmeri*, *S. trowbridgii*, and *S. t. trowbridgii*. **Other hosts.** Lagomorpha: *Ochotona princeps brunnescens*. Rodentia: *Clethrionomys gapperi*, *Microtus oregoni serpens*, *M. t. townsendii*, *Peromyscus maniculatus*, and *Peromyscus* sp. (Hubbard, 1947; Holland, 1949; Hopkins & Rothschild, 1962; Ayala-Barajas *et al.*, 1988; Lewis & Haas, 2001).

***C. decipiens* Rothschild, 1915**

Catallagia decipiens Rothschild, 1915a: 447.
Catallagia moneris Jordan, 1937: 267.

Distribution. Canada and USA.

Hosts. *Sorex* sp. **Other hosts.** Carnivora: *Mustela frenata*. Rodentia: *Clethrionomys gapperi*, *Lemmiscus curtatus pauperrimus*, *Marmota flaviventris*, *Microtus longicaudus*, *M. montanus*, *M. pennsylvanicus*, *Neotoma cinerea*, *Neotoma* sp., *Peromyscus leucopus*, *P. maniculatus gambeli*, *Peromyscus* sp., *Phenacomys intermedius*, *Spermophilus r. richardsoni*, *Tamiasciurus hudsonicus*, and *Zapus princeps idahoensis* (Jellison *et al.*, 1943; Holland, 1949; Rapp Jr. & Gates, 1957; Hopkins & Rothschild, 1962; Ayala-Barajas *et al.*, 1988; Lewis & Haas, 2001).

***C. sculleni* Hubbard, 1940**

Catallagia sculleni Hubbard, 1940: 3.

Distribution. USA.

Hosts. *Sorex pacificus*. **Other hosts.** Rodentia: *Microtus townsendii*, *Peromyscus maniculatus rubidus*, and *Scapanus townsendii* (Carraway, 1985; Hopkins & Rothschild, 1962; Lewis & Haas, 2001).

Subfamily Rhadinopsyllinae

Tribe Corypsyllini

Corypsylla C. Fox, 1908

Corypsylla C. Fox, 1908: 452; Hopkins & Rothschild, 1962.
Corypsylloides Hubbard, 1940: 7.

C. kohlsi Hubbard, 1940

Corypsylla kohlsi Hubbard, 1940: 10.

Corypsylloides spinata I. Fox, 1940b: 273.

Corypsylloides kohlsi; I. Fox, 1941: 10.

Distribution. USA.

Hosts. *Sorex bairdii*, *S. p. pacificus*, and *S. trowbridgii*. **Other hosts.** Rodentia: *Microtus townsendii* (Hubbard, 1947; Hopkins & Rothschild, 1962; Carraway, 1985; George, 1989).

Nearctopsylla Rothschild, 1915

Nearctopsylla Rothschild, 1915c: 452; Hopkins & Rothschild, 1962.

N. genalis (Baker, 1904)

Typhlopsylla fraterna Baker, 1895: 189 (part).

Ctenophthalmus genalis Baker, 1904: 420.

Nearctopsylla hygini laurentina Jordan & Rothschild, 1923: 315.

Nearctopsylla genalis; I. Fox, 1940: 91.

Nearctopsylla genalis laurentina; Holland, 1949:104.

Distribution. Canada and USA.

Hosts. *Blarina brevicauda*, *Sorex cinereus*, *S. c. miscix*, and *S. fumeus*. **Other hosts.** Carnivora: *Mustela frenata noveboracensis* and *Mustela* sp. Insectivora (Talpidae): *Condylura cristata*, *Parascalops breweri*, and *Scalopus aquaticus*. Rodentia: *Clethrionomys gapperi* and *Synaptomys cooperi* (Rapp Jr. & Gates, 1957; Hopkins &

Rothschild, 1962; Miller & Benton 1973; Benton & Kelly, 1975; Benton, 1980; Owen, 1984; Ayala-Barajas *et al.*, 1988; Eckerlin & Painter, 2000; Whitaker, 2004).

***N. georgiana* Pratt & Harrison, 1954**

N. georgiana Pratt & Harrison, 1954: 124.

Distribution. USA.

Hosts. *Blarina brevicauda* (Hopkins & Rothschild, 1962; Benton, 1980).

***N. hygini* (Rothschild, 1904), stat. rev.**

Ctenopsyllus hygini Rothschild, 1904: 650.

Nearctopsylla hygini; Rothschild, 1915c: 307.

Nearctopsylla genalis hygini; Holland, 1949:104.

Distribution. Canada and USA.

Hosts. *Blarina brevicauda*, *Sorex a. arcticus*, *S. monticolus*, and *Sorex* sp. **Other hosts.** Carnivora: *Mustela erminea*, *M. e. richardsoni*, *M. frenata*, and *Mustela* sp. Insectivora (Talpidae): *Condylura cristata* and *Scalopus aquaticus* (Holland, 1949; Hopkins & Rothschild, 1962; Benton, 1980).

***N. hyrtaci* (Rothschild, 1904)**

Ctenopsyllus hyrtaci Rothschild, 1904: 652.

Nearctopsylla hyrtaci; Rothschild, 1915c: 307.

Distribution. Canada and USA.

Hosts. *Sorex arcticus*, *S. cinereus*, *S. monticolus*, *S. palustris navigator*, and *S. p. palustris*. **Other hosts.** Carnivora: *Mustela erminea*, *M. e. richardsoni*, and *M. frenata longicauda* (Hubbard, 1947; Holland, 1949; Hopkins & Rothschild, 1962; Beneski, Jr. & Stinson, 1987).

***N. pfitzeri* Benton, 1981**

Nearctopsylla pfitzeri Benton, 1981: 841.

Distribution. USA.

Hosts. *Blarina brevicauda* (Benton, 1980).

***N. princei* Holland & Jameson, 1950**

Nearctopsylla princei Holland & Jameson, 1950: 251.

Distribution. USA.

Hosts. *Sorex trowbridgii* (Hopkins & Rothschild, 1962; Eads *et al.*, 1979; George, 1989).

Tribe Rhadinopsyllini***Rhadinopsylla* Jordan & Rothschild, 1912**

Rhadinopsylla Jordan & Rothschild, 1912: 367; Hopkins & Rothschild, 1962.

***R. fraterna* (Baker, 1895)**

Typhlopsylla fraterna Baker, 1895: 189.

Ctenophthalmus fraternus; Baker, 1904: 420.

Neopsylla hamiltoni Dunn & Parker, 1923: 2770.

Rectofrontia fraterna; Jordan, 1937: 270.

Rhadinopsylla fraterna; Smit, 1957: 57.

Distribution. Canada, USA, and Mexico.

Hosts. *Sorex cinereus*. **Other hosts.** Carnivora: *Mustela frenata longicauda*. Lagomorpha: *Ochotona princeps*. Rodentia: *Cynomys leucurus*, *Microtus pennsylvanicus drummondii*, *Neotoma mexicana*, *Peromyscus maniculatus*, *P. melanotis*, *Spermophilus colombianus*, *S. richardsoni*, and *Thomomys* sp. (Hopkins & Rothschild, 1962; Morales & Llorente, 1986; Whitaker, 2004).

***R. sectilis* Jordan & Rothschild, 1923**

Rhadinopsylla sectilis Jordan & Rothschild, 1923: 314.

Micropsylla peromyscus Dunn & Parker, 1923: 2767.

Micropsylla sectilis; Jordan, 1937: 270.

Distribution. Canada and USA.

Hosts. *Cryptotis* sp. **Other hosts.** Rodentia: *Dipodomys panamintinus*, *Lemmyscus curtatus*, *Neotoma lepida*, *Onychomys leucogaster fuscogriseus*, *Peromyscus maniculatus artemisiae*, *P. m. gambeli*, *Spermophilus beldingi oregonus*, *S. townsendii*, and *Tamias merriami* (Hopkins & Rothschild, 1962).

Subfamily Stenoponiinae**Tribe Stenoponiini*****Stenoponia* Jordan & Rothschild, 1911**

Stenoponia Jordan & Rothschild, 1911a: 391.

***S. americana* (Baker, 1899)**

Hystrichopsylla americana Baker, 1899: 37.

Stenoponia wetmorei Chapin, 1919: 52.

Stenoponia americana Jordan, 1937:285.

Distribution. Canada, USA, and Mexico.

Hosts. *Blarina brevicauda*, *B. carolinensis*, and *Sorex cinereus*. **Other hosts.** Didelphimorphia: *Didelphis virginiana*. Insectivora (Talpidae): *Scalopus aquaticus*. Rodentia: *Clethrionomys gapperi*, *Microtus ochrogaster*, *M. o. minor*, *M. pennsylvanicus*, *M. pinetorum*, *M. richardsoni arviculoides*, *Microtus* sp., *Peromyscus gossypinus*, *P. leucopus*, and *P. l. noveboracensis* (Wilson, 1957; Benton & Kelly, 1975; Hopkins & Rothschild, 1962; McCay, 2001; Salceda-Sánchez & Hastriter, 2006).

Subfamily Neopsyllinae***Epitedia* Jordan, 1938**

Epitedia Jordan, 1938: 124.

***E. scapani* (Wagner, 1936)**

Neopsylla scapani Wagner, 1936a: 657.

Epitedia jordani Hubbard, 1940: 10.

Epitedia scapani; Wagner, 1940: 465.

Distribution. Canada and USA.

Hosts. *Sorex bairdii*, *S. bendirii*, *S. b. palmeri*, *S. p. pacificus*, *S. p. yanquinae*, *S. palustris navigator*, *S. t. trowbridgii*, *S. v. vagrans*, and *Sorex* sp. **Other hosts.** Carnivora: *Mustela erminea streatorum*. Insectivora (Talpidae): *Neurotrichus g. gibbsii* and *Scapanus townsendii*. Rodentia: *Aplodontia r. rufa*, *Microtus longicaudus abditus*, *M. o. oregoni*, *M. o. serpens*, *M. townsendii*, *Peromyscus maniculatus*, *P. m. gambleli*, *P. m. oreas*, *P. m.*

rubidus, *Peromyscus* sp., *Tamias t. townsendii*, and *Thomomys monticola oregoni* (Hubbard, 1947; Holland, 1949; Hopkins & Rothschild, 1962; Carraway, 1985).

***E. stewarti* Hubbard, 1940**

Epitedia stewarti Hubbard, 1940: 11.

Distribution. USA.

Hosts. *Sorex pacificus* and *S. trowbridgii*. **Other hosts.** Rodentia: *Microtus c. californicus*, *Microtus* sp., and *Peromyscus maniculatus* (Hopkins & Rothschild, 1962; Carraway, 1985).

***E. wenmanni* (Rothschild, 1904)**

Ctenophthalmus wenmanni Rothschild, 1904: 642.

Neopsylla wenmanni; Rothschild, 1915a: 30.

Neopsylla testor Rothschild, 1915b: 34.

Neopsylla similis Chapin, 1919: 50.

Epitedia wenmanni; I. Fox, 1940: 96.

Epitedia testor; I. Fox, 1940a: 99.

Neopsylla wenmanni testor; Hopkins, 1954: 217.

Epitedia wenmanni wenmanni; Hopkins, 1954: 217.

Distribution. Canada, USA, and Mexico.

Hosts. *Blarina brevicauda*, *Cryptotis parva*, *Sorex cinereus*, and *S. fumeus*. **Other hosts.** Carnivora: *Mustela erminea*, *M. frenata*, and *Mustela* sp. Insectivora (Talpidae): *Condylura cristata* and *Parascalops breweri*. Rodentia: *Clethrionomys gapperi*, *C. g. proteus*, *Dipodomys ordii*, *Glaucomys volans*, *Lemmiscus curtatus*, *Microtus chrotorrhinus*, *M. mexicanus subsimus*, *M. ochrogaster*, *M. pennsylvanicus*, *M. p. minor*, *Microtus* sp., *Mus musculus*, *Napaeozapus insignis*, *Neotoma cinerea*, *N. floridana*, *N. f. osagensis*, *Onychomys leucogaster*, *Peromyscus difficilis*, *P. leucopus*, *P. l. noveboracensis*, *P. maniculatus*, *P. m. gambeli*, *P. melanotis*, *Peromyscus* sp., *Rattus* sp., *Spermophilus r. richardsoni*, *Tamiasciurus douglasii*, *T. hudsonicus*, and *Thomomys talpoides quadratus* (Jellison *et al.*, 1942; Holland, 1949; Rapp Jr. & Gates, 1957; Wilson, 1957; Hopkins & Rothschild, 1962; Whitaker, 1974; Benton & Kelly, 1975; Benton, 1980; Owen, 1984; Morales & Llorente, 1986; Ayala-Barajas *et al.*, 1988; Durden & Wilson, 1991; Whitaker, 2004).

Subfamily Anomiopsyllinae***Megarthroglossus* Jordan & Rothschild, 1915**

Megarthroglossus Jordan & Rothschild, 1915: 46.

***M. procus* Jordan & Rothschild, 1915**

Megarthroglossus procus Jordan & Rothschild, 1915: 47.

Megarthroglossus procus procus; Hubbard, 1947: 297.

Megarthroglossus procus oregonensis Hubbard, 1947: 299.

Distribution. USA

Hosts. *Sorex palustris navigator*. **Other hosts.** Carnivora: *Spilogale putorius olympica*. Rodentia: *Glaucomys sabrinus oregonensis*, *Neotoma cienera occidentalis*, *Peromyscus maniculatus*, *P. m. rubidus*, and *Tamiasciurus douglasii* (Hubbard, 1947; Hopkins & Rothschild, 1962).

Family Hystrichopsyllidae**Subfamily Hystrichopsyllinae****Tribe Hystrichopsyllini*****Atyphloceras* Jordan & Rothschild, 1915**

Atyphloceras Jordan & Rothschild, 1915: 59.

Saphiopsylla Jordan, 1931: 227.

***A. multidentatus* (C. Fox, 1909)**

Ceratophyllus multidentatus C. Fox, 1909: 107.

Atyphloceras multidentatus; Jordan & Rothschild, 1915: 59.

Atyphloceras artius Jordan, 1933b: 69.

Atyphloceras felix Jordan, 1933b: 69.

Distribution. Canada and USA.

Hosts. *Sorex trowbridgii* and *S. t. trowbridgii*. **Other hosts.** Rodentia: *Clethrionomys californicus*, *Lemmys curtatus*, *Microtus californicus*, *M. longicaudatus abditus*, *M. l. angusticeps*, *M. oregoni*, *M. townsendii*, *Neotoma* sp., *Peromyscus boylii*, *P. b. rowleyi*, *P.*

californicus insignis, *P. eremicus fraterculus*, *P. maniculatus artemisiae*, *P. m. gambeli*, *P. truei gilberti*, and *Rattus norvegicus* (Hubbard, 1947; Hopkins & Rothschild, 1962; Ayala-Barajas *et al.*, 1988).

***A. bishopi* Jordan, 1933**

Atyphloceras bishopi Jordan, 1933c: 63.
Saphiopsylla bishopi; Holland, 1949: 72.

Distribution. Canada and USA.

Hosts. *Blarina brevicauda* and *B. b. talpoides*. **Other hosts.** Rodentia: *Clethrionomys gapperi*, *C. g. proteus*, *Microtus chrotorrhinus*, *M. pennsylvanicus*, *M. pinetorum*, *Peromyscus leucopus*, and *Synaptomys cooperi* (Jellison & Good, 1942; Hopkins & Rothschild, 1962; Miller & Benton, 1973; Benton & Kelly, 1975; Benton, 1980; Lewis & Lewis, 1994).

***Hystrichopsylla* Taschenberg, 1880**

Hystrichopsylla Taschenberg, 1880: 63.

***H. cryptotis* Acosta & Morrone, 2005**

Hystrichopsylla cryptotis Acosta & Morrone, 2005: 57.

Distribution. Mexico.

Hosts. *Cryptotis mexicana*. **Other hosts.** Rodentia: *Peromyscus furvus* (Acosta & Morrone, 2005; Salceda-Sánchez & Hastriter, 2006).

***H. dippiei* Rothschild, 1902**

Hystrichopsylla dippiei Rothschild, 1902: 63.
Hystrichopsylla gigas dippiei; Jordan, 1937: 271.
Hystrichopsylla dippiei dippiei; Holland, 1957: 315.

Distribution. Canada and Mexico.

Hosts. *Sorex* sp. **Other hosts.** Rodentia: *Neotoma fuscipes*, *Peromyscus maniculatus*, and *Tamias amoenus affinis* (Holland, 1949; Hopkins & Rothschild, 1962; Ayala-Barajas *et al.*, 1988).

***H. guatemalensis* Lewis & Eckerlin, 2004**

Hystrichopsylla guatemalensis Lewis & Eckerlin, 2004: 757.

Distribution. Guatemala.

Hosts. *Cryptotis goodwini* (Lewis & Eckerlin, 2004).

***H. occidentalis* Holland, 1949**

Hystrichopsylla occidentalis Holland, 1949: 76.

Distribution. Canada and USA.

Hosts. *Sorex pacificus*. **Other hosts.** Insectivora (Talpidae): *Neurotrichus* sp. Rodentia: *Microtus oregoni serpens* (Holland, 1949; Carraway, 1985; Ayala-Barajas *et al.*, 1988; Hopkins & Rothschild, 1962).

***H. tahavuaana* Jordan, 1929**

Hystrichopsylla gigas tahavuaana Jordan, 1929: 173.

Hystrichopsylla tahavuaana; Holland, 1949: 76.

Distribution. USA.

Hosts. *Blarina brevicauda*. **Other hosts.** Insectivora (Talpidae): *Condylura cristata* and *Parascalops breweri*. Rodentia: *Microtus pennsylvanicus*, *M. pinetorum*, and *Peromyscus leucopus noveboracensis* (Jellison & Good, 1942; Hopkins & Rothschild, 1962; Benton & Kelly, 1975; Benton, 1980; Lewis & Lewis, 1994).

Family Leptopsyllidae**Subfamily Leptopsyllinae****Tribe Leptopsyllini*****Leptopsylla* Jordan & Rothschild, 1911**

Ctenopsyllus Kolenati, 1863: 37 (*non* Kolenati, 1856).

Leptopsylla Jordan & Rothschild, 1911b: 85.

Triainopsylla Rosický, 1957: 298.

***L. segnis* (Schönherr, 1811)**

- Pulex segnis* Schönherr, 1811: 99.
Pulex musculi Dugès, 1832: 160.
Ctenophthalmus talpae Kolenati, 1856: 33.
Ctenophthalmus quadritentatus Kolenati, 1859: 65.
Typhlopsylla musculi; Taschenberg, 1880: 63.
Typhlopsylla mexicana Baker, 1896: 85.
Ctenopsylla musculi; J. Wagner, 1903: 26.
Ctenopsyllus mexicanus; Baker, 1904: 427.
Ctenophthalmus segnis; Oudemans, 1909: 137.
Leptopsylla musculi; Jordan & Rothschild, 1911b: 85.
Ctenopsylla segnis; Wagner, 1926: 289.
Leptopsylla segnis; Jordan, 1929: 177.

Distribution. Cosmopolitan (Lewis, 1998).

Hosts. *Sorex p. pacificus*. **Other hosts.** Didelphimorphia: *Marmosa elegans*. Rodentia: *Akodon mollis orohillus*, *Cavia aperea*, *Mus m. musculus*, *Peromyscus l. leucopus*, *Rattus norvegicus*, *R. r. rattus*, *R. r. alexandrinus*, and *Sigmodon hispidus* (Hubbard, 1947; Hopkins & Rothschild, 1971; Morales & Llorente, 1986; Ayala-Barajas *et al.*, 1988).

***Peromyscopsylla* I. Fox, 1939**

- Peromyscopsylla* I. Fox, 1939: 47.
Leptopsylla (*Peromyscopsylla*); Ioff *et al.*, 1965: 115.

***P. catatina* (Jordan, 1928)**

- Leptopsylla catatina* Jordan, 1928: 186.
Peromyscopsylla catatina; I. Fox, 1940: 84.

Distribution. Canada and USA.

Hosts. *Blarina brevicauda* and *Sorex cinereus*. **Other hosts.** Insectivora (Talpidae): *Parascalops breweri*. Didelphimorphia: *Didelphis virginiana*. Rodentia: *Clethrionomys gapperi*, *C. g. proteus*, and *Microtus pennsylvanicus* (Holland, 1949; Hopkins & Rothschild, 1971; Ayala-Barajas *et al.*, 1988; Whitaker, 2004).

***P. hesperomys* (Baker, 1904)**

- Ctenopsyllus hesperomys* Baker, 1904: 427.
Leptopsylla hesperomys; Rothschild, 1915c: 304.
Peromyscopsylla spinifrons I. Fox, 1939: 48.

Peromyscopsylla hesperomys; I. Fox, 1940: 84.
Peromyscopsylla hesperomys hesperomys; Holland, 1949: 176.

Distribution. USA.

Hosts. *Sorex cinereus*. **Other hosts.** Rodentia: *Calomys* sp., *Clethrionomys gapperi*, *Neotoma cinerea occidentalis*, *Peromyscus leucopus*, *P. maniculatus*, *P. m. artemisiae*, *P. m. austerus*, *P. m. gambeli*, *P. m. rubidus*, *Peromyscus* sp., and *Tamiasciurus hudsonicus* (Hopkins & Rothschild, 1971; Benton *et al.*, 1969; Miller & Benton 1973; Benton, 1980; Whitaker, 2004).

***P. ostsibirica* (Skalon, 1936)**

Ctenopsyllus ostsibiricus Skalon, 1936: 48.
Leptopsylla hamifer longiloba Jordan, 1939: 319.
Leptopsylla ostsibirica; Skalon, 1950: 77.
Peromyscopsylla ostsibirica ostsibirica; Johnson & Traub, 1954: 5.
Leptopsylla (Peromyscopsylla) ostsibirica; Ioff *et al.*, 1965: 115.
Peromyscopsylla ostsibirica; Smit, 1967: 100.

Distribution. Canada and USA.

Hosts. *Sorex tundrensis*. **Other hosts.** Lagomorpha: *Lepus americanus*. Rodentia: *Clethrionomys rutilus*, *Microtus oeconomus*, *Microtus* sp., and *Tamiasciurus hudsonicus* (Hopkins & Rothschild, 1971; Lakkonen *et al.*, 2002).

***P. scotti* I. Fox, 1939**

Peromyscopsylla scotti I. Fox, 1939: 49.

Distribution. USA.

Hosts. *Cryptotis parva*. **Other hosts.** Rodentia: *Peromyscus leucopus* (Hopkins & Rothschild, 1971; Whitaker, 1974).

***P. selenis* (Rothschild, 1906)**

Ctenopsyllus selenis Rothschild, 1906: 322.
Leptopsylla selenis; Jordan, 1928: 186.
Peromyscopsylla selenis; Jellison & Good, 1942: 123.
Peromyscopsylla duma Traub, 1944: 217.

Distribution. Canada and USA.

Hosts. *Sorex pacificus*, *S. p. pacificus*, and *Sorex* sp. **Other hosts.** Rodentia: *Clethrionomys californicus*, *C. c. obscurus*, *C. gapperi*, *Microtus c. californicus*, *M. canicaudus*, *M. longicaudus*, *M. l. mordax*, *M. l. sierrae*, *M. montanus dutcheri*, *M. m.*

montanus, *M. pennsylvanicus drummondii*, *M. richardsoni arvicoloides*, *M. townsendii*, *Peromyscus maniculatus*, *P. m. artemisa*, *P. m. gambeli*, *P. m. rubidus*, *Spermophilus lateralis chrysodeirus*, *Tamiasciurus douglasii albolimbatus*, and *Zapus* sp. (Hubbard 1947; Hopkins & Rothschild, 1971; Carraway, 1985).

Discussion

Soricid hosts include 17 species of *Sorex*, four species of *Cryptotis*, two species of *Blarina*, and one species of *Crocidura*. No fleas have been already recorded for the genera *Megasorex* and *Notiosorex*. The species hosting the highest number of flea species is *Blarina brevicauda* (19 flea species), followed by *Sorex cinereus* (16), *S. pacificus* (9), *S. trowbridgii* (8), *S. fumeus* (7), *S. palustris* (7), and *Cryptotis parva* (7). Regarding host specificity, is interesting to note that most of the flea species analyzed are polyxenous, belonging mainly to genera associated to small rodents and marginally present on species of Soricidae, e.g., *Catallagia* (Lewis & Haas, 2001), *Jellisonia* (Hastriter, 2004), *Kohlsia* (Lewis, 1998), *Malaraeus* (Traub *et al.*, 1983; Lewis, 1998), *Megabothris* (Traub *et al.*, 1983; Lewis, 1998), *Nosopsyllus* (Traub *et al.*, 1983; Lewis, 1998), *Orchopeas* (Traub *et al.*, 1983), *Opisocrostis* (Lewis, 1998), *Plusaetis* (Traub *et al.*, 1983), and *Rhadinopsylla* (Hopkins & Rothschild, 1962). The association with Soricidae seems to be more evident in *Corrodopsylla* (Hopkins & Rothschild, 1966), *Corypsylla* (Hopkins & Rothschild, 1962), *Ctenophthalmus* (Morrone *et al.*, 2000), *Nearctopsylla* (Hopkins & Rothschild, 1962), *Doratopsylla* (Hopkins & Rothschild, 1966), and *Hystrichopsylla* (Lewis & Eckerlin, 2004; Acosta & Morrone, 2005), although their species are usually polyxenous. Only *Corrodopsylla lira*, *C. barrerae*, *Ctenophthalmus cryptotis*, *C. expansus*, *C. myodosus*, *Nearctopsylla georgiana*, *N. pfitzeri*, *N. princei*, and *Hystrichopsylla guatemalensis* are apparently stenoxenous or monoxenous.

When the geographical distribution of the flea genera is analyzed, most of them appear to be Nearctic (e.g., *Corypsylla*, *Jellisonia*, *Kohlsia*, *Malaraeus*, *Orchopeas*, *Pleochaetis*, and *Plusaetis*) or Holarctic (e.g., *Catallagia*, *Corrodopsylla*, *Ctenophthalmus*, *Doratopsylla*, *Hystrichopsylla*, *Nearctopsylla*, *Nosopsyllus*, and *Rhadinopsylla*). Their species belong to the Nearctic biotic element (Morrone, 2005), as their mammal hosts, and are specially diversified in the Mexican Transition Zone (Morrone & Gutiérrez, 2005). Although their highest diversity lies in North America, some of them have species in Central America, e.g., *Jellisonia* (Lewis, 1998; Hastriter, 2004), *Kohlsia* (Lewis, 1998), *Ctenophthalmus* (Morrone *et al.*, 2000), and *Hystrichopsylla* (Acosta & Morrone, 2005). *Plusaetis* has a species that reaches South America (Traub *et al.*, 1983; Lewis, 1998).

Phylogenetic evidence concerning the flea taxa analyzed is scarce, with cladograms available only for *Ctenophthalmus (Alloctenus)* (Morrone *et al.*, 2000) and the Mesoamerican species of *Hystrichopsylla* (Acosta & Morrone, 2005). In the former, the most basal species are parasites of mice, secondarily associated with Talpidae and

Soricidae, and the three species belonging to the most apomorphic clade (*C. cryptotis*, *C. expansus*, and *C. myodosus*) are exclusive parasites of the shrew genus *Cryptotis*. In *Hystrichopsylla*, the species parasitizing Soricidae, *H. cryptotis* and *H. guatemalensis*, are not sister taxa and both belong to clades of species that parasitize rodents. From an evolutionary viewpoint, it seems that the New World fleas have associated with Soricidae by relatively recent events of colonization.

An interesting aspect that deserves to be further analyzed in fleas associated with shrews, is the existence of modified pronotal and genal combs, which Traub & Barrera (1966) considered as examples of convergent evolution. In the species of *Ctenophthalmus* (*Alloctenus*) parasitizing shrews, pronotal combs are longer than the pronotum, concave, apically blunt or rounded (instead of being sharply pointed), and inclined ventrocaudad. The first spine of the genal comb is apically subovate, or only bluntly pointed, instead of being markedly pointed or acuminate as in species infesting rodents. Traub & Barrera (1966) compared these features with other species that parasitize Soricidae, and concluded that they seem to exhibit parallel developments in shrew-infesting species.

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