

Perdix perdix perdix (Linnaeus) on account of the more heavily marked and darker upper parts, darker grey breast with coarser vermiculations, and deeper tint of the chestnut-coloured ventral patch, and in these respects some of the more extreme examples show an appreciable resemblance to *Perdix perdix sphagnetorum* (Altum), 1894, described from the Meppen peat mosses of N.W. Germany. In others, however, the characters are less pronounced.

Owing to the strong correlation between soil colour and local variations in plumage pigmentation in *P. perdix*, it would seem prudent to leave the northern and western Scottish birds without a racial name until such time as the question has been carefully examined with additional data from the species' entire range.

The Systematic Position of the Musophagi as indicated by their Mallophagan Parasites.

By THERESA CLAY, B.Sc.

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In a previous note ("Ibis", 88 (1946): 403) it was emphasized that, owing to certain factors, the basing of deductions of host relationships on those of their parasites might lead to misleading conclusions. The following discussion should therefore be considered in the light of those limiting factors. The Musophagi are usually placed as one of the suborders of the Cuculiformes, the other being the Cuculi. The Cuculi are parasitized by four genera of Mallophaga none of which shows any close relationship to the genera found on the Musophagi. Five genera of Mallophaga are known from the Musophagi, i.e., *Turacæca* Thompson, *Menacanthus* Neumann, *Clayia* Hopkins, *Splendoroffula* C. & M. and *Cuclotogaster* Carriker. *Turacæca* is a distinctive genus not closely related to any other known genus: *Menacanthus* is found on the Galli and Passeriformes (*sens.* Lowe, "Ibis", 88 (1946): 127) and probably represents a genus which was once distributed throughout the Aves and is now extinct on most orders. *Clayia* is at present known only on the Galli and on *Crinifer africanus zonurus* (Rüppell), Musophagi; *Cuclotogaster* is at present known to occur on the Galli and on two species of the Musophagi. In the original description of *Splendoroffula* it was shown that this genus, represented by species from six genera of the Musophagi, appeared to be closely related to *Oxylipeurus* Mjöberg, known only from the Galli.

The presence of two genera common to the Musophagi and Galli and one genus on the Musophagi closely related to one on the Galli may be explained in one of four ways:—

(1) *Ancient straggling.* At some period there was a transference of Galli parasites to the Musophagi, where they became established and evolved into distinct species; such transferences could have taken place through the use of common dust-baths. The Mallophaga are strongly host-specific and usually die when transferred to another host species. There is, however, one genus of Mallophaga the host distribution of which can only be explained by ancient straggling. The fact that in this case there are three genera involved would suggest that this is an unlikely explanation.

(2) *Convergence.* If the Musophagi and Galli had a number of superficial characters in common, this might have led to a resemblance between the external characters of the Mallophaga. However, it is unlikely that response to a similar environment could have resulted in so many common characters in the Mallophagan species, belonging to three genera, from the two host orders.

(3) *Discontinuous distribution.* The three genera were once found throughout the Aves and have become extinct except in the Galli and Musophagi. There is evidence that *Cuclotogaster* belongs to an ancient group of genera which shows discontinuous distribution and in which little divergence has taken place, resulting in the presence of apparently closely related genera on hosts which are not considered to be closely related. There is no evidence suggesting that this is also the case in *Splendoroffula* or *Clayia*.

(4) *Relationship between the two host suborders.* This suggestion, which would seem to be the most probable, has been put to Dr. Stresemann of the Zoologisches Museum, Berlin, to whom I am greatly indebted for the following information privately communicated (September and October 1946). Dr. Stresemann sends me an extract from Max Fürbringer (1888: 1318) as follows: "Yet I do not deny the possibility that the lines of evolution of the ancestors of these two or three divisions (Gallidæ, Opisthocomidæ and Musophagidæ) have been in very remote phylogenetical times not so very far apart; in other words, I believe it possible that the great divergence which now exists between the Gallidæ and Musophagidæ is a more secondary one". Dr. Stresemann himself suggests that a common ancestor might have given rise to two branches, one the Galli and the other which subsequently gave rise to the Musophagi and Opisthocomidæ, but states that the whole question needs to be reconsidered in the light of present-day knowledge, including biology and behaviour.

If this theory is correct it would be expected that the Mallophaga found on the Opisthocomi would be related to those of the Musophagi; this, however, is not the case. It is not possible to discuss here the five genera

found on *Opisthocomus* except to say that these show no obvious relationship to the genera found on the Musophagi or Galli, but suggest that either (a) *Opisthocomi* has no close relationship with the Musophagi-Galli group or (b) that *Opisthocomi* was separated very early from the ancestral stock giving rise to the other two suborders, or (c) that the Mallophaga from this suborder have for some reason diverged more rapidly than those of the other two suborders. Either of the last two causes might result in the relationships of the Mallophaga being largely obscured.

The above note has been shown to Mr. R. E. Moreau, who suggests that there are certain biological resemblances between the Galli and Musophagi: the young are born clothed with dense down and are active from an early age. The harsh crowing or barking quality of the voices of the Musophagi also reminds one of the Galli. It is unfortunate that very little has been recorded of the breeding behaviour of any of the Musophagi, but Hoesch ("Vögel ferner Länder", 6 (1932): 115-120) had some reason to think that *Corythairoides concolor* A. Smith might at any rate be bigamous.

Breeding-behaviour in Domestic Pigeons four weeks old.

By DEEEK GOODWIN.

Received on 12 March 1947.

A certain amount of what appears to be behaviour of a sexual nature is not infrequent between nest-mates of the Domestic Pigeon (*Columba livia*) at an early age. This usually takes the form of caressing each others' heads in the well-known manner common to pigeons, crows, gallinules and many other birds, and of abortive attempts at the pairing ceremonial.

The head-caressing is not perhaps primarily of a sexual nature since, although at times associated with intense sexual excitement, it seems more generally an expression of quiet affection. Adult pigeons caress their fledged young in this manner, and between adult birds it appears often to be used as a sort of substitute for more positive sexual behaviour, being most frequently and continuously indulged in by pairs whose nesting preliminaries are protracted owing to one bird, or more usually both birds, being in rather poor condition.

Two cases of what one would class as definitely adult behaviour by juvenile pigeons seem to me, however, to be worthy of full record. The age of the birds concerned was such as to make it seem unlikely—even allowing for the precocity of the Columbidae—that the birds could have been very largely impelled to behave as they did by their own physical

state, and to suggest that the behaviour of their close and intimate companion was to a large degree the cause of their reactions.

(1) A young bird (a racing homer), with a malformed wing, had been taken very early from its parents and, I believe, partially reared by hand. When it came to my notice it had begun to pick up corn, although only about 23 days old. A still younger bird—about 16 days old—was put in a basket with it, and since I was feeding the latter by hand I also hand-fed the older bird. After two days I discovered to my amazement that the older bird was feeding the other in the manner of an adult feeding its offspring and quite as eagerly and generously*. This state of affairs continued for some days, and I was able to get a snapshot of the proceedings. Then most unfortunately the authorities (the birds were part of the Middle East Pigeon Service) decreed that the crippled bird be destroyed as it was of no use, and sentence and execution were carried out in my absence before I had any notion of what was afoot.

(2) Whilst on Malta in 1943 I had (besides the Service pigeons) a white hen pigeon (African Owl) who regarded me as her mate. On 2 June, when the racers were out at exercise, one of them displayed to her; she crouched and coition took place. (This act by itself unaccompanied by the normal ceremonial does not result in any permanent alliance between the birds taking part.) She had been nesting for some time and laid her first egg on the evening of 4 June and the second on 6 June. She incubated continuously, not leaving her eggs—except briefly for food and drink—during the period when in the normal course of events the cock bird would have been sitting. She did, however, constantly try to call my attention to my duties, and if I put my hand into the wicker cage and over the eggs would greet me with the usual "broken" coo of a hen pigeon being relieved by her mate and leave with a contented air. As long as I remained by the cage she would bathe or otherwise disport herself, but on noticing that I had left my post would fly up to investigate and, seeing the eggs uncovered, would at once go on to them again. This behaviour is usual with pigeons; birds of either sex will in most cases brood eggs or young "out of turn" if the need arises, a fact well-known to the pigeon-racing fraternity.

Both eggs hatched on 27 June, but one squab died when a few days old. The female was again fertilized by a male with whom she had no further dealings and she laid another two eggs and commenced incubation on 20 July. The surviving young of one of the first brood was then spending most of his time in the "nest" but had begun to investigate the outer world and fly up and down from the ground, a height of

* Presumably no "pigeons' milk" was being secreted, but this normally constitutes only a small proportion of the food given to the young after the first week of life.