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MAMMALIAN ECTOPARASITE CONSORTISM AT THE NATIONAL REACTOR TESTING STATION¹

Dorald M. Allred²

Studies of ectoparasites of vertebrates at the National Reactor Testing Station in Idaho were conducted between June 1966 and September 1967. The host relationships, ecological and geographical distribution, seasonal occurrence and other biotic relationships of each of four major groups—ticks, fleas, mites, and lice—have been published (Allred 1968a, 1968b, 1970). The first article of that series discusses the physical characteristics of the station, study areas and procedures, and lists the vertebrates examined. This paper presents the interspecific and intergroup relationships between the eight most common species of these four major groups of ectoparasites found on the mammals.

The degree of compatibility between different species of ectoparasites is based on a negative correlation factor determined by the following formula:

$$\frac{\text{expected rate minus the actual rate}}{\text{expected rate}} = \text{negative correlation factor,}$$

where the expected rate equals the sum of the actual rates of infestation of the respective, individual groups. For example, only fleas were found on 14.9% and only lice on 0.7% of the kangaroo rats. Fleas and lice together were found on only 1.5% of the rats. Applying the above formula, fleas and lice together are expected to occur on 15.6% of the kangaroo rats. The difference between the actual (1.5%) and the expected (15.6%) is 14.1% which, when divided by 15.6% (the expected rate of infestation), yields a negative correlation factor of 90.4. The higher the correlation factor, the greater the competition between species, or the greater the significance of other factors of environmental resistance opposing their occurrence together.

ECTOPARASITE-MAMMAL RELATIONSHIPS

Fleas were found on mammals of more species than were other ectoparasites, whereas lice were found on the fewest (Table 1). On infested mammals, fleas were the most common ectoparasites on 15 species, ticks the most common on four, mites on one, and lice with fleas and mites with fleas were equally common on one species of host.

Fleas were found on mammals of all species except one, lice on all except six, mites on all except five, and ticks on all except four.

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Table 1. Percentages of mammals infested with ectoparasites.

Species	Mammal					
	No. examined	No. infested ¹	Fleas	Lice	Mites	Ticks
<i>Canis latrans</i>	6	5	100	0	0	0
<i>Dipodomys ordii</i>	808	743	72	15	46	65
<i>Eutamias minimus</i>	398	247	68	43	19	32
<i>Lepus californicus</i>	125	88	64	5	13	67
<i>Lynx rufus</i>	8	7	100	0	0	14
<i>Marmota flaviventris</i>	6	5	100	80	40	40
<i>Microtus montanus</i>	25	17	71	35	53	24
<i>Mus musculus</i>	1	1	100	0	0	0
<i>Mustela frenata</i>	4	4	50	0	0	100
<i>Neotoma cinerea</i>	14	14	100	13	33	47
<i>Onychomys leucogaster</i>	63	63	87	6	84	70
<i>Perognathus parvus</i>	474	318	38	8	29	68
<i>Peromyscus maniculatus</i>	1866	1629	82	30	37	40
<i>Plecotus townsendii</i>	78	43	0	0	100	0
<i>Reithrodontomys megalotis</i>	39	18	72	11	11	22
<i>Sorex merriami</i>	9	1	100	0	100	0
<i>Spermophilus townsendii</i>	60	43	65	65	28	40
<i>Sylvilagus idahoensis</i>	13	11	82	9	9	27
<i>Sylvilagus nuttallii</i>	28	23	83	4	28	39
<i>Taxidea taxus</i>	5	3	33	67	0	100
<i>Thomomys talpoides</i>	8	8	88	13	63	13
<i>Vulpes fulva</i>	4	3	100	0	0	0
Total species infested		22	21	15	16	17

¹With any of the 4 kinds of ectoparasites listed.²Nearest whole percent.³Those infested with any kind of ectoparasite.

ECTOPARASITE COMPATIBILITY ON COMMON MAMMALS

Relative degrees of ectoparasite and host compatibility are shown in Table 2. Fleas on kangaroo rats, chipmunks and deer mice, lice on kangaroo rats and pocket mice, mites on chipmunks, and ticks on deer mice and pocket mice apparently were the least compatible combinations.

Intergroup compatibility of ectoparasites is shown in Table 3. On kangaroo rats the most compatible ectoparasites were fleas with ticks; on chipmunks, lice with ticks; on pocket mice, mites with ticks; and on deer mice, fleas with mites. Greatest incompatibility on these hosts occurred between fleas, lice and ticks on kangaroo rats, mites and ticks on chipmunks, and lice, mites, and ticks on pocket mice and deer mice.

Compatibility between the common species of ectoparasites is shown in Table 4. Chigger mites of *Euschoengastia decipiens* were the least compatible with any other single species, whereas lice of

Table 2. Ectoparasite group isolation on commonly-collected mammals of four species.

Host	% ¹ of mammals ² infested only with:			
	Fleas	Lice	Mites	Ticks
<i>Dipodomys ordii</i>	15	1	5	12
<i>Eutamias minimus</i>	32	12	4	8
<i>Perognathus parvus</i>	16	3	7	37
<i>Peromyscus maniculatus</i>	24	3	3	6

¹Nearest whole percent.

²Of those infested with some kind of ectoparasite.

Table 3. Association relationships between groups of ectoparasites on commonly-collected mammals of four species.

Ectoparasite association	Species and negative correlation factor ¹			
	<i>D. ordii</i>	<i>E. minimus</i>	<i>P. parvus</i>	<i>P. maniculatus</i>
Fleas-lice	90	78	97	72
Fleas-mites	54	90	80	54
Fleas-ticks	15	79	77	47
Lice-mites	86	80	90	68
Lice-ticks	89	77	95	84
Mites-ticks	63	100	69	83
Fleas-lice-mites	85	94	99	81
Fleas-lice-ticks	94	88	99	86
Fleas-mites-ticks	50	96	96	78
Lice-mites-ticks	89	97	100	93
Fleas-lice-mites-ticks	88	94	99	90

¹Equals the expected rate of infestation (sum of the actual rates of infestation of the respective individual groups) minus the actual rate of infestation, divided by the expected rate of infestation. The higher the number the more negative the association.

Table 4. Association relationships between combinations of specific ectoparasites¹ on mammals.

Ectoparasite	Combination and negative correlation factor ²	
	With 1 other ectoparasite	With 2 other ectoparasites
Fleas		
<i>Meringes parkeri</i>	81	197
<i>Monopsyllus wagneri</i>	50	111
Lice		
<i>Polyplax auricularis</i>	80	240
Mites		
<i>Eubrachylaelaps debilis</i>	59	102
<i>Euschoengastia decipiens</i>	102	181
<i>Haemolaelaps glasgovi</i>	39	64
Ticks		
<i>Dermacentor andersoni</i>	79	183
<i>Ixodes kingi</i>	62	136

¹Only commonly-collected species.

²Equals the expected rate of infestation (sum of the actual rates of infestation of the respective individual groups) minus the actual rate of infestation, divided by the expected rate of infestation. The higher the number, the more negative the association.

Polyplax auricularis were the least compatible when more than one other species was involved. *Polyplax auricularis* was the least compatible of all species associations, and the mite *Haemolaelaps glasgovi* the most.

SPECIES CONSORTISM

Ticks of *Dermacentor andersoni* and fleas of *Meringes parkeri* were found alone on their hosts a greater percentage of the time than were other species (Table 5). Mites of *Eubrachylaelaps debilis* were associated with other ectoparasites more than any other species. The most frequent associations occurred between ticks of *Ixodes kingi* and fleas of *Meringes parkeri*. In fact, sufficiently low negative correlation factors occurred between these latter two species and between *Polyplax auricularis* and *Eubrachylaelaps debilis* in comparison to other combinations to suggest a positive interrelationship. However, when a third species is considered in these associations, the negative correlation factors increase considerably, except for the combinations of *Polyplax-Eubrachylaelaps-Monopsyllus wagneri*, and *Ixodes-Meringes-Haemolaelaps glasgovi* wherein the negative correlation factors were the lowest of any triple combinations.

In the nine combinations of four species, seven negative relative values were over 99%, and two were 97% and 98%. Apparently when four groups are involved, too much competition is present to permit frequent infestations by so many different groups.

Table 5. Consortism between species of major groups of some common ectoparasites on mammals.

Parasite Association	% ¹ times occurred:	
	As only common ² ectoparasite	With ectopara- site indicated
<i>Dermacentor andersoni</i>	18	
<i>Eubrachylaelaps debilis</i>		2
<i>Euschoengastia decipiens</i>		1
<i>Haemolaelaps glasgowi</i>		5
<i>Meringes parkeri</i>		11
<i>Monopsyllus wagneri</i>		5
<i>Polyplax auricularis</i>		2
<i>Eubrachylaelaps debilis</i>	3	
<i>Ixodes kingi</i>		2
<i>Meringes parkeri</i>		1
<i>Monopsyllus wagneri</i>		7
<i>Polyplax auricularis</i>		6
<i>Euschoengastia decipiens</i>	14	
<i>Ixodes kingi</i>		2
<i>Meringes parkeri</i>		1
<i>Monopsyllus wagneri</i>		1
<i>Polyplax auricularis</i>		1
<i>Haemolaelaps glasgowi</i>	5	
<i>Ixodes kingi</i>		5
<i>Meringes parkeri</i>		6
<i>Monopsyllus wagneri</i>		8
<i>Polyplax auricularis</i>		3
<i>Ixodes kingi</i>	14	
<i>Meringes parkeri</i>		18
<i>Monopsyllus wagneri</i>		8
<i>Polyplax auricularis</i>		3
<i>Meringes parkeri</i>	18	
<i>Polyplax auricularis</i>		1
<i>Monopsyllus wagneri</i>	16	
<i>Polyplax auricularis</i>		8
<i>Polyplax auricularis</i>	6	

¹Nearest whole percent. 1% indicated if less than 0.5%.²Of the 8 listed in this table.

CONCLUSIONS

Negative consortism occurs between different groups of ectoparasites on the mammals at the NRTS. Only two of the 11 combinations on four common mammals (total of 44 groupings) had negative

correlation factors of less than 50. The lowest negative factor of any ectoparasite was for the mite *Haemolaelaps glasgowi* which is the most ubiquitous of all the species studied. The parasite with the highest factor was the louse *Polyplax auricularis* which belongs to the most host-specific group of the four categories of ectoparasites studied.

Of those ectoparasites which occurred as the only single group on their hosts, the fleas were predominant on three of the four common species of mammals, ticks on the other. Lice occurred alone most infrequently of the ectoparasite groups in all cases except one when they surpassed both the mites and ticks as single-occurring ectoparasites.

REFERENCES

- ALLRED, D. M. 1968a. Ticks of the National Reactor Testing Station. Brigham Young Univ. Sci. Bull., Biol. Ser., 10(1):1-29.
- ALLRED, D. M. 1968b. Fleas of the National Reactor Testing Station. Great Basin Natl., 28(2):73-87.
- ALLRED, D. M. 1970. Mites and lice of the National Reactor Testing Station. Brigham Young Univ. Sci. Bull., Biol. Ser. (in press).