

THE ASSOCIATION OF FEATHER LICE (MALLOPHAGA)  
WITH A HIPPOBOSCID FLY ORNITHOMYIA FRINGILLINA CURTIS

by

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I. INTRODUCTION

The phenomenon of Mallophaga attaching themselves to the bodies of Hippoboscid flies has been known for a long time and there are a great number of recorded cases. Most of these however are single cases which have been noted incidentally, and there appears to have been no intensive study of the phenomenon on any single population of birds. Summaries of records have been published by Clay and Meinertzhagen (1943), Ansari (1946) and Bequaert (1952, p. 163), the last containing American records only.

In the course of this study, which is described separately, a considerable amount of information was collected on the occur-



The lice have usually been found clinging to the abdomen of the fly, often holding with their mandibles to the base of a bristle, but some have been recorded attached to the wing veins. Many different species of flies have been recorded carrying lice but Ornithomyia fringillina figures very largely in the records. The species of Mallophaga concerned, as pointed out by Thompson (1936), all belong to the superfamily Ischnocera, the members of which are less active than the Amblycera. With few exceptions, they belong to the genera Bruelia and Philopterus.

Most of the records are from birds which had been killed and the suggestion has often been made that the lice only attach themselves to the flies after the death of the host. This was shown to occur by Clay and Meinertzhagen (1943) with O. fringillina from starlings Sturnus vulgaris in Shetland. When the birds were killed they produced flies which were free of lice. These were returned to the birds and recovered an hour later when they were found to have acquired several lice. However many recent records from trapped birds show that the association is also found on living birds.

During the summer of 1954 an intensive study was made on Fair Isle, Shetland, of the infestation of five species of passerine birds by the Hippoboscid fly Ornithomyia fringillina. In the course of this study, which is described separately, a considerable amount of information was collected on the occur-

rence of Mallophaga on the flies. All the flies were removed from each bird trapped, and among other details the number of lice on each fly was noted. Each fly was then marked individually and released on another bird. In this way information was obtained on the changes in numbers of lice on individual flies, as well as on the extent to which the flies were infested by lice. The chloroform apparatus used to remove the ectoparasites from the birds is considered to be 100% efficient in removing flies but it is very much less efficient in removing lice and therefore no quantitative study was possible on the infestation of the birds themselves by lice.

## 2. THE NATURE OF THE ASSOCIATION

All the Mallophaga encountered appeared to be of the same species but since the flies were released carrying any lice they had on capture, their identification could not be confirmed. A sample of 20 was submitted to Miss Theresa Clay who identified them all as Sturnidoecus sturni (Schrank) 1776, which is a specific parasite of the starling. Many others were preserved and appear to be identical. Of the 20 definitely identified there were 14 females and 6 males.

The great majority of the lice were attached to the abdomen of the fly, facing the same direction as the fly. Even in the two cases where nine lice were found on one fly

they were all on the abdomen. The only other site of attachment was under the head, the mandibles being attached to the cuticle at the base of a large bristle while the abdomen extended out in front of the fly. In every case the louse was very firmly attached and was difficult to pull off without damaging it, whether it was alive or dead. In specimens examined carefully the mandibles were seen to be grasping a fold of cuticle but did not appear to be actually penetrating the cuticle.

Before being released again, flies were often kept one or two days in the laboratory in individual glass tubes. During this time the lice usually maintained their hold on the fly without moving. Only in a few cases when the tubes were accidentally exposed to direct sunlight were the lice seen to become active, presumably stimulated by the heat.

### 3. THE INCIDENCE OF LICE

#### (a) Degree of infestation of the flies

The starling Sturnus vulgaris was the only species whose flies regularly carried lice. The few occurrences on the other species will be dismissed first.

Wheatear Oenanthe oenanthe. - Only one fly had a louse out of 243 examined. It was one of seven flies from a juvenile on 22nd July. The louse was preserved and identified as S. sturni. This bird had no contact with a starling in the trap. (A female fly from an adult ♂ on 17th August

had the head only of a louse clinging to its abdomen. Presumably the rest of it had been snapped off by the bird's bill during preening.)

Rock pipit Anthus spinoletta. - Two flies had lice out of 208 examined.

4 on a ♂ fly from juvenile on 18th July.

1 on a ♂ fly from fledgeling on 6th August.

Neither of these birds was in contact with a starling in the trap.

Meadow pipit Anthus pratensis. - One fly was infested, with one louse, out of 67 examined. This bird had been in the trap along with a starling and so the fly could have changed from the starling to the meadow pipit in the trap.

Twite Carduelis flavirostris. - No lice were found on 23 flies examined.

Wren Troglodytes troglodytes. - Only one fly was obtained from wrens and this had the head of a louse attached to the abdomen.

Merlin Falco columbarius. - Of 35 flies, one was infested - with 6 lice which were confirmed as being S. sturni. This fly also had about 20 mites Microlichus avus which were also characteristic of flies from starlings.

All the above cases can be attributed to flies transferring themselves from starlings to the birds concerned, as

from the results of marking flies this is known to occur on a small scale.

Starling Sturnus vulgaris. - A summary of the incidence of lice on flies from starlings is given in table 1, while figure 1 shows the frequencies of the numbers of lice on each fly.

Table 1.

Degree of infestation of starling flies

	Total	♂	♀
Number of flies examined	156	68	88
Number with lice	68	32	36
Percentage with lice	43.5%	47%	41%
Total number of lice	164	79	85
Number of lice per infested fly	2.41	2.47	2.36
Number of lice per fly examined	1.05	1.16	0.97

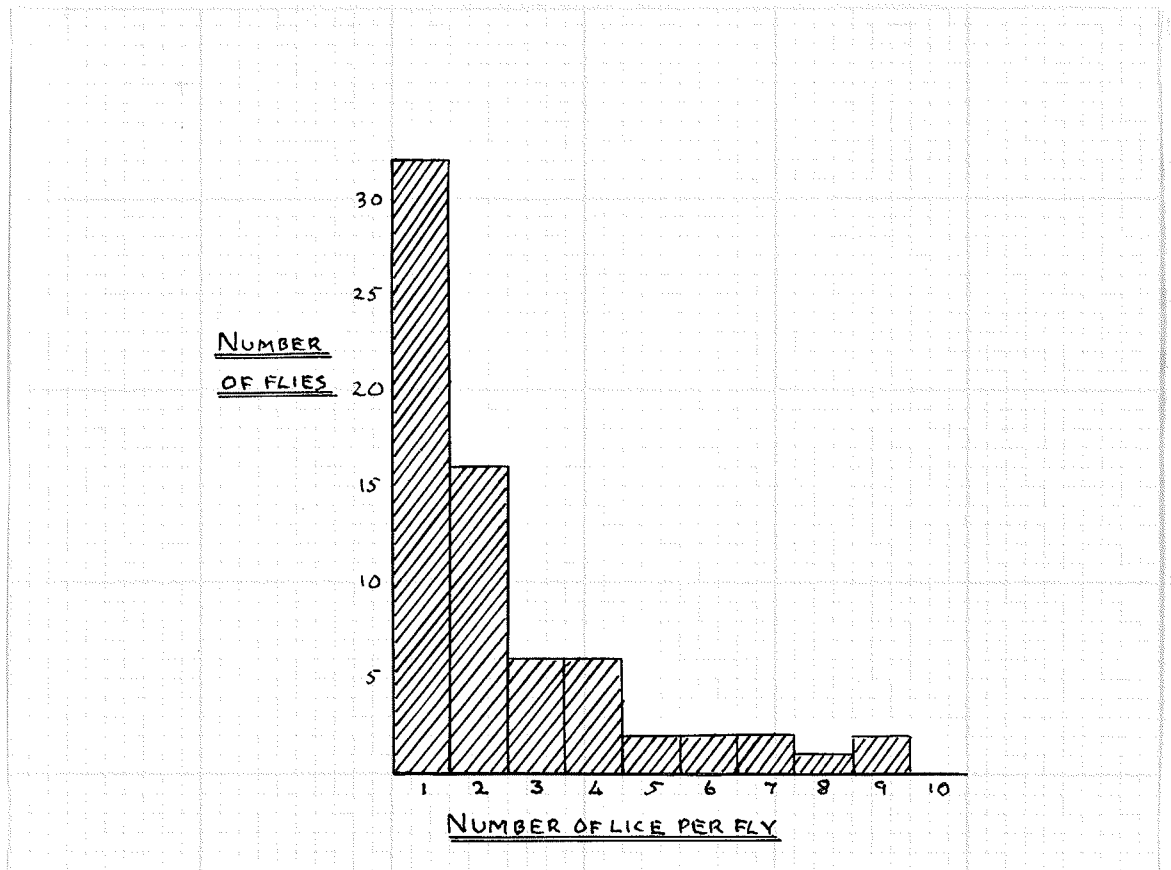


Figure 1. Numbers of lice on flies from starlings.

It will be seen that male flies are more often and more heavily infested than females, but the differences are small and are not statistically significant. Such a difference could be due to the more active habits of the male flies. Males were found to change hosts more often than the females and would therefore be more likely to have been on a heavily infested bird. This activity would also presumably extend

to movement among the bird's plumage and this might also increase the chances of their coming into contact with lice.

(b) Seasonal distribution

The seasonal distribution of lice on flies is shown in figure 2. The birds concerned are all juvenile starlings; only two adult starlings were trapped during the period and neither was infested with flies. In general, these graphs

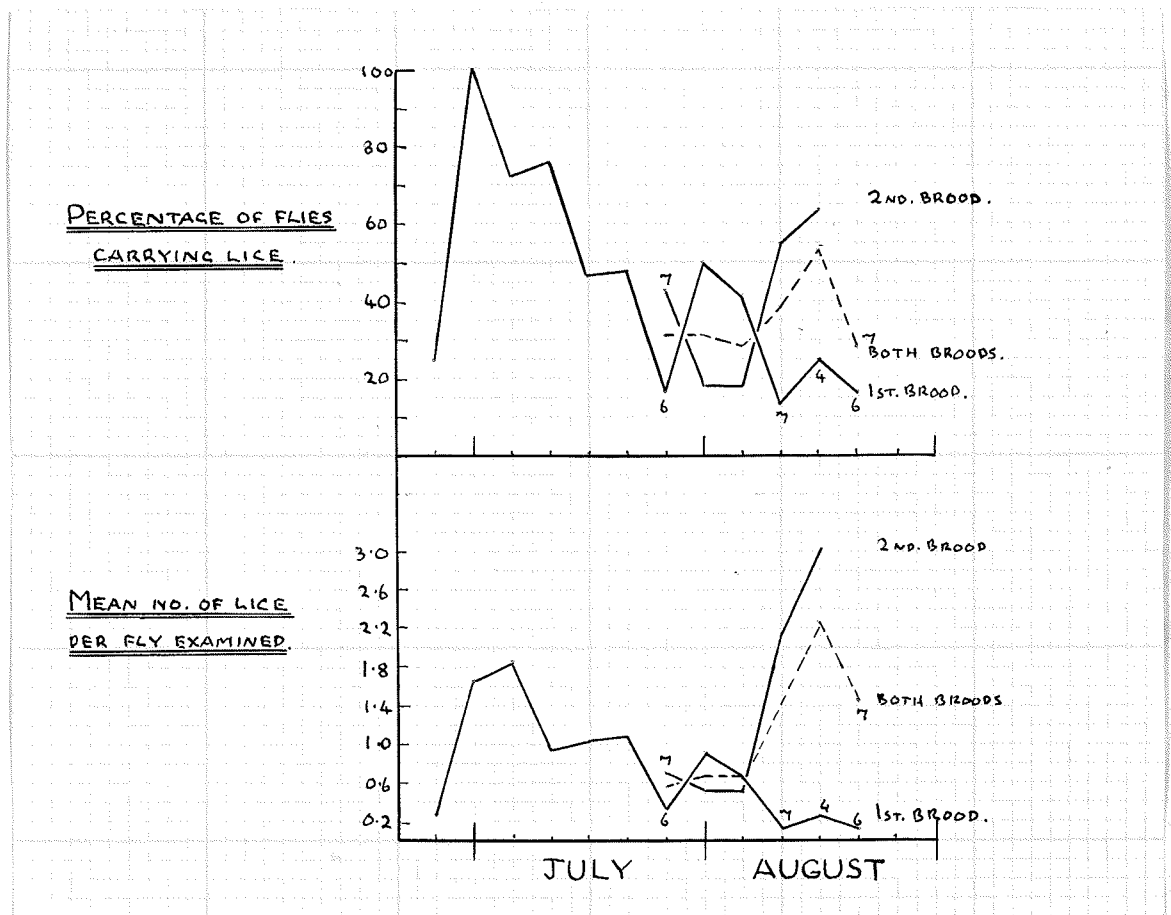


Figure 2. Seasonal incidence of lice on flies.  
(The number of flies on which a value is based is given where it is less than ten.)



are similar to the corresponding graphs for the infestation of the birds by flies, i.e., the greatest infestation of flies with lice occurs when the flies themselves are most abundant. If the number of lice on the flies is any reflection of the number of lice on the birds at the time, then it would seem that the birds are most heavily infested when they leave the nest, after which the number of lice steadily decreases. The rise in infestation on the flies from the first brood at the beginning of August can be explained by the acquisition by the first brood birds of flies from the more heavily infested second brood.

#### 4. MOVEMENT OF LICE

Since very few starlings were trapped a second time, it was not possible to study the changes in louse-infestation of marked flies on their natural host. However many flies originally from starlings, were released carrying lice on birds of the other four species, and of these five were recovered. Details of these are given in table 2 along with one case in which a marked fly, free of lice on release, acquired a louse before recapture. In the first case the fly was recovered on a different bird from that on which it had been released; in the others it was recovered from the same bird. In the first case (a wet-bill), the louse left it and remained on the bird, finally attaching itself to the fly which was now on the bird. In the other cases the fly was recovered on the bird on which it was released.

Table 2  
Change in louse-infestation of marked flies

Fly released on	No. of lice on release	No. of lice on recapture	Time interval
Meadow pipit	4	0	1½ days
" "	9	2	20 hours
Rock pipit	1	0	7 days
" "	2	1	½ hour
" "	1	0	4 days
" "	0	1	1 day

It will be seen that in all cases some lice were lost, while in the three cases where the bird was not retrapped until more than a day after release, all were lost.

The last case is of particular interest. The louse was definitely identified as S. sturni but its probable mode of arrival on the rock pipit was found by going back over the many trapping records of this particular bird. On 3rd August it was released carrying a fly with one louse which had come from a starling. It was next caught on 6th August when it was found to be free of flies. Between then and the final recovery of the louse on 16th August it was trapped six times and had carried four different flies. It is therefore possible that before the first fly, which was released on 6th August, left the bird (or was killed by the bird) the louse left it and remained on the bird, finally attaching itself to the fly which was put on the bird on 15th August, and on which

it was recovered.

### 5. DISCUSSION

Most calculations that have been made of the percentage of flies infested with lice have given results in the region of 10% or less. For example Thompson (1935) examined 150 Hippoboscids from various sources without finding one louse. The same author (1947) records about 10% infestation on Ornithomyia spp. from living birds. Ash (1952) found 6.5% infested. Bequaert (1953, p. 164) records 5 out of 63 (8%) infested on 13 species of birds in New Jersey. From these results Bequaert considers that, whatever the cause of the actual attachment, the association is quite fortuitous. However, these calculations have all been made on collections of flies from several species of birds and no results were available for any single populations. The present study shows that on one species of bird, the starling, a very large percentage of flies can be infested, while the same species of fly (in fact the same population of flies) on other hosts is almost uninfested, despite the fact that lice are present on these species, although not in such numbers as on starlings.

Bequaert also points out that most species of Mallophaga are highly host specific while the bird flies, including Ornithomyia spp., show very little host specificity. He concludes that the probability of a louse reaching another suitable host through the agency of a fly is extremely small and

therefore that the association can have no survival value for the louse. But from the marking of flies in the present investigation it has been demonstrated that although a considerable amount of interchange of flies takes place between birds, it is very largely between birds of the same species. This is not because of any host-discrimination by the flies, but merely because a bird is more likely to consort with members of its own species than with other species. In this way a kind of host specificity develops in the population of flies on any one host during one season although newly emerged flies in the spring probably show no discrimination in choosing a host-species. The more gregarious the birds the greater is the interchange of flies likely to be. Information on the exact extent of this is lacking for the starling but was calculated as being 19% for the rock pipit, which is less gregarious than the starling. In contrast to this only 3.4% of the flies changed to a different host-species.

If it is agreed then that, in some cases at any rate, the attachment of lice to flies has some survival value and is not merely fortuitous, it remains to be shown how the behaviour of the lice is adapted to secure the attachment, and whether any louse at any time, given sufficient contact with the fly, will attach itself. From the present study the only observations relevant to this aspect are that lice are found on the flies throughout the season; that they tend to

remain on a fly while it is away from a host; and that they tend to leave a fly when it arrives on a new host (in this case the "wrong" host). From the high percentage of flies carrying lice it appears probable that a louse will attach itself to a fly whenever it gets the chance. Possibly hunger, accompanied by warmth, may stimulate it to leave again whether or not the fly has meanwhile changed hosts.

## 6. CONCLUSIONS

It is considered that, in the population of starlings studied, the occurrence of lice on the flies and the interchange of flies between birds are both sufficiently common to have some real value in maintaining a circulation of lice within the population. In this respect the association augments the exchange of lice which probably occurs during brooding of the young and during communal roosting, etc.

## 7. SUMMARY

(1) Information on the association between feather lice and the Hippoboscid fly Ornithomyia fringillina was obtained on Fair Isle, Shetland, during a study of the life-history of the fly.

(2) Of five species of breeding passerine birds studied only one, the starling Sturnus vulgaris, carried flies which were commonly infested with lice. These were all of one



species Sturnidoeacus sturni (Schrank). Isolated cases were recorded from five other species of birds all concerning the same species of louse. It is believed that they occurred by the straggling of flies from starlings.

(3) The lice were most often found on the abdomen of the fly, attached to the cuticle by their mandibles. They remained in the same position on the flies while the latter were kept in the laboratory for two days.

(4) 43.5% of all flies from starlings carried lice. Male flies were more highly infested than females.

(5) Lice occurred on flies throughout the season but were commonest on flies from newly fledged young birds.

(6) The significance of the association is discussed in the light of the known movements of the flies.

(7) It is concluded that the association is not fortuitous but plays a significant part in the dissemination of lice throughout the bird population.

#### 8. ACKNOWLEDGMENTS

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