Notes on the Evolution in the Eurasian Jay, *Garrulus glandarius* (L.)

By

Nagahisa Kuroda

(Yamashina Museum of Birds, Shibuya, Tokyo)

(With 2 Text-figures)

Taxonomic studies and reviews of the Eurasian Jay, *Garrulus glandarius*, have been made by various authors, and the species, comprising over 30 races, was classified by, for example, Andreas ('40) into eight groups. Here, I would treat them in five main groups, namely :

glandarius-group (15 or more races) : Europe east beyond the Urals, south to Morocco, Syria and S.W. Persia. Southern populations tend to be black-crowned and white-cheeked. Three subgroups.

brandti-group (2 or 3 races) : Siberia, Sakhalin, Hokkaido, Manchuria, Korea and N. China.

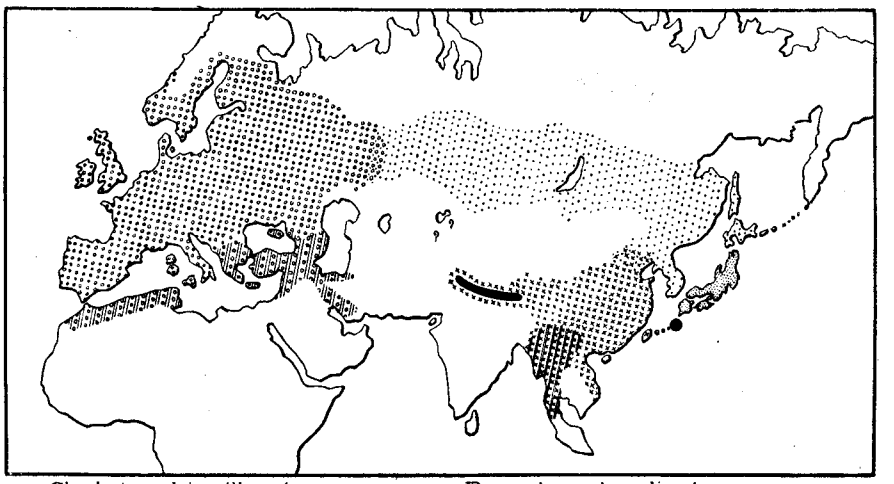

Fig. 1. Distributional map of the Eurasian Jay.

Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 13, 1957 (Prof. T. Uchida Jubilee Volume).

japonicus-group (5 races) : Honshiu and southward, Japan.
bispecularis-group (7 races) : China, S.E.Tibet (Ludlow, Ibis, 93 : 554), Formosa, Indo-China (Delacour), N. Burma, Nepal to Kashmir and part of E. India.
leucotis-group (2 races) : N. Siam (Deignan), E. Burma to Tenaserrim.

Table 1. Table of characters of each group (Characters of *glandarius* taken as standard)

	Characters	*glandarius* group	*brandti* group	*japonicus* group	*bispecularis* group	*leucotis* group
Head	White (A), with stripes (+) or black-crowned (+′)	*A+or+′		A+		A+or+′
	Chestnut (a) or vinous brown (a′), with (+) or without (−) stripes.		a+		a′−	
Back	Vinous grey (B).	B		B		
	Dark grey (b) or vinous brown (b′).		b		b′	b′
Secondaries	Half-white (C), with almost no (−) or completely with (+) markings.	C−	C−		**C+	**C+
	All-length white (c), with some markings (±)			c±		
Primaries	All-length white (D)	D	D			
	Half-black (d), without (−) or with some (±) markings at base.			§d−	d±	d±
Iris	Pale blue (E).	E				
	Deep blue (e), brown (e′) or yellow (e″).		§§e′ or e	e″	e or e′	e′
Feet	Yellowish (F).	F		F	F	F
	Dark (f).		f			
	Total characters	I. II. III. IV (see text)				
		A+BC− (+′) DEF	a+bC− De′f (e)	A+Bc± d−e″F	a′−b′C+ d±eF (e′)	A+b′C+ (+′) d±e′F

Note : * In a few races the color of the back extends to the crown (see text).
** The white area of other races is completely replaced by blue-black markings, and the area is a little extended. § Sometimes with few markings at the base of innermost primary. §§ The iris in *brandti* of Sakhalin and Hokkaido (I found it brown in Hokkaido birds) is labelled as 'chestnut', 'Indian purple' or 'blue rose purple', that of *pekinensis* as 'purple blue' and *sinensis* (Hupeh) as 'deep indigo', but in the Himalayan race and *leucotis*, it is said to be brown.

Analysis of characters

All the races are characterized by I) the black tail and white upper and under tail-coverts, II) black moustachial band, III) blue-black markings on the wing-coverts (extending to the secondaries in various extent and even to the primaries in the extreme case) and IV) vinous color of the flanks which varies in intensity in correlation with the color of the back (the throat is generally white, but in deeper colored races washed with vinous). Other characters can be analysed genotypicaly as Table 1 :

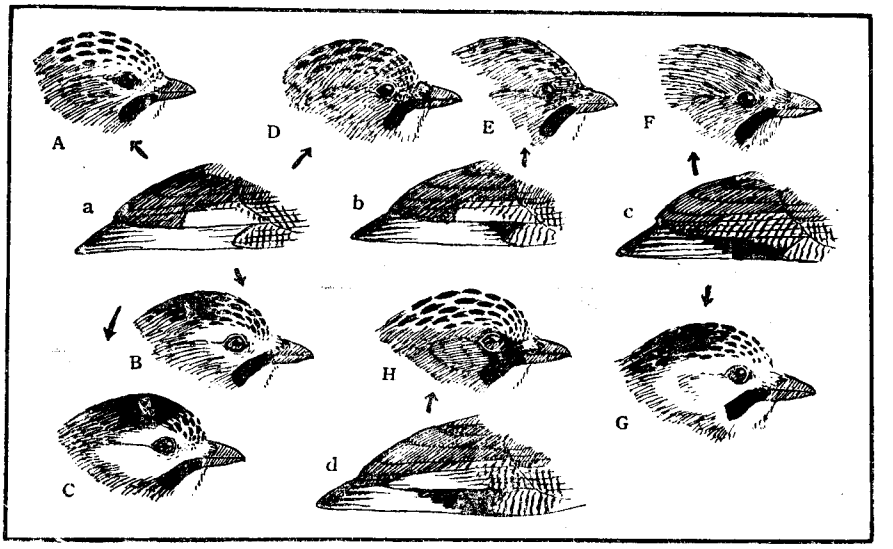

Fig. 2. Head and wing patterns of the Eurasian Jay.
A. *glandarius*, B. *oenops*, C. *cervicalis*, D. *brandti*, E. *pekinensis*, F. *sinensis*, G. *leucotis* (from Baker), H. *japonicus* (for variation cf. Kuroda' 21). a. *glandarius*-type, b. *pekinensis*, c. *sinensis*-type, d. *japonicus*-type.

The characters in *pekinensis* of the *brandti*-group are intermediate between *bispecularis* in that : 1) The head stripes are variable in amount, 2) the back is washed with vinous tinge, 3) the markings on the secondaries vary in amount, 4) the base of inner primaries variably black, and 5) the feet are paler than *brandti*.

Thus, the characters in 12 specimens (8♂♂, 3♀♀, 1 unsexed) from Jehol, S. Manchuria (September, October and one December) can be tabled as Table 2 :

The variation in the head character can further be analysed as follows :

a. White with black stripes ..... *glandarius*-gr., *japonicus*-gr. and *oatesi* (NE. Burma) (*leucotis*-gr.)

Table 2. Variation of characters in *pekinensis* (in 12 specimens)

Head stripes			Amount of markings of secondaries			Black part of the base of primaries		
Heavy	Medium	Forehead only	Little	Half of white area	More than half	No (All-white)	Almost no	Present
4	3	5	4	4	4	3	3	6

Note : These varied characters occur entirely in random combinations by each individual.

b. Aberrant types.

1) Ground color of head as back ..... *glazneri* (Cyprus), *hyrcanus* (N. Persia) (*glandarius*-gr.)
2) The same, but crown black ..... *oenops* (Morocco, S. Algeria), and *iphigenia* (Crimea) (*glandarius*-gr).
3) Forehead white or whitish, crown black ..... *krynicki* (Caucasus, Asia Minor) (*glandarius*-gr.)
4) The same, but cheek white ..... *atricapillus* (Syria, Palestina, SW. Perisa) (*glandarius*-gr.), and *leucotis* (Burma) (*leucotis*-gr.)
5) Same as 4), but back of head distinctly reddish vinous ..... *cervicalis* (N. Tunisia, NE. Algeria) and *whitakeri* (N. Morocco, NW. Algeria) (*glandarius*-gr.)

Evolution

1. The *glandarius*-pattern : Although it may be supposed that the ancestral jay would have been a generally rather brown bird as suggested by the browner color of the juveniles (for example, of *japonicus* and *glandarius*), it may not necessarily follow that the brown-colored present species (*bispecularis*) is ancestral, as it is distinctly specialized towards vinous-red tinge and is restricted in distribution. On the other hand, the *glandarius*-pattern of plumage with many variant forms, is wide-spread in western Palaearctic region and reoccurs in Japan (though modified in wing-pattern and black lores (see figs.)). Such an isolated distribution of the *glandarius*-pattern would suggest that the jay of this type should have spread during old periods over whole of the Eurasia. Two main eastern groups of different plumage patterns, the northern *brandti*- and southern *bispecularis*-groups should therefore be regarded as later mutant populations. In support of this, the similar case in the Long-tailed Tit, *Aegithalos caudatus*, may be referred. The young of white-headed continental form has black eye-streaks as in the forms distributed in England and parts of Europe, and again isolated in Japan (Honshiu). Thus, the white-headed continental population should be a later mutant from the once wide-spread streak-headed type, which was retained

in Honshiu by isolation. Such a speculation involves the suggestion that the mutant white-head character should be genetically dominant to the original streak-head, about which, though, future experimental test is needed. The *brandti*-type would thus also be dominant against *glandarius*-type (The hybrid zone is found in the Ural region).

2. Of *brandti*, *bispecularis* and *leucotis* groups : The *brandti*-group is replaced by *bispecularis*-group in N. China, where *pekinensis* of variable intermediate characters (cf. Table 2), but in general of *brandti*-pattern, is distributed. Thus, and as already suggested in literature, *pekinensis* should be of hybrid origin, and by this I mean that the above two groups (*brandti* and *bispecularis*) are independent mutant populations.

It is to be noticed that the head in *leucotis*-group of Burma is of *glandarius*-type in the race *oatesi*, and *atricapillus*-type (black-crowned) in the race *leucotis*. This would suggest the western origin of *leucotis*-group, and the black-headed tendency may be related to the susceptibility of melanins to higher temperature as it occurs at the southern periphery of the genus distribution (The same effect in *Lanius schach*-group, and also see Frank, 1938 on *Parus atricapillus*). However, *glandarius-atricapillus* and *bispecularis-leucotis* populations are now discontinuous by uninhabitable desert zone (The present distribution is strictly subject to forest zones). This perfect geographical isolation, which would have occurred after the range expansion of the western population to the east, should have resulted in so marked a mutant group as *bispecularis*. The marked extension of blue-black markings on the wing and general deep color of plumage in this group should also be correlated with higher temperature (possibly affecting the modifier genes), and the iris color has also been changed.

3. History of *japonicus*-group : Though generally of *glandarius*-pattern, the *japonicus*-group is distinct in three characters, the pale yellowish iris, 'half-black' primaries, and 'all-length white' secondaries (as well as the black lores). The first and the third characters would have been established as the result of isolation, for they are found in no other groups. But, the second is shared by *bispecularis*, though otherwise the two forms are quite distinct, while from *brandti*-group *japonicus* is very sharply distinct in every character although they face to each other across two narrow straits of Tsugaru and Korea. Thus, the Chinese stock still of *glandarius*-type but already with that mutant character of primaries ('half-black'), would have invaded into Japan to colonize as *japonicus*. This evolutionary route from China to Japan is not only suggested by the migration route of japanese birds, or in the history of the Japanese Skylark (Kuroda, '53) but also in racial relationships of some mammals of Honshiu, such as *Pteromys volans*, and four other species, which are closer to China than Siberian races, according to Mr. Imaizumi who considers them as old intruders, the northern races being specialized newer forms (from his speech, 1954).

Conclusion

The *glandarius*-type of Eurasian Jay will be the old wide-spread form, and the Siberian *brandti*- and Chinese *bispecularis*-groups are independent mutant populations, and have met in N. China to form a hybrid race *pekinensis* dominantly of *brandti*-type. The *brandti*-group has intruded into Hokkaido and Korea from the north, but Honshiu has been intruded from China by old original *glandarius*-type population, which later evolved into *bispecularis* on the continent. Such a relation of Honshiu and Chinese elements can be suggested in other birds and in mammals also.

Additional note : As to *Garrulus lanceolatus* and *G. lidthi*, the writer agrees with Yamashina('41,'55) in that they are 'bud species' evolved from the southern periphery of the range of Eurasian Jay. But, whether they are of common origin (Yamashina), or have evolved independently by altitudinal (in *lanceolatus*) and geographical (in *lidthi*) isolation may be left to be discussed. They are anyhow marked mutants of the jay (The fine bars on tail feathers distinct in *lanceolatus* is found at the base of the tail of *glandarius*, and concealed in deep color in *lidthi*. The wing makings of *glandarius* is also detectable in *lidthi*. In a melanic mutant of *japonicus* the white shafts of the throat feathers characteristic in *lanceolatus* and *lidthi* occurred (Kuroda, N.m.' 21), and the evolution of such a 'peripherally isolated small population' has been well explained genetically by Mayr ('54). Experimental treatment to cause artifitial mutation will be of interest if made on jays.

References

Amadon, D. 1944. The genera of Corvidae and their relationships. Amer. Mus. Nov. No. 1251.

Buturlin, S.A. and G.P. Dementiev 1935. Systema avium rossicarum. I. (pp. 76-78).

Frank, F. 1938. Pigmentanalytische Untersuchungen am Rassenkreis *Parus atricapillus* L. C.R. IX Congr. Orn. Int., Rouen : 161-175.

Hartert, E. 1910. Die Vögel der Palaearctischen Fauna, I. : 28-34; 1921-2, III : 2030-2033; 1923, Nachtrag 1 : 18-22.

———— 1918. *Garrulus glandarius* and its allies, with list of all forms of *Garrulus*. Nov. Zool. 25 : 430-433.

Kuroda, N.h. 1935. Notes on Japanese Skylark. Tori 13 (62) : 4-17.

Kuroda, N.m. 1921. Head stripe variation in the Jay. Tori 3(11) : 24-5, figs. 7, 8.

Mayr, E. 1954. Change of genetic environment and evolution. Huxley's Evolution as a Process : 157-180.

Stresemann, E. 1940. Orn. Monatsb. 48 (3) : 102-104 (Review of Andreas, K. Systematische Studien über den Corviden (etc.). II. *Garrulus glandarius*. Aquila, 1940 : 42-45; 141-262; 542-549).

Vaurie, C. 1954. Systematic notes on palaearctic birds. No. 5, Corvidae. Amer. Mus. Nov. No. 1668.

Yamashina, Y. 1941. On the three endemic birds in the Ryukyu Islands. Trans. Biogeogr. Soc. Japan 3 (3) : 319-328.

———— 1955. Distributional areas of the birds of the Riukiu Islands. Bull. Biogeogr. Soc. Japan 16-19 : 317-375.