

American Museum Novitates

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET, NEW YORK 24, N.Y.

NUMBER 1833

JUNE 21, 1957

Systematic Notes on Palearctic Birds. No. 26 Paridae: the *Parus caeruleus* Complex

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GENERAL DISCUSSION

A study of the genus *Parus* was undertaken in preparation of a contemplated check list of the birds of the Palearctic region. A number of systematic notes were made, and those on *Parus caeruleus* and related forms are here presented separately. It is desirable to do so, as the treatment of these forms is different from that of the other members of the genus. The notes on the latter are chiefly revisions, but in the present paper the emphasis is on the degree of relationship and origins of the forms concerned.

I should like to express my gratitude to Dr. David Snow and Mrs. B. P. Hall. Dr. Snow has kindly read the manuscript and given me the benefit of his comments, and, together with Mrs. Hall, has examined for me some specimens in the collection of the British Museum. Through his kind cooperation, his notes on these specimens have been incorporated in my study.

The *Parus caeruleus* complex consists of forms that belong to three morphological types (*caeruleus*, *cyanus*, and *flavipectus*), the last-named including a form (*berezowskii*) that is generally similar to the *flavipectus* type, but the true affinities of which are open to question. These titmice are occasionally separated from the tits of the genus *Parus* as a genus or subgenus *Cyanistes*. They differ from the other species of *Parus* by the bright blue or azure coloration of some parts of their plumage, but, because they are true tits in every other respect, they seem best retained in

the genus *Parus*. They are more or less closely related to one another and, generally speaking, are geographical representatives (fig. 1). They cannot, however, be treated as one species. Two, perhaps three, species are involved, if not four. The degree of their relationship gives rise to interesting speculations.

Before the various forms are discussed, the more important morphological characters that differentiate the three types may be summarized as follows: *P. caeruleus* (in Europe and Asia) is bright blue on the crown, green on the back, and yellow below on the breast, flanks, and abdomen; its chin is black as well as the center of its throat, and the black patch is joined to a broad blue nuchal band by a band of blue-black at the base of the throat and cheeks. *Cyanus* and *flavipectus* are white or very pale gray to pale lavender on the crown, blue on the back, and all white below (*cyanus*), or dusky gray on the throat and cheeks with a very broad band of pale yellow across the breast (*flavipectus*). In *cyanus* the cheeks are white and only the bases of the throat feathers are black and do not show on the surface, so that the throat is neither black nor gray; in both *cyanus* and *flavipectus* the bands at the base of the throat and cheeks are lacking. *Caeruleus* differs also from the other two by showing virtually no white in the tail and by being very much less white on the inner secondaries. In *caeruleus*, the white in the tail is present only as a very narrow border on the edge of the outer web of the outer pair of rectrices, whereas these feathers are all white in the other two, and, generally speaking, about half of the total area of their tail is white. In *cyanus* and *flavipectus* also the tail is a little more graduated in shape and is absolutely, as well as proportionately, longer. Ten adults of each have the following measurements and proportions, the wing/tail index being the proportion of the length of the tail to that of the wing expressed in per cent: nominate *caeruleus* (from Scandinavia and northern Russia), wing 64–70 (66.7), tail 49–56 (52.4), wing/tail index 79; nominate *cyanus* (from eastern Russia), wing 68–71 (69.7), tail 60–68 (63), wing/tail index 90; *flavipectus* (seven from Ferghana and three from northern Afghanistan), wing 64–68 (66), tail 58–62 (60), wing/tail index 91.

The differences mentioned are those between adults; the differences in the juvenal plumage are discussed below. It can be seen that the differences between *caeruleus* on the one hand and *cyanus* and *flavipectus* on the other are very striking, but it should be emphasized that the last two are similar, except for the difference in the color of the cheeks and throat, and, of course, the very striking differences in the color of the breast.

Berezowskii belongs to the *flavipectus* type, as it has the same broad

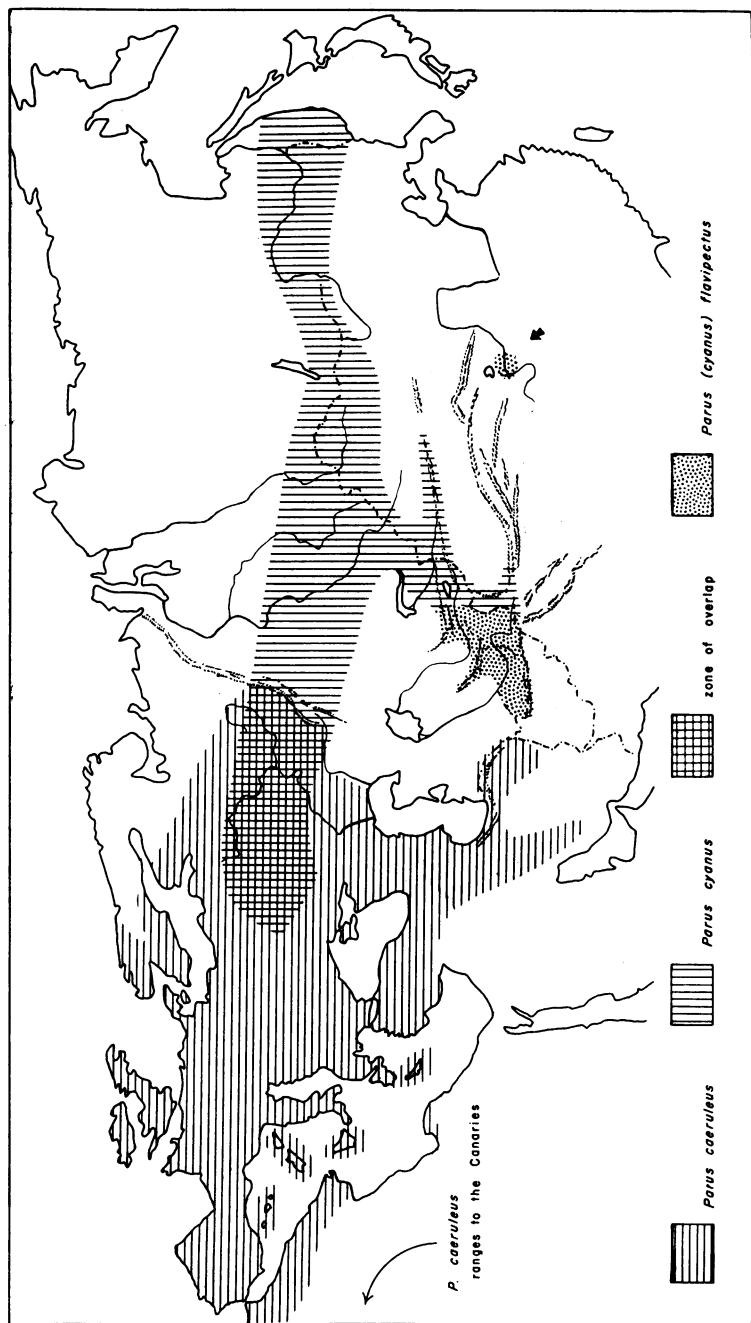


FIG. 1. Distribution of the forms of the *Parus caeruleus* complex.

yellow band across the breast, but it differs from it in that its nuchal band is very poorly indicated and it lacks the postocular streak found in *flavipectus* and also in *cyanus* and *caeruleus*. The only specimen that I have examined has a shorter tail than *flavipectus* with less white. It measures, wing 67, tail 56.5, wing/tail index 85 (I have added 1 mm. to the length of the wing and 1.5 to that of the tail as they are moderately worn). These measurements are open to question, however, because Pleske (1905, *Wissenschaftliche Resultate Przewalski . . . Reisen, Zool. Theil*, vol. 2, *Vögel*, p. 165) gives the wing length of six adults of *berezowskii* as 62–65 (63.5) and the tail length as 57–60 (58.6) which gives a wing/tail index of 92.5.

It seems clear that *cyanus* has invaded the range of *caeruleus* from the east. This is suggested by the pattern of its present-day distribution (fig. 1) and the history of invasions. Moreover, the invasion may be relatively recent, as *cyanus* apparently still hybridizes to some extent with *caeruleus* and a large wave of secondary expansion was reported as having occurred as late as the 1870's and 1880's, this wave having spread northwestward across Russia to reach the Baltic. This expansion was discussed by Pleske (1912, *Jour. Ornith.*, vol. 60, pp. 96–109) who, however, was more interested in establishing the true systematic status of the hybrids,¹ which apparently were common during this period of expansion. *Cyanus* later receded and now occupies about the region shown in figure 1 where it overlaps very broadly with *caeruleus*. The distribution shown in this figure is taken from the statements of range given by Voinstvenski (1954, *Birds of the Soviet Union*, vol. 5, pp. 734–738 and distribution map no. 131). As far as I can judge by the statements of Voinstvenski, hybridization takes place still, but it is less frequent than it was in the 1870's and 1880's and apparently occurs only along the northern border of the range of *cyanus*. This suggests that the pressure towards range expansion may still be active to some extent, but the hybrids seem selected against, and eventually complete reproductive isolation and ecological compatibility will probably be achieved.

It is clear, I believe, that *cyanus* and *caeruleus* are separate species, but the relationships of *cyanus* and *flavipectus* are less certain, as the distribution and morphological characters of the latter present some peculiarities. Superficially, one might assume, as Johansen remarks (1952, *Jour. Ornith.*, vol. 92, pp. 175–176) that *flavipectus* arose as the result of hybridization between *cyanus* and *caeruleus* and now occupies a sep-

¹ The hybrids have been described under several names, the oldest of which is *pleskii* Cabanis, 1877.

arate range in which the characters have become constant. This appears to be most unlikely, however, and Johansen believes *flavipectus* represents more probably a relict of the ancestral form. This interpretation may be correct if we grant that the rate of evolutionary change has been rapid in the case of *caeruleus* but relatively slow in that of *cyanus* and *flavipectus* because, as emphasized above, these last two are still similar in some respects, the most important exception being the lack of the yellow pigments, which may have become lost in *cyanus*. However, despite their similarity, *flavipectus* and *cyanus* may no longer be conspecific. They show no signs of intergradation, and their distribution presents some peculiarities which are discussed below.

The populations of *flavipectus* and *cyanus* do not overlap during the breeding season, but in Russian Turkestan and on the border of north-eastern Afghanistan, where they apparently come into contact, they appear to behave as two competing species limiting each other's range. The only specimens of *flavipectus* that I have examined are from Ferghana and Afghanistan, but according to Hellmayr (1929, Field Mus. Nat. Hist., zool. ser., vol. 17, pp. 86-87) *flavipectus* breeds not only in the mountains surrounding Ferghana Valley but also in the Alexander Range (= Kirghiz Range on current maps) of the western Tian Shan, while in the mountains north of the Issyk Kul it is replaced by *cyanus* (subspecies *tianschanicus*). Yet these mountains and the Kirghiz Range appear to form one more or less continuous range, and *cyanus* may in fact range as far west as the eastern Kirghiz Range where it is said to be the breeding form by Voinstvenski (*loc. cit.*). In Badakhshan, in northeastern Afghanistan, *flavipectus* is the breeding form on the western side of the Hindu Kush, but on the eastern side of this range in Chitral it may be replaced by *cyanus*, though this is open to question (see below). During the breeding season the two forms may be separated by stretches of unsuitable territory, and on opposite sides of a mountain are certainly separated by an inhospitable zone consisting of the watersheds above tree limit. After the breeding season they wander and, according to the literature, seem to mingle to some extent or at any rate to occur in the same regions.

One is reminded of the situation in the southern Appalachian Mountains of the United States carefully studied by Tanner (1952, Auk, pp. 407-424). In these mountains two very closely related and extremely similar but distinct species of tits (the Black-capped Chickadee, *P. atricapillus*, and the Carolina Chickadee, *P. carolinensis*) mingle during the winter but nest at different altitudes, the presence of one species apparently preventing the other from spreading its breeding range. Tanner

found almost no evidence of hybridization, but it occurs nevertheless, and in his summary he states, "Hybridization, if such actually occurs, is so rare as to have little effect on the characteristics of either species except for small, isolated populations such as the Black-capped Chickadees of the Plott Balsams, North Carolina; here hybridization may have occurred often enough to change the characteristics of the Black-caps of these mountains."

The two chickadees are extremely similar morphologically, far more so than are *flavipectus* and *cyanus* which are so strikingly differentiated by the color of the breast, a visual character which no doubt plays a part in mutual recognition. If hybridization does occur between the two forms, it should be easy to detect not only in the adult but in the immature plumage also. In immature plumage *cyanus* and *flavipectus* are even more distinct than are the adults. The former is gray above, white on the face, and as a rule pure white below, whereas *flavipectus* is as a rule very conspicuously tinged with yellow throughout, on the back, face, and the whole of the under parts, including the under tail coverts, and some individuals resemble very closely nominate *caeruleus* in the same plumage with the exception, of course, that they have white areas in the tail and wing. However, in *tianschanicus* (a subspecies of *cyanus*) occasional specimens in juvenal plumage show a faint tinge of yellow on the breast, but the adults never do.

I am not aware that any evidence of intergradation has ever been reported in the literature, though such intergradation would be expected between subspecies with a continuous range, and there is very little evidence of hybridization. None is shown by the adults or immature specimens that I have examined, but Hartert (1921, *Die Vögel der paläarktischen Fauna*, p. 2113) reports two specimens, which he calls *flavipectus*, that show only a slight tinge of yellow on the breast. Dr. Snow and Mrs. Hall tell me that they are from "Gultcha" and that these specimens are not in immature plumage and are probably adult. They believe, therefore, that they are not immature *tianschanicus* with a trace of juvenal yellow on the breast.

"Gultcha" [= Gulcha] is in the Alai Range, southeast of Osh, and the two specimens were collected by Severtzov between October 11 and 30, but the year is not indicated on the label. At Gulcha and "Mygent" (not located and spelling questionable), Severtzov collected two other specimens between October 6 and November 4, and these are typical *flavipectus* according to Dr. Snow and Mrs. Hall. The four specimens came to the British Museum from the Menzbier collection, and as they are of Russian origin and date back to at least 1870 or earlier, when

Severtzov was collecting in Russian Turkestan, the dates mentioned are probably in the old Russian calendar. If they are corrected by the addition of two weeks, the two specimens with a tinge of yellow were probably collected between October 25 and November 13. On these dates, or even on the uncorrected ones, there is no certainty they were local birds. Gulcha is west of the Ferghana Range and within the breeding range of *flavipectus*, but as the latter seems to be replaced by *tianschanicus* on the eastern side of this mountain range it is possible that some individuals may wander across and remain to breed. At any rate, whatever their origin, the characters of these two birds suggest that *flavipectus* and *cyanus* hybridize occasionally.

The two forms appear to hybridize in Chitral though insufficient material is known from this region. Dr. Snow tells me that three specimens in juvenal plumage, collected on July 26, 1902, the only specimens in the British Museum from Chitral, vary individually in coloration. One of these appears to be a typical *flavipectus*, but the other two are only slightly tinged with yellow above and below, though he adds they are "far too much yellow" to be "typical *tianschanicus*." These two specimens suggest that the two forms may hybridize in Chitral, though this is not quite certain and should be confirmed by hybrids in adult plumage, as the amount of yellow varies individually in immature *flavipectus* and some specimens are considerably less yellow than others. This is well shown by six young in a series of adults and young that I have examined from a single population collected during the breeding season in Afghanistan, a region far enough removed from the range of *tianschanicus* for hybrids to be expected.

The status of the population of Chitral also appears to be uncertain and requires further study, as this population is said to be *tianschanicus*, but I believe that it may in fact be *flavipectus*. It seems to be known from only five specimens collected by Fulton at Shost in July, 1902, to which belong, apparently, the three young birds examined by Snow. Fulton (1904, Jour. Bombay Nat. Hist. Soc., vol. 16, p. 47), who identified his specimens as *tianschanicus*, states, "They are very like the European *Parus caeruleus*, but without the blue head and nape, and the yellow of the under parts is less bright in the full-grown birds and brighter in the young." As adult *tianschanicus* never shows any yellow in its plumage, and the young are "far too much yellow," according to Snow, to be *tianschanicus*, which shows only a very faint tinge of yellow and that only occasionally, it is probable that the population of Chitral is *flavipectus*, not *tianschanicus*, though the two young slightly tinged with yellow may be hybrids. On the basis of Fulton's record, Hellmayr (*loc. cit.*), and Stuart

Baker (1922, Fauna of British India, London, Taylor and Francis, vol. 1, p. 81) include Chitral within the range of *tianschanicus*, but as shown above this is open to question.

I have gone into detail on the question as to whether or not *flavipectus* and *cyanus* are separate species, but all the evidence available is very meager and inconclusive. It seems to show that the two forms are allopatric and probably hybridize, at least occasionally, and that they represent a case similar to that of the two chickadees. The presence of an occasional hybrid does not prove that they are conspecific, because, as we have seen from Tanner, even the two chickadees hybridize occasionally, although our knowledge of these birds in life shows that they are without any doubt separate species. In the case of *caeruleus* and *cyanus* also, hybrids are far more common, though every author and student in the field grants that they are separate species; and interspecific hybrids are far from unknown in many other birds. Nevertheless, in view of our sketchy present knowledge, it is probably best to continue to treat them provisionally as one species, as there is no doubt that they are closely related. The regions these birds inhabit are not well known, and as Hartert (*loc. cit.*) remarked further study is necessary. Additional collection, and especially field studies such as the one made by Tanner, will decide this question.

Berezowskii poses another question. This form, which is rare in collections, is little known and apparently occupies a very restricted range (shown by the arrow in fig. 1). As far as I can find, it does not seem to have been collected since the 1880's when Przevalski discovered it in the region south of the Koko Nor and collected it at Gomi and Gui-dui (now Kweitech) on the Hwang ho, places that are about 70 kilometers apart. A good color plate of it is given by Pleske (1905, *op. cit.*, pl. 7, figs. 3-4). This plate and the single adult male that I have examined (collected in March, 1880 or 1882, according to the original label which also bears Przevalski's name) show that *berezowskii* and *flavipectus* are similar but differ in some characters which were mentioned above. The young of *berezowskii* is apparently unknown, but it would be of much interest to know if it resembles the young of *flavipectus*.

The very isolated and restricted range of *berezowskii* and its general similarity to *flavipectus* suggest that it may be a relict of a once more widely distributed form of the *flavipectus* type, but the nearest population of *flavipectus* is now about 2500 kilometers distant on a straight line. The nature of the intervening territory is such that one may question whether the ranges were ever continuous, as it consists of the inhospitable plateaus of northern Tibet and several of the highest mountain ranges of

the world, though it is possible that at one time the range was more or less continuous along the slopes of the Kun Lun, Astin Tagh, and Nan Shan. At present, the range of the two (fig. 1) is interrupted also by a southern extension of the range of *cyanus* (probably as the result of secondary expansion) to the western Kun Lun, east of which no azure tits have been reported.

The nearest present-day colonies of *cyanus* are in the eastern Tian Shan and in Mongolia at only about half of the distance which now separates *berezowskii* from *flavipectus*. As, according to Kozlova (1933, Ibis, p. 303), the Mongolian populations are numerous and wander in flocks after the breeding season when they have reached the Gobian Altai, one wonders whether one of these flocks, of which there are very many according to Kozlova, may not have reached the region south of the Koko Nor and established a colony. The distance that they would have had to travel is considerable and across inhospitable regions, but *cyanus* has given proof of explosive range expansion. As there is reason to believe that this type of expansion is initiated by genetic alteration (see Mayr, 1950, Proc. Xth Internatl. Ornith. Congr., p. 118), it is possible that the colonizers, which probably were few in numbers, evolved rapidly in their isolation. Through parallelism they may have become generally similar to present-day *flavipectus* or possibly may have reverted to some extent to the ancestral type, if indeed *flavipectus* represents the ancestral type.

Whatever the origins of *berezowskii*, its systematic treatment presents difficulties. If it represents a relict of a once widely distributed form of the *flavipectus* type, it should be considered conspecific with *flavipectus*, if this form is eventually shown to be specifically distinct from *cyanus*. If, on the other hand, *berezowskii* represents a colony of *cyanus* which through parallelism or reversion to putative ancestral characters has become similar to *flavipectus*, the situation becomes complex if the latter is indeed a separate species. The question is academic, however, if, as seems best for the present, *flavipectus* and *cyanus* are considered to be conspecific. Eventually, the only logical treatment may be to consider that *berezowskii* has also reached species level. It may very well have done so in its extreme isolation and, as we have seen, has clear-cut characters of its own, notably the lack of a postocular streak, common to all forms of *flavipectus*, *cyanus*, and *caeruleus*.

PARUS CAERULEUS

About 14 to 16 subspecies of the Blue Tit are currently recognized. These can be divided into two groups, the *teneriffae* group with four

racés in the Canaries and two in northwestern Africa, and the nominate *caeruleus* group with the remaining races inhabiting the European continent, the British Isles, and the islands of the Mediterranean. The races of the *teneriffae* group have a relatively long and attenuated bill. The bill is stubby in those of the nominate *caeruleus* group and, with the exception of *ombriosus*, which is restricted to the island of Hierro and is olive green on the back, the other races are slaty or blue on the back, the back being always green in those of the nominate *caeruleus* group.

The races of the *teneriffae* group are all very sharply or very clearly differentiated from one another, though *degener*, which inhabits the eastern Canaries, approaches the coloration of *ultramarinus* which ranges from Morocco to Tunisia, but the two can nevertheless be differentiated without difficulty, *degener* being paler above and below and showing more white on the center of the abdomen.

In contrast, the geographical variation in the nominate *caeruleus* group is slight or relatively so. The races (*orientalis*, *satunini*, *raddei*, and *persicus*) at the eastern end of the range of the species, which is reached in the Urals, the Caucasus, and Iran, have been discussed in detail by me in an earlier paper (1950, Amer. Mus. Novitates, no. 1459, pp. 5-10). They vary rather slightly from one another, but all appear to be separable from one another and from nominate *caeruleus*, and of these *persicus* is well differentiated.

The remaining races that are more or less currently recognized consist of *obscurus* in the British Isles, *balearicus* in the Balearic Islands, *harterti* in Portugal and southern Spain, *ogliastrae* in Corsica and Sardinia, and *calamensis* in the Peloponnesus and Crete. Of these it seems amply sufficient to me to recognize only *obscurus*, *balearicus*, and *ogliastrae* and to synonymize *harterti* and *calamensis* with the latter. *Obscurus* Prazák, 1894, type locality, England, is a little greener above, less grayish, than nominate *caeruleus* Linnaeus, 1758, type locality, Sweden. It is also a little darker yellow below, less pure, more "soiled," and is somewhat smaller, the wing length of 10 males measuring 61-65 (63) as against 65-71 (68) in nominate *caeruleus*. *Balearicus* von Jordans, 1913, type locality, Mallorca, is said to be a poorly differentiated form. The only two specimens available to me resemble nominate *caeruleus* closely but are slightly paler above and below and have a whiter abdomen. They measure 60 and 69, and it is possible that *balearicus* is somewhat smaller. *Ogliastrae* Hartert, 1905, type locality, Sardinia, is also a poorly differentiated race. As recognized by Hartert himself (1905, Die Vögel der paläarktischen Fauna, p. 349), *ogliastrae* resembles *obscurus* very closely in size and coloration, and he remarked that the two were extremely ("äusserst")

similar. The only constant difference is that *ogliastrae* is slightly darker and more bluish green above. In *ogliastrae* the outer webs of the wing feathers become a little brighter blue with wear than in *obscurus*, but this character is not constant and can be matched in an occasional specimen from England and by many specimens from Ireland.

Hartert (1921, *op. cit.*, p. 2113) recognized *harterti* Tratz, 1914, type locality, Portugal, stating that it was darker and more bluish green on the back than *ogliastrae* and was very bright blue on the wings, but he acknowledged that the two were extremely similar. The brightness of the wings is affected by wear and varies individually to the same extent in the specimens of the two forms that I have compared. In view of the fact that I cannot see any difference whatever in the shade and depth of the color of the back, I believe that *harterti* is best synonymized with *ogliastrae*.

In my opinion, *calamensis* Parrot, 1908, type locality, southern Peloponnesus, does not differ sufficiently from *ogliastrae* to warrant its recognition. The only difference I can detect between specimens from Crete and Sardinia is slight, the specimens from Crete being very slightly paler on the breast, and it may not be constant, as some authors believe the two populations are not separable. It is best therefore not to recognize *calamensis*, but if this form averages paler below than *ogliastrae*, and in this respect is therefore intermediate between the latter and nominate *caeruleus*, the question arises whether it would not be better to synonymize the poorly differentiated *calamensis* with nominate *caeruleus* rather than with *ogliastrae*. However, in view of the fact that the birds of Crete are similar above to *ogliastrae* in coloration and measure smaller than nominate *caeruleus* but are similar to *ogliastrae* in size, it seems to me that *calamensis* is best synonymized with the latter. This has already been done by Witherby (1912, *Ibis*, p. 145), Meinertzhagen (1921, *Ibis*, p. 131), and White (1939, *Ibis*, p. 120). Specimens from southern Greece, the type locality of *calamensis*, were not examined by me, but it is universally acknowledged in the literature that the population of that region is identical with that of Crete.

In adults that I have measured, six from Sardinia have a wing length of 60–63 (62), nine from Portugal and southern Spain, 59–65 (61.2), and five from Crete, 59–65 (61.5). As stated above, *ogliastrae* is similar in size to *obscurus*.

Harrison (1945, *Bull. Brit. Ornith. Club*, vol. 65, pp. 13–15) has described the population of Switzerland as *flückigeri*. His description goes into minute details, mentioning even the color of the cutting edges of the bill, but fails to diagnose the new form by a comparison of it to any sub-

species. I fail, however, to see any of the differences implied by Harrison in the material that I have examined from Switzerland and believe *flückigeri* is but a synonym of nominate *caeruleus*. Dr. Snow, who has examined Harrison's series of *flückigeri*, tells me he could detect only very slight differences and that he agrees that *flückigeri* must be synonymized with nominate *caeruleus*.

PARUS CYANUS

NOMINATE *cyanus* GROUP

The relationships of this group (without yellow on the breast) to the *flavipectus* group including *berezowskii* (with yellow on the breast) are discussed in detail above.

The population of the nominate *cyanus* group (the Azure Tit) were reviewed by Dementiev and Heptner (1932, *Alauda*, pp. 284–291), who divided them into four subspecies, one of which, *hyperrhiphaeus*, type locality, near Kustanai, Turgai, western Kirghiz Steppes, they described as new. Since that paper, two additional forms have been described, one by Meise (1934, *Abhandl. Ber. Mus. Dresden*, vol. 18, no. 2, p. 31) as *apeliotes*, type locality, Tschen [= A Cheng] 21 kilometers southeast of Harbin, Manchuria, and the other by Portenko (1954, *Fauna, U.S.S.R.*, no. 54, *Birds*, vol. 3, p. 107) as *koktalensis* with type locality, the Koktal River, Ili River Basin, Semirechia. Both of the new forms are based on differences in the size of the bill, *apeliotes* as having a smaller bill than *tianschanicus* Menzbier, 1884, type locality, Tian Shan, and *koktalensis* as having a heavier, stouter bill than *hyperrhiphaeus*, but both of these new forms are in my opinion invalid.

Voinstvenski (1954, *Birds of the Soviet Union*, vol. 5, pp. 734–738) in his review of the species, recognized only three races in the nominate *cyanus* group: nominate *cyanus* Pallas, 1770, type locality, Volga Basin, synonymizing *hyperrhiphaeus* with it; *yenisseensis* Buturlin, 1911, type locality Krasnoyarsk, central Siberia; and *tianschanicus* Menzbier, synonymizing *apeliotes* with this last-named. He presumably reached these conclusions on much more and fresher material than is available to me, and I follow his decisions.

Post-mortem changes in this species seem to be rather rapid, for according to Dementiev and Heptner (*loc. cit.*) the delicate shades of gray and blue of its plumage become dulled with age in collections. As most of my material is old, the majority of the specimens dating back to the turn of the century or to 1910, I cannot discuss slight differences in coloration, but even in old skins the coloration of nominate *cyanus* is

always very distinctly brighter and purer, with more white showing throughout, than in either *yenisseensis* or *tianschanicus*. Although my material from the western end of the range is insufficient, it suggests, and this is borne out in the literature, that a cline of decreasing saturation runs eastward, and, as stated, the eastern populations from southeastern Russia to western Siberia were separated as *hyperrhiphaeus*. However, according to Johansen (1952, Jour. Ornith., vol. 92, p. 176) the difference between the two forms is "not great," and Voinstvenski apparently did not consider it to be sufficient to warrant the recognition of *hyperrhiphaeus*. *Yenisseensis* is duller and grayer than nominate *cyaneus*, especially on the crown, but, judging by the literature, it does not seem to be well differentiated from *tianschanicus* in which the crown is said to be still grayer and the back duller and darker. My old specimens of these two races show only a very slight and not very constant difference. *Yenisseensis* is said to be clearly larger than *tianschanicus*, but this is open to question, as the comparative measurements given by Dementiev and Heptner or by Voinstvenski show so much overlap. According to Dementiev and Heptner, the wing length of males is 66.6–69.9 in *yenisseensis* as against 62.6–68.5 in *tianschanicus*, and according to Voinstvenski it is 62.8–70.0 in the first as against 65.2–68.5 in the second.

Although my specimens are old, they permit me to judge about any possible differences in the bill. According to Meise, *apeliotes* is identical in coloration with *tianschanicus* but has a shorter and a "generally" thinner bill, the length of the bill measured from the nostril being 6.0–6.7 in *apeliotes* as against 6.7–7.5 in the specimens he measured from Russia, Siberia, and Turkestan. In the only two specimens available to me from the range of *apeliotes* (collected at Komsomolsk on the Amur), the bill is very slightly smaller than usual in *tianschanicus*, but the differences in height, thickness, or length are so extremely slight that they are not of taxonomic importance. In these two specimens, the bill measures 6.5 and 7 from the nostril. Portenko (*loc. cit.*) mentioned no differences in the bill but stated that *apeliotes* was very dark, darker than *tianschanicus*, but as stated above Meise observed no difference in his material from Manchuria that had been very recently collected.

Nor can I discern any appreciable and constant difference in the size of the bill between a series from Orenburg, which is within the range of *hyperrhiphaeus* as defined by Portenko, and one from the Ili River Valley collected at Djarkent and in the region of Ili. The difference is one of average only and is so extremely trivial that it is not sufficient to warrant the recognition of *koktalensis*. In length, the bill measures 6.5–8 (7.2) from the nostril in 10 adults from the Ili as against 6.5–7.5 (7.0) in 10

from Orenburg. In the specimens from the Ili, which should be typical *koktalensis*, the bill is similar to that of a series of six adults of *yenisseensis* from the Altai and 16 of *tianschanicus* from the Tian Shan. As my specimens from the Ili, Altai, and Tian Shan are too old (1896–1930) to show any reliable difference in coloration, I cannot tell whether *koktalensis* should be synonymized with *yenisseensis* or *tianschanicus*, but on geographical ground it is best synonymized with the latter. *Tianschanicus* is alleged to show less white in the tail than *yenisseensis*, but this character varies too much individually, as shown by my specimens, to be diagnostic. In view of the fact that the specimens of *hyperrhiphaeus* examined by Portenko apparently had a weak bill, a character that is mentioned also by Dementiev and Heptner, I can only conclude that the bill is variable in different populations of this form. As stated above, it is not weak in my series from Orenburg. It seems to me that in this species the variations in the shape and length of the bill are too slight and inconstant to be a good taxonomic character.

Flavipectus GROUP

The valid races of the *flavipectus* group consist of three: *carruthersi* Hartert, 1917, type locality, Samarkand; *flavipectus* Severtzov, 1872, type locality, "Turkestan" [i.e., Russian Turkestan]; and *berezowskii* Pleske, 1893, type locality, upper Hwang ho, eastern Tsinghai. The affinities of this last form are considered in detail in the general discussion. Its origin is uncertain, but, because of its general similarity to *carruthersi* and *flavipectus*, it is probably best to include it in this group.

Voinstvenski (*loc. cit.*) synonymized *carruthersi* with *flavipectus*, but as I have shown in an earlier paper (1950, Amer. Mus. Novitates, no. 1459, p. 12) *carruthersi* appears to be a valid and sufficiently well-characterized race. Delacour, who kindly examined at my request the type and paratypes in the British Museum, found that they were grayer and darker above and grayer also on the throat than *flavipectus*, less clear yellow on the breast, less pure white on the abdomen, had less white in the tail, and also measured a little smaller. He found that the wing length in these specimens measured 63–66 (64) as against 65–70 in *flavipectus*. In a series of seven adults of the latter from Ferghana that I have measured the wing length is 65–68 (66.5), and Snow tells me that in eight males he has measured from Ferghana the wing measures 65–70 (67.8). *Carruthersi* wanders to northeastern Iran in the winter, as Snow has examined a specimen from the Meinertzhagen collection that was collected at Meshed on February 22, 1927. This specimen, a male, is in worn plumage and measures 62.5.

In 1950 I stated erroneously that the only references to *carruthersi* in the literature consisted of its description and its inclusion by Hartert in 1921 in "Die Vögel der paläarktischen Fauna." I have since found that Hellmayr (1929, Field Mus. Nat. Hist., zool. ser., vol. 17, p. 87) mentioned it also in a footnote in which he wrote that *carruthersi* "Judging from the original series in the British Museum, . . . is a fairly well-marked race."

In view of the fact that two valid races occur in Russian Turkestan (*carruthersi* in the west, in the Hissar and Zaraf Shan Ranges, and *flavipectus* in the east) the type locality of *flavipectus*, which is always cited as "Turkestan," is not very satisfactory. Severtzov failed to indicate a locality in the text when he described *flavipectus* (1872, Vertikal i Horizontal . . . Turkestan Dzhivotnik, "1873," pp. 133-134), but on page 66 (table, footnote 1) he said he met *flavipectus* at "Uylgum." I have not been able to find this locality, but it appears to be in Ferghana.

The distinguishing characters of *berezowskii* are mentioned above in the general discussion.

