NOTES ON THE INFESTATION OF WILD BIRDS BY MALLOPHAGA[1]

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During the past five years while collecting birds for various scientific purposes, such as museum skins and mounts and parasite studies, records were kept on the infestation of these birds by Mallophaga. The birds were collected from various localities in Ohio, with the bulk of them taken at Buckeye Lake and in central Ohio, by the writer and others. For the opportunity to examine birds taken by other collectors I am indebted to Mr. Milton B. Trautman, formerly of the Ohio Division of Conservation, and to Mr. Charles F. Walker, of the Ohio State Museum. I thank Mr. Edward S. Thomas, of the Ohio State Museum, Mr. Milton B. Trautman, and Mr. Harold S. Peters, of the Bureau of Entomology, for their critical reading of this paper.

In this work a bird was considered to be infested with Mallophagan parasites if any stage in the life cycle of the insect was found on the bird. To date a total of 1,025 birds have been examined.

Nine of the 19 orders of birds are represented by these 1,025 individuals, of which the Passeriformes include more than half the total number. The nine orders are: Ciconiiformes, Anseriformes, Falconiformes, Galliformes, Gruiformes, Charadriiformes, Cuculiformes, Piciformes and Passeriformes. Table I gives the orders together with the individuals examined and the number infested.

The total infestation of the first eight orders was 178 birds out of 315 examined, or 56.5 per cent. The number of birds from each of these orders was admittedly too small to draw a definite conclusion. However, since these specimens were collected from many localities in Ohio during a five-year period, it would seem that a general idea of the amount of infestation might nevertheless be obtained.

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It has been frequently stated that aquatic birds are more often parasitized than land birds, due to the more humid environment of these groups. If the following orders are considered to include aquatic birds, Ciconiiformes, Anseriformes, Gruiformes, and Charadriiformes, out of 97 examined, 56 individuals were found to be parasitized, or 57.7 per cent. If this is compared with the infestation of the entire first eight orders there is a difference of only 1.2 per cent in favor of the aquatic birds.

If we may consider the Falconiformes and Galliformes as large land birds, and compute the per cent of infestation in

TABLE I

Order	Individuals Examined	Individuals Parasitized	Per Cent of Infestation
Ciconiiformes	9	4	44.4
Anseriformes	21	16	76.1
Falconiformes	18	9	50.0
Galliformes	153	99	64.7
Gruiformes	5	5	100.0
Charadriiformes	62	31	50.0
Cuculiformes	4	2	50.0
Piciformes	43	12	27.9
Passeriformes	710	292	41.1
Total	1,025	470	Average 56.0

these groups, it is found that of 171 birds examined 108 were parasitized, or 63.1 per cent. This is 5.4 per cent more than in the aquatic group. Thus it would seem that the humidity factor is not as important as generally considered. Taking the Cuculiformes, Piciformes and Passeriformes as small land birds, from 757 of these, 306 were parasitized giving a percentage of 40.4. These figures show that in this case at least, the large land birds are more heavily parasitized than the other groups.

Another statement that has been commonly made in the literature is that gregarious birds are more often parasitized than non-gregarious birds. Of the orders represented, the Ciconiiformes, Anseriformes, Galliformes and Charadriiformes are the only ones which may be definitely considered gregarious. Combining these groups, of 245 birds examined 150 were parasitized, or 61.2 per cent. Considering the others non-

gregarious, 320 of 780 birds were parasitized, 41 per cent. These results tend to show that the gregarious habit is probably an important factor in the transmission of Mallophaga from host to host.

About 137 species of Passerines are found commonly in Ohio. Of this number, 710 individuals of 120 species, have been examined. In the Passeriformes the Hirundinidae, Corvidae, Laniidae, Sturnidae, Vireonidae and Icteridae show the heaviest infestation. Of these the Laniidae and Vireonidae are not gregarious. Computing the amount of parasitism in

TABLE II

Family	Individuals Examined	Individuals Infested	Per Cent Infestation
Tyrannidae	34	9	26.5
Alaudidae	25	3	12.0
Corvidae	16	10	62.5
Sturnidae	76	65	85.5
Icteridae	203	90	44.3
Fringillidae	105	39	37.1
Tangaridae	6	1	16.6
Hirundinidae	15	8	53.3
Bombycillidae	10	1	10.0
Laniidae	4	3	75.0
Vireonidae	16	8	50.0
Mniotiltidae	115	30	26.0
Motacillidae	1	0	none
Mimidae	10	6	60.0
Troglodytidae	15	6	40.0
Certhiidae	8	0	none
Sittidae	5	0	none
Paridae	13	1	7.6
Sylviidae	14	4	28.5
Turidae	19	8	42.1

the gregarious families, of 310 birds 173 were parasitized, or 56 per cent. Now computing the infestation of those families most often parasitized, but not gregarious: 19 birds, 10 infested, or 52.5 per cent. Results here again show that the gregarious habit tends to increase the infestation. Table II shows the numbers by families in the order Passeriformes.

From the data obtained in this study it would seem that the parasite life cycle extends over the entire year, since eggs and lice, or, eggs or lice, may be found on the same bird species during the entire year and is thus not seasonal. The birds examined during the winter months had few or no adults and

nymphs and usually many eggs, while the same species examined in early spring were found to have eggs and nymphs. In late spring and early summer the adults were numerous as were the nymphs and eggs, while in late summer and early fall the adults decrease in number and the eggs increase in abundance. It seems likely that the parasite cycle should be continuous throughout the year due to the comparative changelessness of the insect's environment. If, however, the weather was very cold the number of adults found on the birds was smaller. Probably in very cold weather even though the temperature of the bird remains practically the same the adult insects cannot live while the eggs carry the species over.

In as much as Mallophaga are seldom found living off the bodies of their hosts, the dispersal of the various species must depend upon bodily contact among the individual birds. However, the opportunities for bodily contact are not numerous. They are probably limited to roosting, nesting, copulation and from prey to predator.

There are a few records in the literature where Mallophaga have been found on birds of prey which undoubtedly came from the prey unless straggling occurred. It is believed this rarely occurs and no such cases were found in any of this work.

In the case of copulation the opportunity for transmission is relatively short and it is questionable whether many parasites are thus transferred. Also in birds that mate for only one nesting season during a year the transmission in this manner would be slight.

The opportunity for transmission in roosting is greater. Migration of lice from one host to another probably takes place, for undoubtedly there is often contact of the bodies of the various individuals. Kellogg states that he has found pelicans, cormorants and gulls roosting together on the "bird rocks" off Monterey, California, and that he has taken *Esthiopterum toxocerum* Nitz., a parasite of the cormorants, on the pelicans, as well as on the cormorants. But even on these ocean rocks, after frightening away hundreds of these birds he has looked in vain for Mallophaga that might be wandering from host to host.

Perhaps the greatest opportunity for transmission is from adult bird to young during feeding and brooding. Particularly during brooding the time of bodily contact is longest and the opportunity for the lice to find new feeding grounds is greatest.

It might be expected then that birds reared by foster parents would have the parasites of these parents. The cowbird (*Molothrus ater ater*) would furnish a case of this kind.

Since cowbirds are parasitic on about one hundred species of Passerine birds, it might be expected that Mallophaga of the cowbird's hosts would be found on cowbirds. In all the literature, prior to 1930, there is but one record of a louse taken from a cowbird, and that is Kellogg's record of *Philopterus transpositus* (Kell.) taken in Kansas in 1896. This species is a member of Piaget's group *forficulati*, which had up to that time been found only on the Psittacinae. This group of insects has a forcipated clypeal front. Kellogg's species has never been taken since to my knowledge.

One hundred fifty-five cowbirds have been examined; 71 or 45.8 per cent of which were infested with Mallophaga. Adult lice were found on 42 of these 71. The following five species of Mallophaga were taken:

1. *Menacanthus persignatus* (Kell.). Type host, California jay. This species has been taken from six American Passerines of which three are hosts of the cowbird.
2. *Myrsidea incerta* (Kell.). Type hosts, Goldfinch and russet-backed thrush. This species has been taken from nine Passerines, seven of which are hosts of the cowbird.
3. *Philopterus subflavescens* (Geoff.). Type host, European white wagtail. Also taken from some 80 Passerines, 70 of which are cowbird hosts.
4. *Degeeriella illustris* (Kell.). Type host, Red-winged blackbird. This species has been taken from six Passerines, of which five are cowbird hosts.
5. *Machaerilaemus laticorpus* Carr. Type host, a South American vireo It has also been taken from two Passerines, both of which are hosts of the cowbird.

Of these five species, *Philopterus subflavescens* and *Degeeriella illustris* were taken the most often. From the above records it seems that the parasites of the cowbirds fall into three general groups: (1) parasites that are found only on Icterid hosts; (2) parasites that lack host specificity and are found on many Passerines; (3) others that do not regularly parasitize cowbirds. The first two groups rank approximately equal in numbers, the third group being much the smallest.

Bagnall (1931) made a similar study on the Mallophaga of the European cuckoo which is also parasitic. He found

these parasites to be distinctly peculiar to the cuckoo and not to the various hosts of the cuckoo.

Some experiments in temperature response were performed on *Degeeriella vulgata* (Kell.) taken from an English sparrow. Ten adult lice of this species were kept in the laboratory on English sparrow feathers at a temperature of 38 degrees C. for ten days. The average temperature of the host of this louse is approximately 42 degrees C. Another group of 15 parasites of the same species was subjected to a temperature of 48 degrees C. This latter group showed marked irritation and all died within a few hours, while the controls lived 12 days at a temperature of 38 degrees C.

In collecting some of the birds in this work their temperatures were taken immediately after being killed. This was done by means of a special clinical thermometer which was thrust down the throat of the bird into the proventriculus. It is well known that the temperature of a bird varies four or five or more degrees between periods of rest and those of activity. Kendeigh and Baldwin in a study of nestling house wrens found the body temperature of these birds to vary as much as 8 degrees F. Simpson and Galbraith found the daily variation in temperature to be greater in birds of small size than in those of large size. Wetmore made a study of the temperatures of birds using the same methods as outlined above.

Wetmore's data on temperatures were used to check the amount of variation among the birds parasitized by certain species of Mallophaga. In this study *Philopterus subflavescens* (Geoff.) was taken from 30 different species of birds. The average temperatures of these hosts vary from 107 degrees F. to 110.2 degrees F., a difference of 3.2 degrees. Similarly the temperatures of the birds parasitized by *Degeeriella vulgata* (Kell.) vary from 106.9 degrees F. to 110.2 degrees, a difference of 3.3 degrees. The temperatures of the Anserine hosts of the three common duck infesting Mallophaga, *Trinoton querquedulae* Linn., *Anatoecus dentatus* (Scop.), and *Esthiopterum crassicorne* (Scop.) vary from 105.8 degrees to 107.9 degrees, a difference of 2.1 degrees. The difference in any of these cases is not more than 3.3 degrees, while other studies show variations in bird temperatures of as high as eight degrees, depending on rest and activity.

The average temperature of the cowbird is 108.2 degrees F. If this temperature is compared with the temperatures of the

hosts of the four principal parasite species mentioned above very little difference is found. The temperatures of the hosts of *Menacanthus persignatus* vary from 107.6° to 109.7°; those of *Myrsidea incerta* from 107.9° to 109.3°; those of *Degeeriella illustris* from 107° to 109.6°; those of *Philopterus subflavescens* were given above. These temperatures vary only 1.5° either way from that of the cowbird.

TABLE III

	Tyrannidae	Alaudidae	Corvidae	Sturnidae	Icteridae	Fringillidae	Tangaridae	Hirundinidae	Bombycillidae	Laniidae	Vireonidae	Mniotiltidae	Montacillidae	Mimidae	Troglodytidae	Certhiidae	Sittidae	Paridae	Sylviidae	Turidae
Menopon	x		x		x	x								x	x					x
Colpocephalum			x		x	x														
Menacanthus					x	x						x		x						x
Myrsidea			x	x	x	x		x				x		x	x					x
Machaerilaemus					x	x														
Eureum								x							x					
Ricinus	x	x				x			x		x	x							x	x
Philopterus	x	x	x		x	x	x	x	x	x	x	x		x	x			x	x	x
Degeeriella	x		x	x	x	x		x	x	x		x		x		x		x		x

Temperature may be a factor in determining host specificity for parasitic species, but the data so far accumulated is insufficient to draw any conclusions. Furthermore, by moving in close to the body of the host or out to the surface of the feathers, the parasite might make a suitable response to a variation in the host's temperature. It is probable then that temperature may be a relatively unimportant factor in host specificity.

Since more than half the birds examined in this study belong to the order Passeriformes, it is of interest to note the distribution of the parasite genera on the various bird families. Of the four Mallophagan families infesting wild birds all are found on the Passerines except Laemobothriidae. Of the Menoponidae the genera Menopon, Colpocephalum, Myrsidea, Eureum, Machaerilaemus and Menacanthus are found on this

bird order. Of the Ricinidae only the genus Ricinus is represented. The genera Philopterus and Degeeriella of the Philopteridae are found on the Passerines.

The genus Philopterus is present on 16 of the 20 families. On one of the remaining four families, the Sittidae, there were no lice taken. This genus includes more species than any other genus of the family. Degeeriella was found on 13 of the 20 families.

In the family Ricinidae the single genus Ricinus is found on but eight of the 20 families and of these eight it is found chiefly on the Turdidae and Fringillidae.

In the family Menoponidae, Menopon is found on seven of the bird families; Colpocephalum on three; Menacanthus on five; Myrsidea on nine; Eureum on two; and Machaerilaemus on two. Table III shows this relationship in graphical form.

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Blood Will Tell

The newer knowledge of the blood groups has developed so rapidly in the past few years that an up-to-date revision of this subject becomes essential. Dr. Wiener has supplied this need in his volume dealing with the blood groups and blood transfusion. All the practical applications of the groups are fully discussed: transfusion, clinical medicine, forensic medicine and anthropology. The M-N reactions are fully explained and their legal applications illustrated with case histories. The heredity of the M and N agglutinogens, as well as the older A and B antigens, is fully elaborated. The book is well illustrated with photographs and diagrams. Physicians, lawyers, biologists and anthropologists will find it essential to have this book on their shelves.—L. H. S.

Blood Groups and Blood Transfusion, by Alexander S. Wiener, M. D. xiv+220 pp. Springfield, Ill., Charles C. Thomas, 1935.

Mallophaga (biting or chewing lice) is a group of obligatory ectoparasites mainly of birds and to a lesser extent (only 12%) of mammals. The large diversity of avian mallophaga of more than 3800 different species in 253 genera can be explained by the strict stenoxeny of most species and their presence in nearly all bird species.Â Large infestations of the rabbit louse (Haemodipsus ventricosis) can cause severe itching and scratching, which results in the host rubbing against its cage, often resulting in hair loss.Â Several species of sucking lice (order Anoplura) have been noted on wild guinea pigs in South America: Pterophtirus alata and Polyplax spinulosa (Dittmar, 2002). These later lice are listed in Table 23.1, but not discussed here in detail. Table 23.1.