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**A CHECK LIST OF THE FLEAS OF BRITISH COLUMBIA WITH  
A NOTE ON FLEAS IN RELATION TO SAWDUST  
IN HOMES**

By G. J. Spencer

As far as I can determine from a check of published lists of insects of this Province, the only mention of local Fleas is a short list of six species, apparently contributed by the energetic secretary of our Society at that time, Capt. R. V. Harvey. The list was published in the (then) Bulletin of the British Columbia Entomological Society, Quarterly, September, 1907, No. 7. The following species are mentioned:

1. **Pulex irritans** Linn.
2. **Ctenocephalus canis** Curtis. (On cats and dogs).
3. **Ceratophyllus gallinae** Schrank. (On poultry).
4. **C. Charlottensis** Baker. (In a mouse nest).
5. **C. keeni** Baker. (On *Peromyscus keeni*).
6. **C. perpinnatus** Baker.

That is the bare list, without locality or collector's records. If the first record, that of the human flea, is authentic, then our later records of this insect in our midst must be antedated by several years and a long-existing fear of mine that this insect may assume plague proportions in Vancouver if it gets established, may be laid at rest. If Harvey found it here 27 years ago and it is still of very spasmodic occurrence, then we may have no further fear of its becoming general. It is very unfortunate that Harvey did not give any further details about his records or state where his material was placed.

For the past six years I have collected fleas as well as other external parasites of birds and mammals of this Province and it gives me pleasure to present herewith a second and somewhat longer list of these insects than was contributed by Harvey. Many of them are of my collecting, but I gratefully acknowledge contributions from that most faithful and energetic collector, Mr. R. A. Cumming of this city, as well as from Messrs. E. R. Buckell, the late Eric Hearle, Hugh Leech, K. Racey and Dr. M. Y. Williams. I am indebted to four of my students, Messrs. Arkwright, McHugh, Poole and Thomkinson for certain assistance in connection with the experimental feeding of larvae. Most especially do I gratefully acknowledge the kindness of Dr. Julius Wagner, of Belgrade, Yugo Slavia, for having undertaken the laborious task of checking over my specimens and naming them for me, and of Dr. Karl Jordan of the Museum at Tring for sending me the list of B.C.

fleas in his possession named by Lord Rothschild and by himself. Several of those I sent Dr. Wagner are new to science and he has not yet had time to describe them and publish his descriptions. When this is done I shall submit to you a supplementary list which will include other and further specimens which I have collected in the last two years and have not yet sent him.

Dr. Wagner tells me that it should not be taken for granted that any one small mammal carries only one species of flea or that it carries the same species in all parts of the country. He says that a mammal may carry at least two species of fleas, and he would particularly like to see all collections that may be made from birds because bird fleas are largely untouched.

With regard to the collecting of these insects, I may say that the *nests* of birds and mammals are usually the best sources of fleas, although mammals like squirrels and marmots may carry very large numbers on their bodies in addition to those remaining in their nests. I would particularly urge the members of this Society to keep for me, all nests of birds and small mammals that they come across, putting them in paper bags securely fastened or tied. If you scoop up every last trace of dust and trash under the nests, you will be sure to get eggs and larvae of fleas in the mess, and if these are kept at normal room temperature in summer, the larvae will complete their development and will eventually emerge as adults.

The list submitted herewith contains 61 species, of which 25 species are recorded from 34 and possibly 35 hosts. You will note that nine of our local birds share one species of flea, shared also by their (probably) common enemy, the red squirrel, while the visitor to our land, the Japanese starling, has apparently its own flea which it guards jealously and so far as I have found, has shared with no other bird. In addition to this item, you will note several interesting relationships apparently of host and victim; thus the same flea has been found on the weasel and the red squirrel and I myself have seen the ease and remarkable speed with which the weasel can catch and overpower the red squirrel: the weasel shares another species of flea with the pika and the pack rat, both of which it probably eats: the common dog flea is shared by the dog, the black fox and the tame rabbit: a monkey imported from Uganda apparently got its flea from a domestic cat (monkeys generally swarm with lice and not fleas and it is lice that one notes them chasing so assiduously in the park and crushing with their teeth): yet a third flea does the weasel share, this time with a pocket gopher: the lynx and the snow-shoe rabbit share a distinct species: and finally, the spotted skunk shares a species with the shrew.

Some of these, I imagine, are temporary and accidental; thus it seems strange to find a bird flea living for long on a squirrel and several

of the others make me think that either one or the other host I have mentioned is the *true* host, and the second is *temporary*.

In fact, the study opens the way to half a dozen points of great interest which can only be solved by further and much larger collections.

#### Records of Fleas from British Columbia up to November 1935.

The species with host lists opposite are in the collections of the University (U.B.C.) and have been named by Dr. J. Wagner of Belgrade. Those without host lists are in the collections of the Lord Rothschild Museum at Tring, England. Those with asterisks are in both collections :

**Hoplopsyllus glacialis lynx** Baker 1904.

**Hoplopsyllus glacialis** Tasch. U.B.C. lynx; snow-shoe rabbit.

**Opisodasys vespertalis** Jord. 1929.

\***Opisodasys keeni** Baker 1896. U.B.C. *Peromyscus* sp.

\***Orchopeas (Bakerella) caedens durus** Jord. 1929. U.B.C. Weasel; red squirrel.

**Orchopeas (Bakerella) nepos** Roths. 1905.

\***Orchopeas (Bakerella) sexdentatus agilis** Roths. 1905. U.B.C. Weasel; Pack rat; Pika.

**Tarsopsylla coloradensis** Baker 1895.

**Thrassis petiolatus** Baker 1904.

\***Thrassis acamantis** Roths. 1905. U.B.C. Marmot; Vanc. Is. Marmot; Columbia ground squirrel.

**Oropsylla idahoensis** Baker 1904 (= *poeantis* Roths. 1905).

\***Oropsylla arctomys** Baker. U.B.C. Black Marmot.

\***Foxella ignotus reclusa** Jord & Roths. 1915. U.B.C. Weasel; Pocket gopher.

**Dactylopsylla comis** Jord. 1929.

**Ceratophyllus diffinis** Jord. 1925.

\***Ceratophyllus niger niger** Fox 1908. U.B.C. Japanese starling.

**Ceratophyllus adustus** Jord. 1932.

**Ceratophyllus idius** Jord. & Roths. 1920.

**Ceratophyllus riparius** Jord. & Roths. 1920.

**Ceratophyllus celsus celsus** Jord. 1926.

\***Dasypsyllus gallinulae perpinnatus** Baker 1904. U.B.C. Black capped chickadee, Junco, Russet-backed thrush, Blue Jay, Alaska hermit, thrush, Red squirrel, Oregon towhee, Black headed grosbeak, Western tanager, Nest of Cassin's vireo.

**Malaraeus telchinum** Roths. 1903.

**Malaraeus penicilliger** Grube 1852.

**Malaraeus euphorbi** Roths. 1905.

**Malaraeus bitterrootensis** Dunn & Parker 1923 (= *isus* Jord. 1925).

**Megabothris abantis** Roths. 1905.

\***Megabothris asio** Baker. U.B.C. Mouse nest, sp. unidentified.

- Megabothris quirini* Roths. 1905.  
*Megabothris megacolpus* Jord. 1929.  
 \**Monopsyllus eumolpi eumolpi* Roths. 1905. U.B.C. Chipmunk.  
 \**Monopsyllus ciliatus protinus* Jord. 1929. U.B.C. Squirrel, chipmunk.  
 \**Monopsyllus vison vison* Baker 1904. U.B.C. Red squirrel.  
 \**Monopsyllus wagneri wagneri* Baker 1904. U.B.C. Mouse  
 (*Peromyscus*).  
*Ctenophyllus terribilis* Roths. 1903.  
*Leptopsylla ravalliensis* Dunn & Parker 1923.  
*Leptopsylla selenis* Roths. 1906.  
 \**Neopsylla grandis* Roths. U.B.C. Lyster chipmunk. Quebec.  
 \**Neopsylla fasciatus* Bosc. U.B.C. Norway rat  
*Neopsylla wenmanni* Roths. 1904.  
*Catallagia charlottensis* Baker 1898.  
*Catallagia decipiens* Roths. 1915.  
*Catallagia telegoni* Roths. 1905.  
*Rhadinopsylla fraterna* Baker 1895.  
 \**Rhadinopsylla sectilis* Jord. & Roths. 1923. U.B.C. Mouse  
 (*Peromyscus*).  
*Nearctopsylla hyrtaci* Roths. 1904.  
*Nearctopsylla brooksi* Roths. 1904.  
 \**Hystrihopsylla dippiei* Roths. 1900. U.B.C. Spotted skunk, nest of  
 shrew, house at Nanaimo.  
*Atyphloceras artius* Jord. 1933.  
*Callistopsyllus terinus* Roths. 1905.  
*Ctenocephalides canis* Curt. U.B.C. Black fox, dog, tame rabbit.  
*Ctenocephalides felis* Bouch. U.B.C. Cat, Uganda monkey.  
*Pulex irritans* Linn. U.B.C. Man.  
*Megarhthroglossus divisus* Baker 1898.  
*Megarhthroglossus longispinus* Baker. U.B.C. Pika.  
*Megarhthroglossus procus* Jord & Roths. 1915.  
*Megarhthroglossus sicamus* Jord & Roths. 1916.  
*Megarhthroglossus senisles* Wagner 1935. U.B.C.  
*Megarhthroglossus spenceri* Wagner 1935. U.B.C.  
 \**Trichopsylla (Chaetopsylla) setosus* Roths. 1906. U.B.C. Grizzly bear.  
*Myodopsylla gentilis* Jord. & Roths. 1921.  
*Rhinolophopsylla palposus* Roths. U.B.C. Big brown bat.

Concerning the occurrence of fleas in sawdust, a considerable number of householders have made loud complaint to me. I had had two reports and doubted the authenticity of the identification of the insects, when Mr. W. G. Mathers asked me about the situation. In the last two years, reports have come in from homes small and large, and from a firm which does a general cleaning-up and fumigating business. In most cases, where a sawdust burner has been installed and the dog and

cat of the household sleep in the basement, these animals like to make beds for themselves in the sawdust and there somehow arises a veritable plague of cat or dog fleas. At times these plagues have arisen when there are no domestic animals; in such cases the fleas have obviously come in with the sawdust in which stray animals must have been sleeping for some time before delivery into that particular household. In no case have I been able to get specimens from the complainants, although several enquiries came in only last autumn. In one case only did I get a portion of a flea brought in by a commercial exterminator from a Shaughnessy home where they had no sawdust burner but had experienced an outbreak of fleas. The "portion" of flea had been *P. irritans* L., the human flea.

Now flea larvae are supposed to feed on minute organic particles in dust and especially on the faeces of adult fleas which may contain practically pure blood passed through the digestive tract with little change other than being dried. If this is the case, then the food of this type contained in the sawdust must either be exceedingly abundant or a chance disposition has placed it in the bags of sawdust where it can be reached by the larvae after it has been dumped into cellars. It is unlikely that there is anything in the actual particles of the wood that the larvae can feed upon, unless there is some further very necessary work to be done upon the biology of the cat and the dog flea.

The whole situation needs very careful checking up, but for some reason or other those troubled with outbreaks of fleas which they blame upon the sawdust, never report the matter until the outbreak has died down, when they can never find specimens. Personally, I question there being any food material whatever for flea larvae in sawdust, but from the fact that enormous numbers of fleas have been cropping up within recent years, since sawdust burners have become popular in this city, and that these outbreaks have occurred, with one exception, in homes where this type of fuel is being used, there certainly seems to be some connection between the two.

Apart from the annoyance of the outbreak at the time, the situation needs investigation on account of the reported longevity of fleas. While conditions in Vancouver may not be optimum for these insects, the following tables of longevity give us food for thought in case these outbreaks become more frequent and of regular occurrence.

Bishopp gives the complete life cycle of the cat flea on the Atlantic Coast as 2-4 weeks and that of a human flea on the Pacific Coast as 9-11 weeks. Bacot and Digewood in 1914 published in *Parasitology*, much information on the larvae of fleas. They show that in cool, damp climates, fleas live much longer than in hot, dry ones; also that fleas can live a long time as is shown below.

	Fed	Unfed
<i>Pulex irritans</i> , the human flea .....	513 days	125 days
<i>C. fasciatus</i> , the European rat flea .....	106 days	95 days
<i>Xenopsylla cheopsis</i> , Indian rat flea .....	100 days	38 days
<i>Ctenocephalus canis</i> , dog flea .....	234 days	58 days
<i>C. gallinae</i> , the hen flea .....	354 days	127 days

Bacot also shows that even when fed at irregular periods, fleas can live for really astonishing periods.

He records the following survivals:

<i>Ceratophyllus fasciatus</i> .....	22 months
<i>Pulex irritans</i> .....	19 months
<i>Xenopsylla cheopsis</i> .....	10 months
<i>Ctenocephalus canis</i> .....	18 months

I cannot state at what infrequent intervals Bacot fed his fleas to get them to live so long, but I feel certain that no fleas could exist under our summer or winter conditions for as many weeks as he has here recorded for months. I have bred fox fleas in my laboratory from a mass of rubbish collected from their nests in fox-farm buildings and obtained a cubic centimetre of adults, not one of which lived **without an initial feed**, for two weeks, let alone two months or still less, eighteen months. Also I have kept in test tubes in a darkened corner of the laboratory, some recently fed fleas removed from cats, without damage, and the longest I could keep any of them alive was one week. This does not mean that in a basement full of sawdust which could provide the conditions suited to the development of fleas, said fleas could not survive for several months without a feed from their particular host; I merely state that I haven't been able to keep them alive. That flea larvae certainly can survive adverse conditions, I determined this winter when I watched a batch hatch from eggs dropped from a cat on to a velour-topped chair; the eggs hatched within one week and to test their powers of endurance I sat on that chair for an hour (apart from others who may have sat on it unknown to me) and found the larvae still well and kicking. I regret that my dislike of the creatures kept me from further observations and I destroyed the brood.

#### Later Note. November 1935.

This autumn I conducted certain experiments on the development of fleas. I returned in mid-September after an absence of 3½ months to find the basement and the sawdust bin, literally alive with cat fleas. People who occupied the house during the absence of our family had been severely bitten but were treating themselves for hives. I did not enlighten them

Many life-history experiments were conducted during October. Cat fleas are so prolific that one half cubic centimetre of flea eggs may be collected off one cat and from its bed, in a twelve hour period. Eggs of a known age in hours, were placed on the following substances in big glass-topped tin cans: plain floor dust, dust and fluff from under beds, dust and fluff from pockets of woolen coats, dust from door jambs in public buildings, dust and trash from cats and dogs beds, pure culture of dried blood droppings from fleas, very dry fir sawdust, damp fir sawdust, cedar sawdust and finally, eggs, dry blood and trash from animals' beds, placed above dry fir sawdust and above damp fir sawdust.

The last combination of eggs, trash, blood and damp sawdust produced a 100% hatch and a huge crop of adult fleas in 31 days from time of egg-laying, the tin being placed among others on my office table. All other combinations failed to produce adults although in some, the larvae lived until nearly mature. No development at all occurs on cedar sawdust. My experiments indicated that fleas cannot develop on pure dry or damp fir sawdust, cedar sawdust, on pure flea faeces of blood, on pure dry room dust or on ordinary *dry* house dust mixed with wool dust. Apparently dry blood, dust and trash (room dust is a very complex substance) in a certain degree of moisture, are essential for their development.

After no more flea eggs were required for experiments, the house was completely cleared of the fleas by the following measures:

1. Sweeping up every trace of dust on the floor and under the cats and dogs beds.
2. The animals' bedding was thoroughly washed.
3. Cats and the dog were used as bait, the dog especially proving a wonderful trap. One ounce of pyrethrum per cat and two ounces per dog greatly reduced each infestation. Better by far was a dessert spoon full of derris powder per dog and half that amount for a cat which entirely freed each animal when left on them overnight. Pyrethrum causes choking and some inflammation of mucous membranes; derris does not irritate. Neither powder harms the skin.
4. A **very** thin dusting of derris around the edges of the sawdust pile, kills all stages of fleas.