Baker, E. C. S. 1928. *The Fauna of British India. Birds.* Vol 5. 2nd edn. Taylor & Francis.
Canover, W. J. 1980. *Non Parametric Statistics.* 2nd edn. Wiley.
Davison, G. W. H. 1985. Avian spurs. *J. Zool. Lond.* A 206: 353–366.
Delacour, J. 1977. *The Pheasants of the World.* 2nd edn. Spur Publications.
Grahame, I. 1971. Breeding the Himalayan Blood Pheasant. *Avicult. Mag.* 77: 162–166.
Grahame, I. 1976. The Himalayan blood pheasant. Some further observations. *World Pheasant Assoc. J.* (1975–76) 1: 15–22.
Henry, G. M. 1978. *A Guide to the Birds of Ceylon.* De Silva.
Hume, A. O. & Marshall, C. H. T. 1879. *The Game Birds of India, Burmah and Ceylon.* Vol 1. Calcutta.
Kiltie, R. A. 1985. Evolution and function of horns and hornlike organs in female ungulates. *Biol. J. Linn. Soc.* 24: 299–320.

Address: Dr G. W. H. Davison, Zoology Department, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia 43600.

Polymorphic rectrix number and ocellus size in *Polyplectron*

by G. W. H. Davison

Received 24 December 1985

Cases of polymorphism involving distinct plumage colour are rare amongst Galliformes; male *Pucrasia macrolopha* (breast colour) and *Polyplectron emphanum* (brow colour) are examples (Delacour 1977). Much more common is polymorphism in spur number, amongst species with multiple spurs (Davison 1985a), and in tail feather number, as in Tetraonidae. Male *Dendragapus obscurus* have from 8 to 11 pairs of rectrices, and male *Bonasa umbellus* 7 to 10 pairs (Short 1967).

One group in which spur number is highly variable within species is *Polyplectron,* the peacock pheasants (Davison 1985b). In that genus few-spurred males are generally small, with absolutely and relatively short tails. Spur number and size might influence fighting ability, yet in the sample sizes used by Davison there was no clear correlation between a major visual component of display, namely the ocelli, and either size or spur number. This paper therefore reconsiders the above features in relation to rectrix number, another polymorphic feature of the genus not yet investigated.

The specimens used by Davison (1985b) were re-examined, and rectrix number counted on each. Care was taken to include feather positions undergoing moult. An additional 11 adult male *P. bicalcaratum bakeri* were measured for all characters (wing and tail lengths, largest wing ocellus and largest tail ocellus dimensions, rectrix number and spur number), representing a 60% increase in sample size for this subspecies. Correlations between ocellus size and other physical characters were re-tested using this expanded sample.

Table 1 shows the range in number of rectrices for the 2 sexes of all *Polyplectron* species. The data suggest that 8 pairs is the primitive number within the genus. This is the number in both sexes of *P. chalcurum,* generally considered the most primitive species (Delacour 1977, Geist 1977), and in females of some others. In other species, rectrix number is greater and more variable in males than in females.

TABLE 1

Number of pairs of rectrices in the 2 sexes of *Polyplectron* spp.

	Male		Female	
	This study	Delacour (1977)	This study	Delacour (1977)
P. chalcurum	8	8	8	8
P. inopinatum	9–10	10	9	9
P. germaini	10	10	9	–
P. bicalcaratum	8–11	10–12	9	–
P. malacense	9–10	11	8	–
P. (m.) schleiermacheri	10	–	8	–
P. emphanum	11–12	11–12	9–10	–

There is no evidence, in *P. bicalcaratum,* that rectrix number increases with age. Rectrix number in the few juveniles available varies over as wide a range as in adults, and in all age categories 10 pairs are most common (Table 2). For this species, there is no evidence that males with 10 pairs of rectrices have longer tails than those with 9 pairs (Mann-Whitney $U = 231.5$, $n_1 = 13$, $n_2 = 34$, $p > 0.10$).

TABLE 2

Frequency of different rectrix numbers in *Polyplectron bicalcaratum* according to age class.

	Rectrices (pairs)			
	8	9	10	11
Juvenile	1	–	3	1
Adolescent	1	–	2	–
Adult	3	15	34	1

Surface area of the largest ocellus on the central pair of rectrices was used as an index of plumage extravagance. Rectrix number is not significantly correlated with tail ocellus size (Spearman $r_s = 0.190$, $n = 51$, $p > 0.05$). Nor is it correlated with spur number.

TABLE 3

Spearman rank correlations (r_s) between various physical features of *Polyplectron bicalcaratum.* Sample sizes are given in parentheses; $^*p < 0.05$; $^{**}p < 0.01$.

	P.b. ghigii	*P.b. bakeri* (Davison 1985b)	*P.b. bakeri* New sample	*P. bicalcaratum* Pooled sample
Wing *v.* wing ocellus	0.013 (9)	–0.047 (18)	–0.055 (29)	0.0813 (55)
Tail *v.* tail ocellus	–0.317 (9)	0.307 (18)	0.213 (29)	0.0507 (55)
Wing *v.* total ocellus	–0.158 (9)	0.106 (18)	0.188 (29)	–0.0111 (54)
Spur number *v.* total ocellus	0.475 (9)	0.693 (18)**	0.307 (29)	0.2799 (55)*

Correlations between various physical features of *P. bicalcaratum* are shown in Table 3. An increase in sample size of *P.b. bakeri,* from 18 to 29 adults, did not improve correlations between ocellus size and other features. When data are pooled from all subspecies of *P. bicalcaratum,* only spur number is correlated with ocellus size, and the correlation is weak. A male with 7 spurs had particularly tiny ocelli, but this specimen was not accessible to accurate measurement. More strikingly, wing length and tail length show no correlation with the sizes of ocelli they bear, and this is true for each subspecies as well as for the pooled sample (Table 3).

As amongst grouse (Short 1967), the frequency of variations in rectrix number greatly exceeds what might be expected from recurrent mutations, and is more plausibly explained as the effect of a genetic polymorphism. Variation in rectrix number among these Galliformes thus differs fundamentally from the occasional variation found in other birds (Somadikarta 1984, Hanmer 1985). Terrestrial habits might release rectrix number from unifying selection pressure, which could then be susceptible to random drift or to pressures conferring advantages other than those of flight.

The general picture within *Polyplectron* is now of a network of poorly correlated variations, in wing length, tail length and spur number. These correlations, because low, are more likely the result of weak genetic linkage than of pleiotropy (Berry 1977). Particular interest attaches to the lack of correlation between wing or tail lengths, which are direct measurements of feather size, and the ocelli borne on those feathers. These 2 aspects seem to be controlled by different and independent loci. This might be related to the distinction between those features important in inter-male competition (spur number, and wing or tail lengths as a reflection of intimidating body size), and those important in the attraction of females by display. In the second category, number of ocelli may be no less important than their size, and the abundance of ocelli can be manipulated by differences in the number of rectrices which bear them.

Acknowledgements: Specimens were examined through the kindness of I. C. J. Galbraith, British Museum (Natural History), and Mrs C. M. Yang, National University of Singapore.

References:

Berry, R. J. 1977. *Inheritance and Natural History.* Collins.
Davison, G. W. H. 1985a. Avian spurs. *J. Zool., Lond.* A 206: 353–366.
Davison, G. W. H. 1985b. Spurs and ornaments among *Polyplectron* (Phasianidae). *Bull. Brit. Orn. Cl.* 105: 102–109.
Delacour, J. 1977. *The Pheasants of the World.* Spur Publications.
Geist, V. 1977. A comparison of social adaptations in relation to ecology in gallinaceous birds and ungulate societies. *Ann. Rev. Ecol. Syst.* 8: 193–207.
Hanmer, D. B. 1985. Abnormal numbers of tail feathers. *Bull. Brit. Orn. Cl.* 105: 91–95.
Short, L. L., Jr. 1967. A review of the genera of grouse (Aves, Tetraoninae). *Amer. Mus. Novit.* 2289: 1–39.
Somadikarta, S. 1984. Polyrectricyly. *Bull. Brit. Orn. Cl.* 104: 60–61.

Address: Dr G. W. H. Davison, Zoology Department, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia 43600.

A new race of *Grallaria haplonota* (Formicariidae) from Ecuador

by Mark B. Robbins and Robert S. Ridgely

Received 2 January 1986

An ornithological survey of the Cordillera de Cutucú in southeastern Ecuador by members of the Academy of Natural Sciences, Philadelphia (ANSP), resulted in the discovery of a new form of the Plain-backed Antpitta *Grallaria haplonota.* We propose to call this new form