

Stanko, M. Fleas synusy (Siphonaptera) of small mammals from the central part of the East-Slovakia lowlands. *Biologia, Bratislava* 49(2): 239-246.

Stolper, R. & J.P. Opdebeeck. Flea allergy dermatitis in dogs diagnosed by intradermal skin tests. *Research in Veterinary Science* 57(1): 21-27.

Stone, B.F., M.A. Shipstone, K.V. Mason, M. Cunningham & C.W. Wong. Efficacy of Permethrin in controlling the Australian paralysis tick *Ixodes holocyclus* and the cat flea *Ctenocephalides felis* on dogs. *Australian Veterinary Journal* 71(3): 90-91.

Trpis, M. Host-parasite relationships between fleas (Siphonaptera) and bats (Chiroptera) hibernating in ice and limestone caves in Slovakia. *Bulletin of the Society for Vector Ecology* 19(1): 8-12.

Trpis, M. Host-parasite relationships between fleas (Siphonaptera) and small mammals in the Tatras Mountains of Slovakia. *Bulletin of the Society for Vector Ecology* 19(1): 13-17.

Trpis, M. Host specificity and ecology of fleas (Siphonaptera) of small mammals in mountains of north-central Slovakia. *Bulletin of the Society for Vector Ecology* 19(1): 18-22.

COEXTINCTION

In an interesting letter to the British Journal NATURE (366: 307, 25 November) Nigel Stork and Christopher Lyal discuss the extinction of endo- and ectoparasites, along with the extinction of their hosts. The authors suggest that in at least one group of insects,

the lice (Phthiraptera) and possibly another, fleas (Siphonaptera), the extinction rates approximate those of their avian and mammalian hosts. This is particularly the case in the lice because of their high degree of host specificity. Using the passenger pigeon and its extinction in 1914 as an example, they note that at least two species of chewing lice, *Columbicola extinctus* Malcomson and *Campanulotes defectus* Tendeiro, evidently became extinct at the same time as their host, relatively unnoted by the scientific community. They go on to point out that most people "consider the value of insects, either positive or negative (with perhaps the exception of butterflies), solely in terms of their contribution to ecosystems and their direct or indirect effect on humans." Whether its lice should be given the same value as their avian host raises ethical questions that should not be ignored when discussing conservation priorities and practices. If conservation needs require the extinction of their parasites while conserving the host species, such practices should be pursued "... in the full knowledge of what is being lost."

This has long been a matter of lively discussion among pulicologists since many families of fleas show phylogenetic affinities within the order that suggest extinction patterns of certain of their mammalian hosts. It is seldom noted that while hemimetabolous parasites such as lice pass all of their life stages on the host, the holometabolous fleas differ drastically in their requirements between the larvae and the adults and the law of the minimum applies to both stages. While we can never accurately reconstruct the phylogenetic position of these extinct taxa in a current context, a hypothetical example taken from the North American fauna demonstrates the potential damage to our studies created by host extinctions.

The host is the mountain beaver, *Aplodontia rufa*, a primitive rodent with a restricted range from northern California to extreme southwestern British Columbia. According to the literature, ten species of fleas have been reported from this host. Five of these are obviously strays from other hosts, or at least accidental associations. Another, while found on this and other rodent hosts fairly frequently, is mainly a parasite of insectivores (shrews and moles). The

remaining four are specific parasites of *A. rufa* and are almost never found on other hosts. Four genera are represented and three of these are monotypic. Depending on the family classification followed, either two or three separate families are represented.

The first of these is *Dolichopsyllus stylosus* (Baker, 1904) (Leptopsyllidae, Amphipsyllinae, Dolichopsyllini). The proper phylogenetic position of this taxon is very much a matter of speculation. According to current family definition it is a leptopsyllid but it is not in the mainstream of evolution in the family. That it is larger and hairier than other members of the family suggests its primitivity. However, the presence of a well developed pronotal ctenidium and the loss of eyes suggest some specialization as a parasite of a semifossorial host. In my view, its extinction would eliminate what I consider to be the most plesiomorphic member of the entire family.

The remaining three species are hystrichopsylloids, usually considered to be the most primitive superfamily in the order. The first of these, *Hystrichopsylla schefferi* Chapin, 1919 (Hystrichopsyllidae, Hystrichopsyllinae, Hystrichopsyllini), is a member of an Holarctic genus containing 19 species and 32 named taxa. Only seven species occur in the Nearctic Region, and all except *H. schefferi* are associated with rodent and insectivore hosts. *Hystrichopsylla schefferi* has the distinction of being the largest, non-neosomic flea in the entire order, and females may exceed one centimeter in length. All members of the genus are considered primitive by most students of the order and the most plesiomorphic taxa seem mostly associated with insectivores, although host specificity is not particularly strong in this genus. That the largest and one of the most primitive species is associated with such a primitive host suggests a fascinating evolutionary complex of taxa that has been lost to us through extinction of their hosts. Lewis & Lewis (1994) discuss this species in more detail.

Both of the other two taxa are monotypic and both are assigned to the family Ctenophthalmidae, Rhadinopsyllinae, Rhadinopsyllini. The eighty odd taxa assigned to this tribe are all nest fleas in that they have lost the ability to jump well and are

confined to the nest of the host during most or all of their existence, both as larvae and adults. Members of the Palaearctic genus *Stenischia* are shrew fleas, while species of the Holarctic *Rhadinopsylla* parasitize rodents and/or insectivores, depending upon the subgenus to which they belong. *Paratyphlocercas oregonensis* Ewing, 1940 and *Trichopsylloides oregonensis* Ewing, 1938, are exclusively parasites of *A. rufa* and are seldom taken on any other host species. It is apparent that *Stenischia* and *Rhadinopsylla* are closely related, in spite of the strong tergal and sternal incrustations of the abdomen in the former genus, and *Stenischia rhadinopsylloides* Smit, 1975, connects the two genera quite obviously. While both of the *Aplodontia* parasites are distinct from this line of evolution in the tribe, they are both much more setose, and *P. oregonensis* is much larger than any other member of the tribe. The genal ctenidium is present in this species, which is normal in the tribe, but it is missing or vestigial in *T. oregonensis*. All males in this tribe normally lack antepygidial bristles, an apomorphic character in the order, but a pair of these bristles is present in males of *P. oregonensis*.

In summary, while neither of these fleas seem to be in the mainstream of evolution within the tribe, each shows traits that are thought to be ancestral. Consequently, their loss could severely dampen phylogenetic studies in this large and important family of fleas. As pointed out by Lewis and Lewis (1994) these strongly host-specific species may become the first fleas to be placed on the Endangered Species list since at least two subspecies of *A. rufa* are seriously threatened by habitat reduction due to housing developments and other types of construction. REL

**We wish you the happiest of
holiday seasons and the best of
New Years!**

Larimer County, 2.5 km W Fort Collins, 40.35N 105.06W, 1580 m, 24-X-1969, from *Peromyscus difficilis*, E. G. Campos). HOLOTYPE ♂, allotype ♀, said to be deposited in the USNM but not included in their inventory.

Hystrichopsylla occidentalis sylvaticus Campos & Stark: Lewis & Lewis, 1985: 144; Kucera & Haas, 1992: 382.

This is an inland taxon that has been recorded from Idaho, Utah, Colorado, Arizona, and southern California. It evidently prefers *Peromyscus* species as hosts and seems to frequent more arid habitats. The describers indicate that the subspecies is abundant in coniferous forests. It has most often been collected during the cooler months.

In general, the zoogeography of the *H. occidentalis* species complex presents some interesting possibilities. It is known from Alaska to south-central California, inland to the eastern front range of the Rocky Mountains in Colorado. The inland population, including material from Colorado, Idaho, Utah, Arizona and one record from Wrightwood, Los Angeles County, California, was described as *H. o. sylvaticus*. Records from Wyoming and Nevada are not available, but Campos & Stark (1979) showed an intergrade between this and *H. o. linsdalei* from Tulare County, California. They also listed intergrades between the nominate form and *H. o. linsdalei* in Siskiyou and Plumas counties in northern California. The Tulare County record is troublesome because it is in the Californian Subregion whereas all other records of *H. o. sylvaticus* are from the Rocky Mountain Subregion. Perhaps the collection data are faulty. Distribution records almost suggest a type of cline extending from Alaska southeast into Colorado, Arizona, and southern California, with the *H. o. occidentalis* phenotype occurring from Alaska to the northern California region, where it blends into the *H. o. linsdalei* phenotype. This in turn seems to blend into the *H. o. sylvaticus* phenotype inland to the east. Additional material is needed from eastern Washington, Oregon, southern Idaho, and especially Nevada and Wyoming, to resolve the subspecies complex in this group, if indeed they are valid. The authors of *H. o. sylvaticus* quoted H. J. Egoscue as stating that *H. occidentalis* subspecies prefer drier areas, particularly coniferous forests. Can this possibly apply to the coastal collections of the nominate subspecies?

Members of this aggregation of subspecies are quite catholic in their selection of hosts but show a distinct preference for species of *Peromyscus* and *Microtus*, with frequent infestations of other cricetine and microtine species and even an occasional shrew.

Hystrichopsylla schefferi Chapin, 1919
(Fig. 8) [91901]

Hystrichopsylla schefferi Chapin, 1919: 50–52 (USA, Washington, Pierce County, Puyallup, 47.12N 122.19W, no date given, from *Aplodontia rufa* nest, T. H. Scheffer). Described from a single female. Deposition unknown to us.

Hystrichopsylla schefferi Chapin: Svihla, 1941: 18; Hubbard, 1947: 359; Holland, 1949b: 78; Holland, 1957: 319; Hansen, 1964: 80; Jellison & Senger, 1976: 74; Haas, 1982a: 46; Lewis et al. 1988: 65.

Hystrichopsylla mammoth Chapin 1921: 25–26 (USA, California, Mono County, Mammoth, ≈37.47 N 118.40 W, VII-1917, from *Aplodontia californica* [= *rufa*], A. B. Howell). Type ♂, allotype ♀, USNM No. 104157.

Hystrichopsylla mammoth Chapin: Holland, 1949a: 8 (synonymized); Holland, 1957: 320; Lewis & Lewis, 1989: 92.

Hystrichopsylla schefferi mammoth Chapin: Hubbard, 1947: 361.

Hystrichopsylla hubbardi Augustson 1953: 119, pl. 22, figs. 1–2 (USA, Oregon, Coos County, Coos Head Park, 25-VIII-1942, from *Aplodontia rufa*, F. C. Ziesenhenné). Holotype ♂ deposited in the Allan Hancock Foundation, University of California, Los Angeles. Now in the Los Angeles County Museum.

Hystrichopsylla hubbardi Augustson: Holland, 1957: 320 (synonymized); Haig, 1978: 2; Lewis & Lewis, 1989: 74.

This species has the distinction of being the largest non-neosomic flea in the entire world. Mounted females measure up to 9–10 mm in overall body length. It is also unusual in that it is a specific parasite of the Sewellel or Mountain Beaver, *Aplodontia rufa* (Rafinesque), generally thought to be the most primitive of all living rodents. In passing, this species is also the true host of two monotypic ctenophthalmid genera and one monotypic leptopsyllid genus. Members of these four taxa are seldom encountered on any other hosts, except for occasional predator records.

The distribution of this flea exactly matches that of its host and extends from northern California to south of the Frazer River in British Columbia in the coastal Pacific northwest. According to Hubbard (1947), this is a rare species. He suggested a sex ratio of 1:6 males/females, and a peak population of adults in March. He also opined that perhaps the species was a nest flea, which would account for its infrequent collection. At least two of the recognized subspecies of *A. rufa* are seriously threatened by habitat reduction due to housing developments, etc.,

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and their fleas may become the first siphonapterans to be placed on the endangered species list.

Genus *Atyphloceras* Jordan & Rothschild, 1915

Atyphloceras Jordan & Rothschild, 1915: 59.
Generitype: *Ceratophyllus multidentatus* C. Fox, 1909.

Atyphloceras Jordan & Rothschild: Dalla Torre, 1924: 3; Ewing, 1929: 173; I. Fox, 1940: 78, 80; Jellison & Good, 1942: 24; Ewing & I. Fox, 1943: 38; Costa Lima & Hathaway, 1946: 244; Hubbard, 1947: 274; Holland, 1949b: 72; Hopkins, 1952: 365; Jellison et al., 1953a: 14; 1953b: 612; Hopkins & Rothschild, 1962: 86; Jellison & Glesne, 1967: 20; Lewis, 1974: 147; Holland, 1985: 66; Lewis & Lewis, 1985: 136; Lewis et al., 1988: 66; Lewis, 1993a: 65, 1993b: 243; Whitaker et al., 1993: 446.

Saphiopsylla Jordan, 1931: 227. Generitype: *Saphiopsylla nupepa* Jordan, 1931.

Saphiopsylla Jordan: Holland, 1949b: 71; Hopkins, 1952: 365 (synonymized); Jellison et al., 1953a: 185; 1953b: 612; Lewis & Lewis, 1989: 136.

There are currently eight named taxa assigned to this genus belonging to six recognized species. Two of these are restricted to the Palaearctic Region, and one species and one subspecies are extralimital to North America. The principal hosts of all members of the genus are small rodents, particularly microtines and cricetines in the western hemisphere. The taxa occurring in the United States and Canada may be separated with the following key.

Key to the *Atyphloceras* Species of the United States and Canada

1. Labial palpus of only 5 segments; posterior arms of male st IX with parallel margins (Fig. 18); sinus in margin of female st VII broad and shallow (Fig. 15); distributed in northeastern North America *bishopi* Jordan
Labial palpus of >5 segments (Fig. 14); apex of male st IX expanded (Figs. 19, 20); western species 2
2. Apex of distal arm of male st IX expanded into a triangular lobe that is pointed apically and caudoventrally (Fig. 19); bulga of female spermatheca oval, noticeably longer than hilla; apical margin of female st VII variable but usually divided by a deep, rounded sinus, the lower lobe truncate apically and slightly concave (Fig. 16); northwestern United States, extending into British Columbia
. *multidentatus multidentatus* (C. Fox)
Apex of distal arm of male st IX expanded

into a rounded lobe with a blunt apex and no caudoventral point (Fig. 20); bulga of female spermatheca much shorter and more spherical, with apex of hilla expanded; st VII with a shallow sinus subtended by a blunt or rounded ventral lobe (Fig. 17); southwestern United States on *Neotoma* species *echis* subspecies.

3. Labial palpus with 7 segments in males, 7 or 8 in females; movable process of male and distal arm of st IX as in Fig. 20; ventral lobe of female st VII rounded (Fig. 17) *echis echis* Jordan & Rothschild
Labial palpus of 8 or 9 segments in males, 9 in females; movable process of male usually longer and distal arm of st IX broader; ventral lobe of female st VII somewhat square
echis longipalpus Stewart

***Atyphloceras bishopi* Jordan, 1933**
(Figs. 15, 18) [933333]

Atyphloceras bishopi Jordan, 1933a: 63, figs. 11-12 (USA, New York, Monroe County, Fairport, 43.06N 77.27W, 10-X-1929, from *Blarina brevicauda*, R. Hart). HOLOTYPE ♂, BMNH.

Atyphloceras bishopi Jordan: I. Fox, 1940: 80; Hubbard, 1940: 4; Jellison & Good, 1942: 24; Ewing & I. Fox, 1943: 38; Fuller, 1943a: 21, 1943b: 9; Jameson, 1943a: 177; Costa Lima & Hathaway, 1946: 244; Jameson, 1950: 142; Pfitzer, 1950: 46; Hopkins, 1952: 363; Holland, 1958: 645; Benton & Cerwonka, 1960: 387; Cressey, 1961: 1; Wilson, 1961: 292; Hopkins & Rothschild, 1962: 92; Benton & Smiley, 1963: 3; Lawrence et al., 1965: 1; Jellison & Glesne, 1967: 21; Holland & Benton, 1968: 254; Humphreys, 1968: 126; Main, 1970: 76; Benton, 1971: 36; Timm, 1975: 42; Main et al., 1979: 135; Benton, 1980: 55; Benton & Timm, 1980: 166; Scharf & Stewart, 1980: 165; Whitaker, 1982: 9; Holland, 1985: 68; Whitaker & French, 1988: 43.

Saphiopsylla bishopi (Jordan): Holland, 1949b: 72; Jellison et al., 1953a: 185; 1953b: 612; Burbutus, 1956: 28; Geary, 1959: 86; Connor, 1960: 1; Mathewson & Hyland, 1964: 158; Buckner & Blasko, 1969: 55.

This is typically a parasite of *Microtus* and *Clethrionomys* species in northeastern North America. Benton (1980) showed scattered records as far west as Clark County, Illinois, and Cook County, Minnesota, but the bulk of his records were from Pennsylvania, New York, and New England. Holland (1985) showed collections from Labrador west to Manitoba.