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Since the publication of my last notes on the association of Hippoboscidae and Mallophaga (Thompson, 1937) some new and interesting records of this relationship, which has been referred to as phoresy, have come to hand and numerous records have been published by other workers. I am giving below some additional references which it is to be hoped will bring my original bibliography (Thompson, 1936) up to date, together with thirteen new records and some notes on previously published records.

Herman (1937) recorded two Mallophaga found attached to the sides of the abdomen of a specimen of *Ornithomyia anchineuria* Speis. taken from an eastern cowbird (*Molothrus a. ater* L.). The determination of the Mallophaga was not given. Mr. C. M. Herman very kindly sent me one of the specimens, the other having been lost, and it proves to be a species of *Philoaterus*. I cannot be certain of the species, but it may be the one described male of Kellogg's *P. transpositus*, which was originally described from a female taken off *Molothrus a. ater* L.

Séguy (1938)¹ recorded a specimen of a species of *Degeeriella* attached to a specimen of *O. roubaudi* Séguy taken in the French Congo, 'environs de Brazzaville, bord du nid des hirondelles du fleuve St-Pool, 25.10.38 (E. Roubaud et A. Weiss, 1908)' (i.e. from the edge of a swallow's nest on the Congo River at the Stanley Pool).

Bequaert (1943) recorded three specimens of *Ornithoica vicina* (Walk.) off *Uroleuca cristatellus* (Temm.) and one specimen off *Pyroderus scutatus* (Shaw), each with Mallophaga fixed by the mandibles to the tip of the abdomen; also two specimens of the same species of Hippoboscidae off a thrush (? *Turdus*) each bearing a specimen of Mallophaga. The first four flies were collected at Nova Teutonia, Brazil, and the last two at Abitagua, Ecuador.

Clay and Meinertzhagen (1943) have given a number of new records together with a summary of the published records up to 1935. The names of the Hippoboscidae mentioned by them should read as follows: *Ornithomyia avicularia* ('*aviculare*'), *O. fringillina* ('*fringillaria*') and *Ornithoica vicina* ('*confluenta*'). I cannot agree with these writers that one can be positive that the total louse population can be removed with certainty from any one bird either by careful examination or by 'shaking' and, therefore, the fact that they claim to have accounted for the total louse population of a specimen of *Sturnus vulgaris zetlandicus* (Hart. (Shetland starling) (*loc. cit.*: 14) may not be true. Moreover, no mention was made of the presence of a Hippoboscid fly on this bird prior to immersion in chloroform vapour, and since *Ornithomyia lagopodis* Sharp is comparatively large it seems extremely likely that more lice could have passed unnoticed. In the case of the *Philoaterus* sp. found on the recently fledged albino cuckoo (*loc. cit.*: 14), should this species prove to be a true parasite of the house martin (*Delichon u. urbica* (L.)) it would be most interesting, especially as I gather from the statement that it is assumed the lice were transported by a Hippoboscid fly. In my own experience of the records of Hippoboscidae parasitizing the house martin in England I do not know of any record of a species of *Ornithomyia*² from this host or of any instance of *Stenepteryx hirundinis* (L.), the specific

¹ I am indebted to Dr. J. Bequaert for kindly verifying this reference.

² *Ornithomyia biloba* Duf. occurs normally on *Hirundo r. rustica* L. (swallow) on the Continent, and it has been recorded from *Delichon u. urbica* (L.), but I am inclined to doubt the latter records since so many observers confuse swallows, martins, swifts, etc.

parasite of the house martin, having been found on any other species of bird. If it is possible, as is stated, that the cuckoo had the house martin as foster parents then the question of the transportation of the lice by Hippoboscidae does not arise. The statement on p. 15 (*loc. cit.*),

'the only genera of Mallophaga known to be carried by hippoboscid flies are *Philoaterus* and *Bruelia*' [= *Degeeriella partim*]

is incorrect. Peters (1935)³ and Thompson (1936)³ have both recorded *Ardeicola botauri* (Osb.) attached to specimens of Hippoboscidae (*Lynchia albipennis* (Say) and *L. americana* (Leach)), Forsius (1912)³ recorded a specimen of *Lagopoecus lyrurus* Clay from a specimen of *Ornithomyia avicularia* L., Martin (1934)³ and Hathaway (1943) recorded specimens of *Columbicola columbae* (L.) from specimens of *Pseudolynchia canariensis* (Macq.). Bequaert (1945) referred to Peters' (1935) record—see below.

ADDITIONAL BIBLIOGRAPHY OF PAPERS CONTAINING RECORDS OF THE ASSOCIATION OF HIPPOBOSCIDAE AND MALLOPHAGA

Adie, H., 1913, The sporogony of *Haemoproteus columbae*, *Indian J. Med. Res.* 2: 671-80 [p. 679]. **Bequaert, J.**, 1943, Notes on Hippoboscidae. 16. Hippoboscidae from southern Brazil. With the description of a new species of *Lynchia*, *J. Parasit.*, 29 (2): 131-5 [p. 131]; 1945, Notes on Hippoboscidae. 19. Additions to the large species of *Lynchia*, with descriptions of two new species, *Psyche, Camb., Mass.*, 52: 88-104 [p. 100]. **Clay, T., & Meinertzhagen, R.**, 1943, The relationship between Mallophaga and Hippoboscidae flies, *Parasitology*, 35: 11-16, 2 figs. **Guimaraes, L. R.**, 1944, Mais um caso de associaçao entre Mallophaga e Hippoboscidae, *Papéis Avulsos Dept. Zool., S. Paulo*, 4 (5): 79-84, 1 Pl. **Hathaway, C. R.**, 1943, Associação entre Mallophaga e Hippoboscidae, *Mem. Inst. Oswaldo Cruz*, 38 (3): 413-17, 2 figs. **Herman, C. M.**, 1937, A case of super-parasitism, *Bird-Banding*, 8 (3): 127; 1937, Notes on Hippoboscidae flies, *Bird-Banding*, 8 (4): 165. **Séguy, E.**, 1938, Synopsis des pupipares du groupe de l'*Ornithomyia biloba* (Dufour) Bequaert, *Encycl. Ent., Diptera*, 9: 75-8. **Thompson, G. B.**, 1937, Further notes on the association of Hippoboscidae and Mallophaga, *Ann. Mag. nat. Hist.* (10) 20: 441-2.

NEW RECORDS

Degeeriella sp. (= *Bruelia* sp.), ♀, attached to the side of the abdomen of *Ornithomyia avicularia* L., ♂.

Degeeriella sp., ♀, attached to the base of the right wing of *O. avicularia*, ♂.

Degeeriella sp. attached to the terminal portion of the abdomen of *O. avicularia*, ♀.

NOTE.—The above Hippoboscidae were all collected at the same time from a single specimen of *Turdus ericetorum philomelos* Brehm (song thrush) at Hartley, Longfield, Kent, 19.viii.37 (Arnold Clark).

3 *Degeeriella* sp. attached to the terminal portion of the abdomen of *O. avicularia* L., ♀, taken from *Turdus ericetorum philomelos* at Hartley, Longfield, Kent, 28.viii.37.

1 *Degeeriella* sp. attached to the abdomen of *O. avicularia* from *Turdus m. merula* L. (blackbird), same locality, 17.vi.38.

1 *Degeeriella* sp. attached to the abdomen of *O. fringillina* Curt. from *Sylvia c. communis* Latham (whitethroat), same locality, 13.vii.38.

3 *Degeeriella* sp. attached to the abdomen of *O. avicularia*, ♂.

1 *Degeeriella* sp. attached to the abdomen of *O. avicularia*, ♀.

NOTE.—The *O. avicularia* referred to in the last two records were taken at the same time from a single *Turdus m. merula*, same locality, 27.vii.38.

3 *Degeeriella* sp. attached to the abdomen of *O. avicularia*, ♂, from *Sturnus v. vulgaris* L. (starling), same locality, 27.vii.38.

1 *Degeeriella* sp. attached to the abdomen of *O. avicularia*, ♀, from *Turdus m. merula*, same locality, 4.viii.38.

1 *Philoaterus sturni* (Schränk) attached to the abdomen of a female *O. avicularia* from *Sturnus v. vulgaris*, same locality, 6.viii.38.

7 *Degeeriella* sp. attached to the abdomen of *O. avicularia* from *Turdus e. ericetorum* Turton, Wilmslow, Cheshire, 25.viii.38 (*E. Cohen*).

2 *Degeeriella* sp. (= *Bruelia* sp.) attached to the abdomen of *O. avicularia* from *Accipiter n. nisus* (L.) (sparrow hawk, immat.), Llanbwehllyn, Radnorshire, 8.viii.38 (*J. W. Williams*).

For all except the last two of the above I am deeply grateful to Mr.

³ See Thompson (1936), *Ann. Mag. nat. Hist.* (10) 18: 311-2.

Arnold Clark, who sent me a very considerable number of specimens of *Ornithomyia* spp. which he collected from birds trapped for 'ringing.' A total of 112 specimens was collected from known hosts by Mr. Clark, of which only eleven specimens of *Ornithomyia* spp. carried Mallophaga—roughly ten per cent.

In most of the examples of this association that I have seen the Mallophaga have been attached by their mandibles to hairs of the abdomen or to veins at the base of wings or to the soft integument at the base of a hair.⁴ The specimen of *Philoaterus sturni* recorded above was attached to the soft integument of the terminal portion of the abdomen, in an area around the male genital aperture which is devoid of hairs. Dr. Bequaert (*in litt.*), referring to his records (1943), says he is unable to make out for certain how the lice are attached. The flies were dry and the lice so large in comparison with the fly that he doubted the mouth-parts could grasp just a hair.

The true test of host-specificity in the Mallophaga is the power of a parasite to live and to reproduce on a host. The records of 'straggling' in the Mallophaga have become rarer in recent years as a result of more careful collecting. It seems almost certain that some Mallophaga are transferred by means of Hippoboscidae to a host upon which they do not normally occur, but for reasons which we are not at present able to explain these lice are unable to survive. It may be concluded that Hippoboscidae cannot be regarded as serious agents in the transfer of Mallophaga from one host species to another to the extent of causing active 'straggling.'

POSTSCRIPT.—Since preparing the manuscript of this paper an additional reference has come to my notice, thanks to the kindness of Dr. J. Bequaert, of the Museum of Comparative Zoology, Harvard University, Cambridge, Mass., U.S.A.

Ansari, M. A. R., 1947, Association between the Mallophaga and the Hippoboscidae infesting birds, *J. Bombay nat. Hist. Soc.*, 46 (3): 509-16.

On p. 509 there are two new records:—

Columbicola columbae (L.) on *Pseudolynchia canariensis* Macq., off Indian rock pigeon, *Columba livia intermedia* Str.

Philoaterus sp. on *Ornithoeca* sp. (*sic*), off bank myna, *Acridotheres ginginianus* Lath.

The remainder of the paper consists of a list of the cases known thus far (with some omissions) and a discussion of various explanations offered for the phenomenon. The author's conclusion (p. 515) is

'From the above it appears that the transport of Mallophaga by the "bird flies" is purely accidental, and is not a common feature.'

On p. 511 there is an interesting observation on the behaviour of lice after the bird dies:—

'In the case of crows, the lice were seen to swarm about the head region two to three hours after the death of the bird. They were apparently so panic-stricken that they moved in and out the feathery covering for likely favourable spots, persistently biting the feathers here and there and attaching themselves by their strong sharp-edged mandibles to the fragments coming in their way. But they did not quit the body at all. From this it may be inferred that lice will fasten upon Hippoboscid fly, if the latter comes in the way, but not purposely for reason of the higher temperature of the fly.'

Science Museum, Institute of Jamaica, Kingston, Jamaica.

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