ABANDONMENT OF DISTURBED HOSTS BY THEIR FLEAS

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Indices of fleas on hosts are of particular concern in ecological studies of parasitism or of plague in nature. The method of capturing hosts for flea counts is important in obtaining accurate indices. For example, more fleas are obtained from live-trapped animals than from animals caught in snap traps (Jameson, 1947; Gross and Bonnet, 1949). Cole and Koepke (1947:8) impugn the validity of indices from animals that have remained long in live traps.

In our work, we have noted an additional factor that may be important in collecting fleas from live animals. On numerous occasions while processing live-trapped rodents, we have observed a mass exodus of fleas from the host that is highly disturbed. This behavior pattern was suggested by Bequaert (1953:215) in the case of hippoboscids. Baltazard and Eftekhari (1957) state that "certain" species of fleas abandon an excited host and suggested blowing on the host as method of removing fleas.

In early March 1959, studies were conducted on the transfer of radioactively tagged fleas from one host to another. The method of handling the rodents for this study and the large number of fleas per host at this particular time made this abandonment pattern apparent and subject to observation. The rodents were captured in cage-type traps fitted with a retreat box to provide shelter and to facilitate removal of animals (Kinney *et al.*, 1957). Animals removed from the retreat box were held over an enameled bucket by the scruff and tail for a period of from 3 to 5 minutes while being scanned with a counter. When radioactivity was detected, the host was anesthetized and all fleas were removed. The animal was released if radioactivity was not detected.

To determine the proportion of fleas that left the host under different conditions of handling, a count of fleas in the bucket was made before and after etherization of each rodent. Care was taken to avoid blowing or breathing on the rodent's pelage during handling. A total of 241 fleas was removed from 10 *Microtus californicus* and 2 from a single *Reithrodontomys megalotis*; the latter

2 fleas dropped from the host while it was being held. Of the 241 fleas from *Microtus*, 24 were *Hystrichopsylla linsdalei*, a giant flea identifiable in the field, and the remaining 217 belonged to various smaller species. Fleas were not identified microscopically but were necessarily returned to their hosts as part of the transfer study. Previous checks of flea indices indicated that about 88 percent of the small species were *Malareus telchinus*. Of the 24 *Hystrichopsylla*, 1 was found inside the retreat box of the live trap after removal of the host, 13 left their host while it was being held, and 10 were removed by etherization. Of the 217 smaller fleas, 3 were found in the retreat box, 167 voluntarily left their immobilized host, and 47 were removed by etherization.

The totals of the above numbers of fleas indicated that the majority of fleas remained on the host as long as it was inside the live trap, and afterward if the host was handled carefully. Approximately two-thirds of the fleas left a disturbed host, and the remainder were recovered after etherization. The proportions of collected fleas are shown in Table 1.

Table 1. Proportions of fleas that left forcibly restrained rodent and proportion recovered after etherization of the host.

Flea Species	Number and proportion of fleas that voluntarily left host			
	Host forcibly restrained		Host etherized after restraining	
	% left	index*	% left	index*
Malareus telchinus +12% other species**	78	17.0	22	4.7
Hystrichopsylla linsdalei	58	1.4	42	1.0

* Mean number of fleas per host.

** *Atyphloceras multidentatus multidentatus*, *Catallagia wymani*, and *Opisodasys keeni nesiotus*.

In addition to loss of fleas from carelessly handled live-trapped animals, these observations bring up the question of possible effects steel traps might have in calculating flea indices. It seems fairly certain that even though the animal remains alive in a steel trap, the pain, fright and struggling caused by the trap would result in a considerable loss in the number of fleas and consequently in the species compostion of fleas obtained from such a host.

The nature of the changes which cause fleas to leave following death of a host or disturbance of living host is not known. However, we wish to emphasize that the reactions of the fleas to the disturbance stimulus was immediate. Few fleas left a quiet host, but if it struggled or became particularly excited, or if the restraining grip was tightened, fleas would often drop in unison.

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NEW DISTRIBUTION AND HOST RECORDS OF NEORHYNCHOCEPHALUS SACKENII (WILLISTON)

(Diptera: Nemestrinidae)

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A recent collection of *Neorhynchocephalus sackenii* (Williston) has stimulated us to present some additional information on this interesting parasite of certain species of rangeland grasshoppers.

Bequaert (1950, 1953) records this species from British Columbia, Washington, Oregon, Montana, Idaho, Wyoming, Utah, Arizona, Colorado, New Mexico, Kansas, Oklahoma, Arkansas, Missouri, Iowa, Michigan, Illinois and from the northern Sierras of California.

Specimens in the collection of the California Insect Survey now