

# A STUDY OF ASIATIC LARKS

CHARLES VAURIE

BULLETIN

OF THE

AMERICAN MUSEUM OF NATURAL HISTORY

VOLUME 97 · ARTICLE 5

NEW YORK : 1951





## A STUDY OF ASIATIC LARKS





# A STUDY OF ASIATIC LARKS

CHARLES VAURIE

*Research Associate, Department of Birds*

NOTES FROM THE WALTER KOELZ COLLECTIONS  
NUMBER 11

BULLETIN  
OF THE  
AMERICAN MUSEUM OF NATURAL HISTORY  
VOLUME 97 : ARTICLE 5  
NEW YORK : 1951

BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY

Volume 97, article 5, pages 431–526, text figures 1–5, plate 17, tables 1–23

*Issued November 19, 1951*

*Price: \$1.25 a copy*



## CONTENTS

INTRODUCTION AND ACKNOWLEDGMENTS. . . . .	437
GENERAL DISCUSSION . . . . .	438
The Genera in Asia and Their Characters . . . . .	438
Species Characters . . . . .	438
Intraspecific Variation . . . . .	439
Ecology and Distribution . . . . .	439
Correlation between Color of Plumage and Soil (Cryptic Coloration) . . . . .	442
Molts and Plumages . . . . .	446
KEY TO THE LARKS OCCURRING IN IRAN, AFGHANISTAN, AND INDIA . . . . .	448
SYSTEMATIC SECTION . . . . .	450
<i>Mirafra</i> . . . . .	450
<i>Eremopterix</i> . . . . .	455
<i>Ammomanes</i> . . . . .	459
<i>Alaemon</i> . . . . .	466
<i>Calandrella</i> . . . . .	468
<i>Melanocorypha</i> . . . . .	481
<i>Eremophila</i> . . . . .	489
<i>Galerida</i> . . . . .	495
<i>Alauda</i> . . . . .	503
<i>Lullula</i> . . . . .	525
SUMMARY . . . . .	526





## INTRODUCTION AND ACKNOWLEDGMENTS

THIS PAPER is based on the larks collected by Dr. Koelz in Iran, Afghanistan, and India. The specimens collected, which number about 1800 and represent all the forms that occur regularly in these regions, were studied with the equally abundant material in the collection of the American Museum of Natural History. In most cases opportunity was taken to review each species as it occurs from Iran eastward. In the case of *Alauda* the study proved to be a major undertaking for, in addition to the specimens in New York, the huge series in the British Museum and part of the series in the Stockholm and Paris Museums were examined also. My time in these institutions was all too short, and I am grateful to their authorities for having facilitated my work in every way. To Sir Norman Kinnear, Count Gyldenstolpe, M. J. Berlioz, and their staff I owe personal thanks for gracious help. I am very grateful also to Mr. J. D. Macdonald for permitting me to report on the unmatched series of larks and soil samples collected by the late Hugh Whistler whose collection had been recently donated to the British Museum. I am thankful to Dr. G. C. Junge for his help in Leiden, to Mr. Derek Goodwin in London, and to Dr. K. Paludan who in Copenhagen discussed conditions in Afghanistan and showed me his large collection of photographs from that country.

On this side of the Atlantic I am in debt to Dr. A. L. Rand and Mr. J. C. Greenway for lending me critical specimens under their care at the Chicago Natural History Museum and at the Museum of Comparative Zoölogy. Mr. J. Delacour, Dr. J. P. Chapin, and Dr. D. Amadon have also aided in various ways.

It is to Dr. E. Mayr and Colonel R. Mei-

nertzhausen that I am most indebted. Dr. Mayr, as usual, has guided and inspired these studies. He has taken as much interest in them as I have, and his critical and ever friendly assistance is beyond thanks. Colonel Meinertzhagen made available a copy of the manuscript of his revision of the *Alaudidae*.<sup>1</sup> This was a great and stimulating help, and I also had the pleasure of being shown part of his fine collection and discussing some of the more thorny questions. I am most grateful for his cordial reception.

In the lists of specimens, all of the specimens collected by Dr. Koelz at any time are listed here for the first time. These specimens are in three parts. The major part are in the collections deposited in the American Museum, one older lot mostly from Kashmir is part of the collection of the American Museum, and a third and very large lot is part of the collection of the Museum of Zoology of the University of Michigan. The last was lent by Dr. J. Van Tyne who suggested it be studied with the others. I am most grateful to Dr. Van Tyne for, thanks to his kindness, these studies are now more rounded.

I would have liked to list the specimens from the University of Michigan separately, but they are too numerous for such a course to be practical. They represent the great majority of the specimens examined from Sind, most of the specimens from the Punjab, and from one-third to about one-half of the specimens from Kashmir, and include also a few odd skins from Karaj in Iran.

<sup>1</sup> Colonel Meinertzhagen's paper (1951, Proc. Zool. Soc. London, vol. 121, pt. 1, pp. 81-132) was published while the present article was in proof. As I often refer to the Meinertzhagen paper, further citations other than the date are omitted.

## GENERAL DISCUSSION

### THE GENERA IN ASIA AND THEIR CHARACTERS

TEN GENERA of larks occur in Asia from Iran eastward. These genera in the order in which they are treated in this paper, together with the number of their species in Asia, are as follows: *Mirafra* (3), *Eremopterix* (2), *Ammomanes* (3), *Alaemon* (1), *Calandrella* (4, possibly 5), *Melanocorypha* (6), *Eremophila* (1), *Galerida* (3), *Alauda* (2), and *Lullula* (1). Only one (*Lullula*) is monotypic, for *Alaemon* and *Eremophila* each have another species west of the study area.

*Lullula* is obviously not very far removed from *Alauda*, and it has also been suggested that it is closely allied to *Galerida*. It is treated as being congeneric with *Alauda* by Meinertzhagen. It differs from both, however, through a number of morphological characters and in life has little if anything in common with *Alauda* and *Galerida*.

The characters that have been used for separation of the genera of larks are many. Those that have been most frequently used consist of the shape and size of the bill and of the hind claw, the pattern of the plumage, the relative length of the outer primary, the feathering over the nostrils, the relative length of the secondaries and tertials, and the presence of a crest, or of "horns," on the sides of the head. These characters are of unequal value, some are not very distinct, and still others vary intragenerically. The character that has been used perhaps more extensively than any other is the shape and size of the bill, but this character may be purely adaptive. It may vary abruptly within a genus. In *Melanocorypha*, a typical member of the genus (*maxima*) has a very long and attenuated bill, very different from that of the other species of the genus in which the bill is high and stout, somewhat resembling that of many Fringillidae. The bill can be very misleading. For instance, Meinertzhagen (1951) treats *Alaemon* and *Chersophilus* as congeneric with *Certhilauda*. These three have long curved bills, but the last two have a very strongly streaked plumage, whereas the plumage in *Alaemon* is completely unstreaked above as in *Ammomanes*; *Chersophilus* has a rudimentary outer primary, whereas it is very

long, for a lark, in *Alaemon* and *Certhilauda* (almost one-half to more than one-half of the length of the wing); further, as shown by Heim de Balsac (1936, Bull. Biol. France et Belgique, suppl. 21, pp. 156–160, figs. 4–5), there are striking osteological differences between *Alaemon* and *Chersophilus*. These characters, however, are identical in *Alaemon* and *Ammomanes*. These two have long outer primaries, and the plumage of their upper parts is completely unstreaked. *Alaemon* and *Ammomanes* appear to be not too far removed.

However, similarly long outer primaries are present in other genera, such as *Mirafra*, and a similar plumage pattern reappears in many larks, in which, in many unrelated genera, the upper parts are more or less streaked. Sexual dimorphism would separate *Eremopterix*, but in *Melanocorypha* again, one species (*yellow-niensis*) is also sexually dimorphic. The "horns" of *Eremophila* are a good character, but the crest of *Galerida* is less valuable, as several larks show a well-marked tendency towards a crest.

A complete analysis of the generic characters is outside the scope of this paper, but it may be pointed out that convergence is very great. It affects not only the size and shape of the bill, the pattern of the plumage, the relative length of the outer primary, the bones of the skull, but also the size and shape of the hind claw, the feathering over the nostrils, the relative length of the secondaries and tertials, general body size, and possibly still other characters.

Despite the fact that larks are very variable in their structure or plumage, it seems that on a combination of characters the 10 genera listed above are valid. They are of unequal value, but nothing would be gained by combining several, such as *Galerida* and *Lullula* with *Alauda*. No linear sequence can represent the true phylogeny, and it is hard to fit in it such specialized genera as *Alaemon* and *Eremophila* or the primitive *Eremopterix*, but the sequence followed appears to be as logical as possible.

### SPECIES CHARACTERS

The species characters, in strong contrast to the generic characters, have been found by



this study to be very distinct. In Asia the pattern of the plumage and the difference in the shape of the wing are excellent specific characters. The last may be questioned, but a study of the wing formula or the shape of the wing definitely shows that in every instance where a difference in the shape of the wing separates forms that have been made conspecific, these forms are found to be separate species which are also found to be sharply differentiated by the pattern of the plumage or to overlap and breed in the same regions.

At one time or another the following were made conspecific: *Ammomanes phoenicurus* and *cincturus*, *Calandrella cinerea* and *C. acutirostris*, *Alauda arvensis* and *A. gulgula*. To these may be added *Melanocorypha bimaculata* and *M. calandra*, which are made conspecific by Meinertzhagen, and possibly *Calandrella rufescens* and *C. leucophaea*. In the case of the first three pairs there is a well-marked difference in wing formula. Only in *Alauda*, the population of Japan has a variable wing formula, but this possible exception, discussed in detail in the text, does not invalidate the thesis. *Ammomanes phoenicurus* and *A. cincturus* are also differentiated by the pattern of the plumage; *Alauda arvensis* and *A. gulgula*, and *Calandrella cinerea* and *C. acutirostris* overlap very broadly, breeding in the same regions. In the case of *Melanocorypha bimaculata* and *M. calandra*, and of *Calandrella rufescens* and *C. leucophaea*, the differences in the shape of the wing are present but are slight. But these two pairs are sharply differentiated by the pattern of the plumage. *Melanocorypha bimaculata* and *M. calandra* overlap very broadly; *Calandrella rufescens* and *C. leucophaea* appear to overlap, but too little is known about these two. Our knowledge of the life histories of all these forms in Asia is very fragmentary, but they appear to be separated also by other factors, such as ecological preferences and differences in the song and calls.

Other instances where a sharp difference in the pattern of the plumage separates closely related species are numerous. They separate all the species in *Mirafra*, *Eremopterix*, *Ammomanes*, and *Melanocorypha*. These differences in pattern consist in the presence or absence of a rufous or white patch in the tail or in the wing or in both the tail and wing,

the restriction of this patch to certain areas, the presence or absence of white tips on the secondaries, the presence or absence of black on the crown, the presence or absence of a black band across the upper breast, and the presence, absence, or distribution of chestnut on the crown, rump, and lesser upper wing coverts. In *Melanocorypha* two or more differences separate the species. When the difference is sharp, the nature of the streaking on the upper parts (whether heavy or light) can be considered as a difference in pattern. Some of these differences are specified in the key.

In *Galerida* relative body size and the degree of saturation are good specific characters. In this genus the three species are differentiated by clear-cut differences in both: *G. cristata* is large and pale (sandy); *G. malabarica* is of medium size and very saturated above (dark rufous), but pale (creamy) on the under parts from the breast down, the upper breast itself being heavily streaked; *G. deva* is small and very saturated above (dark rufous), but all the under parts are strongly rufous, and the upper breast is very faintly streaked.

In *Alauda*, the difference in the wing formula between the two species is correlated with a difference in the shape and, especially, the proportionate size of the bill. With one exception in each, *A. arvensis* is large and *A. gulgula* small.

#### INTRASPECIFIC VARIATION

Intraspecific variation involves increase or decrease in size, in the wing as in the bill, a greater or lesser degree of saturation, a change in the nature of the pigment towards an increase of the black or its replacement by red pigments. Much of this variation is clinal in character and sometimes is accompanied by a high degree of individual variability. These two factors often make subspecific discrimination difficult.

#### ECOLOGY AND DISTRIBUTION

Good series of all the larks breeding in Iran, Afghanistan, and India were collected by Koelz. Although no notes on ecology were supplied by the collector, it seems desirable to give a brief statement of their habitat and range as they occur in these regions. The in-

formation as to habitat is taken from many sources, chiefly from Whistler, Meinertzhagen, Ticehurst, Ali, and Schäfer, but the statements are general and no doubt allow for many exceptions. The range of the species (occurrence) in the three regions is summarized in table 1. *Melanocorypha yeltoniensis*

#### FORMS LIMITED TO THE DESERT

*Alaemon alaudipes* occurs in the most absolutely bare and featureless regions where other larks do not venture and occasionally in regions with sparse and stunted growths of bush, but is above all a form of the flat and open stretches of the desert.

TABLE 1  
DISTRIBUTION OF THE LARKS IN IRAN, AFGHANISTAN, AND INDIA  
(x Denotes breeding form; +, winter visitors)

Species	Iran	Afghanistan	India	Confined to India
<i>Mirafra javanica</i>	—	—	x	—
<i>Mirafra assamica</i>	—	—	x	—
<i>Mirafra erythroptera</i>	—	—	x	x
<i>Eremopterix grisea</i> <sup>a</sup>	—	—	x	x
<i>Eremopterix nigriceps</i>	—	—	x	x
<i>Ammomanes deserti</i>	x	x	x	—
<i>Ammomanes cincturus</i>	x	x	x	—
<i>Ammomanes phoenicurus</i>	—	—	x	x
<i>Alaemon alaudipes</i>	x	x	x	—
<i>Calandrella rufescens</i>	x	x	+	—
<i>Calandrella cinerea</i>	x	x	+	—
<i>Calandrella acutirostris</i>	x <sup>b</sup>	x	x	—
<i>Calandrella raytal</i>	x <sup>b</sup>	—	x	—
<i>Melanocorypha bimaculata</i>	x	x	+	—
<i>Melanocorypha calandra</i>	x	x	+?	—
<i>Melanocorypha maxima</i>	—	—	x	—
<i>Melanocorypha leucoptera</i>	+	—	—	—
<i>Melanocorypha yeltoniensis</i>	+	—	—	—
<i>Eremophila alpestris</i>	x	x	x	—
<i>Galerida cristata</i>	x	x	x	—
<i>Galerida malabarica</i>	—	—	x	x
<i>Galerida deva</i>	—	—	x	x
<i>Alauda arvensis</i>	x	x	+	—
<i>Alauda gulgula</i>	x <sup>b</sup>	x	x	—
<i>Lullula arborea</i>	x	—	—	—
Total breeding	14	12	17	6
Total breeding and visitors	16	12	22	—

<sup>a</sup> Occurs also in Ceylon.

<sup>b</sup> See text.

and *M. leucoptera* are not part of this study, but they are added to the table for the sake of completion, as these two species, which are notorious wanderers, are said to have occurred in Iran as rare winter visitors. The table, but not the notes on ecology, is arranged in the systematic order followed in this study.

*Ammomanes cincturus*, habitat much the same as *Alaemon*, but occurs also on stony slopes and rocky wastes.

*Ammomanes deserti* shows a strong preference for rocky slopes and hills and stony areas.

The isohyet of 200 mm. of annual rainfall limits rather accurately the range of these three species, though *A. deserti* also occurs in



regions where the rainfall is a little greater (in the Meshed region where the precipitation is about 250 mm., in northern Khorasan, in certain parts of the Zagros, and in eastern Afghanistan where the precipitation seems to be about 300 mm.<sup>1</sup>). None of these species occurs east of the Indian desert and of the Rann of Kutch.

#### FORMS OF SEMI-DESERTS, ARID REGIONS, AND DRIER STEPPES

*Galerida cristata* occurs on the edge of the desert, in semi-deserts, dry steppes, waste lands, dry pastures, cultivated and fallow fields in high and low country.

*Alauda gulgula inconspicua*, same habitat.

*Calandrella rufescens*, same habitat.

*Calandrella cinerea*, same habitat.

*Melanocorypha calandra*, same habitat.

*Melanocorypha bimaculata*, same habitat but prefers higher and more barren sites than *M. calandra*.

The first two forms breed in India but only in the northwest, west, and on the Ganges Plain; they reach to, but do not penetrate into, peninsular India. The other four occur in India only as winter visitors. I know of no certain record of *M. calandra* for India, but as it breeds in northeastern Afghanistan it may be expected to reach India as a winter visitor.

#### FORMS RESTRICTED TO HIGH STEPPES AND ALPINE REGIONS

*Melanocorypha maxima* occurs on high, grassy steppes, rocky uplands with sparse vegetation, and sometimes on swampy places on the steppes.

*Calandrella acutirostris*, same habitat, including the attraction to water, but also occurs in lower and drier regions in Afghanistan and, apparently, in eastern Iran.

<sup>1</sup> The precipitation is much less in the Afghan desert. Meteorological data for the Iranian region are fragmentary. Up to 1939, Afghanistan had only one station (Kabul, opened around 1930); several others were opened between 1939 and 1943. Their first series of records, which are obviously very short but highly interesting, were reported for the first time, together with those of neighboring stations in Iran, India, and Turkestan, by Stenz (1946, "The climate of Afghanistan, its aridity, dryness, and divisions," Polish Institute of Arts and Sciences in America, New York).

*Calandrella cinerea dukhunensis*, same habitat on the higher grassy steppes.

*Alauda gulgula inopinata*, same habitat, a little lower than the two *Calandrella*.

*Eremophila alpestris*, mountain valleys, plains, and steppes, and mountain sides above the timber line.

#### FORM RESTRICTED TO RIVER BANKS, SAND BARS, AND TIDAL FLATS

*Calandrella raytal*, on the larger rivers of India and Burma, also on the Persian Gulf coast.

#### FORMS RESTRICTED CHIEFLY TO THE OPEN PLAINS

*Ammomanes phoenicurus* occurs in waste, stony, and fallow land, sparse scrub, semi-deserts.

*Eremopterix grisea*, same habitat.

*Eremopterix nigriceps*, same habitat, but does not occur in the more humid regions of India.

These three species are confined to India, *A. phoenicurus* from the Ganges to about Coimbatore (Whistler), *E. nigriceps* in the west and northwest, *E. grisea* from the foot of the Himalayas to Ceylon.

#### FORMS RESTRICTED CHIEFLY TO BUSHY AND SCRUBBY PLAINS

*Mirafra erythroptera*, *M. javanica*, and *M. assamica*, not found west of India. *Mirafra erythroptera* is patchily distributed in India in drier, more sandy, and more stony regions than the others; *M. assamica* sometimes in "better watered and fairly well-wooded tracts . . . cultivated fields" (Whistler).

*Galerida deva* and *G. malabarica*, habitat much as in *Mirafra*. Confined to India, the first in central India and the peninsula, *G. malabarica* in the western half and southern part of the peninsula.

#### FORMS RESTRICTED CHIEFLY TO GRASSLANDS AND OPEN CLEARINGS

*Alauda arvensis* and *A. gulgula* (other than *A. g. inconspicua*), in open grassy fields, pastures, mountain meadows, grazing and cultivated lands, steppes, marshland, and open and wide clearings in the forest; from the seaboard into the high mountains in dry and very wet regions.

FORM OF GRASSLAND WITH  
SCRUBBY TREES AND OF  
TREE-FRINGED FIELDS  
AND MEADOWS

*Lullula arborea*, a western form reaching the eastern limits of its range in the Zagros in the south and Khorasan-Transcaspia in the north.

There is some evidence that the habitat preferences vary geographically. For instance, in eastern Tibet, according to Schäfer, *Melanocorypha maxima* occurs in the south (Chinese Tibet) in swampy places on the steppes, but farther north on the high Tibetan steppe country it occurs in rocky areas. In eastern Tibet *Calandrella acutirostris* is very fond of pools and slow-flowing rivers. In Afghanistan it occurs in dry regions. Ecological data are very sketchy, but other instances of geographical variation in habitat preference may be looked for in the species in which the habitat preferences seem to be most varied, such as *Galerida cristata*, *Calandrella rufescens* and *cinerea*, the other *Melanocorypha*, probably in *Eremophila*, *Ammomanes phoenicurus* and *Eremopterix grisea*, and especially in *Alauda*.

CORRELATION BETWEEN COLOR  
OF PLUMAGE AND SOIL  
(CRYPTIC COLORATION)

Many observations have been published on the remarkable correlation that exists in some larks between the coloration of the upper parts of the plumage and the soil on which the birds are found. But actually the results of only a few direct comparisons between the birds and a sample of the soil upon which they were shot have been published. They are by Kleinschmidt (Falco, 1907 and 1912), Bannerman (1927, Ibis, suppl., p. 96), and Niethammer (1940, Jour. Ornith., vol. 88, Sonderheft, p. 75). The last paper gives very fine colored illustrations of 14 specimens with their soil samples. In all instances these papers deal with only a dozen or so samples taken in limited regions of Africa. It would be desirable, as Hartert intended (1905, Novitates Zool., vol. 12, p. 503), to bring together as large a number as possible of specimens with their soil samples from as many regions as possible. This is further de-

sirable, for as shown below there is evidence that what applies to the African regions does not apply to the same degree in Asia.

In the Rothschild Collection Hartert brought together 24 samples, all from Africa. To these I have been able to add, thanks to the courtesy of the authorities of the British Museum, the very fine collection of the late Hugh Whistler. In this collection I found 49 soil samples together with their birds; 16 of these samples are from India and 19 from southern Europe and Mediterranean islands, regions from which no comparisons have been published. The great majority (52) of these 73 samples are of the two species *cristata* and *theklae* of the genus *Galerida* which are well known for their sensitivity to soil coloration. It would have been better if a larger number of samples of the true desert larks such as *Alaemon* and *Ammomanes* had been available.

The results of the comparisons are presented in table 2. The nomenclature which concerns forms that I have not studied for the most part is taken from the labels as identified by Hartert and Whistler.

This analysis shows that in Africa out of 33 samples there is correlation in 25 cases and none in eight; in southern Europe and islands, out of 14 samples there is correlation in eight and none in six; in India out of 13 samples there is correlation in seven and none in six. At Azilal in Morocco there occur two types of contrasting soils; the specimens match one fairly well but contrast very strongly with the other. These specimens were collected on April 1 and may have been already on their breeding grounds, for by the beginning of March in Africa, labels show that the birds are in breeding condition. From the standpoint of protection the breeding season is the more critical one. If then all the birds that were taken before March 1 and after October 1 are eliminated, out of 22 samples from Africa, 20 show correlation and only two are negative.

The comparison between Africa and southern Europe and islands may not be valid, as the latter regions are much less arid, but the correlation appears less strong. In southern Europe and islands out of 12 samples that belong to the same species as in Africa, six show correlation, three are

negative, and three are inconclusive. In the case of India no adequate comparison is possible, as only two samples taken during the breeding season and that belong to the same species as in Africa are available; both are strongly positive. The Indian specimens show, however, that sensitivity to soil coloration varies in the genus *Galerida*, seven samples of *G. deva* taken in arid regions (Mhow, Dhar, and Gwalior) being strongly negative in six, inconclusive in one. The lone sample of *G. malabarica* shows no correlation. This species, restricted to India, shows, as *deva*, only slight or no evidence of geographical variation.

Nevertheless, although I have no soil samples from Iran and Afghanistan, an examination of the species common to Africa and Asia shows that there is much less variation in the arid regions and deserts of Asia. Of the two species that are the most sensitive to soil coloration 14 races of *Ammomanes deserti* have been described from Africa and only six east of the western border of Iran, which include two Turkestan forms, and more than 25 races of *Galerida cristata* have been described from Africa but only five in the Iranian region, Russian and Chinese Turkestan, and Gilgit. In *Ammomanes cincturus* which is less plastic, five races have been described from Africa (not counting the race of the Cape Verde Islands), but only one from the Iranian region. This enumeration does not imply that all the described forms are valid or clearly separable, but it illustrates the trend. A very strict interpretation such as Meinertzhagen's (1951) still recognizes, however, 11 clear-cut races of *G. cristata* in Africa and two in the Iranian region, of which one is the very localized form of Gilgit.

In the case of *Ammomanes deserti* it is especially interesting to note that the race (*iranica*) with the widest distribution in the Iranian region (fig. 2) shows no instance whatever of variation, although its range and that of the slightly paler *darica* cover the greater part of the Iranian region, all the way from Tehran to Kabul, Isfahan to Quetta, and south of Meshed to the Gulf. In this enormous range these forms occur in many regions where (see below) the color of the soil and rocks is most varied.

Further, in the Iranian region and in Tur-

kestan the populations never show an instance of abrupt variation in coloration from one contiguous area to another as happens elsewhere in *Galerida* and *Ammomanes*. Throughout the whole of the Iranian and Turkestan regions the transitions in the varying depth and shade of pigmentation, in larks as well as in many other families of birds, are almost always very gradual. Does this mean, in the case of larks, that in these regions the coloration of the soil and the nature of its surface are very uniform, or that the surface, as happens in the Sahara, is covered by large tracts of wind-blown sand varying little in color? Neither of these alternatives is true, at least in Iran, the only region from which data are available to me. The charts and colored maps and sketches of the landscape in Sven Hedin (1918, 1927, "Eine Routenaufnahme durch Ostpersien," Stockholm, vols. 1 and 2) show that in Iran the surface of the desert and arid regions is mostly hard, gravel and rocks are very abundant, with here and there steppes and sparse bushes. The coloration of the surface varies through all the shades of yellow, brown, and red—even green occurs—and some stretches are white, while others are black. In some sites it is noted that a black stretch adjoins a yellow one.

Since the larks have the general pale coloration associated with the desert but do not appear to react to the coloration of the soil, they may be submitted to different climatic factors than in Africa. It is not clear what these factors could be. It does not seem to be the amount of available light, for north Africa and the Iranian region are at the same latitude. Owing to the low amount of water vapor in the air, the sun and ultra-violet radiations are probably intense in both. It does not seem to be aridity, for the two regions receive about the same amount of annual rainfall (137 mm. at Tedjen in Transcaspi, 175 at Kalat in Baluchistan, 116 at Isfahan, 177 at Biskra in southern Algeria). It could possibly be heat, for on an annual average the Iranian and Turkestan regions are colder, and Meinertzhagen (1950, *Ibis*, p. 340) has noted "that the hotter the desert the more does pigmentation react towards a desert coloration."

This author, as well as others, believes that the desert coloration may be a mechanical



TABLE 2

CORRELATION BETWEEN THE COLORATION OF THE PLUMAGE AND OF THE SOIL  
(\* Denotes specimens in the Whistler Collection)

Form	N of Spec.	Locality	Date	Color of Soil	Good*	Fair	Poor	None
<i>Galerida c. cristata</i>	*1	Santiago, N. W. Spain	May 15	Dark brown	x			
<i>G. c. meridionalis</i>	*2	Durazzo, Albania	Oct. 4	White				x
	*1	Palermo, Sicily	Nov. 22	Red brown				x
	*3	Tivat, Dalmatia	May 10	Clay gray		x		
	*1	Agrigento, Sicily	Nov. 11	?		x		
<i>G. c. maculata</i>	*3	Mena, Cairo	Apr. 10-12	Brown				x
	*1	Abou Rasch, Cairo	Mar. 18	Dark brown	x			
	*2	Giza, Cairo	Mar. 22-24	Brown		x		
<i>G. c. pallida</i>	*1	Monchique Road, Portugal	Apr. 15	Red		x		
	*2	Villa Real St. Antonio, Portugal	Apr. 10	Light gray		x		
	*2	Tangier, Morocco	Jan. 7	Grayish clay		x	x	
<i>G. c. kleinschmidti</i>	*1	S. of Laghonat, Algeria	Oct. 21	Red				x
<i>G. c. macrorhyncha</i>	1	Merg, Cyrenaica	May 5	Brick red	x			x
<i>G. c. festae</i>	2	Biskra, S. Algeria	Mar. 14	Buffy gray	x			
<i>G. c. arenicola</i>	4	Mouleina, S. of Biskra	Mar. 8	Buff	x			
	1	S. W. of Biskra	Mar. 12	Buffy gray	x			
	1	Between Biskra-Tuggurt	Mar. 21	Pinkish sand		x		
	1	Ourlana, between Biskra-Tuggurt	Mar. 22	Pale sand		x		
	1	Sidi Amran, between Biskra-Tuggurt	Apr. 4	Pinkish sandy		x		
	1	Biskra, S. Algeria	Mar. 18	Pinkish sandy			x	
<i>G. c. chendoola</i>	*2	Bahawalpur Town, India	Jan. 28-29	Light gray	x			
	*2	Harunabad, Bahawalpur	Mar. 16	Light gray	x			
	*1	Ghazipur, United Provinces	Dec. 9	Light gray			x	
<i>G. c. lynesi</i>	*2	Jutial, Gilgit, India	June 12-17	Gray		x		
<i>Galerida t. theklae</i>	*1	L. Albuera, Cezimbra, Portugal	Apr. 14	Dark brown		x		
	*2	Troia, Portugal	Apr. 7	Light brown			x	
	*1	Monchique Hills, Portugal	Apr. 13	Dark brown	x			
	*1	Villa Real St. Antonio, Portugal	Apr. 9	Golden sand				x
	*1	Oulmes, Morocco	Feb. 19	Light gray				x
	*1	Ibiza, Balearic Is.	May 8	Red ochre				x
<i>G. t. polatzeki</i>	*1	Ibiza, Balearic Is.	May 9	Light red ochre			x	
	*1	Formentera, Balearic Is.	May 18	Red sandy			x	
	*2	Formentera, Balearic Is.	May 17-18	Red sandy			x	
<i>G. t. harterti</i>	1	Hamman Meskoutine, Algeria	May 16	Black brown	x			x
	1	Constantine, Algeria	Mar. 10	Earth brown	x			
	1	Kerrata, Algeria	May 4	Dark brown		x		
	*1	Medea, Little Atlas	Oct. 7	Raw umber				x
	*3	Boghari, Little Atlas	Oct. 10	Umber	x			

TABLE 2—Continued

Form	N of Spec.	Locality	Date	Color of Soil	Good <sup>a</sup>	Fair	Poor	None
<i>G. t. caroliniae</i>	*2	Laghonat, Algeria	Oct. 20	Reddish sand	x			
	*4	S. of Laghonat, Algeria	Oct. 21	Red sand		x		
<i>G. t. hilgerti</i>	1	Tilghemtp, Algeria	Apr. 13	Pinkish buff	x			
	1	El Kantara, Algeria	Mar. 3	Pinkish buff			x	
	*1	Djelfa, Algeria	Oct. 17	Red				x
<i>G. t. erlangeri</i>	*1	Tangier, Morocco	Jan. 12	Clay gray				x
<i>G. t. deichleri</i>	1	S. W. of Biskra, Algeria	Apr. 21	Pale golden sand	x			
<i>G. t. ruficolor</i>	1	El Kantara, Algeria	Mar. 16	Cinnamon		x		
	1	Ben el Ouidane, Morocco	Apr. 15	Buff		x		
	2	Chiadma, Morocco	Feb. 10	Brownish			x	
	1	Seksawa, Morocco	Mar. 24	Pinkish buff			x	
	7	Oued Issen, Morocco	May 4-June 16	Red brown	x			
<i>Galerida malabarica</i>	4 <sup>b</sup>	Azilal Basin, Morocco	Apr. 1	Red brown		x		
<i>Galerida dera</i>	4 <sup>b</sup>	Azilal Basin, Morocco	Apr. 1	Drab gray				x
	*1	Somwarpet, Coorg, India	Sept.	Brownish			x	
	*1	Mhow, C. P., India	Aug. 31	Brownish			x	
	*1	Killod, Mhow, India	June 11	Blackish				x
	*1	Mhow, India	Aug. 8	Black				x
	*1	Mhow, India	Sept. 16	Blackish				x
	*1	Mhow, India	May 26	Black				x
	*1	Mandu, Dhar, India	Sept. 11	Umber brown				x
	*1	Sardarpur, Gwalior	Sept. 15	Rich earth brown				x
<i>Calandrella brachydactyla</i>	*?	Ibiza, Balearic Is.	May 8-9	Red				x
	*1	Formentera, Balearic Is.	May 17	Reddish			x	
<i>C. minor apelsii</i>	*5	Podgorica, Montenegro	Apr. 28-May 2	Reddish		x		
<i>C. acutirostris</i>	*1	Las Golas, Spain	May 1	Sandy gray			x	
<i>C. roytal</i>	*4	Dras, Ladak, Kashmir	May 27	Grayish ochre	x			
<i>Ammomanes phoenicuroides</i>	*1	Ganges at Patna, India	Apr. 10	Pale gray sand	x			
	*2	Manthar, Bahawalpur, India	Feb. 21	Gray sand	x			
	*1	Simrole Road, Mhow, India	Apr. 1	Red brown		x		
<i>A. cinctura arenicolor</i>	*1	Laghonat, Algeria	Oct. 19	Pinkish sand	x			
<i>A. deserti algeriensis</i>	*3	Laghonat, Algeria	Oct. 22	Pinkish sand	x			
<i>Alaemon a. alaudipes</i>	1	Between Biskra and Oumash	Apr. 22	Yellowish sand	x			
<i>Chersophilus d. dupontii</i>	1	Ain Oussera, Algeria	May 13	Pale red brown	x			
<i>Eremophila bilophia</i>	1	Tilghemtp, Algeria	Apr. 13	Pinkish buff	x			

<sup>a</sup> Definition of terms: good, strong or, in some cases, perfect agreement; fair, general agreement; poor, lack of agreement but no contrast; none, contrast, sometimes very strong. The first two terms denote the positive presence of agreement, but the third is not conclusive and the samples in this category are disregarded unless stated otherwise in the analysis of the results.

<sup>b</sup> Two soil samples were taken with the four specimens at Azilal.

protection against heat and light. However, this does not explain why greater heat should produce dark and light birds in one continuous area. From the standpoint of mechanical protection, the dark larks, as well as black desert birds such as the *Oenanthes*, while well protected against ultra-violet radiation, would absorb much more heat than the pale birds, and vice versa, the pale birds, while better protected against heat, being permeable to the ultra-violet radiations. Meinertzhagen contends that the pale birds never take advantage of whatever slight shade may be available in the desert, and that the black and white birds do, but other authors contend strongly that all the birds of the desert do so at the hours of the day and during the period of the year when radiation is most intense.

The simplest explanation of the desert coloration and the one most universally accepted is that it is protective not against the environment but against predation. In recent years this view has been strongly challenged, not only by Meinertzhagen but also by Heim de Balsac for the Sahara (1936, *Bull. Biol. France et Belgique*, suppl. 21, pp. 297-345) and by Kachkarov and Korovine for the deserts of Turkestan (1942, "La vie dans les déserts," Payot, Paris). All these authors have had wide experience in the field. They point out that in order for the protective coloration to be effective the animal must not defeat this protection through its actions. They state that larks and other cryptically colored animals very often do defeat the advantage given to them by their coloration, also that strictly nocturnal animals are cryptically colored, sometimes perfectly so. They emphasize the very small amount of predation that takes place by daylight and assume that the cryptic coloration is of no value at night.

Concerning this last point, Dice has shown, however, that even under very weak illumination predators exert a very high degree of selection (1947, *Contrib. Lab. Vertebr. Biol.*, Univ. Michigan, no. 34). Using owls (*Tyto* and *Asio*) and deer-mice of one species (*Peromyscus maniculatus*) in carefully controlled experiments, he found that, in every experiment in which the predator was forced to use sight, "concealingly colored individuals enjoyed more than a 20 per cent advantage

over the conspicuous animals in escaping capture." One of his statements that "under illuminations so weak that the birds could not be expected to discriminate colors . . . the choice must have been based on the difference in shade rather than on the difference in hue" may explain why the larks of the Asiatic deserts may be as well protected as the larks of Africa. Although the Asiatic larks may not match so well the hue of the soil, they are not conspicuous in shade.

It has been suggested by Mayr (verbally) that one reason why the larks of the Asiatic deserts do not, apparently, show close correlation to local changes in the coloration of the soil may be that, owing to the more severe climatic conditions, they are forced to wander more throughout the year in search of suitable conditions. In the Asiatic deserts, a good deal of the precipitation, not as in the Sahara, takes place in the form of snow.

In summary it can be said that in some cases desert coloration may be a mechanical protection against physical agents such as heat and light, and there is probably a correlation between the pale plumage and the great aridity of the environment. Nevertheless, it has been established that cryptic coloration has a strong selective value against predation, and recent studies have shown that forms that contrast conspicuously against the background are protected against predation in other ways such as the lack of edibility. An explanation on purely mechanical grounds seems to be, as stated above, contradictory.

#### MOLTS AND PLUMAGES

All major works of reference state categorically that larks have but one molt a year, that this molt, postnuptial and postjuvenile, is complete, and that first winter birds are indistinguishable from the adult. This pattern, I find, is true of most of the larks that occur in Iran, Afghanistan, and India, but many of the forms depart from it in various ways and show, in fact, almost every type of molt and plumage sequence. This was first shown by Ticehurst (1923, *Ibis*, pp. 11-22) and Whistler (1941, *Ibis*, p. 174), and this paper reports still other instances, seemingly for the first time. To save much repetition and possible confusion, the different types in the forms listed in table 1 are summarized

below. The accounts on molt and plumages in the text are limited to details and dates, including some notes on breeding.

I have followed, more or less, Dwight's classification of molt (1900, Ann. New York Acad. Sci., vol. 13, p. 132), but I use different terms for the different classes of molt.

#### CLASS A, OR "REGULAR" MOLT

One annual molt; the postjuvenile molt is complete, and the first winter bird cannot be distinguished from the adult. This class includes the majority of the larks studied: *Ammomanes deserti*, *A. cincturus*; *Calandrella rufescens*, *C. cinerea* (in part); *Melanocorypha bimaculata*, *M. calandra*, *M. maxima*; *Eremophila alpestris*; *Galerida cristata*, *G. deva*; *Alauda arvensis*, *A. gulgula*; and *Lullula arborea*.

#### CLASS B

One annual molt; the postjuvenile molt is partial (the juvenile wing and tail feathers are not changed), but the body plumage is all changed and is indistinguishable from that of the adult: *Alaemon alaudipes*.

#### CLASS C

A double annual molt; a complete postnuptial and postjuvenile molt, and a partial prenuptial molt of apparently the whole of the body plumage; the first winter bird is indistinguishable from the adult: *Calandrella acutirostris*, *C. cinerea dukhunensis*.

#### CLASS D

Same as class C, but the partial prenuptial molt is not so full, and although the body plumage of the first winter bird cannot be distinguished from that of the adult the primaries differ, although they too were changed at the complete postjuvenile molt: *Mirafra javanica*, *M. erythroptera*, and very likely *M. assamica*.

#### CLASS E

Same as classes C and D, but the partial prenuptial molt is still more limited (to the crown and sides of the head), the first winter male is either like the adult female or lacks most of the full markings of the adult male, the markings are not deep black, and the first winter female appears to have wider buffy edgings on the wing coverts than the adult: *Eremopterix grisea* and very likely *E. nigriceps*.

The molts in classes D and E require further study. More molting specimens, especially in the case of *Eremopterix*, should be examined from various regions.

No molting specimens of *Ammomanes phoenicurus*, *Calandrella raytal*, or *Galerida malabarica* are available. I have not been able to find information in the literature other than a statement by Ticehurst (*loc. cit.*) that in *Calandrella raytal* the postjuvenile molt is complete.

In the list of specimens in the Systematic Section first winter birds in classes B, D, and E are identified as subadult (subad.).

# KEY TO THE LARKS OCCURRING IN IRAN, AFGHANISTAN, AND INDIA<sup>1</sup>

1. Inner primaries with broad white band across the base . . . . . *Alaemon alaudipes*  
All primaries without white band across the base . . . . . 2
2. All primaries pure black except for very narrow buffy tips in fresh plumage . . . . .  
 . . . . . *Melanocorypha yeltoniensis* male  
All primaries brownish or grayish . . . . . 3
3. Lesser upper wing coverts (wing bend) chestnut (also distal half of secondaries pure white) . . . . . *Melanocorypha leucoptera*  
Lesser upper wing coverts not chestnut . . . . . 4
4. Secondaries very broadly tipped with pure white . . . . . 5  
Secondaries not broadly tipped with pure white . . . . . 6
5. Bill short (16–24 mm., average about 18) and thick; wing, 115–140 mm. . . . .  
 . . . . . *Melanocorypha calandra*  
Bill long (20–32 mm., average about 26) and attenuated; wing, 130–160 mm. . . . .  
 . . . . . *Melanocorypha maxima*
6. Lores black . . . . . 7  
Lores not black . . . . . 9
7. Size very small (wing, 85 mm. or less) . . . . . 8  
Size large (wing, 105 mm. or over) . . . . .  
 . . . . . *Eremophila alpestris*
8. Crown black . . . . . *Eremopterix nigriceps* male  
Crown not black . . . . . *Eremopterix grisea* male
9. Size very small (wing, 80 mm. or less) . . . . . 10  
Size not very small (wing, 85 mm. or over) . . . . . 11
10. Upper plumage gray brown; grayish below; bill averages slightly smaller . . . . .  
 . . . . . *Eremopterix grisea* female<sup>2</sup>  
Upper plumage paler, more sandy; paler (more creamy) below; bill averages slightly larger . . . . . *Eremopterix nigriceps* female
11. Upper plumage not streaked . . . . . 12  
Upper plumage very distinctly or heavily streaked . . . . . 14
12. Upper plumage dark (fuscous), under parts strongly rufous . . . . . *Ammomanes phoenicurus*  
Upper plumage pale (sandy gray), under parts buffy . . . . . 13
13. Basal one-half to two-thirds or more of the tail feathers rufous on both webs . . . . .  
 . . . . . *Ammomanes cincturus*  
All tail feathers dark on the inner web . . . . .  
 . . . . . *Ammomanes deserti*
14. Axillaries and under wing coverts blackish . . . . .  
 . . . . . *Melanocorypha yeltoniensis* female  
Axillaries and under wing coverts sandy, rufous, grayish, or whitish . . . . . 15
15. A complete or interrupted black band across the lower throat . . . . .  
 . . . . . *Melanocorypha bimaculata*  
No black band across the lower throat . . . . . 16
16. Central feathers of the middle crown prolonged into a long and thin crest . . . . . 17  
Feathers of the crown not prolonged into a long crest . . . . . 19
17. Large (wing, 96–121 mm.); pale above (sandy); bill long (17–24 mm.) . . . . .  
 . . . . . *Galerida cristata*  
Small (wing, 79–100 mm.); dark above (with very prominent black feather centers); bill short (13–18 mm.) . . . . . 18
18. Pectoral streaks few and narrow; belly strongly rufous . . . . . *Galerida deva*  
Pectoral streaks numerous and broad; belly pale . . . . . *Galerida malabarica*
19. Outermost ("first") primary conspicuous . . . . . 20  
Outermost ("first") primary lacking or very minute . . . . . 23
20. Outermost primary shorter than the primary coverts (also primary coverts tipped with white) . . . . . *Lullula arborea*  
Outermost primary distinctly longer than the primary coverts . . . . . 21
21. Basal two-thirds of the primaries very distinctly rufous on both webs, the two rufous areas being broadly confluent . . . . .  
 . . . . . *Mirafraga erythroptera*  
Basal one-half of the primaries rufous, the rufous areas on the outer and inner webs always separated by a brown band . . . . . 22
22. Inner web of the outermost tail feather very largely white or very pale rufous . . . . .  
 . . . . . *Mirafraga javanica*  
Inner web of the outermost tail feather brown . . . . . *Mirafraga assamica*
23. Feet large, hind claw long (from one and one-half to twice the length of the hind toe); bill attenuated or attenuated and slender . . . . . 24  
Feet weak, hind claw short (about the length of the hind toe); bill attenuated or conical and blunt . . . . . 25
24. Wing pointed, the fifth and especially the sixth primary very distinctly shorter than the second (outermost) primary; bill attenuated, nearly straight; large (wing, 101–123 mm., average in male about 116, aver-

<sup>1</sup> Both sexes in adult plumage. Female in *Eremopterix* includes juvenal males.

<sup>2</sup> Cannot be identified unequivocally without comparative material.



- age in female about 107) . . . . .  
 . . . . . *Alauda arvensis*  
 Wing rounded, the fifth primary almost as  
 long as the second, the sixth 10 mm. or less  
 shorter than the second instead of 20 mm.  
 or more as in *A. arvensis*; bill attenuated or  
 very attenuated, slender and slightly de-  
 curved; small (wing, 82–105 mm.,<sup>1</sup> average  
 in male 91–102, average in female below 90  
 to about 93) . . . . . *Alauda gulgula*  
 25. Tertials shorter than the longest primary  
 (about equal to the sixth). . . . . 26  
 Tertials nearly as long as, as long as, or  
 longer than, the longest primary . . . 27  
 26. Under surface dull, washed with fulvous  
 brown, strongest on the upper breast and  
 lower flanks, these parts and especially the  
 breast almost always fairly well streaked;  
 upper plumage brownish gray; bill conical

<sup>1</sup> Excepting *Alauda gulgula inopinata* (Tibet) in  
 which the wing measures about 94 to 112 mm., averag-  
 ing about 106 to 109 in the male, and about 98 in the  
 female.

- and blunt or attenuated; large (wing, 89–  
 105 mm.) . . . . . *Calandrella rufescens*  
 Under surface whitish, not streaked on the  
 flanks and very faintly on the upper breast;  
 upper plumage pale grayish brown; bill at-  
 tenuated and slender; small (wing, 77–89  
 mm.) . . . . . *Calandrella raytal* (part)  
 27. Wing pointed, fifth primary much shorter  
 than the second (outermost) primary. . .  
 . . . . . *Calandrella cinerea*  
 Wing rounded, fifth primary equal to, or  
 slightly shorter than, the second . . . 28  
 28. Fifth primary equal to the second; tertials as  
 long as, or slightly longer than, the longest  
 primary; throat and especially the upper  
 breast fulvous; upper plumage brownish  
 gray; large (wing, 85–100 mm.) . . . . .  
 . . . . . *Calandrella acutirostris*  
 Fifth primary nearly as long as, or slightly  
 shorter than, the second; tertials slightly  
 shorter than the longest primary; throat  
 and upper breast whitish; upper plumage  
 pale grayish brown; small (wing, 77–89  
 mm.) . . . . . *Calandrella raytal* (part)

## SYSTEMATIC SECTION

### GENUS *MIRAFRA*

#### *Mirafra javanica cantillans* Blyth

INDIA: Rajputana, Jodhpur: December 13–16, 1948, 3 ♂, 3 ♀. Rajputana, Sirohi: Anadra, December 29–31, 1 ♂, 1 ♀. Kathiawar, Junagadh: Sasan, January 30–February 3, 1949, 1 subad. ♂, 1 ♀, 2 unsexed ad.; Jamwala, February 11–12, 2 ♂, 3 ♀, 1 unsexed ad. Northern Central Provinces: Bheraghat, April 20–May 27, 1946, 4 ♂, 5 ♀, 2 unsexed ad.; November 5–January 1, 2 ♂, 2 juv. ♂, 3 ♀, 1 subad. ♀, 1 juv. ♀; Bichhia, July 15, 1 juv. ♀. Southern Bombay Presidency: Hubli, March 17–20, 1948, 7 ♂, 3 ♀.

I lack specimens from other parts of the range. On the basis of the present material no separation is possible, but the various populations are not quite uniform. They vary somewhat individually and geographically, but the differences are slight and hard to assess. As the buffy edges of the feathers wear off, the plumage darkens in proportion to the individual degree of wear. However, independent of wear, as the populations in comparative (fresh) plumage show, darker or paler specimens occur in each.

The specimens from Hubli in southern Bombay are redder than the others owing to staining. One unstained specimen is colored as in the northern and western populations, and in the others the red pigment can be washed off by scrubbing with lukewarm, soapy water.

*Mirafra cantillans bangsi* Koelz, described from southern Bombay, is discussed under *Galerida deva*.

MOLT AND PLUMAGES, CLASS D: In the specimens examined the postnuptial and post-juvinal molts appear to have taken place, or

to take place, in the fall or early winter (to February 2). All the specimens taken in Rajputana from December 13 to 31 are in very fresh plumage, and one still shows a few traces of molt. All these specimens are adult. Specimens taken in northern Central Provinces from November 5 to January 1 have finished the molt and in the case of adults are also in very fresh plumage, but four juvenals have either not started to molt (November 13) or are halfway or more through the molt by December 26. Adult specimens taken in Junagadh are a little more worn, and one juvenal is nearing the end of the molt on February 2.

This specimen and one of the juvenals from Central Provinces taken on December 26 are interesting. Their body plumage, which has been entirely replaced, is indistinguishable from that of adults, but the new primaries which are not completely grown are more rounded, broader at the tips, not so pointed, and not so dark as in specimens that are unquestionably adult. These differences are slight but indicate that before its flight feathers become worn, the first winter bird can be distinguished from the fully adult.

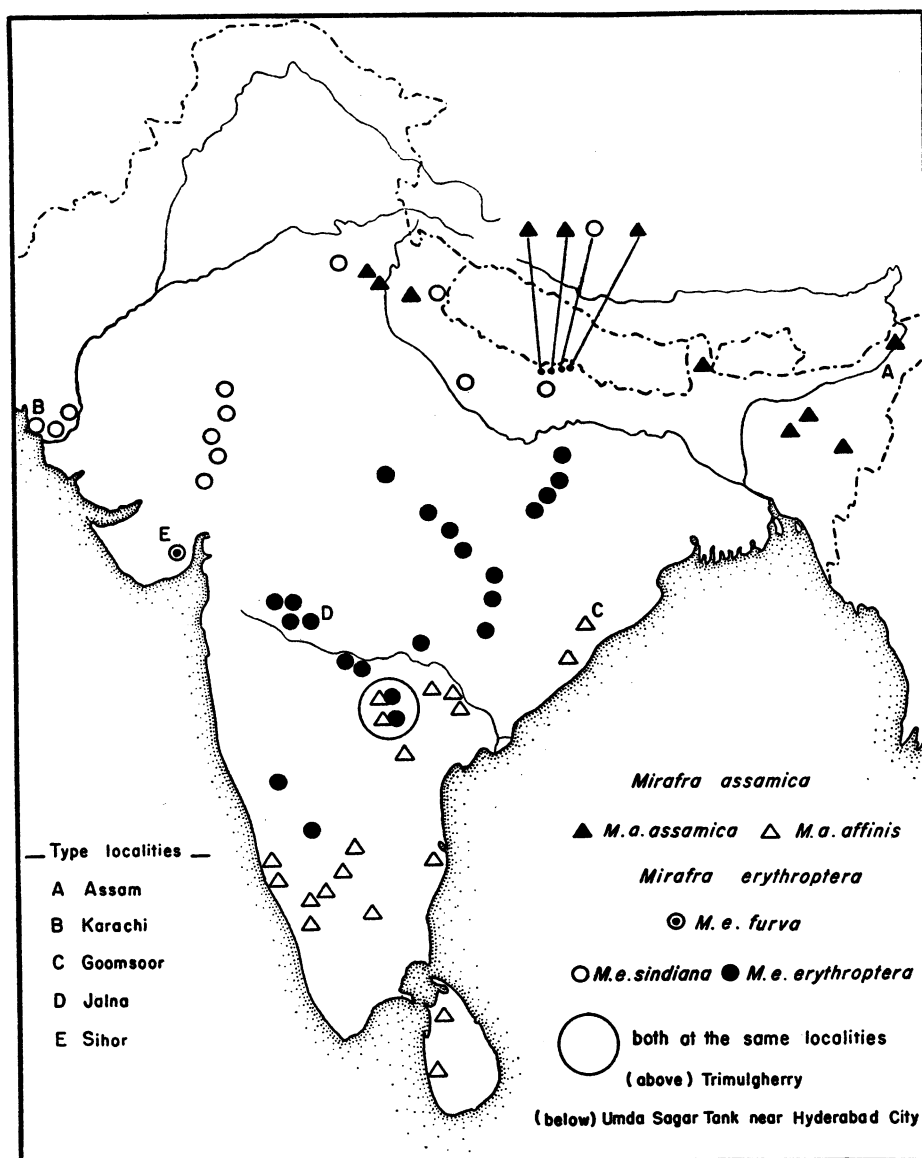
All the specimens taken from April 20 to May 7 in Central Provinces are molting also, but this molt appears to be prenuptial in that it is partial only. Only the feathers of the forecrown, face, and throat, and in one specimen those of the breast and mantle as well, are being replaced. All these specimens appear to be adult.

MEASUREMENTS: As shown in table 3, the measurements of the various populations are identical or very similar.

TABLE 3  
MEASUREMENTS OF ADULT MALES IN *Mirafra javanica cantillans*

Region	N	Wing	Tail	Bill
Rajputana	4	75.5–78 (76.7)	48–51.5 (49.4)	13 –14.5 (13.9)
Kathiawar	2	79, 79	53, 54	13.5, 14
Central Provinces	6	74 –77.5 (76.1)	48–52 (50.5)	12.5–14 (13.3)
Southern Bombay	7	75.5–78 (76.3)	46–53 (48.0)	12.5–13.5 (13.1)

ALL SPECIMENS: Wing, 19 males, 74–79 (76.5); 19 females, 71–78 (74.7). Tail: 19 males, 46–54 (49.6); 19 females, 46–52 (48.2). Bill: 18 males, 12.5–14.5 (13.4); 19 females, 12–14.2 (13.3).

FIG. 1. Distribution of *Mirafra assamica* and *M. erythroptera*.

#### *MIRAFRA ASSAMICA* AND *MIRAFRA ERYTHROPTERA*

Stuart Baker (1926, The fauna of British India, vol. 3, pp. 336–340) correctly treats the rufous *affinis* of southern India and Ceylon as a race of *M. assamica*. The material I have examined fully supports Baker, but this treatment was strongly objected to by Whistler (1933, in Ali, Jour. Bombay Nat. Hist. Soc., vol., 36, pp. 912–913, and 1934, in Ali, *ibid.*, vol. 37, p. 103).

Apparently, Whistler's only objection to treating *affinis* as conspecific with *M. assamica* is the marked difference in coloration, this author stating in the 1934 paper that *affinis* "can certainly not be considered a race of *Mirafra assamica*. The change in colour is too abrupt and striking. . . . It must be either treated as a separate species or as a race of *Mirafra erythroptera*." He adds that the ranges of *affinis* and nominate *erythroptera* are largely complementary, but since the two

were taken at the same localities (fig. 1) by the Hyderabad Survey (1934, *loc. cit.*), he treats *affinis* as a separate species.

The difference in coloration between nominate *assamica* and *M. assamica affinis* is only one of degree, not of pattern, the two being identical in this as well as in all other characters. It may be pointed out that in a related species (*M. javanica*) there is a similarly abrupt change from the dark pigmentation of the more eastern race (*williamsoni*) from Siam to the rufous pigmentation of the Indian race (*cantillans*). The conspecificity of these two forms is not questioned, even though, as in *M. assamica*, intermediates are lacking.

*Mirafra assamica assamica* is dark and grayish, while *M. assamica affinis* is rufous. In every other character these two forms agree with each other and are different from *M. erythroptera*, as follows:

Identical wing pattern: The rufous bay on the inner and outer webs of the primaries and secondaries is always separated by a brown band. This band is variable in width, but the two rufous areas are never broadly confluent as in *M. erythroptera*.

Identical streaky pattern: In *erythroptera* the dark centers of the feathers are much narrower and smaller.

Identical bill: Much heavier, broader, and higher, as well as much longer than in *erythroptera*.

Identical proportions and measurements: For differences from *erythroptera*, see table 4.

Therefore, in view of the fact that *affinis* is also the geographical representative of nominate *assamica*, I do not see how it can be maintained that it is a separate species, or, even if the facts of distribution were disregarded, a race of *M. erythroptera*.

In figure 1, I indicate the localities of all the specimens of *M. assamica* and *M. erythroptera* examined by me from India and Ceylon, as well as the type localities of the various forms and the localities of the specimens reported in the Hyderabad Survey (1934, *loc. cit.*).

#### *Mirafra assamica assamica* Horsfield

INDIA: Khasia Hills: Nongpoh, April 18–30, 1949, 1 ♂, 1 ♀; Burnihat, May 15, 1 ♀, 1 juv. ♀. Northern Bihar: Bhagahaghat, February 28, 1947, 1 ♂. United Provinces, Gorakhpur District: Nichlaul, January 31–February 14, 9 ♂, 1 subad. ♂, 1 ♀, 1 subad. ♀; Kalnahi, February 16–17, 2 ♂. Kumaon, Naini Tal District: Kashipur, August 22, 1948, 2 ♂, 2 ♀, 1 juv. ♀.

Other specimens have been examined from Kumaon, Sikkim, Assam, and Cachar. There is apparently no geographical variation. Not all the specimens are in comparative plumage, but in those that are, immature and worn adults from Kumaon are identical with immature and worn adults from the Khasia Hills.

MOLT AND PLUMAGE, CLASS D: The only molting specimens examined are adults from Kumaon and Cachar, in which the post-

TABLE 4  
MEASUREMENTS OF ADULTS IN *Mirafra assamica* AND *M. erythroptera*

Race	N	Wing	Tail	Wing Tail Index <sup>a</sup>	Bill
<i>M. assamica</i>					
<i>assamica</i>	28	78 –86 (82.05)	38–48 (43.0)	48 –57 (52.4)	14.5–17.5 (16.0)
<i>affinis</i> (India)	21	76 –89 (83.06)	39–50 (43.3)	48 –56 (52.0)	15.5–17.5 (16.4)
<i>affinis</i> (Ceylon)	6	77 –86 (83.9)	40–46 (43.2)	50 –53 (51.7)	16 –17.5 (16.8)
<i>M. erythroptera</i>					
<i>erythroptera</i>	33	70.5–82 (77.3)	45–56 (49.1)	59 –70 (64.0)	12.5–15 <sup>b</sup> (13.9)
<i>sindiana</i>	31	71 –82 (77.0)	43–55 (49.7)	57 –69 (64.6)	13 –15 (13.8)
<i>sindiana</i> (Gorakhpur)	10	72 –81 (77.8)	43–52 (47.7)	57 –65 (61.2)	13.5–15 (14.2)
<i>furva</i> (Kathiawar)	7	74 –81 (77.8)	46–55 (50.3)	62.5–68 (64.7)	12.5–14.5 (13.4)
Type of <i>furva</i>	♀	74 — —	46 — —	62.5 — —	13.5 — —

<sup>a</sup> The proportion expressed in per cent of the length of the tail to that of the wing.

<sup>b</sup> Forty-four specimens.

nuptial molt is starting on August 13 in Cachar and starting or from one-half to two-thirds complete on August 22 in Kumaon. A male and a female taken on January 31 at Nichlaul have the body plumage indistinguishable from that of the adult, but the primaries are more rounded at the tips, the outer primary is especially so and is proportionately longer than in other specimens which are certainly adult. I believe that, as in the case of *M. javanica*, these specimens are first winter birds.

***Mirafra assamica affinis* Blyth**

SYNONYM: *Mirafra affinis ceylonensis* Whistler.

INDIA: Northern Madras: Bengasai, January 27, 1937, 2 ♂. Southern and western Madras: Kasaragod, February 27, 2 ♂; Mangalore, March 1, 1 ♂; Nilambur, March 5, 1 ♂; Salem, March 7-8, 1948. 3 ♂, 3 ♀.

The coloration in this form varies individually more than in nominate *assamica*. This is probably due to wear, the rufous coloration bleaching more quickly than the darker, grayer pigmentation of nominate *assamica*. This was noted by Whistler (1936, *in* Ali, Jour. Bombay Nat. Hist. Soc., vol. 38, p. 769) who, nevertheless, in the same paper separates the populations of Travancore and Ceylon as *ceylonensis* (type locality, Colombo) on the basis of being slightly darker and of having a longer bill. Whistler suggests that the range of the "new" race may extend as far north as north Kanara.

However, my specimens from south Kanara (Kasaragod, Mangalore) do not differ from specimens showing comparative wear from Bengasai near Mahendra in northern Madras. There is no significant variation between the Indian specimens and a small series from Colombo and northwestern Ceylon. The Ceylon specimens are paler above and below, not darker, but the Ceylon specimens are more worn and being old skins have probably faded also.

The difference in the length of the bill (table 4) is very trivial and loses all significance when individual measurements are compared. In the specimens I have examined the bill measures: Ceylon: males, 16.5, 17, 17.5; females, 16, 16.5, 17. Western Madras: males, 16.5, 16.5, 16.5, 17. Mysore: males, 16.5, 17.5, 17.5; females and unsexed, 16,

16.5, 16.5, 16.5. Eastern Ghats: males, 15, 16, 17, 17, 17.2, 17.2; females, 15.5, 16, 16, 16.5. Whistler does not give individual measurements, but states that his specimens show little overlap. No averages are given either. However, small as the difference appears to be, it is further weakened by the specimens collected by the Ceylon Survey (1944, *Spolia Zeylanica*, vol. 23, p. 195). For instance, in the 1936 paper the measurements of 11 males from Ceylon are given as 16 to 18.5, of 15 from Travancore as 16 to 18, against 14.5 to 17.5 for 26 from the Eastern Ghats, but the new specimens from Ceylon measure only 15 to 16 in seven males. Ripley's specimens from Ceylon measured 15 to 16 in males and 14 to 15.5 in females (1946, *Spolia Zeylanica*, vol. 24, p. 215). He had no specimens from India for comparison, but I agree with him that the differences in bill measurements do not "justify by themselves, the setting up of a separate subspecies" when other differences are lacking.

***MIRAFRA ERYTHROPTERA***

In "The fauna of British India" (1926, vol. 3, pp. 341-342) this species is divided into two races: a pale race with little or no rufous (*sindiana*, type locality, Karachi) found in "Sind and the Punjab; Jodhpur east to Etawah," and a darker rufous race (nominate *erythroptera*, type locality, Jalna) from east Punjab to western Bengal south through the Deccan. A third race (*furva*, type locality, Sihor, Kathiawar) has been described recently by Koelz (1951, Amer. Mus. Novitates, no. 1510, p. 2). This new race is distinctly darker than *sindiana* and, like it, shows little or no rufous.

I have examined nearly 100 specimens from Sind, Kathiawar, northern Baroda, Rajputana, Punjab, Kumaon, central and eastern United Provinces, Bihar, Surguja, Central Provinces, Bastar, southern Bombay, and southern Mysore. All but one were collected in recent years (1934-1949). Most of them are in slightly to moderately worn plumage, and, unless otherwise stated, comparisons below apply to specimens in that plumage. This material shows that probably no more than three races can be recognized nomenclatorially, but that the paler northern populations (*sindiana*) are quite variable



geographically, and that *furva* and some of the populations of *sindiana* also vary individually. As the variation in this species chiefly affects the general tone of the upper parts, the account below refers to these parts.

Pale populations referable to *sindiana* are found in Sind, Rajputana, northern Baroda, Punjab, Kumaon, central and in the Gorakhpur district of eastern United Provinces, but these populations are not entirely alike. The very palest is the population of Sind, and indistinguishable from it are two specimens from Patiala City in the Punjab, and one from Lucknow in central United Provinces. Very slightly darker, as a series, are two populations from Sirohi and one from Sidhpur in northern Baroda. However, in these three populations, which are identical, one-third to one-half of the specimens are as pale as those from Sind. A series from Malasa, not located but in Kumaon, and a series from Jodhpur are also very slightly darker than the series from Sind. However, the series from Jodhpur is in considerably fresher plumage, and it is possible that with wear and bleaching it would become as pale.

As a series, the specimens from Gorakhpur and district are darkest, but this population varies individually. Most of the specimens match the specimens in fresher plumage from Jodhpur, but some paler ones are identical with the darker specimens from Sirohi and Baroda, and some of the darker ones match also the paler specimens of the dark *furva* from Kathiawar. However, since the Gorakhpur population and all the other northern populations are connected by a chain of intermediates showing but slight increases in pigmentation, I do not see how they can be separated nomenclatorially from *sindiana*. Table 4 shows that the Gorakhpur population varies very slightly in the length of its bill and tail, but the overlap in individual measurements between this population and the other populations of *sindiana* is complete or virtually so.

The population from Kathiawar (*furva*) also varies individually, but out of seven specimens only two match the darkest specimens of *sindiana* from Gorakhpur. The other five are distinctly darker, and the difference is quite or very abrupt between these and the paler specimens of *sindiana* (Sind, etc.).

Since the Gorakhpur population is the only population that in *sindiana* contains some specimens of common coloration with *furva*, it is interesting to test whether or not there are any significant differences in measurements between these two populations. The wing length is identical, but there is only a slight overlap in the individual measurements of the tail and bill. Since the tails are worn to an uncertain degree, the bill length seems more reliable. In Kathiawar it measures 12.5, 13, 13.2, 13.5, 13.5, 13.5, 14.5 (13.4), and in Gorakhpur 13.5, 14, 14, 14, 14.2, 14.2, 14.5, 14.5, 14.5, 15 (14.2). This difference is slight, but when the differences in the means is tested (using the "Students" distribution test,  $t=2.964$  for 15 degrees of freedom) this figure is significant below the 1 per cent level. More humid conditions prevail at Sihor in Kathiawar and in the Gorakhpur district of eastern United Provinces than in the regions where "typical" *sindiana* is found. This, together with a possible adaptive correlation to the coloration of the soil, may account for the darker *furva* and the presence of the darker specimens of *sindiana* at Gorakhpur.

The northernmost specimens of the rufous populations examined (nominate *erythroptera*) are, in the east, from Muhammadganj in western Bihar, and, in the west, from Bina in northwestern Central Provinces. Northwest of this last locality, Ali (1939, Jour. Bombay Nat. Hist. Soc., vol. 41, p. 105) has identified specimens from Gwalior as nominate *erythroptera*. One of his specimens comes from Bhind, only a little way across the Jumna from Etawah where Baker reports *sindiana* and not very far from Lucknow from which I have one of the palest specimens of this race. I would have expected to find *sindiana* in northern Gwalior, or at any rate an intermediate population.

The populations of nominate *erythroptera* examined vary less geographically and individually than those of *sindiana*. The population from Surguja is very slightly darker and less rufous, and in Central Provinces three specimens out of 21 are paler, one of them quite so. I have only one specimen from Bina, and it is probably not coincidence that it is the palest of these three. It is interesting to note that the only specimen that I

have from Marikanive, my southernmost locality, is as pale as the other two. The population from Hubli is stained with red, and, as in the case of the series of *M. javanica cantillans*, taken at the same locality, the pigment can be washed off. One may speculate whether independent of this pigment the population is not really more rufous. However, Hubli is in a dry zone, and the color of the under parts in two specimens that are less stained is matched by that of the great majority of the specimens from Central Provinces.

In the preceding account nothing has been said of the coloration of the under parts. In nominate *erythroptera* these parts are a little more creamy and buffy, less white on the breast and abdomen than in *sindiana* and *furva*. In the latter the breast spots are darkest and therefore are more prominent, but here again some specimens from Kathiawar are matched by three specimens out of 10 from Gorakhpur.

**MOLT AND PLUMAGES, CLASS D:** The post-nuptial and postjuvinal molt may start towards the end of July or early August and end by the end of October, at least in Bihar, Surguja, and northern Central Provinces. All the specimens taken in these regions whether adult or juvenal, from August 19 to November 1 are molting, the molt being at its height in late August and early September.

Specimens going through the partial pre-nuptial molt have been examined from Central Provinces. These specimens were taken from March 28 to May 27, and the molt is limited to the feathers of the crown, throat, and upper breast. First winter birds in which the body plumage is indistinguishable from that of the adult but in which the primaries are rounder have been examined from Kumaon, southern Bombay, and Bihar. In these the outer primary is also proportionately longer than in adults.

***Mirafra erythroptera sindiana* Ticehurst**

INDIA: Sind: Khinjar Lake, February 24–26, 1934, 2 ♂, 1 ♀; 10 miles above Landhi, March 4, 1 ♂. Baroda: Sidhpur, January 12–14, 1949, 2 ♂, 4 ♀. Sirohi: Sirohi, December 27, 1948, 1 ♂, 2 ♀; Anadra, December 29–31, 1 ♂, 2 ♀. Rajputana, Jodhpur: Rohit, December 14–16, 2 ♂, 4 ♀; Jodhpur City, December 23, 1 ♂.

Punjab: Patiala City, January 20–21, 2 ♂. Kumaon: Malasa, April 1–3, 2 ♂, 1 subad. ♂, 1 ♀. Central United Provinces: Lucknow, December 10, 1936, 1 ♂. Eastern United Provinces, Gorakhpur District: Gorakhpur, January 26–29, 1947, 7 ♂, 2 ♀; Chitoni Ghat, February 27, 1 ♂.

***Mirafra erythroptera furva* Koelz**

INDIA: Kathiawar: Sihor, January 25–28, 1949, 4 ♂, 2 ♀, January 26, 1 ♀ (the type of *M. e. furva*).

***Mirafra erythroptera erythroptera* Blyth**

INDIA: Bihar: Muhammadganj, August 19–31, 1947, 6 ♂, 3 subad. ♂, 1 juv. ♀; Garhwa Road, September 10–November 17, 2 ♂, 1 ♀. Surguja: Ramanujganj, September 28–November 1, 2 ♂ 1 ♀; Gargori, October 22–23, 2 ♂. Central Provinces: Bina, February 20, 1946, 1 ♂; Bheraghat, March 11–May 27, 6 ♂, 1 unsexed [♂], 5 ♀, October 30–November 17, 1 ♂, 2 ♀; Mandla, June 21, 1 ♂; Bichhia, October 10, 1 ♀; Nawapara, March 9, 1949, 1 ♂ "breeding"; Raipur, March 31, 1 ♂, 1 ♀. Bastar: Kesarpal, March 28, 1 ♀. Southern Bombay Presidency: Hubli, March 17–19, 1948, 5 ♂, 2 ♀, 1 subad. ♀.

**GENUS EREMOPTERIX**

***Eremopterix grisea* Scopoli**

INDIA: Sind: Khinjar Lake, February 20–March 2, 1934, 4 ♂; Tatta, March 2, 1 ♂. Junagadh: Sasan, January 31–February 2, 1949, 1 ♂, 1 subad. ♂, 2 ♀, 1 subad. ♀; Jamwala, February 12, 1 subad. ♂. Rajputana, Sirohi: Sirohi, December 27, 1948, 2 ♂, 1 juv. ♂; Anadra, December 29, 1 ♂, 1 subad. ♂. Rajputana, Jaipur: Phulera, December 11, 1 ♂, 1 subad. ♂, 1 subad. ♀, 1 unsexed subad. United Provinces, west: Malasa, April 3, 1948, 1 ♂; east: Gorakhpur, January 27, 1947, 3 ♂, 4 ♀; Nichlaul, February 12, 1 ♂, 1 ♀. Northern Bengal: Siliguri, December 30–31, 1936, 4 ♂. Bihar: Muhammadganj, August 19–September 2, 1947, 3 ♂, 6 ♀. Central Provinces: Bina, February 20–21, 1946, 3 ♂; Bheraghat, February 26–April 10, 4 ♂, 3 ♀, 1 subad. ♀, October 27, 1 ♀; Mandla, June 25, 1 juv. ♂; Bichhia, October 3–10, 2 ♂, Bar Nawapara, March 13, 1949, 1 ♀. Northern Madras: Mandasa, January 21, 1937, 3 ♂, 2 ♀; Ellore, February 2, 2 ♂, 1 ♀; Kodur, March 18, 5 ♂, 2 ♀; Sidhout, March 22, 1 nestling ♀; Hospet, March 24, 1 ♂. Southern Madras: Salem, March 7–11, 1948, 3 ♂, 2 ♀, 1 unsexed juv.; Coimbatore, February 11, 1937, 1 ♂, 2 ♀. Southern Bombay: Hubli, March 17–19, 1948, 5 ♂, 2 juv. ♂, 4 ♀, 1 juv. ♀.

This species is widely distributed throughout most of India. It varies somewhat

geographically, and the populations of the northwest have been separated as *siccata* and the population of Ceylon as *ceylonensis*. However, when the populations of India are studied as a whole the variation is found to be more or less irregular, and it seems best to recognize only one form nomenclatorially.

The type locality of this form (*grisea*, 1786) is Gingee, south Arcot district, southern Madras. The type locality of *siccata* Ticehurst (1925, Bull. Brit. Ornith. Club, vol. 45, p. 87) is Deesa, Palanpur, on the border of Kutch and Rajputana. This form was described as having the males paler and grayer above and the females paler above and whiter below than the populations of southern India. Ticehurst gave its distribution as "Sind, Punjab, Rajputana, Gurgaon, Cutch, West United Provinces to Fategarh, etc. . . ." stating that the distribution "follows remarkably closely the area where the rainfall is 25 inches or less." The type locality of *ceylonensis* Whistler (1934, Jour. Bombay Nat. Hist. Soc., vol. 37, p. 105) is "8 miles north of Palatupana" on the east coast of Ceylon. Whistler stated that this form was restricted to Ceylon and had a slightly longer and much heavier bill. In 1944, Whistler added (*Spolia Zeylanica*, vol. 23, p. 196) that recently collected specimens from Ceylon were also "much colder and greyer in tint with the black of the under surface of the males purer" than in the populations of southern India.

With the exception of the difference in the intensity of the black, which I cannot confirm, the notations on the coloration made by Ticehurst and Whistler are quite correct. However, examination shows that gray specimens inseparable from those of northwestern India and Ceylon are found in widely separated areas with very different conditions of rainfall. The geographical variation is best studied when the populations are compared as a whole. From the specimens listed above and in table 5, it can be seen that specimens have been examined from almost all parts of the range, the only important exception being perhaps eastern Bengal and Assam where *E. grisea* is said to occur by Baker (1926, The fauna of British India, vol. 3, p. 354). On the continent my populations from Salem and Sirohi are very close to being, re-

spectively, toprototypical *grisea* and *siccata*.

The difference in coloration is best shown on the upper parts of males in adult plumage, females in all populations tending to be browner than males. In the specimens examined, brown populations are found throughout Madras Presidency and in southern Bombay. The males of all the other populations are grayish, the palest being the populations of North-West Frontier Province, Sind, Rajputana, western United Provinces, and Gorakhpur and Gorakhpur district in eastern United Provinces. These populations vary individually, but the great majority of the specimens are identically pale. With the exception of the population from eastern United Provinces, the others come within the range of *siccata* as defined by Ticehurst, that is, within or close to the isohyet of 25 inches of annual rainfall, but the Gorakhpur region is within the isohyets of 50 to 75 inches. I have only one adult male each from Junagadh and southern Mysore; these specimens are grayish and cannot be separated from the specimens above; Junagadh receives a rainfall of about 30 inches and southern Mysore between 30 and 40 inches. The populations from the following regions are not separable from one another. They are darker than the specimens above but still grayish, not brown. They are from Siliguri in northern Bengal, Bihar, northern Central Provinces, and Ceylon. The precipitation in these regions varies from 100 to 200 inches at Siliguri, to 50 to 75 in Ceylon and Bihar, to about 40 in northern Central Provinces.

Females from North-West Frontier Province, Sind, Rajputana, and Gorakhpur are equally pale. Females from Bihar, northern Central Provinces, and Ceylon are a little browner, and the darkest and brownest are the populations of Madras and Bombay. I have two females each from Junagadh and southern Mysore; they are brown, darker than the females from Bihar, Central Provinces, and Ceylon, but not so dark as the females from Madras and Bombay.

It can be seen that the distribution of the gray populations is irregular and is not always correlated with precipitation. Specimens from the wettest region (Siliguri) are grayish and not so dark as the brown populations of

TABLE 5  
MEASUREMENTS OF FULL ADULTS IN *Eremopterix grisea*

Population	N	Wing	Tail	Bill from Skull
N. W. Frontier Province	1 ♂	76	39	12.5
	1 ♀	78	42	12.8
Sind	7 ♂	75-79.5 (77.0)	39-43 (42.0)	12 -14.5 (13.07)
	1 ♀	75	45	13
Junagadh	1 ♂	75	40	12
	2 ♀	75, 78	39, 42	12.5, 12.8
Jaipur	1 ♂	74	38	12.8
Sirohi	3 ♂	77, 78.5, 79	42.5, 44, 44	12.5, 12.5, 13
W. Un. Provinces	1 ♂	75	38	12
E. Un. Provinces	4 ♂	76-80 (78.0)	39-44 (41.0)	12.5-13.5 (13.00)
	5 ♀	74-78 (75.2)	36-41 (39.4)	12.5-13.5 (13.04)
N. Bengal	4 ♂	77-78 (77.3)	40-43 (41.8)	13 -14 (13.35)
Bihar	4 ♂	74-79 (76.8)	42-44 (43.1)	13 -14.5 (13.62)
	6 ♀	74-76 (75.0)	38-43 (40.8)	12.5-14 (13.20)
N. Central Provinces	9 ♂	74-79 (76.6)	40-45 (42.4)	12 -13.5 (12.90)
	5 ♀	74-76 (75.0)	37-42 (39.2)	12 -13.5 (12.78)
N. Madras	11 ♂	74-79 (76.0)	38-43 (40.5)	12 -15 (13.27)
	5 ♀	72-75 (74.0)	39-40 (39.6)	12 -13.5 (12.70)
S. Mysore	1 ♂	76	44	12.5
	2 ♀	74, 77	41, 43	12.5, 13
S. Madras	11 ♂	74-79 (76.4)	39-44 (41.3)	12 -15 (13.53)
	4 ♀	73-75 (74.0)	37-44 (40.2)	12.5-13.5 (12.95)
S. Bombay (Hubli)	5 ♂	74-78 (76.4)	39-44 (41.6)	12 -13.5 (12.50)
	4 ♀	72-75 (73.8)	37-41 (39.0)	11.5-12.5 (12.00)
Ceylon	6 ♂	75-80 (77.1)	40-44 (41.9)	13.5-14 (13.83)
	2 ♀	75, 75	37, 43	14, 14

INDIVIDUAL BILL LENGTHS: Sind: males, 12, 12, 12.5, 13, 13.5, 14, 14.5. Eastern United Provinces: males, 12.5, 12.8, 13.2, 13.5; females, 12.5, 13, 13, 13.2, 13.5. Northern Bengal: males, 13, 13.2, 13.2, 14. Bihar: males, 13, 13, 14, 14.5; females, 12.5, 13, 13, 13.2, 13.5, 14. Northern Central Provinces: males, broken, 12, 12.5, 12.5, 13, 13, 13.2, 13.5, 13.5; females, 12, 12.2, 13, 13.2, 13.5. Northern Madras: males, 12, 12, 13, 13, 13, 13.2, 13.5, 13.5, 13.8, 14, 15; females, 12, 12.5, 12.5, 13, 13.5. Southern Madras: males, 12, 13, 13, 13.2, 13.2, 13.5, 13.5, 13.5, 14, 15, 15; females, 12.5, 12.8, 13, 13.5. Southern Bombay: males, 12, 12, 12, 13, 13.5; females, 11.5, 12, 12, 12.5. Ceylon: males, 13.5, 13.5, 14, 14, 14.

TOTAL BILL MEASUREMENTS (INCLUDING THOSE IN BODY OF TABLE): 105 = 68 males, 37 females.

Madras and southern Bombay where the annual rainfall varies from 50 to 75 inches. Under the circumstances it seems best not to separate the populations on the basis of coloration. I can see no evidence of geographical variation in the intensity of the black on the under parts of fully adult males that were recently collected and show the same condition of plumage.

Concerning size no separation is possible. Table 5 shows, in fact, that all the populations are remarkably uniform. Although the population of Ceylon is not shown to have an appreciably longer bill (individually, specimens with the longest bills are found elsewhere) its bill is definitely heavier. How-

ever, in my material, specimens in which the bill is as heavy or virtually as heavy are found in Sind, eastern United Provinces, northern Bengal, Bihar, northern Central Provinces, and northern and southern Madras. But, with the possible exception of the population from northern Bengal, in which the shape of the bill comes closest to that of the population of Ceylon, the bill, taken in series, is not so massive as in Ceylon. In series the populations of Madras and southern Bombay appear to have the least massive bill. All the differences are slight, and the difference between the population of Ceylon and the others is not so great as inferred by Whistler. In view of the irregular

variation in coloration the slight difference in the shape of the bill alone does not seem to warrant separation.

**MOLT AND PLUMAGES, CLASS E:** This species apparently breeds throughout the year. S. Baker (*loc. cit.*) states that "eggs have been found in practically every month." Ticehurst states that it breeds in Sind from April to October (1923, *Ibis*, p. 20). Whistler states in various papers that it breeds in southern India in July and August and from November to May, and in Ceylon from April to August. I have examined breeding specimens, immatures, and specimens in first winter plumage taken from October to June. The complete molt, which is presumably postnuptial, may therefore occur at any time of the year, and in the populations examined the molting period appears to vary individually, for in the same population some specimens are in fresh while others are in worn plumage. Although I have examined a large series taken in every month of the year, I have seen only two molting specimens. In these, both adult males taken on December 27 in Sirohi, the plumage is neither very fresh nor very worn, and the only signs of molt consist in the replacement of the feathers of the forehead and crown. This very limited molt and the general state of the rest of the plumage suggest a partial prenuptial molt.

*Eremopterix grisea* and *E. nigriceps* are the only two sexually dimorphic larks occurring in India. While the plumages of the adult and immature have been described, the literature is silent on the molt and plumage sequence other than a statement by Ticehurst (*loc. cit.*) that the postjuvenile molt is partial in *E. nigriceps*. The literature does not mention the first winter plumage. As stated above, the plumage of the specimens

examined shows that adults have a complete postnuptial molt and a very limited prenuptial molt. A first winter plumage, apparently acquired through a partial postjuvenile molt, is recognizable. In this plumage, specimens labeled either male or female have the body plumage brown and indistinguishable from that of the adult female except that the upper wing coverts have broad, buffy edgings as in the juvenile, the primaries not being adult. Other first winter specimens labeled male have the under parts irregularly spotted or streaked with blackish or dark gray. In these dark feathers, which are very variable in abundance, only the basal one-half or two-thirds of the feather is dark; the tips and the edges are whitish and, as these wear off, allow the blackish to appear on the surface. If I interpret the plumage sequence correctly, the first winter bird has no partial "prenuptial" molt and acquires the full adult plumage through a complete molt in the second year.

The conclusions reached are inferred through a study of the plumage sequence of non-molting specimens, as two molting specimens of *E. grisea* only are entirely inadequate. It would seem that a study of the molt and plumage sequence in *Eremopterix* would repay study.

***Eremopterix nigriceps affinis* Blyth**

INDIA: Sind: Khinjar Lake, January 23–February 23, 1934, 4 ♂, 6 ♀; Dabeji, March 4, 1 ♀; Karachi, December 3, 1939, 1 ♂. Rajputana, Jodhpur: Pakaran, December 17, 1948, 1 ♀; Kalanpur, December 19–20, 2 ♂. Punjab, Hissar: Darba, March 14, 1933, 1 ♂, 1 ♀.

All the specimens are in worn to very worn plumage and are identical.

This species which, according to Ticehurst

TABLE 6  
MEASUREMENTS OF *Eremopterix nigriceps affinis*

Region	N	Wing	Tail	Bill from Skull
Sind	5 ♂	81+–85+ (82+)	45+–51+ (48+)	14–14.5 (14.1)
	7 ♀	77+–80+ (78+)	43+–47+ (46+)	13–14 (13.6)
Jodhpur	2 ♂	82+, 82+	49+, 53+	13, broken
	1 ♀	79+	48+	13.5
Punjab	1 ♂	81+	49+	13.5
	1 ♀	78+	45+	13.5



(1923, Ibis, p. 20), is commoner in Sind and the Thar desert than *E. grisea* differs from it by having a black crown in the adult male; the females of both are very similar (and also the juvenals, according to Ticehurst), but are paler and sandier. *E. nigriceps* is a slightly larger bird, and its bill is a little heavier, about as heavy as in the population of *E. grisea* from Ceylon. Ticehurst confirms the observation that the two species do not associate.

The nesting season is long, apparently from February to the end of August. No molting specimens have been examined, but the molt is probably as in *E. grisea*.

#### GENUS *AMMOMANES*

##### *AMMOMANES DESERTI*

A series of 180 specimens of this desert lark has been examined from Palestine, Iran, Afghanistan, and Sind. Seven races occur in this region, from west to east: *fraterculus*, *cheesmani*, *darica*, *iranica*, *parvirostris*, *orientalis*, and *phoenicuroides*. The variation is in coloration and size.

Three of these races, *fraterculus*, *cheesmani*, and *orientalis*, are of a pale "warm" sandy cast. The others are of a "cooler" coloration, darker and grayer in *iranica*, more clay-like in *darica* and *parvirostris*, with a faint suggestion of brown in *phoenicuroides*. The distribution is shown in figure 2. The ranges and the variations are as follows:

*Ammomanes deserti fraterculus* and *cheesmani*. The range of *fraterculus* Tristram (1864, type locality, Palestine) is from Palestine to the right bank of the Tigris. On the left bank, according to Meinertzhagen (1923, Bull. Brit. Ornith. Club, vol. 43, p. 157), specimens from Samarra north of Baghdad are intermediate between *fraterculus* and *cheesmani*. This last, described by Meinertzhagen (*loc. cit.*) from the Shatt al Adhaim, a tributary on the left bank of the Tigris, is said to be darker above and darker and more pinkish below than *fraterculus* and to have a smaller bill. Specimens showing these characters were examined by Meinertzhagen from Naft Khaneh where the eastern end of the Jebel Hamrin touches the Iran border.

No specimens from Iraq are available, but my good series from Qasr i Shirin across the

border from Naft Khaneh shows the color difference very well. It does not confirm the difference in the bill length but has a distinctly longer wing (table 7). The range of *cheesmani* on the southern side of the Zagros and along the northern coast of the Gulf extends at least as far south as Borazjan near Bushire. The specimens from Qasr i Shirin were taken from December 28 to January 7 and are in relatively fresh plumage. Worn specimens taken while breeding at Ahwaz on April 20 and in Bakhtiari in the region above Dizful on April 26 to 27 still show traces of the pinkish tinge. A specimen taken at Borazjan on June 18 has the long wing of *cheesmani*, but, being a very old skin and extremely worn, has lost the pinkish tinge. This tinge is lacking entirely in comparative specimens of *fraterculus* from Palestine which are distinctly paler below, slightly paler above, and have, of course, a shorter wing.

Paludan (1938, Jour. Ornith., vol. 86, p. 597) found that his specimens taken also near Dizful on March 18 to April 6 were a little "brownier" below than in *fraterculus*. He identifies them as belonging to this race, but, judging by specimens in identical plumage from Palestine and Bakhtiari, there is no doubt that the latter is true *cheesmani*, although the pinkish tinge is gradually reduced through wear and bleaching.

*Ammomanes deserti orientalis* Zarudny and Loudon (1904, type locality, "lower mountains of southwestern Bukhara . . . Kushka River, sporadic in northeastern corner of Persia"; "around the middle Amu Daria" according to Dementiev). This race has a longer wing than *cheesmani* and, especially, *fraterculus*. In coloration it is virtually identical with the latter though perhaps faintly paler and is distinctly paler than, and lacks the pinkish tinge of, *cheesmani*.

According to Hartert (1921, Die Vögel der paläarktischen Fauna, p. 2082) Zarudny states that the range of *orientalis* extends to the Quchan-Meshed Plain in northern Khorasan and that it is also found in Seistan. As Hartert remarks, this last region is within the range of *iranica*. Of the two specimens from Seistan in the Rothschild Collection discussed by Hartert (sexed as females on the original labels, not males), one, I find, is identical with my specimens of *orientalis*

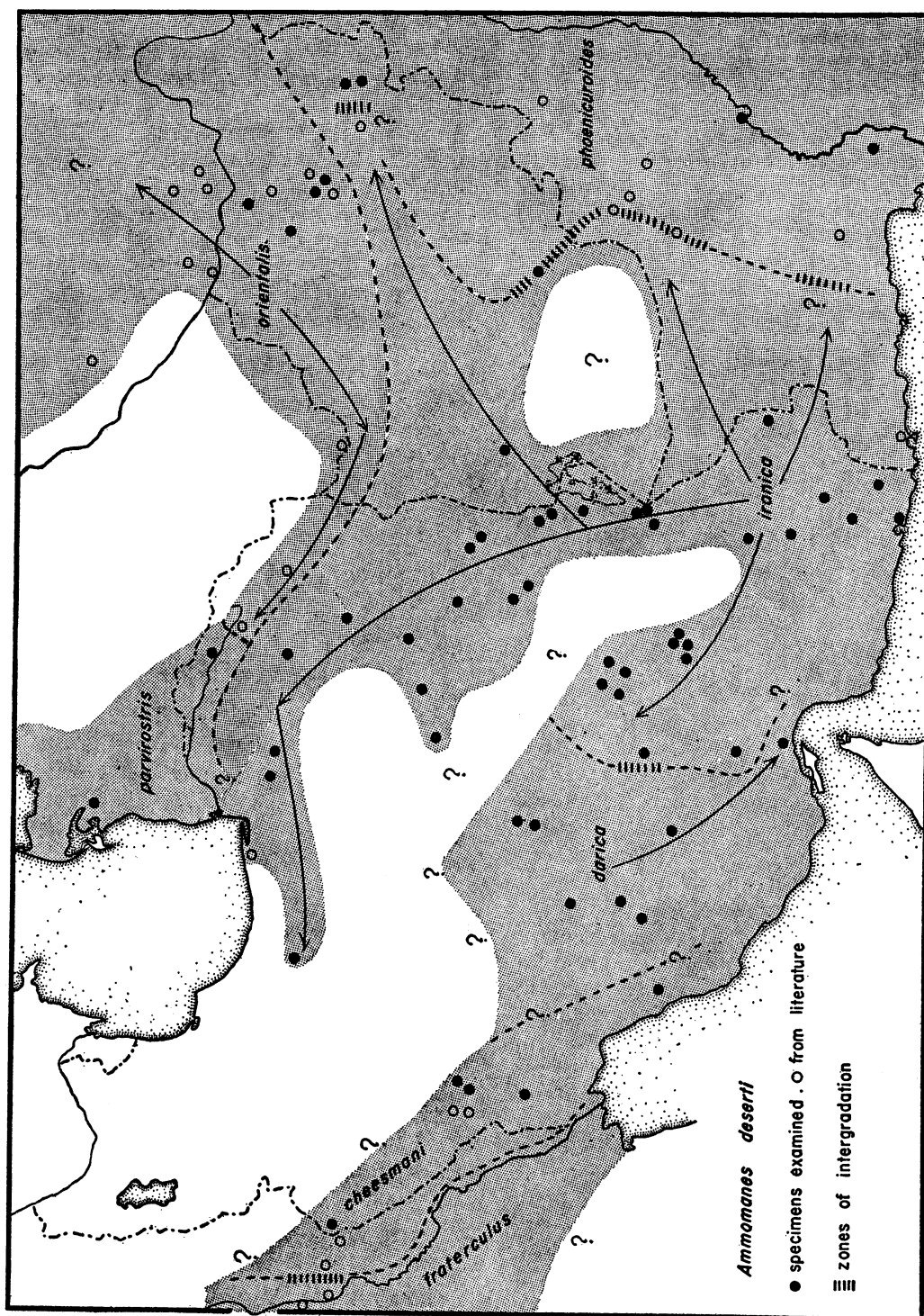


FIG. 2. Distribution of *Ammomanes deserti* in the Iranian region and neighboring territories.

from Afghan Turkestan and north Afghanistan. Since the range of this race extends through the Paropamisus and it is said to exist as scattered colonies or to be sporadic, it is possible that wandering individuals may find their way south to Seistan. It is listed as nesting in this region by Zarudny (1911, Jour. Ornith., vol. 59, p. 211), but I know of no records. The specimen of *orientalis* discussed was collected on December 25, 1900 (Russian calendar), and may have been a winter visitor to Seistan. In another region, in the Kyzyl Kum to the north of Bukhara, *orientalis* is also said to occur accidentally (Dementiev, 1934, L'Oiseau, p. 595).

*Ammomanes deserti darica* Koelz (1951, type locality, Shiraz, Fars). This recently described race (1951, Amer. Mus. Novitates, no. 1510, p. 2) which lacks the "warm" cast of the three preceding races is most closely related to *iranica*, from which it differs by being paler, less gray above, and a little paler below.

The populations of Yezd taken on February 20 to 23 and Fars taken on March 8 to April 5 are identical. They are in moderately worn plumage and were compared to populations of *iranica* taken in southeastern Kirman on February 1 to 15 and in Persian Baluchistan from January 18 to April 23.

A good series in fresh plumage taken at Isin about 10 miles north of Bandar Abbas on December 17 to 19 differs from all the populations in comparative plumage of *iranica* examined, by being distinctly paler above and below, soft pale gray above and whiter below. The Isin population certainly cannot be referred to *iranica*, and it is likely that with wear the plumage, losing its freshness, would become similar to that of the paler *darica*.

*Ammomanes deserti iranica* Zarudny (1911, type locality, "Persia proper," here restricted to Hurmuk, Persian Baluchistan; see below). This race, the darkest and grayest of the seven races, has a very wide range which extends from Karaj near Tehran, Ges near Gurgan according to Zarudny, Khorasan south of the Atrek Basin and the mountain ranges south of Quchan and Meshed, the region west of Tabas, Seistan, Kirman west to the region of Saidabad, south to about latitude 28° N., all of Persian Baluchistan to

the coast, southern Afghanistan and Baluchistan to a line approximately running south from Kandahar through Quetta and Kalat to Las Bela. Hartert (1933, Die Vögel der paläarktischen Fauna, Ergänz., p. 112) states that it should occur also in Muscat in Arabia, Transcaspia, and Bukhara. I do not know on what the Muscat statement is based, but it does not occur in Transcaspia, where it is replaced by *parvirostris*, or in Bukhara, where it is replaced by *orientalis*.

As the soil and rock coloration is not uniform throughout this great range, it is surprising that the various populations vary so little. The darkest population examined was taken in the region which projects southwest from Firdaus through Tabas to Robat i Khan between the two great deserts. But these specimens taken from August 28 to September 4 are just finishing the molt. Specimens taken in the regions of Sabzawar much farther north and Shahrud south of Gurgan are not quite so dark; these specimens, taken from September 22 to 26, are also in the last stages of molt. A specimen, which is apparently the westernmost record, taken at Karaj on November 7 is still very fresh and is identical with the Sabzawar-Shahrud birds. So also are three specimens taken at Farah in Afghan Seistan on October 30 to November 9. A specimen taken at Saadatabad, about 85 kilometers north of Isin, on December 23, and specimens taken at Kirman or near it from January 6 to 19 are slightly paler than the preceding populations, but the plumage has begun to wear.

The variation in two other populations on the periphery of the range is of a different order. Of specimens in fresh plumage taken at Kandahar on October 17 to 26, some are dark and gray, while others are browner; the population varies individually and supports Hartert's (1904, Die Vögel der paläarktischen Fauna, p. 224) and Ticehurst's (1927, Jour. Bombay Nat. Hist. Soc., vol. 31, p. 876) observations that in this region *iranica* intergrades with *phoenicuroides*; the Kandahar population, however, is still much closer to *iranica*. At Balvard, on the Kirman side of the Kavir which reaches to Saidabad, three specimens still in rather fresh plumage taken on December 30 to 31 are paler than in any population of *iranica*. Although this series

TABLE 7  
MEASUREMENTS IN SOME POPULATIONS OF *Ammomanes deserti*

Race, Region or Locality	N	Wing	Tail	Bill from Skull
<i>fraterculus</i>				
Palestine	12 ♂	94- 99.5 <sup>a</sup> (97.6)	58-67 (62.3)	15.5-18.5 <sup>b</sup> (16.5)
	9 ♀	92- 99 <sup>a</sup> (94.4)	56-62 (59.9)	13 -17.5 <sup>b</sup> (15.0)
<i>cheesmani</i>				
Qasr i Shirin	7 ♂	103-108 <sup>c</sup> (105.8)	64-75 (70.0)	16 -18 <sup>d</sup> (16.9)
	5 ♀	96- 99 <sup>c</sup> (97.7)	62-67 (64.5)	14.5-16.2 <sup>d</sup> (15.5)
Ahwaz	1 ♂	102+	67+	17.5
	1 ♀	97	63+	16.5
Bakhtiari	1 ♂	104	69	17
	3 ♀	95, 96.5, 98.5	62+, 63, 66	16, 16.5, 17
Borazjan	1 ♂	104+	67+	17.5
<i>darica</i>				
Fars	9 ♂	107-113 <sup>e</sup> (109+)	69-75 (72+)	17 -18 <sup>f</sup> (17.7)
	4 ♀	99-104 <sup>e</sup> (102+)	66-69 (67+)	16.5-17 <sup>f</sup> (16.7)
Yezd	4 ♂	108-112 <sup>g</sup> (109.8)	70-78 (72.8)	All, 18
	2 ♀	104, 106	67, 70	16.5, 17.5
Laristan	3 ♂	101, 102, 102	66, 68, 71	16, 16.5, 16.8
	5 ♀	93-100 <sup>h</sup> ( 96.8)	58-66 (61.7)	14.5-16 <sup>h</sup> (15.7)
Type of <i>darica</i> (Shiraz, Fars)	♂	108	69	18
<i>iranica</i>				
Balvard	1 ♂	117.5 <sup>l</sup>	77	18
	2 ♀	103, 104	65, 65	16, 16.5
Kirman region	5 ♂	105-112 <sup>i</sup> (108.0)	68-76 (71.2)	16.8-18 <sup>j</sup> (17.5)
	4 ♀	97-104 <sup>i</sup> ( 99.7)	60-70 (65.7)	17 -18 <sup>j</sup> (17.2)
S. E. of Kirman	5 ♂	101-111 <sup>k</sup> (105.0)	67-74 (70.0)	16 -18.5 <sup>i</sup> (17.5)
	6 ♀	96-101 <sup>k</sup> ( 98.9)	63-68 (65.1)	15.5-18 <sup>i</sup> (16.5)
Persian Baluchis- tan and Makran	8 ♂	98-111 <sup>m</sup> (105.5)	60-68 (64.1)	17.5-18.5 <sup>n</sup> (18.0)
	5 ♀	96-106 <sup>m</sup> ( 98.2)	55-66 (61.4)	16 -18.2 <sup>n</sup> (17.0)
Khorasan	10 ♂	100-112 <sup>o</sup> (107.1)	60-73 (68.0)	16.2-18.5 <sup>p</sup> (17.8)
	7 ♀	100-106 <sup>o</sup> (101.8)	60-70 (66.3)	15.5-17.5 <sup>p</sup> (16.8)
Karaj	1 ♀	98	64	15.5
Seistan and Farah	2 ♂	100, 107	67, 67	16.8, 16.8
	2 ♀	100, 104	63, 65	16.5, 16.5
Kandahar	8 ♂	101-111 <sup>q</sup> (105.5)	61-71 (66.6)	15.5-18 <sup>q</sup> (17.4)
	2 ♀	102, 103	63, 66	15, 16.5
<i>phoenicuroides</i>				
Afghanistan (E. of Kabul)	1 ♂	101+	66+	17
	2 ♀	96+, 99+	63+, 63+	16.5, 17.5
Lower Sind	1 ♂	102	64	16.5
	1 ♀	94.5	60	15.5
<i>orientalis</i>				
N. Afghanistan	2 ♂	109, 110+	68, 72+	16.5, 17
	4 ♀	100-105 <sup>r</sup> (103+)	59-67+ (64+)	15.5-16.2 <sup>r</sup> (15.7)
Seistan (see text)	♀	102	60	16.5
<i>parvirostris</i>				
Transcaspia (Dzhebel)	8*	99-106 <sup>s</sup> (102.5)	57-67 (62.0)	14 -16.2 <sup>s</sup> (14.8)
	1 ♀	97	60	15

consists of only three specimens, it shows that in this region *iranica* tends towards the paler *darica* which replaces it to the west.

In view of the great range of *iranica* and the geographical variation it seems desirable to restrict the type locality to a definite locality, and I do so to Hurmuk in Persian Baluchistan in the heart of the range. Ticehurst (*loc. cit.*) implies that Persian Makran is the type locality. This is incorrect. Zarudny merely states (1911, *Messenger Ornith.*, p. 111 [in Russian]) that in naming *iranica* he "has in view Hartert's No. 355. *Ammomanes deserti* subsp. nov.?" (1904, *loc. cit.*). Zarudny's specimens "proceed out of the limits of Persia proper," and Hartert gives for the range of his unnamed form "East-Persia, from the Straits of Hormuz to Baluchistan and Afghanistan."

*Ammomanes deserti phoenicuroides* Blyth (1853, type locality, Kashmir). The range of this race follows the border of western India from Kashmir to Sind. According to Ticehurst (*loc. cit.*) it occurs in Baluchistan as far west as Las Bela in the south and Bolan Pass and Fort Sandeman in the north; west of the Bolan Pass, at Kalat and Quetta, as also at Kandahar, it intergrades with *iranica*.

I have seen too few specimens of this race. Two birds from Soneri Lake in Sind in still rather fresh plumage taken on December 6 to 7 are distinctly browner than in *iranica*, lacking the characteristic grayish tinge. Three specimens taken on May 10 and 29 east of

Kabul are too badly worn, two are quite brownish, but the other is gray and quite inseparable from similarly worn specimens of *iranica*. The measurements of these five specimens appear to be a little smaller than in *iranica*, which, Ticehurst states, averages larger than *phoenicuroides*.

*Ammomanes deserti parvirostris* Hartert (1890, type locality, Kuba Dag near Krasnovodsk, eastern shore of the Caspian). This race, which Dementiev (*loc. cit.*) states ranges in Transcaspia from the Kara Bugaz Bay south to the Kopet Dag and the Atrek, has a shorter bill, on an average somewhat less thick, than in the other races discussed. My specimens from Dzhebel, a station on the Transcaspian Railway near Balaishem, are clay colored, very similar to *darica*, slightly darker above but slightly paler below. However, the Dzhebel specimens were taken in 1896 and 1905, and if the skins were not so old the color difference might be better marked. They are a little paler than, and lack the brownish tinge of, *phoenicuroides*.

Only one specimen of *parvirostris* was collected by Koelz, an immature male taken at Garmah on August 6. This locality is on the Atrek a little to the north and east of Bujnurd and about 65 kilometers west of the Quchan plain where *orientalis* is said to be sporadic. When this specimen is compared with other immatures of *orientalis* collected on August 24 and September 10 in northern

\* Wing: males, 94, 94, 97, 97.5, 98, 98, 98, 99, 99, 99, 99.5; females, 92, 93, 93, 93.5, 94, 94, 95, 96, 99.

<sup>b</sup> Bill: 11 males, 15.5, 16, 16, 16, 16.2, 16.5, 16.5, 17.5, 17.5, 18.5; females, 13, 13.5, 14, 14.5, 14.5, 15.5, 16, 16.2, 17.5.

<sup>c</sup> Wing: males, 103, 104, 105, 107, 107, 107, 108; females, 96, 96.5, 98, 99, 99.

<sup>d</sup> Bill: males, 16, 16.5, 16.5, 17, 17, 17.2, 18; females, 14.5, 15.2, 16, 16, 16.2.

<sup>e</sup> Wing: males, 107, 108, 108, 108, 108+, 109+, 112, 113; females, 99+, 102+, 103, 104.

<sup>f</sup> Bill: males, 17, 17, 17.5, 17.5, 18, 18, 18, 18; females, 16.5, 16.5, 17, 17.

<sup>g</sup> Wing: males, 108, 109, 110, 112.

<sup>h</sup> Wing: females, 93, 96, 97, 98, 100. Bill: females, 14.5, 16, 16, 16, 16.

<sup>i</sup> Wing: males, 105, 107, 108, 109, 112; females, 97, 98, 100, 104.

<sup>j</sup> Bill: males, 16.8, 17, 17.5, 18, 18; females, 17, 17, 17, 18.

<sup>k</sup> Wing: males, 101, 104, 104, 105, 111; females, 96, 99, 99, 99, 99, 101.

<sup>l</sup> Bill: males, 16, 17.2, 18, 18, 18.5; females, 15.5, 16, 16, 16.2, 17, 18.

<sup>m</sup> Wing: males, 98, 98, 102, 107, 108, 110, 110, 111; females, 96, 96, 96, 97, 106.

<sup>n</sup> Bill: males, 17.5, 17.5, 17.5, 18, 18.2, 18.5, 18.5, 18.5; females, 16, 16.5, 17, 17.2, 18.2.

<sup>o</sup> Wing: males, 100, 105, 105, 105, 106, 107, 110, 110, 111, 112; females, 100, 101, 101, 101, 101, 102.5, 106.

<sup>p</sup> Bill: 15 males, 16.2, 17, 17.5, 17.5, 17.5, 17.5, 18, 18, 18, 18, 18.2, 18.2, 18.2, 18.5; 15 females, 15.5, 16, 16, 16, 16, 16.5, 16.5, 16.8, 16.8, 17, 17, 17, 17, 17, 17.5.

<sup>q</sup> Wing: males, 101, 104, 104, 105, 105, 106, 108, 111. Bill: 7 males, 15.5, 17.2, 17.5, 17.5, 18, 18, 18.

<sup>r</sup> Wing: females, 100, 103, 104, 105+ Bill: females, 15.5, 15.5, 15.5, 16.2.

<sup>s</sup> Unsexed. Wing: 99, 99, 100, 103, 103.5, 104, 105, 106. Bill: 14, 14.5, 14.5, 14.5, 14.7, 15, 15.2, 16.2.

Afghanistan, the darker and more clay-like coloration contrasts sharply from the very pale sandy of *orientalis*.

**MOLT, CLASS A:** The molt apparently starts towards the middle or end of July and is completed by the end of September. No July specimens are available except two immatures from southern Khorasan and Persian Baluchistan which had not started to molt by July 17 and 20. Between this date and August 24, only one specimen was examined, the immature of *parvirostris* taken on August 6; in this specimen the molt is just starting, but it is very far advanced or nearly ended in a long series of *iranica* taken in various parts of eastern Iran from August 26 to September 26. In these specimens, apparently all adult, the body plumage has been entirely renewed or shows only a very few last traces of molt, the wing and tail, however, being not quite fully grown. In the region of Sabzawar the molt is over in three specimens out of five on September 22 to 23. It is virtually over in two adults of *orientalis* taken in Afghan Turkestan on September 4, and far advanced in a September 10 adult of *fraterculus* from Palestine. But during this same period four immatures of *orientalis* taken on August 24 to September 10 show no signs whatever of starting to molt.

***Ammomanes deserti cheesmani* Meinertzhagen**

IRAN: Kermanshah: Qasr i Shirin, December 28, 1940–January 7, 1941, 7 ♂, 5 ♀. Khuzistan: Ahwaz, April 20, 1940, 1 ♂, 1 ♀ "breeding." Bakhtiari: Mulikaulia, April 26, 1 ♂, 2 ♀ "breeding"; Labisufed, April 27, 1 ♀ "laying."

***Ammomanes deserti darica* Koelz**

IRAN: Yezd: Yezd, February 20, 1940, 1 ♂; Shir Kuh, Dehibala, February 22–23, 3 ♂, 2 ♀. Fars: Eglit, March 8, 4 ♂, 2 ♀; Persepolis, March 12, 2 ♂, 1 ♀; Shiraz, March 15, 1 ♂ (the type of *A. d. darica*), April 5, 1 ♂, 1 ♀; Niriz, March 28, 1 ♂ (all Fars birds "paired, nesting, or breeding"). Laristan: Isin, December 17–19, 1939, 3 ♂, 5 ♀.

***Ammomanes deserti iranica* Zarudny**

IRAN: Kirman: Saadatabad, December 23, 1939, 1 ♀; Balvard, December 30–31, 1 ♂, 2 ♀; Dehibala, January 6, 1940, 1 ♂, Khabis, January 9–13, 1 ♂, 1 ♀; Chaharfarsakh, January 14–15, 1 ♂, 3 ♀; Dehishib, January 17, 1 ♂; Kirman, January 19, 1 ♂. Kirman, southeast: Chesh-

maedzi, February 1–2, 2 ♂, 4 ♀, 1 unsexed ad. [♀], 1 unsexed ad.; Cheshmaeduzdan, February 8, 1 ♂; Guragan, February 10, 1 ♂; Darzin, February 15, 1 ♂, 1 ♀. Khorasan: Firdaus, August 27–30, 4 ♂, 5 ♀; Robat i Khan, September 1–2, 3 ♂, 3 ♀; Khaur, September 4, 4 ♀; Baghi Jar, September 22, 1 unsexed ad. [♂], 1 ♀, 1 unsexed ad.; Sabzawar, September 23, 1 ♀, 1 unsexed ad.; Zedar, September 25, 1 ♂; Shahrud, September 26, 1 ♂. Region of Tehran: Karaj, November 7, 1945, 1 ♀.

AFGHANISTAN: Seistan: Farah, October 30–November 9, 1937, 2 ♂, 1 ♀. Kandahar, October 17–26, 7 ♂, 2 ♀.

***Ammomanes deserti parvirostris* Hartert**

IRAN: Northern Khorasan: Garmah, August 6, 1940, 1 imm. ♂.

***Ammomanes deserti orientalis***

Zarudny and Loudon

AFGHANISTAN: Northern: Tale [Tala], December 10, 1937, 1 ♂, 3 ♀; Kamard, August 24, 1939, 1 imm. ♀; Chigzar, September 10, 2 imm. ♂, 1 imm. ♀. Afghan Turkestan: Tashkurghan, September 4, 1937, 1 ♂, 1 ♀.

***Ammomanes deserti phoenicuroides* Blyth**

EASTERN AFGHANISTAN, EAST OF KABUL: Turuk Pul, May 10, 1937, 1 ♀ "laying"; Nazhil [Najil], May 29, 1 ♂, 1 ♀.

INDIA: Sind: Soneri Lake, December 6–7, 1 ♂, 1 ♀.

**AMMOMANES CINCTURUS AND  
AMMOMANES PHOENICURUS**

Hartert in "Die Vögel der paläarktischen Fauna" holds that these two forms are conspecific. *A. phoenicurus* is an Indian form the range of which extends, in the west, to Kutch and Hissar in southern Punjab. On the other side of the presumably impassable barrier of the Rann and the Thar Desert it is replaced by *A. cincturus* which reaches all the way to the Cape Verde Islands. Hartert admits that the two forms are strongly differentiated, but holds that they are linked by a detail in the pigmentation of the easternmost race (*zarudnyi*) of *cincturus*. Examination, however, shows very convincingly that this detail is quite trivial and that the two forms are undoubtedly separate species.

Bates in 1935 (Bull. Brit. Ornith. Club, vol. 55, p. 139) said that he "counted" *phoenicurus* "as a distinct species," but since



he gave no reasons and the recent authors in Indian ornithology still follow the views of Hartert, the differences may be stated below.

Throughout its range, *cincturus* (divided into nominate *cincturus*, Cape Verde; *arenicolor*, north Africa to Arabia; *kinneari*, Sudan; and *zarudnyi*, eastern Iran to Sind) is, in spite of its long wing, a considerably smaller bird, with a very pale, adaptive, cryptic coloration. *A. phoenicurus* (divided into nominate *phoenicurus* for its more northern populations and *testaceus* for the populations from approximately latitude 16° S.) is very strongly colored. It is well, instead of very faintly, streaked on the throat and upper breast, its tail pattern is very sharp and bold, and its wing is dark brown except for a narrow and limited band of rufous on the outer border of the inner web, and a very narrow edging on the outer web. In *cincturus* the whole wing is rufous except for dusky tips; in the easternmost race (*zarudnyi*) these dusky tips are a little darker, and this dusky is continued, but only faintly or much reduced, along the insides of the inner web.

Varying degrees of rufous are common in the wing of many larks, but the wing pattern of nominate *phoenicurus* and *testaceus* does not fit at all in the range of the geographical variation of *cincturus*, whereas that of *zarudnyi* does very well. It seems extreme, therefore, to base the conspecificity of the two forms on the sole basis of a slight increase in pigmentation which is in no sense intermediate between the dark wing of *phoenicurus* and the pale wing of *cincturus*. In addition to the abrupt differences in coloration, there are significant differences in structure.

As stated, *cincturus* is a smaller bird, and its bill is very much weaker. The reduction in length is not proportional, and the shape is different. In *phoenicurus* it is more strongly decurved and from two to three times more massive. The bill coloration may not be important, but in skins collected in recent years it remains dark brown, blackish on the top in *phoenicurus*, while it is virtually colorless in *cincturus*.

There is an equally well-marked difference in wing formula. In *cincturus* the second outer primary is always longer than the sixth (in 18 specimens: 3.5 to 8 mm., average

4.6). In *phoenicurus* it is usually shorter, less often equal, rarely longer (in 45 specimens: shorter in 26, equal to in 15, longer in four by 1 to 2 mm., average 1.4). In *cincturus* the first primary is slightly longer than the primary coverts (1.5 to 3 mm.), in *phoenicurus* it is distinctly longer (9 to 12 mm.). The difference in the shape of the wing tip does not seem to be adaptive, for apparently neither form is migratory, and the smaller bird has the more pointed wing. This study has shown definitely that in closely related larks a difference in wing formula is almost always a very good specific character.

#### *Ammomanes cincturus zarudnyi* Hartert

IRAN: Kirman: Balvard, December 31, 1939, 1 ♂; Kirman, January 18, 1940, 1 ♀. Khorasan: Firdaus, August 27–29, 3 ♂, 6 ♀, 1 unsexed ad.; Robat i Khan, September 2, 1 ♂; 25 miles east of Robat i Khan, 1 ♂, 2 ♀, 1 unsexed ad.; Khaur, September 4, 1 ♀; Tabas, September 7, 1 ♀; Gunabad, September 9, 1 ♂, 3 ♀.

All these specimens, except the two from Kirman and one taken on September 2 at Robat i Khan in which the molt is barely over, are in the last stage of the molt. The body plumage seems to have been all replaced, and in the bloom of this perfectly fresh plumage the specimens are very delicately and pleasingly tinged with warm, buffy gray. With wear and bleaching this color is lost, the specimens become sandy, the dusky tips of the wing and tail pale, and the dusky on the inside on the inner web of the wing feathers fades almost completely, the whole wing becoming rufous except at the very tips.

An old specimen taken south of Sehwan in Sind in 1875 is identical with the most faded of the specimens taken by Zarudny around the turn of the century in southern Khorasan and the region of Bam in southeastern Kirman.

MOLT, CLASS A: (See above.)

#### *Ammomanes phoenicurus phoenicurus* Franklin

INDIA: Junagadh: Sasan, January 31–February 4, 1949, 2 ♂, 1 ♀. Kathiawar: Sihor, January 27, 1 ♂. Bhopal: Sanchi, January 2, 1938, 1 ♂. Surguja: Gargori, October 21, 1947, 1 ♂. Central Provinces: Bina, February 20, 1946, 1 ♂; Bheraghat, February 28–March 22, 7 ♂, 1 ♀, May 7,

TABLE 8  
MEASUREMENTS IN *Ammomanes phoenicurus* AND *A. cincturus zarudnyi*

Form	N	Wing	Tail	Bill from Skull
<i>A. p. phoenicurus</i>	24 ♂	101+--113 (105.7)	57-69 (60.5)	17 -19 (17.6)
	4 ♀	98 -101 ( 99.3)	54-59 (58.0)	16 -17 (16.3)
<i>A. p. testaceus</i>	9 ♂	102 -112 (106.9)	58-64 (62.0)	16.5-20 (18.3)
	5 ♀	99 -102 (101.4)	57-59 (57.5)	16 -18 (17.1)
Type of <i>testaceus</i> (Salem)	♂	108	64	18
<i>A. c. zarudnyi</i>	8 ♂	98.5-104 (101.2)	52-59 (56.3)	13.5-14.5 <sup>a</sup> (14.0)
	9 ♀	92 - 99 ( 95.0)	51-61 (55.3)	12 -14 <sup>b</sup> (13.1)
Type of <i>zarudnyi</i> (Mudjanabad, Khorasan)	♀	97	57	13

<sup>a</sup> Fourteen specimens.

<sup>b</sup> Twenty-two specimens.

1 imm. ♂, November 13-December 24, 2 ♂; Bichhia, October 6-8, 1 ♂, 1 ♀; Bar Nawapara, March 12, 1949, 1 ♂ "breeding." Northern Bombay Presidency: Surat, February 27, 2 ♂.

#### *Ammomanes phoenicurus testaceus* Koelz

INDIA: Southern Bombay Presidency: Hubli, March 19, 1948, 1 ♀. Madras Presidency: Ellore, February 2, 1937, 2 ♂, 1 ♀; Kodur, March 18, 1 ♂; Sidhout, March 21-22, 1 ♀, 1 unsexed nestling; Hospet, March 25, 1 ♀; Salem, March 7, 1948, 1 ♂, March 8, 1 ♂ (the type of *A. p. testaceus*), March 9, 1 ♂.

The two races differ in coloration, and *testaceus* (1951, Amer. Mus. Novitates, no. 1510, p. 3; type locality, Salem, Madras) averages perhaps very slightly larger (table 8). In specimens in comparative plumage taken in recent years, populations from Hubli in the west through the Bellary district of Madras to Ellore on the east, south to Mandya in southern Mysore and Salem are more rufous than the northern populations. The difference is slight but distinct and constant. It is shown above and below: above, the northern populations (nominate *phoenicurus*) are grayer, and below they are less bright, duller, and grayer.

In addition to the regions listed, specimens of the northern populations have also been examined from Indore and the Hamirpur district of the United Provinces. All the specimens of both races are in moderately worn (end of October to the end of December) to worn plumage (end of January to the end

of March). A worn specimen taken on February 4 in Junagadh is as rufous above as in *testaceus* but is duller below. In *testaceus* the southernmost populations, those of Mysore and Salem, are the brightest and reddest below.

No molting specimens of this species have been examined.

#### GENUS ALAEMON

##### *Alaemon alaudipes doriae* Salvadori

IRAN: Fars: Surmag, March 7, 1940, 2 ad. ♂. Kirman: Saadatabad, December 23, 1939, 3 ad. ♂; Teserj, December 25, 1 ad. ♀; Saidabad, December 28-29, 4 ad. ♂, 3 subad. ♂, 4 subad. ♀; Darzin, February 15, 1940, 2 subad. ♂, 1 ad. ♀, 1 subad. (?) ♀, 1 unsexed ad. Southern Khorasan: Tabas, August 31, 1 ad. ♂, 1 subad. ♂; Robat i Khan, September 1-2, 1 ad. ♂, 1 ad. ♀; Khaur, September 4, 1 subad. ♀.

AFGHANISTAN: Seistan: Khang, November 1, 1937, 1 ad. ♂, 1 ad. ♀; Salyan, November 6, 1 ad. ♂. Southern: Girishk, October 29, 1 ad. ♂.

INDIA: Sind: Soneri Lake, December 5, 1939, 1 ad. ♂.

This form is larger than nominate *alaudipes*, which replaces it to the west from northern Arabia to Morocco, and *A. a. desertorum* examined from the Red Sea coast and British Somaliland. In coloration it is a little grayer and darker than the first and a little less brownish than the latter. In comparative plumage all the specimens examined from Surmag in Fars eastward to Sind are identical in coloration and have similar measure-

ments (table 9). The spotting on the breast varies individually and becomes more prominent with wear, the whole plumage also becoming rather grayer and "streakier" with wear. The type locality of *doriae* is Bandar Abbas, and the specimens from Saadatabad were taken at about 100 kilometers to the north. In addition to the Koelz specimens, I have examined a series collected by Zarudny in Persian Baluchistan, Persian Seistan, and southern Khorasan.

Salvadori described this form apparently

northwestern Iran and the Zagros. However, Zarudny's "northwestern region" is one of his most unhappy faunistic divisions of Iran, for he includes in it, with the regions of Tehran, Qum, and Kashan, which are oases on the edge of the desert, the whole of Azerbaijan, a much wetter region with different affinities. His "Zagros Region" stretches from Kermanshah to Niriz, but Fars is drier than farther west in the Zagros, and the bird probably does not occur in the Zagros proper but at such localities as Surmag on the plains

TABLE 9  
MEASUREMENTS OF FULL ADULTS (VERY WORN SPECIMENS NOT INCLUDED)  
IN SOME POPULATIONS OF *Alaemon alaudipes doriae*

Region	N	Wing	Tail	Bill from Skull
Fars	2 ♂	138, 143	93, 94	36, 39
Kirman	7 ♂	138-144 (140.3)	90-100 (96.4)	34.5-40 (36.7)
	2 ♀	129, 137	88+, 97	32, 35.5
Persian Baluchistan	4 ♂	139-142 (140.2)	90-100 (95.3)	33-38 (35.5)
	1 ♀	131	90	34
Persian Seistan	6 ♂	140-143 (141.3)	90-99 (95.2)	34-38 (35.8)
	2 ♀	124+, 125+	82+, 85+	30, 32
Afghanistan (Seistan and south)	3 ♂	139, 143, 146	97, 101, 107	36, 36, 38
S. Khorasan	1 ♀	138	90	34
	1 ♂	140	101+	34-37.5* (35.7)
	1 ♀	Molt	Molt	35
Sind	1 ♂	134	95	36

\* Four specimens.

INDIVIDUAL MEASUREMENTS, ADULT AND SUBADULT MALES: Kirman, wing, adults: 138, 138, 139, 140, 141, 142, 144; subadults, 131, 132, 133, 136, 142. Kirman, bill: adults, 34.5, 35.5, 36, 36.5, 37, 37.5, 40; subadults, 35, 35.5, 35.5, 36, 36.5. Southern Khorasan, wing: adults, 135 (very worn), 140 (worn); subadults, 117, 127. Southern Khorasan, bill: adults, 34, 35, 36.5, 37.5; subadults, 31.5, 32. Seistan, juvenal male: wing, 121, bill, 29.

from an immature or a subadult specimen, for the measurements he gives (wing 112, tail 77, culmen 24) are too small for an adult. Two specimens that I have measured, an immature from Seistan and a subadult from Khorasan, have rather similar measurements: wing, 117, 121; tail, 77, 82; exposed culmen, 24, 25.

Kutch and Sind are the eastern limits of the range of the species; in Afghanistan it is restricted to the southern desert and in Iran the northern limits are southern Khorasan and possibly the regions of Tehran, Qum, and Kashan. The distribution in Iran as given by Zarudny in his distributional list is misleading. This author (1911, Jour. Ornith., vol. 59, p. 211) lists *doriae* as nesting in

on the northern side of the Zagros where Koelz collected it.

MOLT AND PLUMAGES, CLASS B: Ticehurst (1923, Ibis, p. 13) has mentioned that the postjuvinal molt is partial and is limited to the body plumage. The first winter plumage has not been described. In this plumage specimens are distinguishable from adults only by their tail and wing feathers. The tail feathers are more pointed and narrower, and the primaries are more rounded and less pointed at the tips. Ticehurst's statement concerning the length of the outer primary is confusing; in my first winter specimens this feather is slightly longer than in the adult, distinctly broader, and distinctly less pointed. In the first winter bird the whole wing tip is

rounder as the second outer primary and the seventh are proportionately longer. The outer webs of the primaries are narrowly but distinctly edged with buffy. These buffy markings are found on the tips of the first seven outer primaries and at the tips of the tail feathers, and are broadest at the tip of the seventh outer primary. In the adult this feather is broadly tipped with pure white and all of the quills are blacker, less brown.

Specimens in first winter plumage usually have shorter bills and measure smaller (table 9).

After the second summer these first winter birds have a complete molt. This molt probably starts in early August. The only molting specimens examined in *doriae* were specimens, adult and subadult, taken from August 31 to September 2 in southern Khorasan, and in these the molt of the body plumage was over, and the wing and tail feathers were about two-thirds grown. In another race (*desertorum*) a specimen from British Somaliland was at about the same stage on October 1.

#### GENUS CALANDRELLA

##### CALANDRELLA RUFESCENS

Six races have been described from Iran, Afghanistan, and neighboring regions. From west to east: *heinei* Homeyer, 1873 (the *pispoletta* of authors), type locality, Volga region; *pseudobaetica* Stegmann, 1932, type locality, Kopa-siva, Kurdistan [apparently between Mosul and Rezaieh]; *persica* Sharpe, 1890, type locality, Niriz, Fars; *seistanica* Zarudny and Loudon, 1904, no type or type locality designated, but all the specimens are from "Seistan," probably Persian Seistan; *minuta* Zarudny and Loudon, 1904, no type or type locality, based on four fall migrants taken in Iran, the first listed being from Isfahan; *leucophaea* Severtzow, 1873, type locality, "Turkestan," probably Russian Turkestan.

According to the descriptions *pseudobaetica* is smaller than *heinei*, is darker, grayish brown above, and is sharply and darkly streaked; *persica* has a heavier bill than the above and is distinctly paler, sandy brown above; *seistanica* has a shorter and thicker bill than *persica*, is considerably paler above, and has more white on the outer

rectrices; *minuta* is like *heinei* but is much smaller and has a smaller bill; *leucophaea* is pale, grayish, less heavily streaked above and has white outer tail feathers and a very small bill.

*Calandrella rufescens* is, on the whole, less migratory than *C. cinerea*, but as it is migratory in the regions where the six races have been described, comparisons must be limited to birds taken during the breeding season. Unfortunately, the only specimens available to me from this season are two from the lower Volga, a small series from Luristan in the Zagros, and a long one taken by Zarudny in Seistan. Although limited, this material shows that *seistanica* is certainly not sufficiently distinct from *persica* to warrant separation. I believe also that *minuta* is merely a name for small-sized winter visitors of *heinei*.

Table 10 shows that the Seistan populations do not have a smaller bill than the specimens of *persica* taken at Karaj in June and in Luristan in April and May. The Karaj birds are labeled "breeding" and those from Luristan as "paired" or as having the "gonads enlarged" and "oviducts swollen." The March specimens from Luristan and Fars and the December birds from Kirman have bills identical with those of the breeding birds. On this basis and on that of coloration they are without a doubt *persica* also. The bill in these specimens measures for 15 males 13.5 to 15 (14.0), while it measures 14 to 15.8 (14.8) in my 20 males from Seistan and 13.9 to 15.7 (14.6) in the 28 males from this region measured by Zarudny. The difference in averages is extremely slight, and the overlap in individual measurements is virtually complete. There are no differences in the shape of the bill, and I am unable to confirm any difference in the coloration of the plumage. The size of the white wedge on the outer rectrices varies a great deal individually and within the same limits in both populations.

All of the October specimens from Mukur in southeastern Afghanistan match very closely the sandy brown coloration of the relatively fresh December specimens of *persica* from Kirman, but their bill is less thick and is shorter than in any population or series of this race examined. They cannot be winter visitors of *leucophaea* from Russian Turke-

stan, for specimens of this race examined are very pale and gray, not sandy, and their outer tail feathers are virtually pure white. Nor can they be *seebohmi* from Chinese Turkestan, for, although this race is sandy also, a specimen from Kaschgaria labeled as being "very typical" has a much smaller and thinner bill. Also, *seebohmi* does not appear to be migratory, Ludlow stating that it is "resident in the plains of Chinese Turkestan throughout the year" (1933, *Ibis*, p. 682). On the basis of coloration I refer the Mukur specimens to *persica*.

The breeding range of *persica* apparently extends in the west to southern Iraq, where Ticehurst reports that a large-billed, sandy juvenal was collected at Zobeir on June 28 (1926, *Jour. Bombay Nat. Hist. Soc.*, vol. 31, p. 96). The Rothschild Collection contains two juvenal specimens of *persica* from Fao, one of which is mentioned by Ticehurst; both lack month and date of collection, but had probably bred locally as they are in immature plumage and are starting to molt.

In describing *minuta*, Zarudny and Loudon state "Diese Form ist noch unsicher." It is based on four specimens taken on November 16 to 26 which, according to Hartert, Bianchi states are only small specimens of *heinei* (1921, *Die Vögel der paläarktischen Fauna*, p. 2081). I see no reason for questioning Bianchi and accepting *minuta*, but Hartert makes a point of mentioning two specimens that he has examined from eastern Iran, which, he says, are so small that they cannot possibly be *heinei*. He suggests further that a small form may visit Iran from some unknown breeding region. But the only specimen with Hartert's notations to that effect found in the Rothschild Collection is a somewhat aberrant specimen of *persica*. This specimen, sexed as male, was collected on December 26 [January 8] by Zarudny in Seistan. It is identified as *persica* on the original label. This I believe to be correct, for, although small, the wing measures 96 and the bill 13.5, measurements that fit into the range of variation of *persica*. Its bill, however, is less thick, and the coloration is darker and grayer than in most *persica*, the coloration but not the shape and size of the bill being very close to that of winter specimens from Palestine identified as *minor*.

In describing *pseudobaetica* Stegmann gives the wing length of nine specimens as 87 to 95 mm. The measurements given are not separated for individuals or for sex. The November specimens in table 10 from Azerbaijan, Luristan, and Afghan Seistan are all dark grayish brown in coloration, but appear to be too large for the published measurements of *pseudobaetica*. Their bill is small and similar to that of *heinei*. I cannot, unfortunately, compare the coloration, as specimens of *heinei* in fresh plumage are not available. On the basis of measurements and shape and size of the bill, however, I refer them to *heinei*. The three series are not uniform. That from Azerbaijan is darkest and most sharply streaked, but two out of 10 specimens are paler and match the Luristan series which averages a little paler, while out of six Seistan specimens, one is as dark as the darkest specimen from Azerbaijan, three are as in the Luristan series, and the other two are the palest of all. The differences appear to be more than just a case of individual variation, and these winter visitors come no doubt from different small-billed populations.

Concerning *leucophaea*, two Russian authors, Stachanow and Spangenberg, have shown in a very interesting paper (1931, *Kócsag*, vol. 4, pp. 59-65) that this form and *pispoletta* [= *heinei*] overlap in western Russian Turkestan, in the part of the Syr Daria region north of the Kyzyl Kum. They show that the two forms are sharply differentiated morphologically and have different ecological requirements. They state, however, that Sushkin has reported hybrids and conclude that *leucophaea*, if not a separate species, is a borderline case.

Stachanow and Spangenberg do not mention a difference in wing formula. I have seen too few specimens of *leucophaea* to be sure, but in those that I have seen there is slight but distinct difference. In *rufescens* (*heinei* and *persica*) the outermost (i.e., second), third, and fourth primaries are equal to, or the fourth is about 2 mm. shorter than, the third, and the fifth is from 7 to 9 mm. shorter than the longest; in *leucophaea* the second is equal to, or slightly shorter than, the third, and the fifth is closer to the longest than in *rufescens*, only 3 to 4 mm. shorter. These differences are slight and may not hold, but

TABLE 10  
MEASUREMENTS OF ADULTS IN SOME RACES OF *Calandrella rufescens*

Race and Region	Collecting Dates	N	Wing	Individual Bill Measurements
<i>heinei</i>				
Lower Volga	May 1-10	1 ♂	98	11
		1 ♀	97	11
Azerbaijan	Nov. 7	3 ♂	97.5, 99, 100	11.5, 12, 12.5
		7 ♀	89 - 94.5 ( 91.9)	11.5, 11.5, 11.5, 11.8, 12, 12, 12, 12
Luristan	Nov. 28-30	1 ♂	98	12
		6 ♀	89 - 96 ( 92.9)	11, 12, 12, 12, 12, 12.5
Seistan	Nov. 1-8	2 ♂	100, 105	12, 12.8
		4 ♀	92 - 100 ( 94.6)	12, 12, 12.2, 13
<i>persica</i>				
Karaj	June 6-11	2 ♂	100, 101	13.5, 14
Luristan	Mar. 24-28	4 ♂	99 - 104 (101.1)	13.5, 14, 14.5, 15
Luristan	Apr. 3-May 4	3 ♂	100, 101, 102	13.5, 13.5, 14
		2 ♀	88, 94	13.5, 13.8
Fars	Mar. 8	2 ♂	104, 105	14, 15
Kirman	Dec. 29	4 ♂	92 - 102.5 ( 99.1)	13.5, 13.5, 13.8, 14
Seistan	May 7-July 8	20 ♂	94 - 102 ( 98.0)	14, 14, 14.5, 14.5, 14.5, 14.5, 14.5, 14.5, 14.5, 14.8, 15, 15, 15, 15, 15, 15, 15.2, 15.2, 15.8 (14.8)
		3 ♀	91, 95, 96	14, 14, 14
Seistan*	No dates	28 ♂	89.3-105 ( 97.0)	13.9, 14, 14.1, 14.2, 14.2, 14.2, 14.3, 14.3, 14.3, 14.3, 14.3, 14.4, 14.4, 14.4, 14.6, 14.6, 14.6, 14.6, 14.7, 14.7, 14.9, 15.2, 15.3, 15.3, 15.4, 15.5, 15.5, 15.7 (14.6)
		9 ♀	91 - 102 ( 93.9)	13.2, 13.6, 14, 14.3, 14.4, 14.5, 14.6, 14.6, 15.3 (14.3)
S. E. Afghanistan	Oct. 10-11	2 ♂	99.5, 102	13, 13.5
		4 ♀	92 - 96 ( 94.5)	12.2, 12.5, 13, 13.2
<i>leucophaea</i>				
Perowsk	Mar. 5	1 ♀	94	12
Amu Daria	Sept. 4	1 ♂	94	11.8
<i>seebohmi</i>				
Kaschgaria	Apr. 29	1 ♀	93	12.5

\* Zarudny and Loudon, 1904, Ornith. Jahrb., vol. 15, pp. 223-224.

they are mentioned, for a difference in wing formula appears to be a good specific character in closely related larks. Further study may show that *leucophaea* and the related *seebohmi* are a separate species.

**MOLT, CLASS A:** The only dated molting specimens examined are three adults of *persica*. In two males from Bid in Persian Baluchistan taken on June 23 [July 6] the molt is just starting in the body plumage and inner wing. In another male taken on September 25 [October 8] in Seistan the molt of the

body plumage has been completed but not that of the wing and tail. The specimens taken by Koelz at Mukur were taken on October 10 to 11, but the molt has been completed, the plumage beginning to show, in fact, some slight signs of wear.

***Calandrella rufescens heinei* Homeyer**

IRAN: Azerbaijan: November 7, 1940, 3 ♂, 7 ♀.  
Luristan: Durud, November 28-30, 1942, 1 ♂, 6 ♀.

AFGHANISTAN: Seistan: Kang, November 1,

1937, 1 ♂, 1 ♀, 1 unsexed ad. [ ♀ ]; Farah, November 8, 1 ♂, 1 ♀, 1 unsexed ad. [ ♀ ].

***Calandrella rufescens persica* Sharpe**

IRAN: Region of Tehran: Karaj, June 6-11, 1943, 2 ♂ "breeding." Luristan: Durud, March 24-28, 1941, 4 ♂, April 3-May 4, 3 ♂, 2 ♀ "paired" or in breeding condition. Fars: Eglit, March 8, 1940, 2 ♂. Kirman: Saidabad, December 29, 1939, 4 ♂.

AFGHANISTAN: Southeast: Mukur, October 10-11, 1937, 2 ♂, 4 ♀.

**CALANDRELLA CINEREA AND  
CALANDRELLA ACUTIROSTRIS**

With the exception of Meinertzhagen (1951), all authors now recognize that *C. cinerea* and *C. acutirostris* are separate species. Their breeding range probably overlaps in Russian Turkestan, and it does so widely in eastern Tibet. The two species are distinguished by an important difference in the shape of the wing tip, the wing being more pointed in *cinerea* where the fourth primary is considerably shorter than the second and third, whereas in *acutirostris* the second, third, and fourth are of about equal length.

Meinertzhagen holds that there is no proof that the two breed in the same area and believes that the difference in the shape of the wing tip is purely adaptive. However, Schäfer (1938, Jour. Ornith., vol. 86, special no., pp. 182-184) has demonstrated conclusively that in eastern Tibet the two species breed beside one another and at the same altitudes. I have examined three specimens of *cinerea* in worn breeding plumage from the Issyk Kul, Russian Turkestan, and Hellmayr (1929, Field Mus. Nat. Hist., zool. ser., vol. 17, p. 67) quotes Bianchi as stating that Severtzow collected breeding *acutirostris* directly to the west of the Issyk Kul in the Talas-tau and in the Chatkal-tau.

The shape of the wing tip is not merely adaptive, since *C. cinerea* and *C. acutirostris* live at the same altitudes in some regions and are both migratory, the migration of the populations from central Asia being similar, both species going to central India. According to Meinertzhagen the wing tip may be more pointed in *cinerea*, for this species is more of a bird of the desert and may, as are all desert species, be forced often to fly long distances for food and water. In *cinerea*, the races *longipennis*, which occurs in the semi-

deserts of Russian Turkestan, and *dukhunensis*, which occurs on the grassy highlands of central Asia, have an identical wing tip. In the range of *longipennis* are found two other species of larks (*Alauda arvensis* and *A. gulgula*) that are as closely related to each other as *C. cinerea* is to *C. acutirostris*. These three larks are presumably subjected to the same conditions, but *dulcivox* in *A. arvensis* has a long and pointed wing, whereas *inconspicua* in *A. gulgula* has a short and round wing. In *A. arvensis* and in *A. gulgula* there is also direct evidence that the shape of the wing tip is not always correlated to the presence or lack of migratory movements. It appears that, in larks at any rate, the shape of the wing tip is a species character that is not necessarily adapted to local ecological conditions.

**CALANDRELLA CINEREA**

In the Palearctic region this species breeds from southern Morocco, the Mediterranean region and southern Russia eastward to northwestern Manchuria, including Transcaucasia, Iran, Afghanistan, Transcaspia, the Caspian-Aral-Kirghiz Steppes, Russian Turkestan, the region of the Altai, Dzungaria, Tibet, northern Gobi, northwestern Mongolia, and the Transbaikal region. The more northern and especially the eastern populations are highly migratory, the migration reaching Africa to the Sahara, Sudan, and northeast Africa, Arabia, India south to about latitude 16° N., northern Burma, and eastern China, strays occurring in western Europe, including the British Isles.

A large series of 482 specimens was examined, 200 of these having been collected by Koelz in Iran, Afghanistan, and India. In addition, the other more important series are from southern Morocco, southwestern Algeria, the Mediterranean region including the Near East, southern Transcaspia, Djarkent and region, and from eastern Iran taken by Zarudny.

Geographical variation involves both coloration and size. It is not abrupt in either case. In size (table 11) the wing length of the various populations is similar except that the wing averages distinctly longer in the more eastern *dukhunensis* which lives in higher regions and has a long migration; the bill is thickest in this race and *longipennis*, aver-



aging shortest in the last. In coloration the western races (*rubiginosa*, *brachydactyla*, and *hermonensis*) are tinged with a varying amount of rufous; the races of western and central Asia (*artemisiana* and *longipennis*) are gray without rufous above, except for a very slight suggestion limited to the crown in *artemisiana*, and are whiter below; while the most eastern (*dukhunensis*) is brownest above and most buffy below.

It will be noticed that two more races (*rubiginosa* and *artemisiana*) are recognized than are recognized by Hartert and subsequent authors. On the other hand, "*orientalis*" Sushkin appears to be a renaming of *longipennis*, and the characters given for "*puii*" Yamashina (1939, *Tori*, vol. 10, no. 49, p. 472) are not diagnostic.

Individual variation is rather great, but taken in series the differences between the various races are quite evident, except in the case of some populations that are intermediate between *artemisiana* and *longipennis*. Unfortunately, owing to the factor of migration, comparisons must be limited to birds taken during the breeding season, and at this time the plumage is worn, often badly so. Geographical variation in the series examined appears to be as follows:

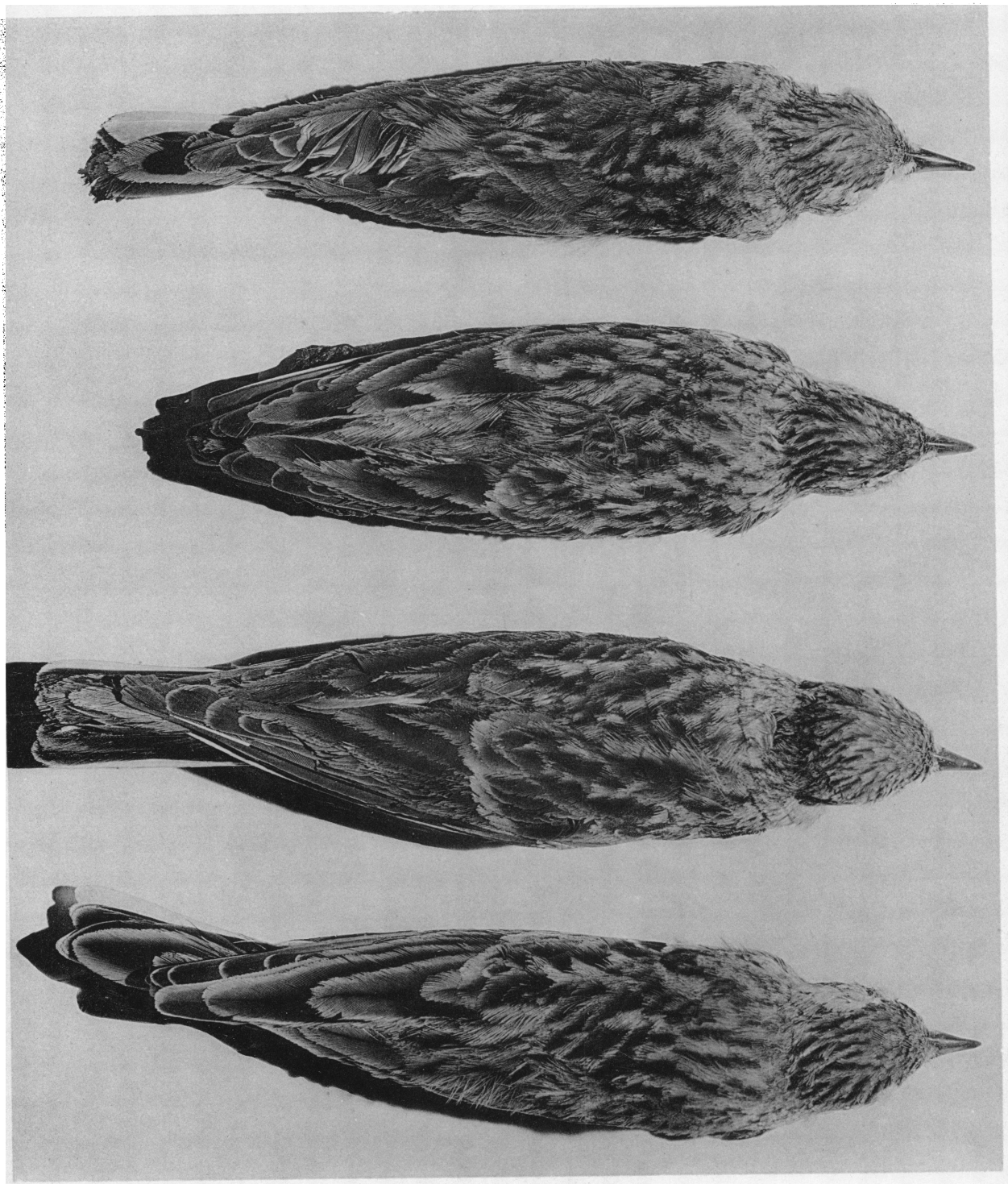
*Calandrella cinerea brachydactyla*, *rubiginosa*, and *hermonensis*. Populations of *brachydactyla* from Spain, Italy, Yugoslavia, and Mediterranean islands are darker than those of either *rubiginosa* or *hermonensis*. Populations of *rubiginosa* from southern Morocco and southwestern Algeria are more rufous throughout, and the crown especially is redder than in *brachydactyla*. Populations of *hermonensis* from Lebanon and Palestine are least rufous, grayer than *brachydactyla*, and, of 18 specimens examined, 14 lack the reddish crown, which is invariably present in *rubiginosa* and almost always present to a varying degree in *brachydactyla* (54 out of 62 breeding specimens). Although *rubiginosa* and *hermonensis* have been made synonymous it is obvious, therefore, that both are valid and perfectly recognizable races.

*Calandrella cinerea longipennis*, *artemisiana*, and "*orientalis*." Until Sushkin's description of "*orientalis*," all the gray populations from Asia were lumped under *longipennis*, including the Iranian populations. My breed-

ing material from western and central Asia consists of one specimen from Tiflis in Transcaucasia, a long series from Luristan in the Zagros, Fars, Persian Baluchistan, and Khorasan, a smaller series from southern Transcaspia, and a good one from Djarkent and region. One glance is sufficient to discover that two perfectly distinct races are represented. Of the two extremes, the population of Luristan and Fars in the west and the one from Djarkent in the east, the former is distinctly paler, less brown, more clayish gray in color, whiter below, and with a whiter, more prominent stripe over and behind the eye. On the crown and whole back it is less broadly streaked and has a very faint but constant rufous tinge on the crown not present in any specimens from Djarkent. There is a conspicuous difference in the shape of the bill and a lesser one in length. In the western populations (pl. 17) it is more pointed and compressed laterally as well as longer.

The characters of my western population are matched by the characters described for *artemisiana* by Banjkovski based on specimens taken in the region of Tiflis (1913, *Mitt. Kaukasus Mus.*, vol. 7, p. 232, pl. 2, fig. 3). The photograph given by Banjkovski shows that the bill is identical in *artemisiana* and in my specimens. The amount of white on the outer rectrices mentioned by Banjkovski is, however, a poor character, as it varies a great deal individually and within the same limits in all populations. I am aware that Banjkovski was comparing his specimens not with *longipennis* but with *brachydactyla* from southwestern Europe. However, Tiflis neighbors upon Iran, and since the diagnosis of *artemisiana* differentiates equally well between my Luristan and Djarkent populations, I believe this name can be applied to the Iranian population. There is an older name, unfortunately a *nomen nudum*, for a southern Transcaspian bird which is aptly descriptive; and there is also Homeyer's *syriaca* (1873) based on Brehm's "pale Syrian Lark," but as no type was designated, Brehm's bird cannot really be identified.

The type locality of *longipennis* is Dzungaria. No specimens from this region are available, but in considering my birds from Djarkent to be typical *longipennis* I am sup-



Shape of the bill in some races of *Calandrella cinerea*. From top to bottom: *C. c. artemisiana*, female; Iran, Luristan: Durud, May 24. *C. c. longipennis*, female; Russian Turkestan, Ili River region, April 10. *C. c. brachydactyla*, male; Italy, Florence, May 25. *C. c. dukhunensis*, male; Kashmir, Rupshu: Debring, September 27



ported by Sushkin's description of "*orientalis*" which seems to be a redescription of true *longipennis*. Sushkin (1925, List of . . . birds of the Russian Altai, p. 68) describes for "*orientalis*" exactly the same differences that I find separate my Djarkent population from my *artemisiana* population from Luristan-Fars, that is, "darker, more brownish above and more broadly striated." Sushkin was misled by his comparative material, for the specimens he takes to be *longipennis* and with which he compares "*orientalis*" were not taken in Dzungaria, but far to the west in the middle Kirghiz Steppes and the Turgai and Ural Provinces of the Caspian region. From Sushkin's description these specimens appear to me to be *artemisiana*, or close to it. Koslowa (1933, Ibis, p. 80) grudgingly accepts "*orientalis*," but adds confusion when she states it breeds in "Tchungaria" which, I assume, is the same as Dzungaria.

Actually, it is possible that north of the Altai, and from there on east, the populations differ (Johansen, 1944, Jour. Ornith., vol. 92, p. 96). However, the characters indicated so far by Sushkin and Johansen fail to distinguish "*orientalis*" from *longipennis*. Kinnear (1933, Ibis, p. 682) writing on the birds of Chinese Turkestan states that on the basis of the material in the British Museum he is "unable to distinguish *C. b. orientalis* of Sushkin."

Not all the Iranian populations are "true" *artemisiana*, the Persian Baluchistan, Khorasan, and the southern Transcaspian populations being to an increasing degree intermediate between this race and *longipennis*. This is true in the case of the bill and appears to be so in coloration, but in the Persian Baluchistan and Khorasan series I have too many specimens that are far advanced through the molt and are no longer comparable. Those that are still worn and even the great majority of those that are in the first bloom of the plumage are too pale for *longipennis*. As the two populations from Iran appear to be closer to *artemisiana* they are referred to this race, and the population of southern Transcaspia is referred to *longipennis*.

Two specimens taken at Eregli, Asia Minor, on May 11 have the long, thin bill and the pale coloration of the birds of Luristan-Fars. The tentative breeding range of *artemisiana*

can then be drawn as from the steppes of the Caspian-Aral region and Ural Province (probably), west to the Caucasus, Transcaucasia, and Asia Minor, south and east to western, southern, and southeastern Iran, the populations of Khorasan, southern Transcaspia, and northern Afghanistan being intermediate between *artemisiana* and *longipennis* to a varying degree.

*Calandrella cinerea dukhunensis*, and "*puii*." No breeding specimens of *dukhunensis* are available, but owing to the characteristically heavy pigmentation, particularly that of the under parts, the identity of winter visitors is never in doubt.

The population of northwestern Manchuria has been separated from "*orientalis*" by Yamashina as *puii* on the sole basis of being larger (90.5–98 mm. in "*puii*" for eight males and two females as against Sushkin's published measurements of "*orientalis*," "♂ 88.5–93, ♀ 81.5–84 after 12 specimens"). The measurements as stated are not comparative, and Yamashina's measurements do not appear conclusive, especially if they be contrasted with the measurements of the Djarkent population (table 11) which, on the basis of coloration, appear to be the same as "*orientalis*."

#### MIGRANTS OR BIRDS TAKEN OUT OF BREEDING SEASON

Individual variation and the seasonal change in the plumage which hides the characteristic differences of the breeding season do not permit the identification of all specimens. The specimens examined are distributed and appear to be as follows:

In Africa all the specimens taken from February 2 to April 21 appear to be *brachydactyla* in the north (Morocco, Algeria, Tunisia, and Cyrenaica); in the south (southern Morocco and southern Algeria, Sahara to Zinder in the Niger, southern Egypt and Sudan) half of the specimens appear to be *brachydactyla* but the others are redder and could be *rubiginosa*; during the same period two "typical" *longipennis* were taken, one in southern Algeria on March 7 and the other in the Sahara on April 3. In the Red Sea districts of the Sudan in October, and in British Somaliland in February, the specimens appear to be *hermonensis*.

No specimens from Arabia are available.

In Europe and the Near East the following were examined: from Palestine, one specimen of *artemisiana* taken on September 11 and one of *longipennis* taken on September 26; from Smyrna one specimen of *artemisiana* taken on December 20, and one from Pskov in western Russia taken on April 16. At Athens a typical *artemisiana* was taken on May 10; barring error this specimen was probably a straggler, or ailing.

In Iran all fall or early spring birds are typical *artemisiana* except for two characteristically dark and thickly billed *longipennis* collected on September 20 at Nishabur in northern Khorasan.

In Afghanistan all specimens appear to be *longipennis* except for a very pale *artemisiana* collected on October 30 at Farah in Seistan; *artemisiana* is the breeding race across the border in Persian Seistan and in Persian Baluchistan. The specimens taken from August 29 to September 13 in Afghanistan were possibly still on their breeding grounds. These, and the specimens taken later, are dark and rather broadly streaked but, on an average, the bill is less thick than in *longipennis* from Djarkent. According to Meinertzhagen (1938, Ibis, p. 512) the breeding population of Afghanistan as well as the winter visitors is *longipennis*. The breeding population, however, may be closer to the Transcaspiian populations of *longipennis* than to the populations of this race that breed farther east.

*Calandrella cinerea dukhunensis* breeds in Tibet, and winter visitors appear in various parts of India. Those collected by Koelz are given in the list of specimens; in addition to these, typical *dukhunensis* have also been examined from Nepal (no date), Sikkim (October 6), northern Bihar (March 31), northern Burma (April 8 to 9), and one specimen taken on April 11 on Shaweishan Island off the mouth of the Yangtze.

Specimens of *longipennis* with the characteristic short and thick bill have been examined from Patiala and Lahore in the Punjab (January 25–February 15), Hissar in southern Punjab (January 24–March 15), and Jodhpur and Sirohi in Rajputana (December 15 to 30). A series of 23 specimens taken in Sind from January 18 to March 7 is interesting. It is already in worn plumage and permits

comparison. As a series it is paler and not so heavily streaked as *longipennis* from Djarkent, and the bill is longer (table 11) and not so thick; in six specimens the bill is as long and as pointed as in *artemisiana*. These visitors may be a mixed flock of *longipennis* and *artemisiana*, but as the plumage is not characteristic of either, I am inclined to think that they are visitors from a region of Transcaspiawhere the populations are intermediate.

With Ticehurst (1927, Jour. Bombay Nat. Hist. Soc., vol. 32, p. 353) I question the identification of *brachydactyla* in India. No specimens of this race have been examined by me from India. In view of the individual variation in the species it seems preferable to drop this race from the Indian list.

MOLT: (Class A, *longipennis* and *artemisiana*; class C, *dukhunensis*.) The Asiatic races of *C. cinerea* have two types of molt. The first two have only the "regular," one annual molt, while *dukhunensis* has an additional, very full, partial, prenuptial molt of the body plumage. This prenuptial molt, which occurs also in a related species (*C. acutirostris*), was first reported by Whistler (1941, Ibis, p. 174) who observed it in specimens of *cinerea* taken in India from the end of January to the middle of March. In the specimens of *dukhunensis* that I have examined, all those taken at Ellore on February 2 are molting all of the crown and throat feathers; in some all of the body plumage is molting as well, including the greater wing coverts and upper tail coverts.

No specimens of *dukhunensis* going through the complete fall molt were available. In the specimens of *artemisiana* from Iran this molt appears to start late in July and seems to end towards the end of September in both adult and juvenal. It is already well started or far advanced in specimens taken in Khorasan from August 6 to 14, far advanced in specimens taken from August 6 to 22 in Persian Baluchistan, and in the very last stages on September 10 in Khorasan and on the 19 in Luristan. In some specimens it is already over by August 27 to September 11.

#### *Calandrella cinerea artemisiana* Banjkovski

IRAN: Luristan: Durud, March 21–May 4, 1941, 16 ♂, 2 ♀, May 23–25, 1940, 6 ♂, 1 imm. ♂, 2 ♀, September 19, 1941, 3 ♂, 1 ♀; Burujird,

TABLE 11  
MEASUREMENTS IN ADULT *Calandrella cinerea*

Race, Region or Locality	Collecting Dates	N	Wing	N	Bill from Skull
Breeding or on breeding grounds <sup>a</sup>					
<i>rubiginosa</i>					
S. Morocco and S. W.					
Algeria	May 2– June 14	10 ♂ 6 ♀	92 – 96 (94.2) 87 – 90 (88.7)	10 ♂ 6 ♀	14 –16 (14.9) 13.5–15 (14.3)
<i>brachydactyla</i>					
Italy and Yugoslavia	Apr. 7– May 25	10 ♂ 10 ♀	94 – 98 (95.5) 88 – 98 (92.5)	10 ♂ 10 ♀	14 –15.5 (14.6) 13 –14.5 (14.0)
<i>hermonensis</i>					
Lebanon and Palestine	May 17– June 15	14 ♂ 4 ♀	90 – 98 (93.9) 88 – 93 (90.0)	14 ♂ 4 ♀	13.5–16 (14.5) 13.5–14.5 (13.9)
<i>artemisiana</i>					
Tiflis	May 17	1 ♂	95	1 ♂	14.2
Eregli	May 11	<sup>b</sup>	95, 100	<sup>b</sup>	15, 15
Luristan and Fars	Mar. <sup>c</sup> 21– May 25	26 ♂ 7 ♀	93 –100 (96.3) 87 – 95 (90.6)	23 ♂ 8 ♀	14.2–15.5 (14.9) 13.8–15.5 (14.7)
Persian					
Baluchistan	May 16– Aug. 13 <sup>d</sup>	7 ♂ 2 ♀	88 – 98 (92.5) 91, 91	7 ♂ 2 ♀	12.5–14.5 (13.8) 12.8, 13
Khorasan	Apr. 23– Aug. 15 <sup>e</sup>	9 ♂ 6 ♀	92 – 98 (94.7) 87 – 93 (89.4)	19 ♂ 11 ♀	12.5–14.8 (13.9) 12.5–14.2 (13.4)
<i>longipennis</i>					
S. Transcaspia	Mar. 21– Sept. 1	5 ♂ 2 ♀	90 – 96 (93.2) 87, 90	5 ♂ 2 ♀	12.8–14 (13.4) 12.5, 13.5
Djarkent and region	Apr. 2– Aug. 16 <sup>f</sup>	10 ♂ 4 ♀	91 – 96 (93.2) 86 – 90 (87.5)	10 ♂ 4 ♀	12 –14 (12.9) 12 –14 (12.9)
Winter visitors, mostly in very fresh plumage					
<i>longipennis</i>					
Afghanistan	Aug. 29– Oct. 13 <sup>g</sup>	17 ♂ 7 ♀	91 – 97.5 (95.0) 86 – 92 (89.3)	17 ♂ 7 ♀	12.5–14.5 (13.4) 12.5–14 (13.1)
S. Punjab and Rajputana	Dec. 15– Mar. 15	10 ♂ 3 ♀	90 – 97 (93.5) 85, 89, 90	10 ♂ 3 ♀	12.5–14 (13.0) 12.5, 13, 13
Sind	Jan. 18– Mar. 7	15 ♂ 8 ♀	91 – 98 (95.1) 85 – 96 (90.0)	15 ♂ 8 ♀	13 –15 (14.1) 12.5–14.5 (13.6)
<i>dukhnensis</i>					
Baltistan and Ladak	Sept. 9–20	13 ♂ 8 ♀	93 –102 (98.5) 93 – 97 (94.5)	13 ♂ 8 ♀	13.2–15 (13.8) 12.5–14 (13.5)
Zaskar	Sept. 23– Oct. 2	22 ♂ 9 ♀	95 –102 (99.6) 93 – 98 (94.5)	21 ♂ 9 ♀	13 –14 (13.5) 12.5–14 (13.4)
Rupshu	Sept. 27–28	9 ♂ 4 ♀	95 –103 (99.0) 94 – 98 (96.3)	9 ♂ 4 ♀	13 –14 (13.4) 12.5–13.5 (13.1)
Spiti and Lahul	Sept. 10– Oct. 2	25 ♂ 5 ♀	94 –103.5 (99.6) 92.5– 97 (95.2)	25 ♂ 5 ♀	12.5–14.5 (13.6) 12.5–14 (13.5)
Central Provinces	Jan. 17	1 ♂ 1 ♀	101 98	1 ♂ 1 ♀	15 13.5
Madras (Ellore)	Feb. 2	9 ♂ 2 ♀	96 –101 (98.5) 98, 100	9 ♂ 2 ♀	13.8–15 (14.2) 13.5, 14

<sup>a</sup> Specimens in worn plumage before the postnuptial molt. Specimens going through this molt are assumed to be on their breeding grounds; numbers and dates of such specimens are given in the footnotes.

<sup>b</sup> Unsexed.

<sup>c</sup> March specimens are labeled "breeding" or "nesting"; includes four molting specimens from August 20 to September 19.

<sup>d</sup> Includes five molting specimens from August 7 to September 30.

<sup>e</sup> Includes 16 molting specimens from August 27 to September 11.

<sup>f</sup> Includes one specimen from September 17 in fresh plumage.

<sup>g</sup> The specimens from August 29 to September 13, and possibly the others also, may be resident.

August 20, 1942, 1 ♀, September 29–October 1, 1941, 4 ♂, 1 ♀. Fars: Jahrum, March 22, 1940, 1 ♂, 1 unsexed ad.; Bushire, April 13, 1 ♀. Khorasan: Garmah, August 6, 1940, 2 ♂, 1 imm. ♂, 2 ♀; Fariman, August 14, 3 ♂, 1 ♀; Firdaus, August 27–30, 5 ♂, 2 ♀, 1 unsexed ad.; Gunabad, September 9, 1 ♀; Turbat i Haidari, September 10–11, 1 ♂, 2 ♀.

AFGHANISTAN: Seistan: Farah, October 30, 1937, 1 ♀.

***Calandrella cinerea longipennis* Eversmann**

IRAN: Khorasan: Nishabur, September 20, 1940, 1 ♂, 1 ♀.

AFGHANISTAN: Northern: Aq Cha, September 8, 1937, 3 ♂, 1 ♀; Sar i Pul, September 13, 1 ♀; Balkh, September 18, 1 ♂; Sabz Pass, August 29, 1939, 1 ♀; Shanbashak Pass, September 1, 1 ♀; Chahar Aulia, September 6, 1 ♀; Cheshmaegawan, September 9, 4 ♂; Aq Kupruk, September 12, 1 ♂; Mak, October 3, 1 ♂. Eastern: Bagrami, September 28–October 1, 1937, 3 ♂, 1 ♀. Southern: Mukur, October 10–11, 2 ♂; Kalat i Ghilzai, October 13, 2 ♂, 1 ♀.

INDIA: Patiala: Moonak, January 25, 1948, 1 ♀. Punjab: Lahore, February 13–14, 1933, 2 ♂. Hissar: Sirsa, January 24–February 26, 5 ♂, 1 ♀; Parwali, February 28, 1 ♂; Darba, March 15, 1 ♀, 1 unsexed ad. Rajputana, Jodhpur: Rohit, December 15, 1948, 1 ♂. Rajputana, Sirahi: Anadra, December 30, 1 ♂. Sind: Khinjar Lake, January 18–March 2, 1934, 14 ♂, 8 ♀; Karachi, March 7, 1 ♂.

***Calandrella cinerea dukhunensis* Sykes**

INDIA: Kashmir, Baltistan: Karzong, September 13, 1936, 4 ♂, 3 ♀. Kashmir, Ladak: Shyok Valley, Kampuk, September 9, 2 ♂, 1 ♀; Leh, September 16, 1 ♀; Pituk, September 19–20, 7 ♂, 3 ♀. Kashmir, Zaskar: Cha, September 23–27, 1931, 8 ♂, 1 ♀, 1 unsexed ad. [♀]; Trangse, September 29, 8 ♂, 7 ♀; Kargiak, September 30–October 2, 4 ♂, 1 unsexed ad. [♂]. Kashmir, Rupshu: Debring, September 27, 1936, 8 ♂, 3 ♀; Rogchin, September 27–28, 1 ♂, 1 ♀. Northern Punjab, Spiti: Kibor, September 10, 1933, 1 ♂; Kahze, September 12, 22 ♂, 5 ♀; Mane, September 22, 1 ♂. Northern Punjab, Lahul: Ramjak, October 2, 1931, 1 ♂. Central Provinces: Bheraghat, January 17, 1947, 1 ♂, 1 ♀. Madras: Ellore, February 2, 9 ♂, 2 ♀.

***CALANDRELLA ACUTIROSTRIS***

There has been a great deal of discussion as to the validity of *tibetana* Brooks, 1880 (type locality, "Thibet beyond Sikkim"), and as to the identity of the populations from the

various parts of Kashmir. Whistler (1932, Ibis, p. 478) cites the various papers and comes to the conclusion that there is but one form identical with *acutirostris* Hume, 1873, described from the upper Karakash just north of the Sughet Pass in the Kuenlun north of the Karakoram. Hellmayr (*loc. cit.*) had eight specimens from the Sughet Range, including three topotypes taken on June 27, 1925; these three topotypes have been kindly lent to me by the Chicago Natural History Museum. He states that on comparing these eight specimens "with a long series of *C. tibetana* Brooks, including the type, from Sikkim and southern Tibet (Mt. Everest region), I fail to see any constant difference in the extent of the white area on the outer tail feather, which seems to vary within the same limits in the two series. Whether other color distinctions exist, is hard to say, as no fresh autumn specimens from the Sughet Range (*acutirostris*) are available. Breeding birds from the Mt. Everest region are certainly indistinguishable in coloration from those in corresponding plumage taken in the Karakash Valley." Whistler had 47 additional specimens not available to Hellmayr. These specimens are from Karakoram, Baltistan, Ladak, Rupshu, Spiti, and Lahul, but he does not say in what state of plumage they are.

I hesitate to reopen the question, but neither Hellmayr nor Whistler had specimens from both of the extremes of the range of *acutirostris*, north central Afghanistan in the west and eastern Tibet and Kuku Nor in the east. Examination also shows that Kashmir is badly situated to decide the question, for, generally speaking, a cline of decreasing pigmentation and increasing size runs from west to east, and the populations of Kashmir are either mixed or intermediate to a varying degree. Hellmayr was aware that no definite conclusions could be reached in the case of the populations of Kashmir, for he lacked specimens in fresh plumage from the Sughet Range. Whistler ignores or at least fails to mention the fact that in this species differences apparent in the fresh plumage are apt to disappear or are greatly modified by wear.

Altogether 100 adults taken during or just after the breeding season have been examined. Specimens from both ends of the range appear to be clearly separable. I lack



specimens from the eastern end, but according to the characters given by Schäfer (1939, Proc. Acad. Nat. Sci. Philadelphia, vol. 90, p. 200) for the population of Jyekundo [Yushu] in eastern Tibet, and the measurements of the population of Kuku Nor given by Meise (1937, Jour. Ornith., vol. 85, p. 491), the eastern populations appear to be larger, are paler and purer gray in coloration, and have more white in the tail. Schäfer and Meise both, correctly I think, identify their specimens as *tibetana*. The population of north

i Turkestan); Kashmir in Gilgit, Baltistan, Ladak, Zaskar, Rupshu; Spiti in northern Punjab; and one undated but very fresh specimen comes from southern Tibet north of Sikkim. The specimens from Afghanistan are darkest and brownest. A single specimen from Gilgit is identical with the Afghan population. The amount of white on the inner web of the outer rectrices varies individually, but the specimens from Afghanistan have the least amount of white (table 12). Specimens from southern Tibet (*tibetana*) and Ladak

TABLE 12  
RELATIVE AMOUNT<sup>a</sup> OF "WHITE" ON THE INNER WEB OF THE OUTER  
PAIR OF RECTRICES IN ADULT *Calandrella acutirostris*

Region	Least	Intermediate	Most
North central Afghanistan	6	1	—
Eastern Afghanistan	2	—	—
Afghanistan (Badakhshan)	5	3	—
Gilgit	—	1	—
Sughet Pass	—	3	—
Baltistan	1	3	1
Zaskar	6	10	4
Rupshu	2	10	5
Lahul	—	5	1
Spiti	1	1	—
Ladak	2	5	7
Southern Tibet	—	1	3
Sikkim	—	1	—
Eastern Tibet	—	—	<sup>b</sup>

<sup>a</sup> Least means that the pale wedge extending upward from the pale tip along the shaft is virtually missing or very narrow and short, about 1 to 2 mm. wide by less than 20 mm. in length; tip and wedge creamy or pale fulvous, becoming whiter with wear but not pure white. Most means that the tip and wedge are pure, or almost pure, white, about 4 to 5 mm. wide by about 25 to 30 mm. long.

<sup>b</sup> "Largest and purest," Schäfer (1939, Proc. Acad. Nat. Sci. Philadelphia, vol. 90, p. 201).

central Afghanistan is darker, brownish rather than grayish, and has less white in the tail. This population may be separable from nominate *acutirostris*, but, as I lack topotypical specimens of the latter in fresh plumage, I must identify it provisionally as nominate *acutirostris* to which it seems closest.

The populations of Kashmir are not identical, although stated to be so by Whistler. The variation is described below. Specimens in very fresh plumage (some are just finishing the molt) taken from August 24 to October 3 (most of them in early to middle September) are available from north central Afghanistan (Sabz Pass west to Sufak in the eastern Bend

are identical and are distinctly paler and gray-er. Specimens from Zaskar and Rupshu are intermediate, duller and less grayish than the southern Tibet-Ladak population, and less dark and less brownish than the Afghan-Gilgit population. The Zaskar series is mixed; out of 13 specimens seven are more brownish and six are more grayish. A single specimen from Baltistan and all the specimens from Rupshu are perhaps closer to the paler specimens from Zaskar. Of three specimens from Spiti, one is grayish, another brownish and darker, while in the third the molt is not sufficiently advanced.

Compare this distribution to that of *Eremo-*

TABLE 13  
MEASUREMENTS OF ADULTS THAT ARE BREEDING OR ARE ON THE  
BREEDING GROUNDS IN *Calandrella acutirostris*

Race and Region	N	Wing	Tail	Bill from Skull
<i>acutirostris</i>				
S. Khorasan	1 ♂	94+	57+	16
N. Afghanistan	4 ♂	90+–95+ (93+)	56+–62+ (60+)	14 –15 <sup>a</sup> (14.5)
	2 ♀	88.5, 93	55, 59	14.8, 15
E. Afghanistan (S. of Hindu Kush)	1 ♂	90+	56	14.8
	1 ♀	87	60	14
N. E. Afghanistan (Badakhshan)	4 ♂	88+–95+ (92+)	57+–64+ (59+)	14 –16 <sup>b</sup> (15.3)
	3 ♀	85+, 87+, 89+	55+, 55+, 56+	14.5, 14.5, 15
Sughet Range	3 ♂	94, 95, 95	59, 59, 62	15, 15.5, 15.5
Baltistan	3 ♂	91+, 94+, molt	56+, 61+, molt	14, 15, 15.2
	2 ♀	88+, molt	59+, molt	14, 15
Zaskar	11 ♂	89+–96 (92+)	54+–62 (59+)	13 –16 <sup>c</sup> (14.6)
	2 ♀	88+, 88+	57+, 59+	14 –14.5 <sup>d</sup> (14.2)
Rupshu	8 ♂	90 –95 (92.5)	56 –62 (57.9)	14.2–15.2 <sup>e</sup> (15.0)
	9 ♀	86.5–93 (88.8)	50 –58 (54.7)	13.5–15 (14.3)
Lahul	5 ♂	91 –95+ (93+)	55 –63+ (59+)	14 –16 (14.8)
	1 ♀	—	54+	14.5
<i>tibetana</i>				
Ladak	8 ♂	89+–94+ (91+)	53+–62+ (58+)	13.5–15.2 (14.6)
	6 ♀	87+–91+ (89+)	53+–58+ (55+)	13.5–15.5 (14.5)
Sikkim	1 ♀	96	59	14
S. Tibet	1 ♀	94, 96, 96.5	62, 63, 64	14.5–15.5 <sup>f</sup> (15.1)
E. Tibet <sup>g</sup>	35 <sup>i</sup>	95 – 100 (97)	—	—
Kuku Nor <sup>j</sup>	4 ♂	98, 98, 98, 100	All, 64	—
	2 ♀	91, 95	59+, 61+	—

<sup>a</sup> Five specimens.

<sup>b</sup> Six specimens.

<sup>c</sup> Sixteen specimens.

<sup>d</sup> Four specimens.

<sup>e</sup> Ten specimens.

<sup>f</sup> Unsexed.

<sup>g</sup> Four specimens.

<sup>h</sup> Schäfer (1939, Proc. Acad. Nat. Sci. Philadelphia, vol. 90, p. 200).

<sup>i</sup> Not separated as to sex.

<sup>j</sup> Meise (1937, Jour. Ornith., vol. 85, p. 491).

*phila alpestris* (fig. 3) where a somewhat similar division prevails: the population of eastern Ladak is identical with that of Sikkim; the Rupshu population is intermediate; while the populations ranging northward to the Karakoram, in the west of Kashmir, in the Zaskar Range, and to the south of it are similar.

Specimens in worn plumage have been examined from the Sughet Range, northeastern Afghanistan (Badakhshan), eastern Afghanistan south of the Hindu Kush, Baltistan, Ladak, Zaskar, and Rupshu in Kashmir, La-

hul, and Spiti in northern Punjab, and southern Tibet and Sikkim. Owing to the advanced degree of wear during the breeding season the differences in coloration may not be significant and are given here for what they are worth. Although, in the case of most of these populations, the specimens are much too worn to be diagnostic, one trend is still evident: the specimens from Sikkim, southern Tibet, and Ladak appear to be more grayish. The three topotypes of nominate *acutirostris* appear to have been perhaps somewhat less grayish, but in their present state

of plumage I agree with Hellmayr that they are indistinguishable. These three specimens were taken on June 27; the others, from the end of May to the middle of June. Specimens from the end of June and the first week of July in Rupshu and Lahul are definitely browner. Unfortunately, the other populations were taken later in July or in August before the molt and are very badly worn. Two specimens taken on June 11 and 15 in eastern Afghanistan are indistinguishable from the specimens from the Sughet Pass.

It is unfortunate that freshly molted specimens from the Sughet Pass are not available, but, in my opinion, the following conclusions are valid. At least two forms are perfectly recognizable: a paler and grayer form (*tibetana*) from Ladak eastward to Sikkim; it is likely that in this form a still paler, grayer, and slightly larger race may be distinguished in eastern Tibet and Kuku Nor; a darker and browner form (nominate *acutirostris*) from the Sughet Range(?) westward to Gilgit and north central Afghanistan. The populations of Baltistan, Zaskar, Rupshu, and Lahul are intermediate. It is possible that the population of the Sughet Range is itself intermediate and not separable from these populations and that a darker and browner race could be distinguished from Gilgit westward.

*Calandrella acutirostris* can, apparently, be added to the list of the birds breeding in Iran. Zarudny, in his distributional list (1911, Jour. Ornith., vol. 59, p. 212), gives it as a migrant in Iran and as possibly nesting in southern Khorasan. The Rothschild Collection contains an adult male collected by Zarudny at Gulindar on June 16, 1896 [Russian calendar corrected to June 29]. This locality is to the southeast of Birjand. This record has been questioned by Hartert (1918, Novitates Zool., vol. 25, p. 91), probably because the nearest breeding region known to Hartert was in the Pamirs and northern Kashmir, a distance of some 1300 kilometers. Now, however, the distance has been cut to a little less than half by the specimen collected by Koelz at Sufak in the Bend i Turkestan. In this specimen the wing molt is not yet complete, and the bird had probably bred locally. I know of no other records for Iran, and the species must be rare, as Zarudny, despite his June specimen, was not sure it bred in Iran.

In the list of the specimens collected by

Koelz, all the specimens with the exception of those of Ladak are identified as nominate *acutirostris*. In the case of the winter visitors taken in United Provinces, Baroda, and Central Provinces no subspecific identification is attempted, for the plumage, although these specimens were taken from December 15 to February 22, is already too worn, measurements alone are not sufficient, and several specimens were not sexed. It is evident, however, that both forms are represented, some specimens being more grayish while others are more brownish. Two specimens that are distinctly grayish, a male taken in United Provinces and another in Central Provinces, have very long wings, respectively 99 and 100 mm., and are probably visitors from the eastern populations of *tibetana*.

**MOLT, CLASS C:** According to the specimens examined, the complete postnuptial molt takes place from the end of July to the end of September, and is at its height from the end of August to the middle of September. There is no apparent difference between the various regions. In Ladak, one specimen is barely starting to molt on July 25, but in the Shyok Valley one specimen had just started to molt on September 9, while in another specimen with the same date and from the same locality the molt was nearly ended. In north central Afghanistan the molt was almost over by August 29, but in a specimen taken a month later on September 27 at Sufak it had only reached the same stage. In Baltistan, specimens were just starting to molt on August 12 and 13.

As in *C. cinerea dukhunensis* there is a partial "spring" molt of the body plumage. In one specimen taken on December 24 at Bheraghat in Central Provinces, this molt is barely starting with that of the throat feathers.

#### *Calandrella acutirostris acutirostris* Hume

**AFGHANISTAN:** North: Sabz Pass, August 29, 1939, 2 ♂; Baligali Pass [Balaghli], August 30, 1 ♂, 1 ♀; Cheshmaegawan, September 9, 1 ♂, 1 ♀; Sufak, September 27, 1 ♂. Northeast (Badakhshan): Aq Bulaq, July 6, 1937, 2 ♂; Gandacheshma, July 10, 2 ♀; Zebak, July 21-22, 3 ♂, 3 imm. ♂, 1 ♀; Sanglich, July 27, 1 ♂. East (south of Hindu Kush): Charikar, June 11, 1 ♀; Pulayalam, June 15, 1 ♂.

**INDIA:** Kashmir, Baltistan: Skardo, August 12-13, 1936, 1 ♂, 1 ♀; Shigar, August 20, 1 nestling ♀; Upper Tale Valley, August 24, 1 ♀;

Tarkalung, September 5, 1 ♂, 1 imm. ♂; Udmaro, September 6, 1 ♀; Hundar, September 10, 1 imm. ♂. Kashmir, Zaskar: Rangdum, September 11, 1931, 1 ♀; Abring, September 15, 1 ♂, 1 imm. ♀; Hamiling, September 16, 2 ♂; Phe, September 16, 1 ♂; Tiul, September 18, 1 ♀; Mune, September 19, 1 ♂, July 17–22, 1933, 3 ♂, 2 ♀; Cha, September 26–27, 1931, 3 ♂, 1 unsexed ad.; Trangse, September 19, 2 ♂; Lagong, July 11, 1933, 1 ♂; Kargiak, July 15, 1 ♂; Tetha, July 16, 1 ♂. Kashmir, Rupshu: Rachogba, June 23, 1931, 1 ♂, 1 ♀; Kiangchu, June 27, 1 ♀; Tso Kar, June 30–July 1, 3 ♂ 2 ♀, August 18, 1933, 1 ♀; Puga, July 4, 1931, 1 ♀; Korzok, July 7, 1 ♀; Tso Kyun, July 11, 1 ♂, 1 unsexed imm.; Debring, August 15, 1933, 1 ♀, September 27, 1936, 1 ♂, Muldem, August 23, 1933, 1 ♂; Rogchin, September 28, 1936, 2 ♂; Tozeri, October 3, 1 ♂, 1 ♀. Northern Punjab, Lahul: Serchu, June 21–22, 1931, 4 ♂, 1 ♀; Kinlung, August 24, 1933, 1 ♂, 1 unsexed imm. Northern Punjab, Spiti: Lasar, September 3, 1933, 1 imm. ♀; Kiomo, September 4, 1 unsexed imm.; Hanse, September 5, 1 ♂, 1 imm. ♂; Kibor, September 8, 1 imm. ♂; Rangrik, September 11, 1 imm. ♀; Kahze, September 14, 2 ♂.

***Calandrella acutirostris tibetana* Brooks**

INDIA: Kashmir, Ladak: Shushul, July 25, 1931, 1 ♂, 1 ♀, 1 unsexed imm.; Shyok Valley, Kampuk, September 8–9, 1936, 2 ♀, 1 imm. ♀, 1 nestling ♀; Pitug, September 20–21, 2 ♂.

***Calandrella acutirostris* subspecies**

Winter visitors, see text.

INDIA: United Provinces: Kalnahi, February

20–22, 1947, 2 ♂, 1 ♀. Baroda: Sidhpur, January 14, 1949, 1 ♂. Central Provinces: Bheraghat, December 24, 1946, 1 ♂, 3 unsexed ad.; Bina, December 15, 1947, 1 ♂.

***Calandrella raytal adamsi* Hume**

NORTHERN INDIA: Sind: Khinjar Lake, January 17–February 27, 1934, 9 ♂, 6 ♀; Soneri Lake, December 6, 1939, 2 ♂. Punjab: Lahore, February 10–21, 1933, 7 ♂, 2 unsexed [♂], 8 ♀.

***Calandrella raytal raytal* Blyth**

NORTHERN INDIA: United Provinces: Kalnahi (Gorakhpur District), February 15–23, 1947, 6 ♂, 3 ♀. Bihar: Bhagahaghat, February 28, 1 ♂; Muhammadganj, August 20–25, 2 ♂, 2 ♀; Garhwa Road, November 16–18, 2 ♂. Northern Bengal: Siliguri, December 31, 1936, 2 ♂, 1 ♀.

The little Sand Lark of northern India is divided into two races, nominate *raytal* and *adamsi*. These two races are apparently not migratory and are exclusively or very largely limited to sandy banks, sand bars, and mud flats along the larger rivers as well as to tidal flats and the seashore. According to Baker (1926, Fauna of British India, vol. 3, p. 331) they replace each other east and west of the Jumna.

The western race (*adamsi*) which is found in Kutch, Sind, and the Punjab has a shorter, thicker, and less attenuated bill. According to Baker it further differs in series from nominate *raytal* by showing "a very faint

TABLE 14  
MEASUREMENTS IN ADULT *Calandrella raytal*

Race, Region or Locality	N	Wing	Tail	Bill from Skull
<i>adamsi</i>				
Sind	11 ♂	80–85 (83.7)	40–49 (45.0)	12 –14 (13.5)
	6 ♀	78–82 (79.5)	42–45 (42.8)	12 –13 (12.6)
Lahore	9 ♂	84–89 (86.0)	46–51 (48.5)	12.5–14.5 (13.5)
	8 ♀	79–84 (82.9)	43–48 (44.5)	12 –14 (12.6)
<i>raytal</i>				
Cawnpore	3 ♂	78, 83, 85	44, 44, 49	14.5, 16, 16
	1 ♀	79	43	15
Kalnahi, U. P.	6 ♂	78–85 (80.5)	38–46 (40.8)	15 –16 (15.5)
	3 ♀	78, 80, 80	38, 41, 41	14, 15, 15.5
Bihar	5 ♂	83–86 (84.5)	44–49 (45.6)	14.5–17 (15.9)
	2 ♀	79, 80	42, 44	14, 15
N. Bengal	2 ♂	81, 85	43, 45	14, 16
	1 ♀	78	41	14.5
Assam	1 ♂	81	43	15

vinous tinge above, which is absent in the Ganges bird." Apparently not all the populations of *adamsi* show this tinge. In the specimens examined it is lacking in a population from Sind but well shown when a population of *adamsi* from Lahore is compared to one of nominate *raytal* from Kalnahi in the Gorakhpur district of the United Provinces. The Sind birds, however, although lacking the faint but characteristic tinge, are slightly darker as a series than the Kalnahi birds. These three populations were taken from January 17 to February 28, and all the specimens are in comparative plumage.

In addition to the coloration of the upper parts, the measurements also vary geographically in both races. In table 14 it can be seen that in *adamsi* the Lahore population has a longer wing and tail, although the bill length remains identical. In nominate *raytal*, the Bihar population is larger than the Kalnahi population.

Ticehurst (1927, Jour. Bombay Nat. Hist. Soc., vol. 31, p. 875) states that *adamsi* in Baluchistan is probably resident along the Makran coast, since it has been found breeding at Jask on the Persian coast, and that he has examined skins from Bandar Abbas still farther west. It was not collected in Iran either by Koelz or by Zarudny. The statement by Baker (*loc. cit.*) that nominate *raytal* occurs in North-West Province is confusing, since *adamsi* is the resident race in the Punjab. The westernmost specimen of *raytal* examined by me is from Cawnpore in United Provinces.

**MOLT, CLASS A:** No dated molting specimens have been examined, but since Ticehurst (1923, Ibis, p. 16) states that the post-juvenal molt is complete it may belong in class A.

#### GENUS **MELANOCORYPHA**

#### **MELANOCORYPHA BIMACULATA AND MELANOCORYPHA CALANDRA**

In 1938, Meinertzhagen (Ibis, p. 512) treated *bimaculata* and *calandra* as separate species but suggested that they might be conspecific, "the former a highland and the latter a lowland group. Nowhere do they breed in the same area and the differences are only a matter of degree." In his review (1951) he makes them conspecific, emphasizing that, although they often breed quite close to each other in the same region, they

do not associate during the breeding season.

I consider, however, that the two are separate species, as they overlap over a very great region, breed at the same localities, and in the zone of overlap, instead of differing to a matter of degree, they are very sharply differentiated from each other, and hybrids are unknown.

The zone of overlap extends from Asia Minor eastward throughout Iran, northern Afghanistan, and Transcaspia north on the Kirghiz Steppes to Zaisan Nor and occasionally to Semipalatinsk. I have examined breeding specimens of *calandra* from northern Palestine and breeding specimens of *bimaculata* from Lebanon, though these specimens were taken at different altitudes. According to Witherby (1907, Ibis, p. 98) Woosnam collected both in the Zagros at the same locality and on the same day (May 9), *calandra* at 7000 feet and *bimaculata* at 8000 feet, "but the two species were seen together." In northeastern Afghanistan both were collected by Koelz during the breeding season at localities not far removed at an altitude between 2500 to 2700 feet. Finally, I have examined specimens collected at the same date and locality, by Zarudny at Gaudan in Transcaspia on May 13 to 23, and by Koelz at Durud in Luristan, where he collected seven breeding specimens of *bimaculata* on May 20 to 24 and seven breeding specimens of *calandra* on May 24 to 25. Gaudan is at an altitude of about 2700 feet and Durud at about 4800 feet.

In a family in which related species are often only slightly differentiated in the pattern of the plumage, *bimaculata* and *calandra* are separated by striking differences. In *bimaculata* there is no white on the posterior border of the secondaries and no white in the tail except for rather small, buffy tips. In *calandra* the whole of the outer pair of rectrices and the outer web of the next pair are pure white, the posterior border of the secondaries being also broadly margined with pure white. *M. calandra* has a longer wing, with a slightly different wing formula, the third and fourth outer primaries (not counting the rudimentary first) being a little longer than in *bimaculata*. In other closely related species of larks I have found that a difference in wing formula is usually a good species character. There is also a small difference in pro-

portion, the wing/tail index being higher in *calandra*, 42 to 52 (47.5) per cent in 25 specimens as against 39 to 47 (42.8) per cent in 25 specimens of *bimaculata*.

These differences are mentioned because these two related species, which, generally speaking, are so similar, present an interesting ecological situation. Apparently they do not compete as they seem to coexist successfully side by side over a very broad region. This implies a division of the available food supply. Although the bill is rather similar in both, it averages shorter and distinctly stouter in *calandra*. This difference and the difference in body size, as shown by the length of the wing, may be correlated with differences in food. Examples of such correlation are discussed by David Lack (1944, *Ibis*, pp. 260-286).

Obviously the presence as against the absence of the flashing white "signals" is a "releaser." There may be other psychological separating mechanisms and, in certain regions, altitudinal preferences. Johansen (1944, *Jour. Ornith.*, vol. 92, p. 93) mentions differences in the song. There is no doubt at any rate that, from the factual as well as the theoretical viewpoint, the two are separate species and that ecological differences are to be expected.

#### MELANOCORYPHA BIMACULATA

Two races occur in Iran. The first, nominate *bimaculata* Ménétries, 1832 (type locality, Talych), occurs in the northwest and in the Zagros, perhaps as far east as Kirman. The other, *torquata* Blyth, 1847 (type locality, Afghanistan), replaces nominate *bimaculata* from Khorasan eastward.

The latter has always been assumed to be a synonym of nominate *bimaculata*, but comparison of breeding birds from the Zagros to other breeding birds from southern and northern Khorasan, Transcaspia, and eastern Afghanistan shows that in worn plumage the eastern populations (*torquata*) are paler and grayer, the streaks on the upper parts are less dark and heavy, and the rump and upper tail coverts are distinctly more grayish, not rufous. In the Zagros population the pileum is tinged very slightly with rufous and tends to be separated from the upper border of the mantle by an ill-defined pale band lacking or less apparent in the specimens of the eastern

populations. The Zagros population also is larger (table 15), the difference being best marked between the Zagros and Khorasan populations.

Winter visitors in southern Afghanistan, Punjab, and Sind are less worn than the breeding birds but are quite grayish throughout; the streaking on the upper parts varies individually but as a series is less heavy than in nominate *bimaculata*; and all the specimens have the rump and upper tail coverts distinctly grayish.

I am unable to state what the differences in coloration are like in the fresh plumage, because all the specimens from the Zagros are in worn plumage and all the specimens taken by Koelz in Khorasan and in Afghanistan, with the exception of the specimen from the northeast, are in very fresh plumage as they are just finishing or have just finished the molt. The worn specimens from Khorasan and Transcaspia used for comparison were collected by Zarudny at the same time of the year that Koelz took his specimens in the Zagros.

One specimen taken by Koelz on December 31 in southern Kirman already shows a good deal of wear. On that date it may not have been a resident, but its coloration, especially that of the rump and upper tail coverts, is distinctly brownish as in the specimens from the Zagros.

Dementiev (1934, *L'Oiseau*, p. 592) lists *M. bimaculata* as breeding in Russian Turkestan in Transcaspia north to the Kirghiz Steppes and Zaisan Nor. Specimens from the last two regions are not available, but as specimens from Transcaspia are *torquata* the populations from farther east and north probably belong to the same race. It is possible that the winter specimens examined from India were visitors from Turkestan.

Because no specimens of nominate *bimaculata* were available in New York from Talych and northwestern Iran, I hesitated to refer the population of the Zagros to this race, but examination of the specimens in the British Museum showed that the specimens collected by Woosnam in the Zagros from May 9 to 11 and at Saujbulagh in western Azerbaijan on June 8 are identical. Judging by the variation of *M. bimaculata* in Iran it does not seem likely that the population of western

TABLE 15  
MEASUREMENTS IN ADULT *Melanocorypha bimaculata*

Race, Region and/or Locality	N	Wing	Tail	Bill from Skull
<i>rufescens</i>				
S. Asia Minor (Gaziantep)	9 ♂	119-127 (123.3)	45-55 (50.0)	21.2-23.2 (22.0)
	1 ♀	112	48	21
High Lebanon	2 ♀	111, 115	49, 53	19.5, 20
Type of <i>rufescens</i> <sup>a</sup>	♀	115	48	21
<i>bimaculata</i>				
Kirman	1 ♂	125	51	20
Luristan	10 ♂	122-130 (125.1)	46-61 (53.4)	20 -22 (21.0)
	1 ♀	112	48	20
<i>torquata</i>				
Khorasan	9 ♂	119-123 (120.0)	48-54 (51.0)	20 -22.5 <sup>b</sup> (20.7)
	3 ♀	110, 113, 115	45, 47, 52	17.5-21 <sup>c</sup> (19.3)
N. Afghanistan	7 ♂	123, 124, molt	50, 54, molt	19 -22 (20.2)
	2 ♀	113, 114	44, 48	19, 20.5
S. Afghanistan	3 ♂	120, 123, 126	55, 56, 57	20, 21.5, 21.5
Punjab	4 ♂	119-123 (121.0)	44, 48, 57	19.5-22 (21.0)
	2 ♀	114, 116	47, broken	19, 20
Sind	7 ♂	118-125 (122.4)	42-54 (47.4)	20 -22 (20.7)
	10 ♀	110-119 (114.5)	40-52 (46.5)	18.5-21 (20.4)

<sup>a</sup> Blue Nile, December, 1850.

<sup>b</sup> Eighteen specimens.

<sup>c</sup> Five specimens.

Azerbaijan would differ appreciably from the populations of the rest of Azerbaijan and Talych.

I revive the name *torquata* for the pale grayish eastern populations. Blyth (1847, Jour. Asiatic Soc. Bengal, vol. 16, p. 476) did not compare his Afghan specimen with *M. bimaculata* but with *M. calandra*. His specimen was pale and had a short wing ("4½ inches," or 115 mm.) and as it lacked the white on the outer rectrices, it was *M. bimaculata* not *M. calandra*. Another race of *M. bimaculata* that has been revived is *rufescens* Brehm, 1855 (type locality, Blue Nile). Bird (1935, Bull. Brit. Ornith. Club, vol. 56, p. 35) found that the populations breeding in southern Asia Minor and Syria and which winter in Egypt and the Sudan were more rufous than the other populations of *M. bimaculata*. I have examined Bird's specimens taken at Gaziantep from April 18 to June 4; they differ from the specimens of Woosnam from the Zagros by being distinctly more rufous throughout. In the American

Museum of Natural History the type of *rufescens* which, although taken in December, is already worn, and two other specimens taken in High Lebanon on June 1 to 3 differ from the Koelz specimens in worn plumage from the Zagros to exactly the same degree shown by the specimens in the British Museum.

MOLT, CLASS A: All the specimens taken by Zarudny and Koelz in Khorasan from June 25 [July 8] to August 30 are molting. In a specimen from July 9 the molt is starting with the feathers of the crown, the rest of the body plumage and the wing and tail showing no signs of molt. In the specimens taken from August 6 to 30 the body molt is very far advanced and virtually complete, but the wing and tail are only about three-quarters grown. A September 11 specimen no longer shows signs of molt, but in specimens from Afghanistan taken at the same date the wing and tail are not quite fully grown, with the exception of one specimen in which the molt is barely over.



**Melanocorypha bimaculata bimaculata**  
Ménétries

IRAN: Kirman: Balvard, December 31, 1939, 1 ♂. Luristan: Durud, March 13–25, 1941, 2 ♂, May 20–24, 1940, 6 ♂, 1 ♀; Safed Kuh, May 13, 1941, 2 ♂. All May birds "breeding"; March birds have gonads enlarged.

**Melanocorypha bimaculata torquata** Blyth

IRAN: Khorasan: Garmah, August 6, 1940, 2 ♂; Bardu, August 15–21, 3 ♂, 1 imm. ♂, 1 ♀, 2 imm. ♀; Firdaus, August 28–30, 3 ♂, 1 imm. ♂, 1 ♀; Turbat i Haidari, September 11, 1 ♂.

AFGHANISTAN: Northwest: Maimana, October 21, 1939, 1 ♂. North: Chigzar, September 10–11, 4 ♂, 2 ♀; Pul i Khumri, November 4, 1 ♂. Northeast (Badakhshan): Gandacheshma, July 9, 1937, 1 ♂. South: Girishk, October 27, 3 ♂.

INDIA: Punjab, Patiala: Moonak, January 26, 1948, 1 ♂. Punjab, Hissar: Sirsa, January 28–February 23, 1933, 1 ♂, 1 ♀. Sind: Khinjar Lake, January 22–February 21, 1934, 7 ♂, 10 ♀.

**MELANOCORYPHA CALANDRA**

The breeding range of this species is from the Mediterranean region eastward through southern Russia, the Near East, Iraq, Caucasus, Transcaucasia, Iran, northern Afghanistan, and Transcaspiia eastward to the region of Alma Ata in Russian Turkestan, and, occasionally, according to Dementiev, to the Semipalatinsk. It is said that the more northern populations are migratory, but except for the changes caused by wear, specimens are similar in the regions from which I have both breeding and winter birds.

Geographical variation affects chiefly the coloration, though there is also some variation in measurements (table 16). The nominate race (from the Mediterranean region) averages a little smaller, and some of the populations of Iran have distinctly longer and stouter bills. However, wing and tail measurements largely overlap, and the bill tends to vary individually as to shape and size.

The nominate race is distinctly darker above, more pigmented on the flanks and upper breast, than the eastern populations. The latter from Luristan and the Persian Plateau eastward (*psammochroa*) are more sandy above, particularly as they range farther east. Two races have been described from Palestine by Meinertzhagen. One of

these (*gaza*) is a well characterized form from southern Palestine, much more rufous than either nominate *calandra* or *psammochroa*. The other race (*hebraica*) from northern Palestine and Syria is very poorly differentiated and is more or less intermediate between nominate *calandra* and *psammochroa*. Another form (*raddei*) has been described by Zarudny and Loudon from an inadequate and composite series taken in various parts of Iran. I do not recognize *hebraica* and *raddei* for reasons discussed below.

The species is most variable geographically in Iran. In this region there is a clear-cut separation in coloration between the gray populations of the northwest and west (nominate *calandra*) and the sandy populations of the east (*psammochroa*), but the intervening populations are intermediate. The variations throughout Iran are clinal in character and are discussed below.

In the northwest, specimens from Azerbaijan are paler and grayer than nominate *calandra*. The decrease in pigmentation is the continuation of a cline running from southern Europe through the Caucasus. The decrease in pigmentation continues into the western Zagros, for a series of 13 specimens from Kermanshah are still paler. This population shows some approach to *psammochroa*, for half of the 13 specimens begin to show a slight suggestion of sandy on the upper parts lacking in the populations from farther north and west. A cline of increasing size accompanies the decrease in pigmentation. I am aware that the specimens from Azerbaijan were taken on November 2 to 19 and those of Kermanshah on January 8 to 14, therefore not during the breeding season. They do not, however, appear to be winter visitors, because they differ as stated from specimens in comparative plumage from the Caucasus and southern Europe. The plumage is fresh in the Azerbaijan specimens and is still relatively fresh in the Kermanshah specimens.

All the differences mentioned are very gradual, and nomenclatorial separation of the western populations of Iran from nominate *calandra* would be misleading. Farther south and east in the Zagros, however, at Durud and Burujird in Luristan, the populations can no longer be referred to nominate *calandra*. The specimens are too pale and too

sandy, though by no means so sandy as toptotypical *psammochroa* from northern Khorasan. Some of the birds are in worn plumage and are quite grayish on the upper parts. The difference is due to wear and has been noticed by Ticehurst, who correctly remarks that *psammochroa* loses a good deal of the yellowish and becomes grayish with wear (1921, Jour. Bombay Nat. Hist. Soc., vol. 28, p. 236). It never, however, becomes so dark or so gray as nominate *calandra*. In the Luristan series the bill is longer (table 16) than in the populations of *psammochroa* from farther east. It is also

more pointed and slender, not so high and stout.

Specimens taken at Karaj near Tehran are sandier than the Luristan birds but still not quite sandy enough for typical *psammochroa*. Like the Luristan birds the Karaj specimens have a long bill, but their bill is much stouter and higher. Specimens from Isfahan and Fars are virtually identical with those of northern Khorasan except for the bill which is perhaps slightly longer. The series from Luristan, Karaj, and Fars include breeding specimens.

The northern Khorasan specimens include

TABLE 16  
MEASUREMENTS OF ADULTS IN *Melanocorypha calandra*

Race, Region or Locality	N	Wing	Tail	Bill from Skull
<i>calandra</i>				
S. Europe	10 ♂	120-135 (128.0)	54-62 (60.1)	16 -21 (18.9)
	5 ♀	114-129 (119.4)	53-60 (55.6)	16.5-20.5 (18.0)
Wladikawkas	2 ♂	130, 134	63, 64	19.2, 21
	1 ♀	120	57	16.5
Azerbaijan	5 ♂	133-136 (135.0)	58-67 (63.6)	18 -20.5 (19.5)
	1 ♀	121	61	18.5
Kermanshah	5 ♂	129-140 (134.6)	59-67 (63.8)	19.5-21 (20.5)
	8 ♀	115-122 (119.1)	51-60 (55.4)	18 -19.5 (18.8)
<i>psammochroa</i>				
Karaj <sup>a</sup>	4 ♂	132-141 (135.7)	65-69 (66.5)	21.5-23 (22.1)
Luristan <sup>a</sup> (Durud)	18 ♂	128-138 (132.7)	59-71 (65.2)	19 -24 (21.5)
	4 ♀	119-122 (120.2)	53-60 (57.5)	19 -19.5 (19.4)
Isfahan-Fars <sup>a</sup>	5 ♂	129-135 (131.5)	61-68 (64.6)	20 -21.5 (20.8)
	3 ♀	115, 118, 118	54, 56, 58	18.2, 18.5 —
N. Khorasan	2 ♂	132, 135	63, 64	20, 20.5
	3 ♀	132, 132, 138	62, 62, 65	19.5, 20, 20
Type <sup>b</sup>	♂	133	63	20
N. W. Afghanistan	18 ♂	133-140 (135.7)	58-73 (64.6)	17.2-20.2 (19.1)
	22 ♀	114-126 (121.0)	52-61 (57.0)	16 -19.5 (18.1)
Transcaspia	2 ♂	130, 132	62, 62	21, 21
Alma Ata	3 ♂	131, 133, 134	59, 62, 63	19.5, 20.8, 21
<i>"hebraica"</i>				
N. Palestine	1 ♂	130	64	21
	1 ♀	117	56	16.5
Type <sup>c</sup>	♂	130	61	21
<i>gaza</i>				
S. Palestine and Transjordan	2 ♂	Molt	Molt	19.2, 21.5
	2 ♀	Molt	Molt	18, 20
Type <sup>d</sup>	♂	Molt	Molt	18

<sup>a</sup> Specimens labeled "breeding" are included.

<sup>b</sup> Durb Adam, northern Khorasan, November 14 [November 27].

<sup>c</sup> Jenin, northern Palestine, May 1.

<sup>d</sup> Shellal, southern Palestine, September 10.

both worn and fresh birds, the worn specimens, as stated above, being considerably grayer. The type, which was taken on November 14 [Russian calendar, corrected to November 27] by Zarudny on the border of Transcaspia, is in fresh plumage and therefore quite yellowish. The many specimens from northwestern Afghanistan (November 20 to 25) and the single specimen from northeastern Afghanistan (August 28) are identical with the type of *psammochroa* and the other specimens from northern Khorasan in similar plumage. Specimens examined from Transcaspia and the region of Alma Ata in Russian Turkestan are more worn but are identical with northern Khorasan specimens in the same state of plumage.

To recognize very poorly differentiated intermediate populations such as *hebraica* from northern Palestine and *raddei* from Bakhtiari would only serve to obscure the trends in the geographical variation discussed above. Three specimens of *hebraica*, including the type, have been examined. They are closest in the coloration of the upper parts to specimens from Luristan in identical plumage (middle of March to the end of May), but they are more heavily pigmented on the flanks as in nominate *calandra*. Since the Luristan population is intermediate between this form and *psammochroa* but closer to the latter, the darker *hebraica* is closer to nominate *calandra* and should be treated as one of its synonyms.

The series described by Zarudny and Loudon as *raddei* is hopelessly mixed as to plumages and regions. It consists of but four specimens. Three are in worn plumage, as two of them, including the type, were collected on April 14 in Bakhtiari, the third on May 10 at Saujbulagh in western Azerbaijan; the fourth was collected on November 24 near Isfahan. This form was said to be distinctly redder above and below, less gray than *psammochroa*. This cannot be reconciled with the geographical variation prevailing in Iran. As Witherby (1907, *Ibis*, p. 98) states, it "is exactly the opposite to what one would expect and to what I find to be the case." Different climatic conditions prevail in the three regions in which the specimens of Zarudny and Loudon were collected, and, as shown above, their populations differ. No

specimens were examined from Bakhtiari, but this region is contiguous with Luristan, and the same climatic and faunistic conditions are common to both. Since the type of *raddei* came from Bakhtiari and the population of Luristan, although farther west than Bakhtiari, is already closer to the eastern *psammochroa*, I consider *raddei* to be a synonym of *psammochroa*.

One evident character of *psammochroa* which does not seem to have been mentioned consists in the reduction of the spotting on the upper breast. This spotting, well marked in nominate *calandra*, is becoming obsolete in *psammochroa* and has, making allowance for wear, all but completely disappeared in 20 out of 86 specimens of *psammochroa* examined.

**MOLT, CLASS A:** The molting specimens examined consist of the entire series of *gaza* (five specimens), and four specimens of *psammochroa*. In the latter, an adult taken on August 4 in Khorasan is just starting to molt, while the molt is nearly ended in a juvenal taken on September 20 in the same region. The specimen from northeastern Afghanistan has completed the molt of the body plumage but not that of the wing and tail on August 28. A few last traces of molt still show by October 4 in a specimen from Burujird in Luristan. No July specimens are available, but the molt probably starts towards the end of that month to end by the end of September or early October.

The specimens of *gaza*, which include the type, were taken by Meinertzhagen at Shella in southern Palestine on September 10 and at Amman in Transjordan on August 22 and September 15 to 16. In all, the body molt appears to be complete and that of the wing and tail is nearly over. These specimens are, apparently, the only ones in existence, and Meinertzhagen (1935, *Ibis*, p. 126) states that they may have been in their winter quarters and, if so, the breeding grounds of this form are not known. The complete postnuptial molt suggests, however, that the birds may have been on their breeding grounds.

***Melanocorypha calandra calandra* Linnaeus**

IRAN: Azerbaijan: Ardebil, November 2, 1940, 3 ♂, 1 ♀; Livan, November 19, 2 ♂. Kermanshah:

Qasr i Shirdin, January 8, 1941, 2 ♂, 1 ♀; Kerman-shah, January 13-14, 3 ♂, 7 ♀.

***Melanocorypha calandra psammochroa***  
Hartert

IRAN: Region of Tehran: Karaj, June 6, 1943, 1 ♂ "breeding," November 10-December 12, 1945, 3 ♂. Luristan: Durud, May 24-25, 1940, 5 ad. ♂, 1 imm. ♂, 1 ♀, adults "breeding" or "laying," January 24-April 7, 1941, 13 ♂, 3 ♀; Burujird, October 4, 1 ♀. Region of Isfahan: Isfahan, March 3-4, 1940, 2 ♂, 3 ♀. Fars: Jahrum, March 23, 1 ♂ "breeding"; Niriz, March 31, 2 ♂ "breeding." Northern Khorasan: Qumbad i Qabus, July 30, 2 imm. ♂, 1 imm. ♀; Kotaliyek-chinar, August 4, 1 ♂; Nishabur, September 20, 1 imm. ♂.

AFGHANISTAN: Northwest: Andkhui, November 20-25, 1937, 18 ♂, 22 ♀. Northeast: Taligan, August 28, 1 ♂.

***Melanocorypha maxima kashmirica*** Koelz

INDIA: Kashmir, Rupshu: Hanle, July 13, 1931, 1 ♂ (the type of *Melanocorypha maxima kashmirica*), July 13-14, 4 ♂, 1 ♀.

These specimens, the only specimens of *Melanocorypha maxima* that have been collected so far in Kashmir territories, were described as *kashmirica* by Koelz, who stated (1939, Proc. Biol. Soc. Washington, vol. 52, p. 122) that the new form was much paler and had whiter under parts than the specimens of nominate *maxima* in the Rothschild Collection.

The new form was categorically rejected by Whistler (1941, Ibis, p. 313), who states that Rupshu is more truly on the fringes of western Tibet than in Kashmir and that specimens in the British Museum from Gartok in western Tibet cannot be separated from nominate *maxima*, the type locality of which was restricted to the "borders of Sikkim" by Hartert (1904, Die Vögel der paläarktischen Fauna, p. 211). I find, however, that the differences between the specimens from Rupshu and Hartert's specimens from the "borders of Sikkim" are precisely as stated by Koelz. The Sikkim specimens are only four in number, and, of these, three are in the same state of plumage as the specimens from Rupshu, and the Sikkim specimens are indeed much darker above and much grayer below, particularly on the upper breast. The fourth specimen from Sikkim is molting, and

the new feathers are dark and brown.

Another specimen taken on February 25 is part of the series collected by Schäfer (1939, Proc. Acad. Nat. Sci. Philadelphia, vol. 90, p. 201). This specimen is not so worn as the specimens from Rupshu and is slightly but distinctly paler, more yellowish above, particularly on the crown, and is purer white below.

This comparative material is too scanty, and while in London I took, therefore, the opportunity of examining the series of *Melanocorypha maxima* in the British Museum. This material definitely shows, contrary to Whistler's opinion, that the birds of Gartok in western Tibet cannot be referred to nominate *maxima*, as they are distinctly paler above and below and correspond to the diagnosis of *kashmirica* as given by Koelz. The specimens from Gartok were taken on September 14 to 23 and are in very fresh plumage, as they are just ending the molt. They were compared to specimens from Sikkim and southern Tibet in exactly the same state of plumage (September 13).

Of greater interest is the fact that the specimens from Gartok are similar in coloration and cannot be separated from specimens in comparative plumage taken in northeastern Tibet at Zaidan and Kuku Nor and in northern Kansu. There is no question that a race paler above and below than nominate *maxima* inhabits the high steppes of Tibet. This is strongly stated by Schäfer (*loc. cit.*) who shows that the paler race replaces nominate *maxima* north of Kham in Chinese Tibet, the latter inhabiting the swampy places of the more southern gazelle steppes. Schäfer identifies, correctly I think, the paler and more northern race as *holdereri*. Meise (1937, Jour. Ornith., vol. 85, p. 488) also identifies his specimens from the eastern shores of Kuku Nor as *holdereri* and treats *subgrisea* as a synonym.

This last form was described by Stegmann from Oring Nor (1937, Ornith. Monatsber., p. 55). Some of his specimens of *subgrisea* came from Kuku Nor, but he makes no mention of *holdereri* described in 1911 from neighboring northern Kansu. Stegmann may have overlooked *holdereri* or he may have been misled by the fact that *holdereri* was considered to be synonymous with nominate

TABLE 17  
INDIVIDUAL MEASUREMENTS IN ADULT *Melanocorypha maxima*

Race, Region and/or Locality	N	Wing	Tail	Bill from Skull
<i>kashmirica</i>				
Rupshu	5 ♂	151, 152, 153, 156, 160	84, 85, 86, 92, 93	29.5, 30, 30.5, 30.5, 30.5
	1 ♀	134	74	28
Type of <i>kashmirica</i>	♂	156	93	30.5
<i>maxima</i>				
Sikkim	3 ♂	148+, 152+, 154	70+, 78+, 79	26, 27, 30
	4 ♀	134, 136+, 138+, 150+	65+, 71+, 73+, 79	25, 25.5, 26, 27
	♂	137, 138, 138, 139+	76, 76+, molt	25, 25.5, 26, 26
Southern Tibet	5 ♂	Molt, 132+, 146+, 149+, 152+	Molt, 64+, 69+, 77+, 80	24.5, 26, 27.5, 28, 28
	2 ♀	143+, 153	74+, 85	26, 29.5
Chinese Tibet <sup>b</sup> (Litang)	4 ♂	151.5-158	—	—
	4 ♀	136-138	—	—
<i>holdereri</i>				
W. Tibet (Gartok)	3 ♀	138, molt	75, molt	26, 26, 26.5
E. Tibet <sup>b</sup> (E. of Jyekundo)	5 ♂	148-157	—	—
	1 ♂	157	84	27
Zaidan	1 ♂	152	82	30.5
Kuku Nor	4 ♂	149, 149, 150, 158	76, 82, 82, 85	28.2, 28.5, 30, 32
	2 ♀	139, 145	69, 72	26.5, 29
	♂	152	81	30.5
E. Kuku Nor <sup>c</sup>	4 ♂	149.5, 151, 151, 155	86, 88, 89, 93	23, 23+, 25, 26
	2 ♀	138, 139	78, 82	20, 24
N. Kansu	2 ♂	148, 152	77, 78	27, 30.5
<i>flavescens</i>				
W. Nan Shan <sup>d</sup>	♂	144-152 (148)	—	—
	♀	128-139 (134)	—	—

<sup>a</sup> Unsexed.

<sup>b</sup> Schäfer (1939, Proc. Acad. Nat. Sci. Philadelphia, vol. 90, p. 201).

<sup>c</sup> Meise (1937, Jour. Ornith., vol. 85, p. 488).

<sup>d</sup> Stegmann (1937, Ornith. Monatsber., p. 55).

*maxima*, Hartert stating that Hellmayr had found that the type of *holdereri* could not be distinguished from specimens from northern Sikkim (1921, Die Vögel der paläarktischen Fauna, p. 2078). In any case the diagnosis given by Stegmann for *subgrisea* corresponds exactly to the characters shown by the populations extending all the way from Gartok eastward through Yushu, Zaidan, Oring Nor, and Kuku Nor, to northern Kansu. Since there is no doubt now that all these populations differ from nominate *maxima*, the older name in the region is *holdereri*, and *subgrisea* is a synonym.

Whether or not the population of Rupshu (*kashmirica*) can be separated from *holdereri* cannot be settled until specimens in fresh plumage are available from Rupshu; *kashmirica* may be slightly larger but only on an average. The measurements given individually in table 17 show that there is a great deal of overlap in all the populations of *M. maxima*, and specimens that are equally large occur in both Rupshu and Kuku Nor. No specimens from the range of *flavescens* were available, but it is doubtful if this form, described by Stegmann from the Humboldt Range in the same paper as

*subgrisea*, can be separated from *subgrisea* [= *holdereri*] on the basis of measurements as stated by Stegmann; however, according to Stegmann, *flavescens* differs also in coloration.

MOLT, CLASS A: Stegmann states that the molt begins in the middle of August and ends by the middle of September or the beginning of October. He cites juvenals collected by Meinertzhagen which were still molting the primaries on December 7. In the dated molting specimens that I have examined the molt as stated was nearly ended in specimens taken from the middle to the end of September in western and southern Tibet and Sikkim.

#### GENUS EREMOPHILA

##### EREMOPHILA ALPESTRIS

A large series of 422 specimens was examined. With the exception of three from southeastern Europe, the specimens were collected in the Near East, Caucasus, Iran, Afghanistan, Transcaspia, Pamirs to western Tian Shan, and in the Himalayas. Much of it is fresh material, as 291 of the specimens were collected by Walter Koelz. Not part of this study and therefore not included in this material is a series of *montana* from certain parts of the Tian Shan.

The forms found in this region can be divided for convenience into two types: one in which the black jugular band and the black area on the sides of the head are connected, and the other in which they are separated by a distinct, white gap. In both forms individual variation in size and coloration is rather great. As wear causes pronounced changes in the appearance and coloration of the plumage, comparisons should, if possible, be limited to specimens in comparative plumage.

Specimens examined show that in the first type three races are recognizable: *bicornis* Brehm, 1855, type locality, Syria; *penicillata* Gould, 1837, type locality, Erzerum; and *albigula* Bonaparte, 1850, type locality, "Alpes Rossiae Asiaticae." In the second type two races are recognizable: *longirostris* Moore, 1856, type locality, Rhotang Pass, Kulu, as shown by Whistler (1932, *Ibis*, p. 471), and *elwesi* Blanford, 1872, type locality, Sikkim. The first type ranges from southeastern Europe eastward to Gilgit, Pamirs, and western Tian Shan; the other is Himalayan.

Other races that have been described from the region are: *balcanica* Reichenow, 1895, type locality, Bosnia; *aharonii* Neumann, 1934, type locality, Ras Balbeck, Syria; *iranica* Zarudny and Härms, 1902, type locality, "northern Persia eastward from the Elburz south to the Lut and the mountains in the region of Sarhad in Baluchistan"; and *diluta* Sharpe, 1890, type locality, Kashgar. The first may be a valid race, *aharonii* is a pure synonym of *bicornis*, *iranica* is of *albigula*, and there is no proof that *diluta* is separable from *albigula*.

#### FORMS IN WHICH THE TWO BLACK AREAS ARE CONNECTED

Of this type 244 specimens were examined. The three races differ as follows: *bicornis*, of which only specimens in worn plumage are available, is more rufous, "pinker" above, than *penicillata* and *albigula*. In *penicillata* the frontal band and throat are sulphur yellow, while these parts are always white in *albigula*. This is the only constant difference between these two, and it disappears with wear and bleaching. The populations of the Near East and the eastern populations appear to be a little smaller (table 18), but all the measurements greatly overlap in the three races.

*Eremophila alpestris balcanica*: Hartert (1905, *Die Vögel der paläarktischen Fauna*, p. 262) states that in fresh plumage this race is purer gray above than *penicillata*, especially on the margins of the middle pair of rectrices, and that the yellow of the frontal band and throat is deeper. I have only three specimens from southeastern Europe, and only one, a topotype taken in January, is in relatively fresh plumage. I cannot agree that it is purer gray above, for January specimens of *penicillata* from the Caucasus are just as gray. However, in this specimen the outer web of the central rectrices is distinctly paler, grayer, less brownish, and the yellow is distinctly darker than in any other specimen in the long series of *penicillata*. As only one specimen is available I cannot judge as to the range of individual variation.

*Eremophila alpestris bicornis*: Direct comparison shows "*aharonii*" to be a pure synonym of *bicornis*. The type of the latter is a very worn specimen taken in the spring in

Syria ("vere Syrien"). It is labeled male, but it is a female, and it is identical with seven females, also in very worn plumage, taken in the same region as Neumann's specimens of "*aharonii*," six of these in High Lebanon and Bikfaya by Aharoni from May 27 to June 10, and one by Tristram on Mt. Hermon on June 2.

*Eremophila alpestris penicillata* and *albigula*: Stresemann (1928, Jour. Ornith., vol. 76, p. 361) states that three specimens taken at Eregli in Asia Minor on May 17 to 19 are *bicornis* and that *albigula* is the race in the Elburz. Concerning the latter, Hartert states (1933, Die Vögel der paläarktischen Fauna, p. 131) that Bianchi found that August specimens from Demavend are *penicillata*, as are my specimens in fresh plumage from Karaj. The seven specimens examined by me from Eregli are also identical in coloration with *penicillata* from the Caucasus. They average smaller (table 18), but a larger series would probably close the gap. These seven specimens were taken from November 14 to January 30 and may be only winter visitors, and it is possible that, although Stresemann does not give the diagnosis of his three specimens, *bicornis* is the breeding form at Eregli.

In Iran the series from Azerbaijan, northern Iran, and a specimen from Hamadan are identical with *penicillata* from the Caucasus. The Luristan, Bakhtiari, and Fars specimens lack the yellow, but they are worn, as most of them were taken while breeding. One or two that are less worn still retain a faint suggestion of yellow. In my only specimen in fresh plumage, a male taken on October 25 in Luristan, the frontal and throat areas, however, are buffy, not yellow or white. It is possible that the Zagros populations are intermediate between *penicillata* and *albigula*. On geographical grounds I follow Paludan (1938, Jour. Ornith., vol. 86, p. 598) and refer them to *penicillata*.

The population from Yezd appears to be *albigula*. Only four specimens taken on February 22 to 23 were examined; three of them are females and they are slightly buffy. The male, however, which is not badly worn, is pure white. From the condition of the feathers it does not appear that they ever were buffy or yellow. Yezd is well separated from the Zagros.

The series from the region of Gurgan in Mazenderan is useless for comparison. It was taken on July 18 to 22 and is utterly worn, down to the very shafts. Populations from this region are usually intermediate. These specimens are referred to *albigula* in the list of specimens.

The eastern populations from Khorasan, Afghanistan, Transcaspia, Gilgit, and from the Pamirs to western Tian Shan are all *albigula*. As noticed by Meinertzhagen (1938, Ibis, p. 516) they are quite variable individually. In the case of my long series from Afghanistan, individuals taken on the same day and at the same locality may be more or less streaky, or a little more brown than sandy, or the two black areas are more or less broadly confluent. The variation runs within the same limits in all the eastern populations.

Hellmayr (1929, Field Mus. Nat. Hist., zool. ser., vol. 17, p. 78) recognizes "*diluta*" but admits it may be a questionable form, as 12 specimens of "*diluta*" from Kashgar which include the type cannot be distinguished from others from western Tian Shan. It is true that the latter, as most of my specimens, are winter birds but there is no proof that "*diluta*" is distinct from *albigula*. Meinertzhagen (*loc. cit.*) and Dementiev (1934, L'Oiseau, p. 602) make it synonymous.

#### FORMS IN WHICH THE TWO BLACK AREAS ARE NOT CONNECTED

The two forms in the material examined consist of *longirostris* and *elwesi* and of populations that are intermediate. *E. a. longirostris* has a longer wing and bill, and *elwesi* is distinctly more vinaceous and sandy above and has a black band of varying width at the base of the bill on the forehead, lacking in *longirostris*.

The difference is clear cut, but in eastern Kashmir the two forms intergrade. The distribution in this region has been discussed repeatedly, perhaps no other problem in distribution in the Alaudidae receiving so much attention. Hellmayr (*loc. cit.*) reviews the literature, but unfortunately his careful paper comes to conclusions which, as Whistler has shown (1932, Ibis, pp. 470-478), are invalidated by a misconception of the complicated geography. Whistler had about 150 specimens not available to Hellmayr, and the



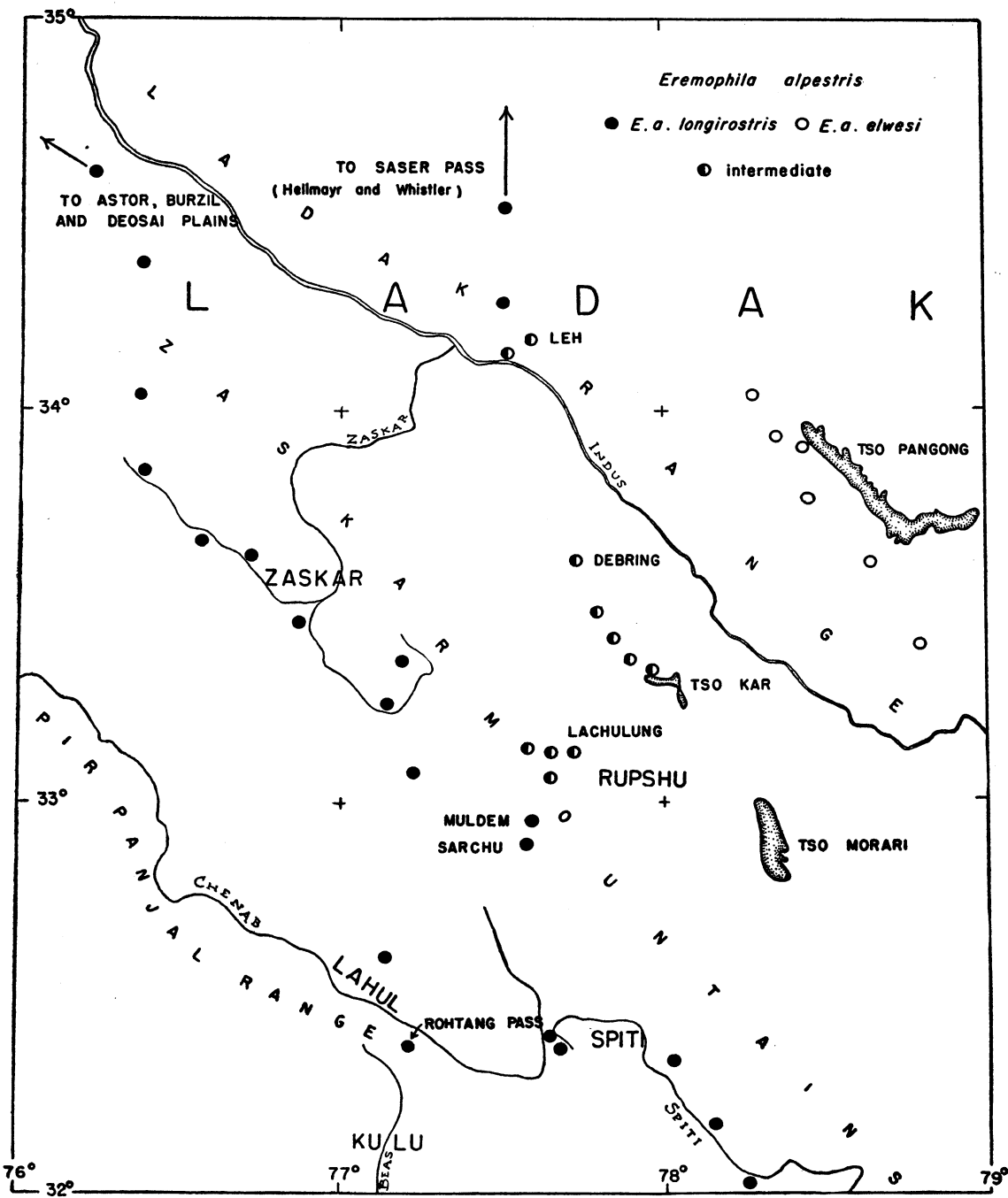


FIG. 3. Distribution of *Eremophila alpestris* in eastern Kashmir, western Tibet, and Punjab Himalayas.

Koelz collections now add another 154 specimens. This new material supports Whistler.

Hellmayr's conclusions quoted by Whistler are, "It thus seems evident that S. E. Ladakh, Rupshu, Kulu, and Lahul are largely inhabited by intergrades between the long-billed, white-fronted form and the smaller, black-fronted *elwesi*, and it is unfortunate that *O. longirostris* was based on a specimen from this contact zone (to use Meinertzhagen's expression) where pure-blooded individuals are of rather rare occurrence." Whistler comments, "The mistake here is the connection between Rupshu and Lahul and Kulu. S. E. Ladakh is rather a vague term which some people would consider synonymous with Rupshu, so it may be disregarded. Rupshu is, faunistically, rather different to Lahul, and totally different to Kulu." He

shows that the type locality of *longirostris* is the Rohtang Pass on the watershed between Kulu and Lahul, and his conclusions are: "The true division is, however, diagonal, sloping from N.W. to S.E., or even, more strictly speaking, right angled, vertical on the west and horizontal on the east. The line of demarcation is, however, not sharply cut."

In the accompanying figure (fig. 3) I have indicated the localities of the Koelz specimens plus one or two from the material in the Rothschild Collection. The localities of Hellmayr and Whistler are omitted purposely, because I cannot satisfy myself as to the characters of the specimens, the bill measurements of Hellmayr are not taken in a comparative way, and those of Whistler are not given by localities.

It can be seen that in the west the division

TABLE 18  
MEASUREMENTS OF ADULTS IN *Eremophila alpestris*<sup>a</sup>

Race, Region or Locality	N	Wing	N	Bill from Skull
<i>bicornis</i>				
High Lebanon, Syria	12 ♂	113+--119+ (114+)	12 ♂	16 -19 (17.6)
(worn)	7 ♀	105+--110+ (106+)	7 ♀	15 -17.2 (16.0)
Type of <i>bicornis</i>	♀	109+	♀	18
<i>penicillata</i>				
Eregli	5 ♂	109 -120 (114.2)	5 ♂	16.2-17 (16.8)
	2 ♀	108, 111	2 ♀	15, 15.8
N. Caucasus	8 ♂	118 -124 (120.2)	7 ♂	16.5-18.2 (17.7)
	7 ♀	109 -121 (116.6)	7 ♀	16 -18 (17.5)
Azerbaijan	15 ♂	117 -126 (122.3)	15 ♂	17 -19 (18.0)
	8 ♀	109 -114 (112.0)	8 ♀	16.2-18.5 (17.4)
N. Iran	8 ♂	110 -122.5 (117.8)	6 ♂	16.5-18.5 (17.5)
	5 ♀	106 -112 (110.6)	5 ♀	16.5-17 (16.7)
Luristan and Bakhtiari	10 ♂	115 -124 (120.0)	10 ♂	17.5-20 (18.6)
	13 ♀	104 -112 (109.6)	11 ♀	16.5-17.5 (17.1)
Fars	3 ♂	115, 116, 119	3 ♂	17, 17.5, 18
	1 ♀	109	1 ♀	16.5
<i>albigula</i>				
Yezd	1 ♂	120	1 ♂	17.5
	3 ♀	105, 107, 110	3 ♀	17, 17, 17.8
Gurgan region (very worn)	7 ♂	113+--115+ (114+)	7 ♂	17.2-19 (17.9)
	1 ♀	107+	1 ♀	17
Khorasan (fresh)	13 ♂	116 -124 (118.9)	18 ♂	16.5-18.5 (17.4)
(very worn)	5 ♂	112+--116+ (114+)		
(fresh)	11 ♀	109 -120 (111.8)		
(very worn)	3 ♀	108+--111+ (109+)		
N. Afghanistan	15 ♂	114 -121 (117.6)	23 ♂	16 -18.5 (17.4)
	6 ♀	110 -112 (111.0)	11 ♀	16 -18 (16.9)

TABLE 18—Continued

Race, Region or Locality	N	Wing	N	Bill from Skull
N. E. Afghanistan	5 ♂	115+–118+ (117+)	5 ♂	16.5–17.5 (17.0)
(very worn)	3 ♀	108+, 108+, 109+	3 ♀	All, 17
Transcaspia (worn)	3 ♂	111+, 112+, 112+	3 ♂	17, 17.5, 18.5
Gilgit	4 ♂	115 –121 (117.7)	4 ♂	17 –18 (17.5)
	1 ♀	111	1 ♀	16.8
Pamirs to W. Tian Shan	7 ♂	115 –122 (118.1)	7 ♂	16 –18 (17.2)
	4 ♀	107 –117 (111.3)	4 ♀	15.5–17 (16.2)
<i>longirostris</i>				
Deosai Plains (very worn)	6 ♂	123+–131+ (127+)	6 ♂	19.8–21.5 (20.7)
	3 ♀	113+, 118+, 120+	4 ♀	18.8–20 (19.5)
Type of "deosai"	♂	Molting	♂	20
Khardong Pass	1 ♂	125+ (molt)	4 ♂	18 –19.8 (18.8)
	1 ♀	116+ (molt)	3 ♀	17.2, 18, 19.2
Zaskar (very worn)	5 ♂	123+–128+ (126+)	17 ♂	19 –21 (20.0)
	4 ♀	114+–119+ (117+)	18 ♀	17.5–21 (18.7)
Lahul	6 ♂	125 –132 (127.5)	9 ♂	18.5–20.5 (19.3)
	1 ♀	Molting	1 ♀	18
Spiti	1 ♂	129	3 ♂	18.5, 20.5, 20.5
	1 ♀	121	5 ♀	18.2–19.5 (19.0)
<i>longirostris</i> × <i>elwesi</i>				
Rupshu <sup>b</sup>	14 ♂	115+–131+ (123+)	22 ♂	17 –20 (18.0)
	10 ♀	111+–118 (113+)	16 ♀	15 –18 (16.8)
<i>elwesi</i>				
Pangong Lake region	11 ♂	116+–123+ (119+)	10 ♂	16 –18 (16.9)
(worn)	4 ♀	112+–117 (114+)	4 ♀	16 –17 (16.8)
Sikkim	9 <sup>c</sup>	110+–122 (116+)	9	15.2–17 (16.3)
Tibet	5 <sup>d</sup>	115 –124 (118.4)	5	15.5–16.8 (16.0)

<sup>a</sup> Discrepancy between N of wing and bill is due to molt.

<sup>b</sup> Four specimens are from Leh and Pituk in Ladak; see individual measurements in text; + symbol in this case indicates that the wing may not be full grown.

<sup>c</sup> Eight unsexed. One topotype, male: wing, 118; bill, 16.2.

<sup>d</sup> Two unsexed. Two males: 115, 16.8; 124, 15.5. One female: 116, 16.

takes place in a roughly vertical line from Leh through Debring to the region of Lachulung, as Whistler states, but in the southeast the division is diagonal, not horizontal, and apparently follows the Zaskar Range. All specimens examined south of this range are typical *longirostris*: in Spiti in the southeast, at Muldem and Sarchu south of Lachulung, and in the west in the valleys of the upper tributaries of the Zaskar River. The distribution north of the Khardong Pass, north of Leh, could not be pursued for lack of specimens. My specimens from the pass are *longirostris*, and both Hellmayr and Whistler agree that beyond the pass as far as the Saser Pass on the Karakoram the populations are closer to *longirostris*. Specimens from the Pangong

Lake area have perhaps a slightly longer bill than topotypical *elwesi* from Sikkim but are identical in coloration.

Measurements from the zone of intergradation are, generally speaking, intermediate, but both large and small individuals are found. The individual measurements from localities I indicated on the map as intermediate are as follows: males (wing and bill), 115+, 18; 119+, 17; 120, 18; 121+, 18.2; 121+, 19; 123, 17.8; 124, 17; 124, 19; 124+, 17; 125, 17.5; 125, 18; 127+, broken; 127+, 20; 131+, 19.5; wing molting, bill only: 17, 17, 17.2, 17.8, 18, 18, 18.5, 18.8, 20. Females: 111, 16; 111+, 16.5; 112, 16.5; 112+, 17.5; 113+, 17; 114, 16.5; 115+, 16.8; 116, 16; 116+, 16; 118, 18; bill only: 15, 16.2, 17, 17.2, 18, 18.

The type of "*deosai*" Meinertzhagen, and a series of topotypes were examined. I agree with Hartert and Whistler that this population from the Deosai Plains cannot be distinguished from *longirostris*.

**MOLT, CLASS A:** Many molting specimens have been examined. The molt starts rather late, towards the end of July, and is over by late September or early October. There may be a slight difference in the various regions, specimens from the west starting a little earlier. In Iran, specimens from the region of Gurgan taken on July 18 to 22 are barely starting, but July specimens from eastern Afghanistan, Kashmir, eastern Ladak, and northern Punjab show no signs of molt. In northern Afghanistan, Kashmir (Deosai, Leh, Rupshu) and in northern Punjab (Lahul and Spiti), and probably in the other regions as well, the molt seems to start a week or two later. A specimen from Leh, however, is far advanced through the molt by August 11, but the other specimens from the regions listed have either not started or are barely starting by about August 15. The molt is over by October 15 at the latest and is already over in some specimens taken from September 21 to 30 in northern Afghanistan.

***Eremophila alpestris penicillata* Gould**

**IRAN:** Azerbaijan: Kuh i Savalan, November 7, 1940, 3 ♂; Livan, November 14–18, 12 ♂, 8 ♀. Northern Iran: Kondor, Kuh Pansar, October 6–12, 1944, 1 ♂, 2 ♀; Karaj, January 18–February 7, 1945, 4 ♂, 1 ♀, October 30–December 28, 3 ♂, 2 ♀. Hamadan: Hamadan, January 17, 1941, 1 ♂, Luristan: Durud, March 15–June 27, 8 ♂, 2 imm. ♂, 12 ♀, 1 imm. ♀ (most of them labeled as breeding), October 25, 1 ♂. Bakhtiari: Ti, February 3, 1 ♂, 1 ♀. Fars: Eglit, March 8, 1940, 3 ♂, 1 ♀.

***Eremophila alpestris albigula* Bonaparte**

**IRAN:** Yezd: Shir Kuh, Dehibala, February 22–23, 1940, 1 ♂, 3 ♀. Mazenderan (region of Gurgan): Shah Kuh, July 18–19, 4 ♂, 2 imm. ♂; Karimserai, July 21, 3 ♂, 1 imm. ♂, 1 ♀, 1 imm. ♀, 1 unsexed imm.; Dimalu, July 22, 1 imm. ♂.

**AFGHANISTAN:** Northern: Lorinj Pass, August 27, 1939, 1 imm. ♀; Sabz Pass, August 28–29, 3 ♂, 1 imm. ♂, 6 imm. ♀, 1 unsexed imm.; Shanbashak Pass, August 31, 1 ♂, 1 imm. ♀; Safedsang, September 20–23, 4 ♂, 1 imm. ♂, 4 ♀; Khami Deh, September 30, 2 ♂, 2 ♀; Qala

Shahar, September 30, 1 ♂; Alinji, September 30, 1 ♂, 1 ♀; Mak, October 2, 1 ♂; Burchao Pass, October 10–15, 10 ♂, 3 ♀, 1 unsexed [♀], 1 unsexed ad. Northeast: Sanglich, July 26–27, 1937, 2 ♂, 1 ♀; Munjan Pass, July 26–27, 2 ♂, 1 ♀, 1 unsexed nestling; Kargasi Pass, August 9, 1 ♂, 1 ♀.

***Eremophila alpestris longirostris* Moore**

**INDIA:** Kashmir: Burzil Pass, August 7, 1936, 1 imm. ♂; Deosai Plains, August 8–9, 6 ♂, 3 imm. ♂, 4 ♀, 3 imm. ♀. Kashmir, Baltistan: Karzong [Khardong Pass], September 13–14, 4 ♂, 1 imm. ♂, 3 ♀. Kashmir, Zaskar: Rangdum, September 10–12, 1931, 10 ♂, 1 imm. ♂, 1 ♀ [♂], 9 ♀; Phe, September 16, 1 ♂; Cha, September 26, 1 imm. ♀; Kargiak, October 1, 2 ♂, 1 imm. ♂, 5 ♀; July 15, 1933, 1 ♂; Padam, July 19, 2 ♂; Seni, July 20, 1 ♂, 1 ♀; Abring, July 22, 1 ♀; Pensi Pass, July 23, 1 ♀; Rangdum, July 25, 1 ♂; Gyama Tangdze, July 25, 1 ♀. Northern Punjab, Lahul: Rohtang Pass, July 1, 1933, 1 ♂; Dilburig, July 31, 1931, 1 imm. ♂; Kilang, August 13, 1933, 1 ♂; Muldem, August 23, 1 ♂; Sarchu, August 23, 1 ♂, October 6, 1936, 3 ♂; Kinlung, August 24–25, 1933, 3 ♂, 1 ♀. Northern Punjab, Spiti: Chandra Tal, August 31–September 1, 1933, 1 ♂, 2 ♀; Kunzam Pass, September 1, 1 ♀; Drasa Pass, September 6, 1 ♀; Kibar, September 8, 2 ♂; Lara, September 15, 1 imm. ♂; Mani, September 22, 1 ♀.

***Eremophila alpestris longirostris* × *elwesi***

**INDIA:** Kashmir, Ladak: Leh, August 11, 1931, 1 ♀ [♂]; Tog Nulla, August 19, 1 ♀; Pituk, September 21, 1936, 1 ♂, 2 ♀. Kashmir, Rupshu: Shakrot, September 25–26, 1936, 6 ♂, 2 ♀; Debring, September 27, 3 ♂, 2 ♀; three miles below Debring, September 27, 1 ♂; Rogchin, September 28, 4 ♂, 3 ♀; Tso Kar, September 29–30, 2 ♂; Ngori, October 2, 1 ♂; Takh Sumba, October 2, 1 ♂; Tozeri, October 2–3, 2 ♂, 1 ♀, 2 imm. ♀; Lachulung, October 4, 1 ♂, 3 ♀; Tso Kar, July 1, 1931, 1 ♀; Debring, August 15, 1933, 2 ♂, 1 ♂ [♀], 1 ♀; More Plain, August 20, 2 ♂, 5 ♀; Lachulung, August 22, 3 ♂.

***Eremophila alpestris elwesi* Blanford**

**INDIA:** Kashmir, eastern Ladak (Pangong Lake region): Tsoka, July 18, 1931, 1 imm. ♀; Tsakzhun Tso, July 20–22, 3 ♂; Chusul, July 24–26, 2 ♂; Spangmik, July 28, 1 ♂; Muglib, July 29, 1 ♀; Tsultak and above Tsultak, July 31–August 1, 3 ♂, 2 imm. ♂, 1 ♀.

(The itineraries in this complicated region are given, as far as possible, in consecutive order.)

GENUS *GALERIDA**GALERIDA CRISTATA*

This species has been badly oversplit. Meinertzhagen in his revision (1951) lists no fewer than 56 more or less generally recognized forms and ends by accepting 20, for one of which he had no specimens. *G. cristata*, on the whole, is a bird of arid regions, and its geographical variability may be due to a fairly high degree of susceptibility to varying conditions of aridity and humidity and, in some cases, to variations in the coloration of the soil. Still, it must be remarked that in Asia from Iran eastward, where these factors are very varied, geographical variation is rather slight. A good deal of the excessive splitting has been due to a disregard of the changes caused by the abrasion of the plumage and by the use of inadequate samples, some "forms" having been described on only two specimens, others on three.

A new study of the Asiatic populations is made desirable by the large amount of fresh material (about 260 specimens) collected by Koelz in Iran, Afghanistan, and India, and by the fact that I differ from Meinertzhagen as to the recognition of some forms. In the region usually covered by these studies, from the Caucasus eastward, Meinertzhagen recognizes four subspecies: *caucasica* in the Caucasus; *altirostris* to which he gives a huge range from the Nile Valley south of Dongola and the Red Sea coast through parts of Arabia, eastern Asia Minor, Iraq, Iran, Afghanistan, Baluchistan, extreme northwestern India, Transcaspia, and both Turkestans to western and northern China; *lynesei* in Gilgit; and *chendoola* in northwestern India south to northern Central Provinces and east to Bihar. I am in accord as to the validity of *caucasica*, *lynesei*, and *chendoola*, but I believe that the treatment of the populations included under *altirostris* is too drastic in that it obscures slight but constant trends in the geographical variation. In my opinion *altirostris* (type locality, "Nubia," Akasheh near Dongola) does not reach Iran. From there on east three forms can be distinguished in the range as given by Meinertzhagen: *subtaurica* in western Iran, *leautungensis* in northern China, and *magna* for the other populations.

The material examined is large. It consists,

in addition to the Koelz specimens, of the specimens in the collection of the American Museum of Natural History from Asia, supplemented by series from the range of *altirostris* in the Jordan Valley and Dongola, specimens from Europe for comparison with the population of the Caucasus, and, thanks to the authorities of the Chicago Natural History Museum, a series of topotypical *magna* from Chinese Turkestan and some specimens from Tashkent. In all, close to 600 specimens were examined. The specimens from Chinese Turkestan and the status of *magna* have been discussed by Hellmayr (1929, Field Mus. Nat. Hist., zool. ser., vol. 17, p. 68).

This material shows definitely that color comparisons must be limited to specimens in fresh plumage (roughly, to the end of December). Specimens taken in January and February are worn but still useful if comparison is made with specimens showing a similar degree of wear. Specimens taken from March on are usually useless for color comparison except when the color contrast between two subspecies is well marked, as in the case of the dark gray versus the sandy forms. With wear all the specimens in the sandy forms and in the less grayish ones take on a "warmer," sand-blasted and bleached appearance. The comparisons below, unless otherwise stated, apply only to specimens in fresh or little-worn plumage.

Since in *G. cristata* the recognition of the various subspecies is a matter of opinion, I have thought it desirable to treat my material in terms of groups rather than to apply hard and fast subspecific names. This species is usually said to be sedentary, but there is plenty of evidence (discussed below) that some populations, or at any rate a substantial number of individuals, wander outside their breeding range in the fall and winter.

THE *altirostris* GROUP

From Dongola and the Nile Valley (*altirostris*, 1855) to the valley of the Jordan (*brachyura*, 1864) the populations are sandy, not grayish. They have a shorter wing and bill (table 19) than any of the populations dealt with in this study except *chendoola* and *lynesei*, which are grayish, and *leautungensis*, which is sandy but browner above and distinctly darker, and a stronger fawn below. The

TABLE 19  
MEASUREMENTS OF ADULTS IN SOME POPULATIONS OF *Galerida cristata*

Group, Region and/or Locality	N	Wing			Tail			Bill from Skull		
<i>altirostris</i> group										
Dongola	11 ♂	99	-110	(104.9)	48	-57	(54.4)	19	-21.5	(20.1)
	14 ♀	96	-103	(99.1)	49	-57	(53.9)	18	-21.5	(19.7)
Type of <i>altirostris</i>	♂	107			62			19.2		
Jordan Valley	10 ♂	101	-109	(105.9)	54	-60	(57.5)	17	-21.5	(20.0)
	5 ♀	99	-104	(101.0)	55	-58	(56.0)	19	-21	(20.4)
<i>cristata</i> group										
Central Europe (9) and Sweden (4)	9 ♂	101	-112	(107.4)	54	-63	(59.0)	19	-21	(20.0)
	4 ♀	99	-106	(102.0)	52	-57	(54.5)	18.5-20.2		(19.3)
Sarepta	3 ♂	110, 110, 111			59, 60, 62			19.5, 20, 21		
Type of <i>tenuirostris</i>	♀	100			57			19		
N. Caucasus (Wladikawkas)	9 ♂	101	-114	(107.3)	56	-68	(61.0)	19	-21	(20.0)
	6 ♀	100	-111	(103.1)	52	-60	(55.6)	17.5-21		(19.0)
<i>magna</i> group										
<i>subtaurica</i>										
Eregli	♂	107			57			21.5		
	♀	104			58			21.2		
Azerbaijan	9 ♂	107	-117	(111.1)	59.5-67		(62.1)	20	-21.8	(20.9)
	5 ♀	100.5-107		(104.1)	56.5-61		(59.0)	19	-20.8	(19.9)
N. Iran <sup>a</sup>	3 ♂	108, 109, 112			57, 60, 63			20.5, 21, 21.8		
Kermanshah	7 ♂	108	-113	(110.5)	58	-66	(62.4)	20	-22.5	(21.6)
	2 ♀	101, 104			57, 59			21, 21		
Luristan (16) and Bakhtiari (1)	11 ♂	107	-113	(109.7)	56	-62	(59.5)	19.5-22		(21.2)
	6 ♀	101	-106	(104.1)	50	-57	(53.5)	20	-21	(20.4)
E. Iraq	4 ♂	108	-111	(109.7)	62	-64	(63.0)	20.5-21.5		(21.0)
	3 ♀	100, 114, 115			56, 65, 70			19, 20, 21.5		
	4 <sup>b</sup>	107	-111	(108.2)	56	-62	(59.3)	21	-22	(21.3)
<i>magna</i> proper										
Yarkand	5 ♂	114	-118+	(116+)	67+-70+		(68+)	22	-24	(22.6)
" <i>iwanowi</i> "										
Ferghana to Djarkent	11 ♂	112	-121	(114.9)	62	-71	(66.7)	22	-24	(22.7)
	4 ♀	105	-112	(108.0)	59	-65	(61.0)	22	-23	(22.3)
" <i>vamberyi</i> "										
Transcaspian border	8 ♂	110	-120	(113.2)	60	-69	(64.0)	21	-23	(22.0)
	4 ♀	106	-114	(110.0)	60	-63	(60.2)	21	-22.5	(21.6)
Tashkent	2 ♂	113, 114			61, 65			21.8, 22		
Khorasan	10 ♂	103+-118		(111+)	58	-67	(62.5)	19	-22.5	(21.0)
	7 ♀	98+-107		(103+)	56+-59		(57+)	20	-21	(20.7)
N. Iran	2 ♂	110, 114			60, 62			21.2, 22		
	2 ♀	101, 101.5			54, 57			20.5, 21		
Laristan	5 ♂	108	-111	(109.6)	57	-62	(59.1)	19.5-22.5		(21.2)
Kirman	17 ♂	105.5-116		(109.4)	56	-65	(60.0)	21	-23	(21.8)
	6 ♀	100	-104	(102.7)	52	-59	(56.0)	19.5-21		(20.0)
Persian Seistan	8 ♂	104	-115	(110.6)	57	-65	(60.0)	20	-23	(21.2)
	5 ♀	104	-106	(105.4)	57	-60	(58.8)	20.5-21.5		(20.7)

TABLE 19—*Continued*

Group, Region and/or Locality	N	Wing	Tail	Bill from Skull
Afghan Seistan	2 ♂ 1 ♀	115, 115 103	61, 64 56	21.2, 22.5 20.5
Persian Baluchistan	4 ♂ 1 ♀	109 -110 (109.7) 99+	59 -62 (60.2) 54	21 -22° (21.2) 19
Baluchistan proper	6 ♂ 5 ♀	104 -113 (109.0) 99 -107 (102.6)	52 -60 (56.9) 52 -61 (57.1)	20 -22 (21.2) 19.5-21 (20.5)
Sind <sup>d</sup>	1 ♂ 4 ♀	117 101.5-107 (103.4)	70 50 -57.5 (54.4)	22.5 20 -21.2 (20.5)
S. Afghanistan	17 ♂ 7 ♀	108+-115 (111+) 102 -103 (102.2)	56+-67 (61+) 50 -60 (54.8)	20.5-22.5 (21.6) 19 -21.5 (20.7)
E. Afghanistan <sup>e</sup> (Kabul to Jalala- bad)	4 ♂ 6 ♀	102+-107+ (104+) 96 -102+ (99+)	55+-59+ (56+) 49 -56+ (51+)	20 -21 (20.5) 20 -20.8 (20.4)
N. E. Afghanistan <sup>f</sup>	4 ♂ 2 ♀	109+-111+ (110+) 99+, 101+	60+-67+ (62+) 54+, 57+	19 -22 (21.1) 19.5, 19.5
N. W. and N. Af- ghanistan	10 ♂ 13 ♀	109 -112 (111.1) 96 -107 (102.9)	54 -64 (60.0) 51 -65 (56.4)	20 -22.5 <sup>g</sup> (21.1) 19 -21 (20.1)
<i>retrusa</i>				
N. Kansu	1 ♂ 1 ♀	116 104	67 63	21 19
N. Kansu <sup>h</sup>	4 ♂ 9 ♀	109 -117 (114.4) 103 -107 (104.1)	— —	— —
<i>chendoola</i> group				
<i>chendoola</i>				
Sind <sup>i</sup>	13 ♂ 5 ♀	98 -106 (102.4) 91 -98 (95.3)	51 -58 (54.0) 48 -54 (49.8)	20 -21.5 (21.1) 19.5-21.2 (20.7)
Punjab (Lahore)	13 ♂ 5 ♀	99 -107 (101.8) 95 -99.5 (96.4)	47 -57 (52.2) 47 -50 (48.8)	20.8-22 (21.4) 19.5-20.5 (20.0)
S. Punjab	7 ♂ 7 ♀	100 -104 (102.0) 94 -100 (97.7)	50 -59 (53.3) 47 -53 (50.3)	20.5-21.8 (21.1) 19.5-21.2 (20.3)
United Provinces	9 ♂ 2 ♀	96 -104 (99.8) 91, 93	48 -58 (53.5) 49, 49	20.5-23 (21.1) 20, 20.8
Central Provinces	2 ♂	99+, 102	56, 59	20.5, 20.5
<i>lynesi</i>				
Gilgit	3 ♂	102, 103, 105	56, 57, 63	19.5, 19.8, 20
<i>leautungensis</i> group				
Shantung	10 ♂ 6 ♀	100 -112 (105.2) 100 -108 (104.0)	55 -63 (59.0) 54 -65 (61.5)	18 -22 (20.1) 19 -21 (19.9)
Korea	1 ♂ 2 ♀	104+ 99+, 104+	58+ 55+, 57+	18.5 17.5, 20.5

<sup>a</sup> Probably winter visitors; see text.<sup>b</sup> Unsexed.<sup>c</sup> Eight specimens.<sup>d</sup> Winter visitors, compare with *chendoola* resident.<sup>e</sup> South of Hindu Kush.<sup>f</sup> North of Hindu Kush.<sup>g</sup> Twelve specimens.<sup>h</sup> Meise (1937, Jour. Ornith., vol. 85, p. 492).<sup>i</sup> Resident.

examined specimens of *G. c. altirostris* and *brachyura* appear not to be separable, but all my specimens from Dongola with the exception of the type of *altirostris* are in very worn plumage. The type of *altirostris* is darker, more brownish, than any specimen from either Dongola or the Jordan, but it is more than 100 years old, and its coloration can no longer be trusted.

No specimens from Iran eastward can be referred to this group.

#### THE NOMINATE *cristata* GROUP

A gray dark form with a slightly longer wing than the *altirostris* group. In this group I have examined, in addition to nominate *cristata*, 1758, specimens from Sarepta on the lower Volga (*tenuirostris*, 1858) and from Wladikawkas in the northern Caucasus (*caucasica*, 1887). The latter are only slightly paler than nominate *cristata*, a little cooler gray, less brownish gray. The populations of southern Russia from the west shore of the Caspian to Rumania, with the exception of the population of Crimea, are recognized as *tenuirostris* by Dementiev (1934, L'Oiseau, p. 596). Four specimens from Sarepta, including the type of *tenuirostris*, one from Poltava in the Ukraine, and six from Rumania have been examined. The specimen from Sarepta and three from Rumania are too worn or too old; the other three from Rumania are identical with *caucasica* in similar plumage. The only distinguishing character in *tenuirostris* is the shape of the bill, which is more slender than in either nominate *cristata* or *caucasica*. However, the difference is extremely slight and is true only of the Sarepta and Poltava specimens. Four of the six specimens from Rumania have a bill indistinguishable from that of nominate *cristata* and *caucasica*, and in the latter, four of 15 have a bill as slender as the specimens from Sarepta. The difference seems hardly sufficient as a basis for separation. In this case *tenuirostris* seems to be a synonym of *caucasica* rather than of nominate *cristata* as given by Meinertzhagen.

No specimens from Iran eastward can be referred to this group.

#### THE *magna* GROUP

This group is palest and includes the most sandy populations and those with the longest

wings and bills. It is very far flung, ranging from eastern Iraq and western Iran to northern Kansu and the borders of India. The majority of the specimens examined belong to this group and show that the geographical variation follows a number of well-defined trends. The most sharply marked occur in western Iran and Chinese Turkestan. It should be emphasized again that the comparisons apply only to specimens in very fresh, fresh, or little-worn plumage. The more important trends are numbered:

1. Trend *subtaurica* (1912): In the west, specimens from Azerbaijan are distinctly grayer than any other population, darker, less sandy and have darker and better-defined markings on the back and breast, which, in series, seem more abundant. In Kurdistan, Iraq east of the Tigris, and the Zagros in Kermanshah and Luristan, the populations taken in series are a little less dark but contain many specimens which are identical or very close to the population of Azerbaijan. Farther south, in Laristan and Kirman the populations tend to be definitely more sandy but still contain a few gray and better-marked specimens. Unfortunately, I have only one rather worn specimen from Fars, but there seems to be no doubt that the decrease from darker and grayer to paler and more sandy is clinal in character. I have no fresh specimens from Isfahan on the southern side of the plateau, but on the northern side in the regions of Kazvin and Karaj both gray and sandy specimens occur. It is likely that in this region the gray birds are visitors from the west or, possibly, the Elburz. I have only one worn specimen from the Elburz; I would expect that farther west in the Elburz, at least on the northern side, the populations are dark and gray as in Azerbaijan.

2. Trend *magna* proper: Topotypes of *magna* (1871) from Chinese Turkestan are much paler than the populations in subdivision 1 and are larger. Their plumage is very pale, not gray, more buffy than sandy, and of a very delicate soft shade.

3. Trend "*iwanowi*" (1903): Specimens from Russian Turkestan from Ferghana north to Djarkent are cooler in shade above than in *magna* proper, slightly grayer, with slightly better-marked shaft streaks and dis-



tinctly whiter below. These differences have been noted by Dementiev (*loc. cit.*). The populations of Chinese and Russian Turkestan have similar measurements, the largest of any Asiatic populations.

4. Trend "*vamberyi*" (1907): Specimens from Transcaspia along the Afghan (Kushka) and Iranian (Ashkhabad) border are duller and more truly sandy than in any other population in the *magna* group, less pale than *magna* proper, less grayish and less white than *iwanowi*. Two specimens from Tashkent are identical with those of the Transcaspien border. Many other populations are either identical with, or very close to, this type. These, in addition to the specimens of Kazvin and Karaj noted above, are the populations of northern and southern Khorasan, Persian and Afghan Seistan, Persian Baluchistan and Baluchistan proper, and of Afghanistan with the exception of the population from the east in the region extending south of the Hindu Kush from Kabul eastward to Jalalabad. *G. c. submagna* Zarudny and Bilkevitch, 1918, described from the Achal Teke a little farther west than Ashkhabad appears to be a pure synonym of *vamberyi*.

In the four trends numbered above, the contrast, of course, is greatest between the populations in subdivision 1 on the one hand and in 2, 3, and 4 on the other. There are other minor trends. The population of eastern Afghanistan living in a region which receives a somewhat greater rainfall is very slightly grayer than the *vamberyi* populations, but the difference is very slight. It is to this population that the population of extreme northwestern India is probably closest, but I have no Indian specimens except two taken in May at Parachinar, and they are badly worn. Another population that might be expected to show geographical variation is the population of Badakhshan, but unfortunately all my specimens from northeastern Afghanistan were taken in July and August and are very badly worn. Another region is northern Kansu. I have but two specimens from this region, and they are only very slightly less pale, a trifle more "earthy," than topotypical *magna*. The size of this population (*retrusa*, 1928), according to the measurements given by Meise (1937, *Jour. Ornith.*, vol. 85, p. 492), appears to be somewhat smaller

though hardly enough to warrant separation. Finally, another population of which I have no specimens but which seems to be part of the *magna* group has been described by Meise from Ala Shan in Inner Mongolia (1933, *Mitteil. Zool. Mus. Berlin*, vol. 19, p. 45). This population (*alaschanica*) is said to be close to *magna* from Chinese Turkestan but redder.

With the exception of the gray populations in subdivision 1 (*subtaurica*), I am not advocating that any of the populations should be recognized nomenclatorially. *G. c. iwanowi*, *vamberyi*, *retrusa*, and perhaps *alaschanica* can be regarded as synonyms of *magna*, but this treatment should not obscure the presence of geographical variation. All the differences noted are slight but apparent. They disappear, however, as the specimens become bleached and worn, and all the populations then become nondescript.

The proper name of the populations in subdivision 1 is open to question. Ticehurst (1921, *Jour. Bombay Nat. Hist. Soc.*, vol. 28, p. 239), who noted the differences mentioned, though they are less apparent in specimens from Iraq than in specimens from Azerbaijan, stated that if separation from *magna* was deemed desirable, the name *weigoldi* could perhaps be used. This form was described from Urfa by Kollibay in the same paper in which he described *subtaurica* from Eregli (1912, *Ornith. Monatsber.*, p. 26). Bird (1936, *Bull. Brit. Ornith. Club*, vol. 56, p. 56) states that both are synonymous with *brachyura*, but this author also states that he is inclined to treat *magna* as synonymous with *brachyura*. I do not agree with this treatment, for the population of Chinese Turkestan is by no means identical with *brachyura* of the Jordan Valley, and the contrast between the sandy but reddish birds of the west, the gray birds of western Iran, and the sandy but very pale birds of Chinese Turkestan is very distinct.

Kollibay's comparisons are none too clear, and he had but three or four specimens taken at a time of the year (April 11 and June 19 to 21) when the condition of the plumage would be anything but diagnostic. It is clear, however, that he considers *subtaurica* the darker and grayer of the two. I have no specimens from Urfa, nor had Ticehurst, and

I have but two from Eregli. One is much too worn, but the other, taken on January 17, is still in fair plumage and matches exactly, both as regards the gray coloration and the better-defined streaking, January specimens from Qasr i Shirin on the border of Iraq, Kermanshah, and Luristan. As first reviser, I therefore accept the name *subtaurica* for this population.

#### THE *chendoola* GROUP

This group is closely related to the *magna* group, from which it differs by having smaller measurements, a generally finer and more slender bill, and, with the exception of *subtaurica*, by being darker and less sandy. From *subtaurica* it differs, in addition to the size and bill, by having the spotting of the breast a little more reduced. Specimens have been examined from Gilgit and Punjab, Rajputana, and Sind in the west to Bihar in the east (Samastipur east of Patna), to northern Central Provinces in the south (Bheraghat in the region of Jubbulpore). In the east and south these localities seem to be about the limit of the range. In the west, in Baluchistan, Ticehurst (1927, Jour. Bombay Nat. Hist. Soc., vol. 31, p. 875) states that *chendoola* breeds in the Hab Valley and the Las Bela Plain, west of which, in western coastal Makran, it probably intergrades with *magna*.

Other than in the specimens from Gilgit there is no evidence of geographical variation in the populations examined. Specimens from Gilgit are a little cooler gray and have the shaft streaks of the upper parts more sharply defined. The Gilgit population has been separated as *lynesi* by Whistler.

#### THE *leautungensis* GROUP

Specimens from Shantung and southern Manchuria are sandy above but more "earthy," ochraceous, than the populations of the *altirostris* and *magna* groups. Below, they are distinctly more broadly and heavily spotted and distinctly more rufous, darker and more pinkish buff on the breast, darker and more brownish buff on the flanks. They measure smaller than the populations of the *magna* group. The population of Korea (*coreensis*) has been separated as being grayer than *leautungensis*. I have examined only

worn specimens from Korea. They are identical with others from Shantung and southern Manchuria in worn plumage, but the plumage is too worn for diagnosis. According to Meinertzhagen (1951), *coreensis* is a valid form characterized by being "considerably darker" than *altirostris*. According to Shaw, *leautungensis* is the breeding form in Hopeh (1936, Fan Mem. Inst., vol. 15, p. 577).

#### MIGRATORY MOVEMENTS

It is usually stated that *G. cristata* shows no evidence of recorded migration. It appears certain that many northern Asiatic populations are resident throughout the year, such as the populations of Hopeh (Shaw), southern Manchuria (Meise), and Yarkand (Meinertzhagen). Nevertheless, a fair to a large number of individuals are found outside their breeding range in the fall and winter. In Sind, in January and February, Koelz took both *magna* and *chendoola*. At Khinjar Lake on the same dates he took four specimens of *magna* and many of *chendoola*. In northern Iran in the region of Karaj he took *magna* and *subtaurica* at the same localities and dates. Other evidence of migration is contained in the literature. Ticehurst (1923, Ibis, p. 19) states that, in Sind, in some years *magna* occurs "in considerable flocks, even up to a hundred individuals, and they usually do not associate with the resident race [*chendoola*]; when the monsoon has failed their numbers are fewer. They are easily distinguished in the field, when both races are present, by their larger size and more sandy colour. They depart about the third week in March." Stuart Baker (1926, Fauna of British India, vol. 3, p. 346) states that *magna* "in great numbers" visit northwestern India, in addition to Sind, "arriving in the middle of October and leaving in the latter half of March." In Iraq and at the head of the Gulf the migration is noted by Ticehurst (1921, loc. cit.). In Transcaucasia, Buturlin (1906, Ibis, p. 410) lists *G. cristata* as "wintering" and "in autumn," but it is not clear whether or not the species breeds in this region or if his specimens were merely winter visitors.

MOLT AND BREEDING, CLASS A: In the Asiatic populations examined the molt starts towards the last days of July or the first week in August and is over by the end of

September or the first few days of October. In northeastern Afghanistan specimens are just starting to molt by the middle of August; in others, such as in Khorasan and Persian Baluchistan, the molt is from one-half to two-thirds over by that date and only a few last traces show in specimens from August 28 to September 2. In Afghanistan the molt may end a little later, by the fifteenth of September in the north and northwest and by the thirtieth in the south. The last date is October 2 for one isolated specimen from Persian Seistan.

Juvenals molt at the same time of the year as adults. Since the postjuvenile molt is complete, and first winter birds are not distinguishable from adults, it is, therefore, particularly interesting to find a number of specimens still in full juvenile plumage on January 18 to 20 in Sind. One of these is molting, and the molt had been from one-half to two-thirds completed by the nineteenth. I can conclude only that the breeding season in Sind extends to at least December, but Ticehurst (1923, *loc. cit.*) states that in this region the breeding season starts in March and that April is the chief month. In other populations for which I have breeding notes, specimens were taken while breeding at the end of March in Luristan, in April in Fars, in May in eastern Afghanistan, while very young birds were taken in July and August in northeastern Afghanistan.

*Galerida cristata subtaurica* Kollibay

IRAN: Azerbaijan: Tabriz, October 30, 1940, 2 ♂, 1 ♀, December 14, 2 ♂, 1 unsexed ad. [♂], 1 ♀; Livan, November 18, 1 ♀; Saujbulagh, November 26, 1 ♀; Maraghe, November 28, 1 ♂, 1 unsexed ad. [♂]; Khoi, December 11, 2 ♂, 1 ♀. Northern Iran, region of Tehran: Qunveh, October 24, 1 ♂; Karaj, October 29, 1945, 1 ♂, December 12, 1 ♂. Kermanshah: Qasr i Shirin, December 28, 1940–January 6, 1941, 5 ♂, 1 unsexed ad. [♂], 2 ♀; Kermanshah, January 13, 1 ♂. Luristan: Durud, January 23–March 22, 8 ♂, 5 ♀; Burujird, January 20, 1 ♂, 1 ♀, October 6, 1 ♂. Bakhtiari: Pashmshurun, May 8, 1940, 1 ♂. Khuzistan: Ahwaz, April 22, 1 ♂.

*Galerida cristata magna* Hume

IRAN: Northern Iran, region of Tehran: Qunveh, October 24, 1940, 1 ♂; Karaj, February 6, 1944, 1 ♂, 1 ♀, October 29, 1945, 1 ♀. Fars: Eglit, March 8, 1940, 1 ♂; Bushire, April 13, 1 imm. ♀.

Isfahan: Isfahan, March 3–4, 1 ♂, 1 ♀. Laristan: Isin, December 16–19, 1939, 5 ♂. Kirman: Saadatabad, December 22, 2 ♂; Saidabad, December 29, 1 ♂; Balvard, December 30–31, 5 ♂, 3 ♀; Dehibala, January 7, 1940, 1 ♂; Khabis, January 12, 1 ♂; Chaharfarsakh, January 14, 2 ♂; Dehishib, January 18, 1 ♂; Tomogaon, February 3–5, 2 ♂, 2 ♀; Guragan, February 10, 1 ♂, 1 ♀; Darzin, February 14, 1 ♂. Khorasan: Gunbad i Qabus, July 30, 1 ♂, 1 ♀; Garmab, August 6, 1 ♀; Firdaus, August 28, 1 juv. ♂, 1 ♀; Robat i Khan, September 2, 1 ♂; Nishabur, September 20, 3 ♂; Sultanabad, September 22, 1 ♀; Sabzawar, September 23, 1 ♂, 1 ♀; Abbasa-bad, September 25, 1 ♂.

AFGHANISTAN: North and northwest: Chahar Aulia, September 5, 1939, 1 ♂, Mak, October 2, 1 ♂ [♀]; Bandar, October 9, 1 ♀; Gaojan, October 16, 2 ♀; Almar, October 19–20, 1 ♂, 2 ♀; Balkh, October 30, 1 ♂, September 5, 1937, 1 ♂, November 29–December 4, 5 ♂, 4 ♀; Shibarghan, September 15, 1 ♀; Pul i Khumri, November 5, 1 ♂; Aq Cha, November 7–8, 1 ♂, 1 ♀; Maimana, November 17, 1 ♂; Andkhui, November 22, 1 ♀. Northeast (Badakhshan): Aliabad, July 1, 1 ♀; Khanabad, July 2, 1 ♂; Atin Jilao, July 8, 2 ♂; Faizabad, July 10, 2 imm. ♀; Gandacheshma, July 10, 1 unsexed ad. [♂], 1 ♀; Takia, August 13, 1 ♂, 1 imm. ♂. Eastern, south of the Hindu Kush (Kabul to Jalalabad): Jalalabad, May 9, 1 ♂, 1 ♀, December 18–19, 1 ♂, 2 ♀; Turuk Pul, May 10, 1 ♂; Kabul, May 16–18, 1 ♂, 1 ♀; Laghman, May 27, 1 imm. ♀; Tagan, June 8, 1 ♀; Charikar, June 11, 1 ♀. Southern Afghanistan: Gardez, June 20, 3 ♂; Bagrami, September 29–October 1, 1 ♂, 2 ♀; Mukur, October 12, 1 ♀; Kalat i Ghilzai, October 13, 1 ♂, 2 ♀; Kandahar, October 20–24, 5 ♂; Girishk, October 27, 1 ♂; Takh ti Pul, November 24, 1939, 1 ♂, 1 ♀ [♂], 1 unsexed ad. [♂], 2 ♀; Spin Baldak, November 24, 3 ♂. Afghan Seistan: Farah, October 30–November 9, 1937, 2 ♂, 1 ♀.

INDIA: North West Frontier Province: Parachinar, May 8, 1936, 1 ♂, 1 unsexed ad. Baluchistan: Spezand Junction, January 19, 1946, 1 ♂, 2 ♀; Quetta, November 26–28, 1939, 5 ♂, 3 ♀. Sind: Soneri Lake, December 6, 1 ♂; Khinjar Lake, January 20–February 6, 1934, 4 ♀.

*Galerida cristata chendoola* Franklin

INDIA: Sind: Khinjar Lake, January 17–February 14, 1934, 12 ♂, 5 juv. ♂, 5 ♀, 4 juv. ♀; 9 miles above Landhi, March 4, 1 ♂. Punjab: Lahore, February 20, 1931, 1 ♂, February 9–21, 1933, 12 ♂, 5 ♀; Hissar, Sirsa, January 21–March 18, 1 ♂, 5 ♀; Parwali, February 4–March 10, 6 ♂, 2 ♀. Rajputana, Jaipur: Phulera, December 11, 1948, 1 ♀. United Provinces: Kalnahi, Febru-

ary 15–23, 1947, 5 ♂, 2 ♀; Malasa, April 2–3, 1948, 4 ♂. Bihar: Bhagahaghat, February 28, 1 ♀. Central Provinces: Bheraghat, May 14, 1946, 1 ♂; Bina, December 15, 1947, 1 ♂.

***Galerida malabarica malabarica* Scopoli**

SYNONYM: *Galerida malabarica propinqua* Koelz; type locality, Londa.

INDIA: Southern Bombay Presidency: Londa, January 11–31, 1938, 5 ♂, 4 ♀, 1 juv. ♀, February 5, 1 ♂ (the type of *G. m. propinqua*), February 8–10, 1 ♂, 2 ♀, 1 juv. ♀; Jagalbed, February 18–25, 3 ♂, 1 juv. ♂, 1 ♀; Castle Rock, March 5, 1 ♀. Western Madras Presidency: Tellicherry, February 25, 1937, 2 ♂, 1 ♀, 1 juv. ♀; Mangalore, March 1, 1 ♂.

Koelz in 1939 (Proc. Biol. Soc. Washington, vol. 52, p. 76) separated the population of the Londa district of southern Bombay as *propinqua*, but examination of his material shows that the so-called distinguishing characters of *propinqua* (less ruddy) are due to the use of comparative specimens from the Malabar coast that are stained with red, or these characters are not constant in the case of the juvenal plumage and the differences in size and shape of the bill. The comparative specimens of topotypical *malabarica* from the Malabar coast used by Koelz are listed above. Four are adult and when these, which were taken from February 25 to March 1, are compared to the specimens from the Londa district which show the same degree of wear (February 20 to March 5), the two series, with the exception of the reddish stain, are identical in coloration. The stain itself comes off easily with the gentle application of a little

warm water and soap. Koelz collected three juvenal specimens in the Londa district, not one as stated; these vary individually and fail completely to confirm a color difference stated to be "evident." The measurements listed individually below fail to confirm any size difference, and the same range of variation is observable in the shape of the bill in both series.

Whistler (1942, Jour. Bombay Nat. Hist. Soc., vol. 43, p. 36), in rejecting *propinqua*, stated that in this species the appearance of the plumage is greatly affected by wear. This observation is confirmed by a series examined by me from Mysore consisting of specimens taken from November 9 to 11 and on December 4, 1939, and January 20, 1940. The November specimens are less worn and are darker and grayer. Incidentally, the specimen showing the most wear (Kadur district, January 20) is even more strongly stained by the red lateritic soil than the specimens of Koelz from the Malabar coast.

The specimens from Mysore had the gonads enlarged, and the Koelz specimens were taken while breeding.

***Galerida deva* Sykes**

SYNONYM: *Mirafraga cantillans bangsi* Koelz; type locality, Hospet.

INDIA: Junagadh: Sasan, January 30–February 2, 1949, 4 ♂, 1 [♂], 1 unsexed ad.; Jamwala, February 11–12, 2 ♂, 1 ♀. Central Provinces: Bheraghat, May 1–16, 1946, 2 ♂, 1 ♀; Bichhia, July 5–14, 3 ♂. Southern Bombay Presidency: Hubli, March 17–19, 1948, 5 ♂, 1 [♂], 1 ♀. Madras Presidency: Hospet, March 25, 1937,

TABLE 20  
MEASUREMENTS IN ADULT *Galerida m. malabarica*

Region	N	Wing	Tail	Bill from Skull
Southern Bombay (Londa and district)	10 ♂ 8 ♀	94–100 (97.2) 90–93 (91.1)	50–54 (51.3) 44–52 (47.0)	17.2–18.5 (17.9) 16.5–17.5 (17.3)
Malabar coast	3 ♂ 1 ♀	97, 99, 99 88	50, 50, 54 43	17.5, 18.5, broken 17
Mysore	6 ♂ 2 ♀	92–100 (96.9) 91, 92	49–55 (51.8) 47, 51	17 –18.5 (17.6) 16.5, 17

INDIVIDUAL MEASUREMENTS: Wing: Southern Bombay, males, 94, 95, 96, 96, 96.5, 97, 98, 99.5, 100, 100; females, 90, 91, 91, 91, 91, 91, 91, 93. Mysore, males, 92, 97, 98, 98, 99, 100. Bill: Southern Bombay, males, 17.2, 17.2, 17.5, 17.5, 18, 18.2, 18.2, 18.5, 18.5, 18.5; females, 16.5, 17.2, 17.2, 17.5, 17.5, 17.5, 17.5, 17.5. Mysore, males, 17, 17.2, 17.5, 17.5, 18.2, 18.5.

TABLE 21  
MEASUREMENTS IN ADULT *Galerida deva*

Region	N	Wing	Tail	Bill from Skull
Junagadh and Central Provinces	12 ♂ 2 ♀	82.5-91 (87.1) 80, molt	42-54 (49.0) 45, molt	14 -16 (15.1) 13.5, 14
S. Bombay and Madras	8 ♂ 3 ♀	81 -89 <sup>a</sup> (86.0) 79, 81, 83 <sup>a</sup>	45-53 <sup>a</sup> (48.1) 39, 45, 46 <sup>a</sup>	14 -15.5 (14.7) 13.8, 14, 14.2

<sup>a</sup> The worn old feathers before the molt.

1 ♂ (the type of *Mirafra cantillans bangsi*), 1 ♂ [?], 2 ♀.

The populations of *G. deva* listed above and other specimens from Indore show no evidence of geographical variation. The series from Hospet (described as a race of *Mirafra cantillans* by Koelz, 1939, Proc. Biol. Soc. Washington, vol. 52, p. 76), and especially that of Hubli, are ruddier throughout, but, as in the case of *Mirafra javanica cantillans* and *M. e. erythroptera* also from Hubli and *Galerida malabarica* from the Kadur district of Mysore and from the Malabar coast, the color is due to staining and washes off. In the case of *G. deva* all these ruddy specimens are molting, and the new feathers are identical with those of a specimen that has just finished the molt and of two molting specimens from Bheraghat.

The presence of a crest and other characters such as the bristle-like little plumes over the nostril as well as habits show that this species is correctly placed in the genus *Galerida*.

MOLT AND BREEDING, CLASS A: *Galerida deva* appears to have the "regular," one annual type of molt, but its breeding season may not be clearly defined. Whistler (1939, in Ali, Jour. Bombay Nat. Hist. Soc., vol. 41, p. 105) states that its life history requires explanation, as he found that, of the many specimens he had examined, those undergoing their complete molt, "which is presumably post-nuptial," had been taken in March, April, and May. I have no April specimens. In my March specimens the complete molt is halfway through or more. Specimens taken on May 5 and 16 still show traces of this molt, though it is barely over in a specimen taken on May 1. If this molt is postnuptial the species would presumably breed in January to February, but at Bichhia in Central

Provinces, Koelz collected two males in worn plumage and in breeding condition on July 15.

#### GENUS *ALAUDA*

#### *ALAUDA ARVENSIS* AND *ALAUDA GULGULA*

The skylarks collected by Koelz in Iran, Afghanistan, and India belong to two groups: the *arvensis* group, in which the birds have a long and more pointed wing; and the *gulgula* group, in which the birds have a shorter wing with more rounded wing tip. With one or two exceptions the general body size is larger in the first group. These two groups were treated as separate species until Hartert (1922, Abhandl. Ber. Zool. Anthropol.-Ethnogr. Mus. Dresden, vol. 15, no. 3, p. 19) pointed out that there was no reason for specific separation, since they were connected by the forms of China and Japan, in which the length of the wing and the shape of its tip are more or less intermediate, and that the distribution, as then known, showed that no more than one form bred in any one region.

This treatment has been generally accepted, but it is open to objections. The strongest is on distribution, recent evidence showing that one race (*inconspicua*) of the *gulgula* group breeds within the range and side by side with one of the races (*dulcivox*) of the *arvensis* group. A study of the difference in the shape of the wing tip suggests that this character may be of more fundamental importance than has hitherto been recognized, and there is also an unrecorded difference in the proportionate length of the bill which appears to be significant. These structural differences together with the distribution of the two groups show, I believe, that they are indeed separate species, as was formerly believed.

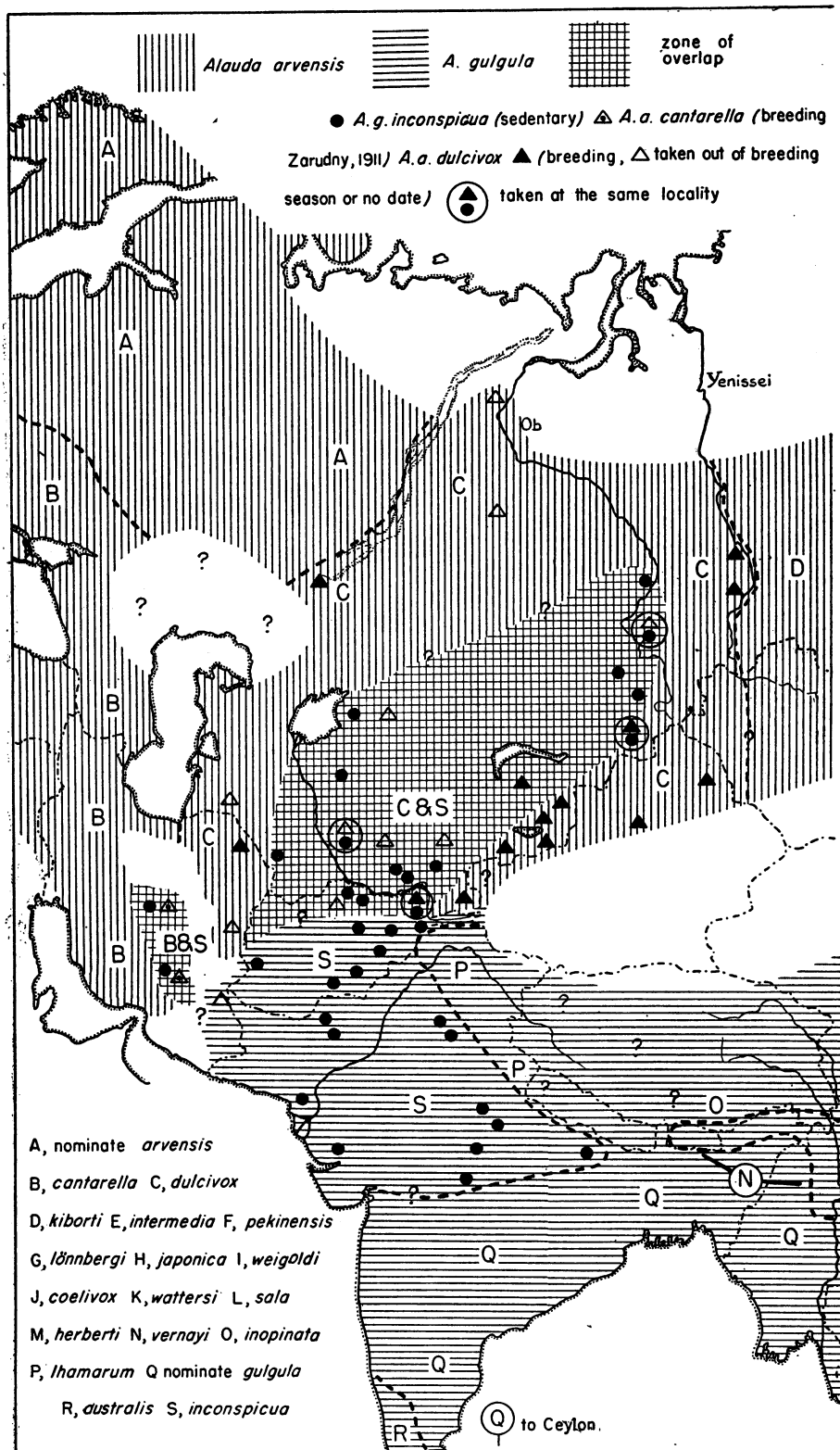


FIG. 4 (WEST; SEE OPPOSITE PAGE). Distribution of *Alauda arvensis* and *A. gulgula* during the breeding season.



## DISTRIBUTION

The two species are separated by the deserts of inner Asia and come in contact only in the west. In this region they overlap over a very broad zone extending from northeastern Afghanistan over the greater part of Russian Turkestan. According to Zarudny's distributional list (1911, Jour. Ornith., vol. 59, p. 212) both nest in Iran in Kirman and Kuhistan (the latter is that part of central Iran north of Yezd). It is probable also that both breed in northern Afghanistan and certain parts of Transcaspiia. The two overlapping forms are sharply differentiated, and hybrids are not known.

The overlap is apparent in the statements of range given by Dementiev (1934, L'Oiseau, pp. 598-600) who treats the two forms as separate species, though in a later unqualified remark he states (1935, Systema avium Rossicarum, p. 284) that it is preferable to consider *inconspicua* as a race of *A. arvensis*. However, the overlap is again discussed and stressed by Johansen (1944, Jour. Ornith., vol. 92, pp. 99-102), and I have new evidence that they apparently breed at the same localities: specimens of both in worn breeding plumage were collected by Koelz on July 9 at Gandacheshma in northeastern Afghanistan; I have examined specimens of *dulcivox* taken from April 3 to May 30 at Zaïsan Nor, where, according to Johansen, *inconspicua* is resident all the year round; and a breeding specimen of *inconspicua* taken on May 18 was examined from the region of Bukhara where *dulcivox* also apparently occurs as a breeder. According to the literature both species are also found at Barnaul. Dementiev (1934, *loc. cit.*) cites *inconspicua* as occurring at this locality which is also the type locality of *cinerea* Ehmecke, a synonym of *dulcivox*.

These four localities are enclosed within circles in figure 4. Symbols are limited to the breeding ranges of *dulcivox* and *inconspicua*; the latter is sedentary while the former is migratory, open symbols in the case of *dulcivox* denoting winter records, records without dates, or where no data are given, as in the case of Bukhara and Barnaul. The overlap in Kuhistan and Kirman is shown on the authority of Zarudny, but no specimens of *inconspicua* from this region and no specimens of *A. arvensis* taken during the breed-

ing season are available. Zarudny's list gives no localities, and in this region the breeding *arvensis* that replaces *dulcivox* is *cantarella*.

The distribution in the east is improperly known, but the two species appear to be separated by a wide gap in northern China, for no breeding skylarks are reported in the region extending from Kansu northeast of the Kuku Nor, Tsin Ling Mountains, and the region north of the Yangtze Valley to Manchuria and Korea. In Hopeh, according to Shaw, skylarks occur only as winter visitors (1936, Zool. Sinica, ser. B. vol. 15, fasc. 1, p. 579), and the same is true in Shantung (Shaw, 1938, Bull. Fan Mem., zool. ser., vol. 8, p. 188).

## SHAPE AND SIZE OF THE WING

With the exception of the southern populations, such as *harterti* from north Africa which is sedentary, *A. arvensis* is highly migratory, while *A. gulgula*, with the exception of *inopinata* from Tibet, is sedentary. An examination of these two forms is therefore particularly interesting. The graph (fig. 5) shows that these populations (F for *harterti* and O for *inopinata*), whether migratory or not, retain the shape of the wing characteristic of their group. The length of the wing apparently does not affect the shape of its tip; a short-winged population of *A. arvensis* (H, *intermedia* from Ussuriland) has a pointed wing, and a long-winged population of *A. gulgula* (O, *inopinata*) has a round one. Altitude also does not seem to affect the shape of the wing; the pointed-wing *harterti* breeds at both low and high altitudes, while the rounded-wing *inopinata* breeds at high altitudes.

In the case of the two forms *weigoldi* and *japonica* cited by Hartert as connecting the *arvensis* and *gulgula* groups, it can be seen that *weigoldi* (I) is much closer to the round- and shorter-winged *gulgula*. The specimens of *japonica* are plotted individually, as the length of its wing and the shape of its tip are quite variable, the more southern ones having the wing as round and as short as in *gulgula*.

## SIZE AND SHAPE OF THE BILL

This character is difficult to assess if only small series are available, for the differences



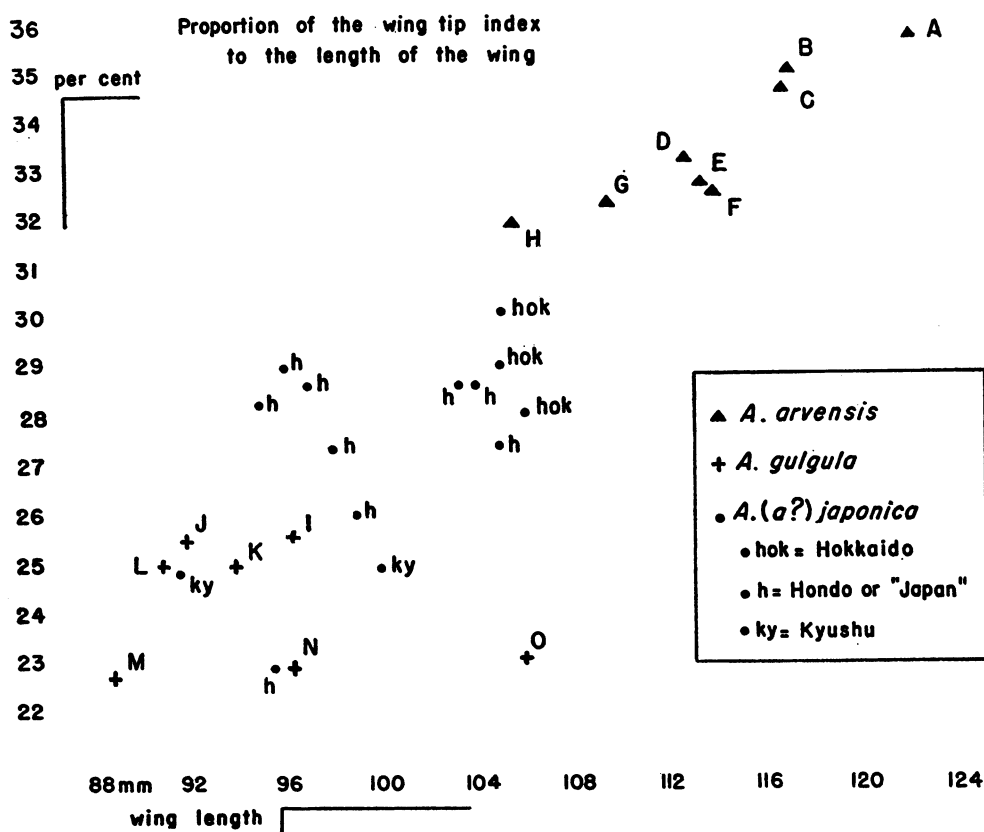


FIG. 5. Proportion of the wing tip index (the difference between the longest and innermost primary) to the length of the wing in some populations of *Alauda arvensis* and *A. gulgula*. Each symbol represents the average of five adults taken at random, except in the case of *japonica* where 14 specimens are plotted individually; of A, three specimens; of H, four specimens. Key: *Alauda arvensis*: A, *pekinensis* (Amur Bay, migrants); B, *pekinensis* (Gizhiga, breeding); C, *dulcivox* (Russian Turkestan, breeding); D, nominate *arvensis* (Scandinavia, breeding, and specimens taken on the breeding grounds); E, *cantarella* (Italy and Sardinia, taken on breeding grounds); F, *harterti* (North Africa, breeding); G, *kiborti* (Korea, breeding); H, *intermedia* (one breeding specimen from Ussuriland and the type and two migrants from eastern China; the breeding specimen and the two migrants are identical with the type). *Alauda gulgula*: I, *weigoldi* (Yangtze Valley); J, *sala* (Hainan); K, *coelivox* (Fukien); L, *inconspicua* (Sind); M, *herberti* (Siam); N, *vernayi* (northern Burma-Yunnan border); O, *inopinata* (Tibet, breeding).

are usually slight and tend to be obscured by individual variation. However, in large series, the bill in *A. gulgula* taken as a whole is definitely longer proportionately. In the populations in table 22 that number four males or more, the proportion of the length of the bill to that of the wing in 21 populations of *A. arvensis* varies from 13.4 to 15.6 (14.2) per cent, and in 19 populations of *A. gulgula*, not counting *japonica*, from 15.4 to 20.1 (17.5) per cent. There is very little overlap; in the populations of *A. arvensis* only two ratios

(15.2 and 15.6) are more than 15, and in *A. gulgula* only three (15.4, 15.5, and 15.8) are less than 16. In the case of *weigoldi*, which has a typical *gulgula* bill in size and shape, the ratio is 16.7. In the case of *japonica* the ratios decrease, getting closer to the ratios in *arvensis* as the populations range farther north; the ratio in Kyushu is 16.2, 15.7 in Hondo, and 15.2 in Hokkaido.

In *A. arvensis* the dominant type of bill is rather straight and stubby and relatively broad at the base, while in *A. gulgula* it is

narrower, finer, more pointed, and more de-curved. Occasionally, more slender bills are found in *A. arvensis* and stubbier, thicker ones in *A. gulgula*, but the difference holds well in long series. In *japonica* the shape of the bill varies individually, and, taken in series, is more or less intermediate, though closer to the bill of *arvensis*.

#### STATUS OF THE "CONNECTING" FORMS

It has been suggested above that of these two forms, *weigoldi* from the Yangtze Valley is much closer to *A. gulgula*. The distribution supports this finding, for *weigoldi* intergrades smoothly into *inopinata* in the mountains of Szechwan and, although I have no inland specimens, probably does so with *coelivox* from southern China, for this form differs from *weigoldi* only by its slightly rounder wing and slightly smaller size. There seems to be no doubt that *weigoldi* belongs to the *gulgula* group.

In the case of *japonica*, however, the situation is perplexing. This form appears to be closer to *arvensis* than it is to *gulgula*, but there are some objections for treating it as a race of either. Zoogeographically speaking the present-day distribution suggests that it is a member of the *arvensis* group. This is supported by its general coloration, which is similar to that of the vividly colored races of *arvensis* from Sakhalin (*lönnerbergi*) and the Okhotsk Sea (*pekinensis*), but, on the other hand, the coastal populations of *arvensis* directly facing Japan in Korea (*kibortii*) and Ussuriland (*intermedia*) abruptly differ from *japonica*, *lönnerbergi*, and *pekinensis* by the almost complete lack of rufous in their coloration. *A. gulgula*, taken as a whole, is a distinctly more rufous species than *A. arvensis*, and *japonica*, *lönnerbergi*, and *pekinensis* may have been derived from *gulgula*. But the increase in pigmentation does not necessarily denote relationship, for in skylarks it appears to be correlated with increased humidity. The coastal populations of *A. arvensis* from Europe such as *theresae* from western Ireland, also show an increase in pigmentation. And in both *gulgula* and *arvensis* the inland populations living in more arid regions, such as *inconspicua* and *dulcivox*, show a marked decrease in pigmentation. However, in the population from near-by Ussuriland, which also lives in

a wet region, the increase in pigmentation is towards the black, while in *japonica*, *lönnerbergi*, and *pekinensis* it is towards the red.

The derivation of *japonica*, *lönnerbergi*, and *pekinensis* from *gulgula* receives support by the progressive changes observable in *japonica* in the shape of the wing tip and in the bill/wing ratio. The last has been mentioned. Regarding the changes in the wing tip, Yamashina (1939, Bull. Brit. Ornith. Club, vol. 59, p. 135) has already shown that the wing is more rounded in the populations of Kyushu than it is in the populations farther north in the Japanese Archipelago. In the specimens I have examined, those from Kyushu have a very rounded wing tip indistinguishable from that of *gulgula*, specimens from Hondo are intermediate, and those from Hokkaido have a more pointed wing tip. This last population also appears to have a slightly longer wing (table 22) than the population of Hondo, but large specimens occur also in Kyushu. It was formerly believed that *japonica* was sedentary, but Jahn (1942, Jour. Ornith., vol 90, p. 105) states that only the populations from Kobe southward are sedentary. In Hondo those living at the higher altitudes come down to the lowlands in winter, while the populations of Hokkaido are migratory, returning in winter to the lowlands of central and southwestern Japan. The more northern *lönnerbergi* and *pekinensis* are migratory; the latter, breeding farthest north, is highly so. In these three forms the wing length also increases from south to north. It appears, therefore, that the long and pointed wing was developed as the population became migratory. But we have seen that in other parts of the range *inopinata*, a true member of the *gulgula* group, retains a very rounded wing even if migratory, while *hartertii*, a sedentary race of the *arvensis* group, has a typically pointed one.

The song and call notes may give a clue to relationships; Jahn states that they correspond in *japonica* to those of European skylarks. But there is a difference, for he adds that all European visitors to Japan notice that the calls and song are distinctly higher and a little fuller. I could find no comparative account of the song in *A. gulgula*, but the alarm note of this species in Fukien (*coelivox*) "is quite different to that of the birds of the *arvensis* group" according to La Touche

(1930, Birds of eastern China, p. 449).

In summary it can be said that, lacking better-defined characters, the status of *japonica* remains in doubt for the present. Whether this form is a member of the *gulgula* group or of the *arvensis* group, I consider it, on the grounds of distribution if no other, to be closer to the latter.

#### GEOGRAPHICAL AND INDIVIDUAL VARIATION

In the two species, taken as a whole, geographical and individual variation is greater in *A. arvensis* than it is in *A. gulgula*.

In *A. arvensis*, with the exception of the coastal populations, geographical variation is very slight, but individual variation is high. In the inland populations, relatively large or small, dark or pale, more or less rufous or more or less heavily streaked birds are found almost everywhere, but if the marked changes in appearance caused by the abrasion of the plumage are taken into consideration, the palest populations are found from eastern Iran to Russian Turkestan. From this arid center pigmentation increases both to the west and east and is accompanied by a limited decrease in size. In Transcaucasia, Armenia, and in northern and western Iran, however, large specimens are found, and on the Pacific the population (*intermedia*) of Ussuriland is quite abruptly smaller than the population (*pekinensis*) of the Ohkotsk Sea. This latter reverses the trend and is distinctly larger than the inland populations. In coloration, *intermedia* is abruptly darker (blackier) than the inland populations, while *pekinensis* and the closely related *lönnerbergi* of Sakhalin differ very strongly from the blackish *intermedia* and the grayish and pale inland populations by their vivid rufous coloration and are more richly and brilliantly colored than the coastal populations of Europe.

This well-marked contrast in characters points, perhaps, to the region of the Pacific as the original center of dispersion, or, as stated in the discussion of *japonica*, the brilliant forms of Sakhalin and the Ohkotsk Sea may have originated elsewhere. In any case the coloration in the coastal populations of the Pacific, whether red or black, and in the coastal populations of the Atlantic is less variable individually than in the inland popula-

tions. The coastal populations inhabit regions where climatic factors are more constant, while the higher degree of individual variation in the inland populations may be due to an increased sensitivity to even small local changes in aridity or humidity.

In the shape and size of the bill no geographical trend is apparent in *A. arvensis* other than in the peripheral *harterti* from north Africa which has a heavier bill, proportionately one of the longest bills in that species.

In *A. gulgula* individual variation is less marked and, with one or two exceptions, geographical variation is rather slight. The geographical variation in the pigmentation is not abrupt, the most significant departure being *inconspicua* which inhabits arid regions. With this exception all the populations are well pigmented, the extreme of saturation in skylarks being reached with the population of southwestern India, in both the red and black pigments.

The island populations are small, and on the continent the more montane forms are larger. The bill is longest in the populations of the South China Sea and Siam. The bill/wing ratio in southern Kwangtung at Kwang Tchou Wan is 19.3, 19.7 on Hainan, and 20.1 at Bangkok. It averages 19 on Formosa, but the bill length is very variable individually in this population, the only marked instance of individual variability in *A. gulgula*.

The material used in this revision was exceptionally large. It consists of 250 odd specimens collected by Koelz, the many hundreds in the collection of the American Museum of Natural History, and, thanks to a recent European trip, of the huge series in the British Museum and those in the Stockholm and Paris museums. Altogether some 2000 or more specimens have been examined. The material is about equally divided between the two species. A number of critical specimens were taken from the American Museum of Natural History to Europe for comparison. In all, 14 types were examined.

#### MOLT AND BREEDING

CLASS A: With one or two exceptions no notes were kept on the molting specimens examined in the European collections. At present, notes on molting specimens are available only in the case of a few Asiatic forms, namely,

*dulcivox* and *pekinensis* in *A. arvensis*, and *inopinata*, *lhamarum*, and *inconspicua* in *A. gulgula*. In these forms the molting period is short, usually starting towards the end of the first week in August to end by the second or third week in September. This is true in western Tian Shan and the region of Djarkent in Russian Turkestan, in the southern Kuriles, Tibet, and in Baltistan, Ladak, and Zaskar in Kashmir, and Spiti in northern Punjab. In some populations the molt starts and ends earlier, starting by the end of July in Kashmir and ending or barely over by the end of August (August 21 in Orenburg, August 26 in western Tian Shan, August 26–31 in northeastern Afghanistan, and September 5 in northern Afghanistan, both of these Afghan populations being north of the Hindu Kush). However, some specimens from Ladak are only barely starting to molt by September 9, and some specimens from eastern Afghanistan south of the Hindu Kush still show traces of molt on October 1–2.

All the forms above either are migratory (*dulcivox* and *pekinensis* highly so) or come from regions of high altitudes. It is possible that in the forms from southern and semi-tropical latitudes the complete postnuptial molt takes place at other times in the year, for, as mentioned by Whistler (1936, Jour. Bombay Nat. Hist. Soc., vol. 38, p. 768) in the case of *australis* from southwestern India, specimens in breeding condition or specimens taken while actually breeding are collected from November to May, and it is possible that some breed throughout the year. In the northern forms, populations do not seem to breed before the middle or end of April, and some of these appear to be already on their fall migration by early or middle September. Judging by the great freshness of the plumage in migrants, they appear to leave for their winter quarters as soon as the molt is over.

#### ALAUDA ARVENSIS

*Alauda arvensis cantarella* Bonaparte, 1841

TYPE LOCALITY: Central Italy.

SYNONYM: *Alauda arvensis armenica* Bogdanow, 1879; type locality, Akhalzykh, "Gouvernement de Tiflis."

This race is grayer than nominate *arvensis*, less sandy and, in series, slightly darker than

*dulcivox* which replaces it in the east.

Stresemann (1928, Jour. Ornith., vol. 76, p. 360) identifies the specimens collected by Heinrich along the southern Caspian from May 22 to July 23 as *schach*, but this form is not well authenticated and appears to be synonymous with *dulcivox* (see discussion of this form). Stresemann was guided by Hartert's acceptance of *schach* as a well-marked form (1921, Die Vögel der paläarktischen Fauna, p. 2091), but in 1933 (*op. cit.*, p. 124) Hartert says that *schach* is a synonym of *armenica*, stating that a comparison of the specimens of Heinrich to those in the Leningrad Museum showed that the same form occurs in the southern Caspian as in Russian Armenia (Erivan) and Ararat. I find, however, that *armenica* is not sufficiently distinct from *cantarella* to warrant recognition.

Bogdanow separated *armenica* solely on the basis of greater size, but Seebohm (1883, Ibis, p. 12), who examined Bogdanow's material, states in his English digest of this author's paper that the specimens vary so much in size that it is unwise to accept *armenica* "on that character alone."

My specimens support Seebohm. Unfortunately, only three were taken during the breeding season; one, almost a topotype of *armenica*, taken at Tiflis on May 10, is identical in coloration with breeding specimens of *cantarella* from Italy. The other two, taken by Heinrich on May 22 and now in the collection of the Museum of Comparative Zoölogy, are too badly worn for color comparison. All three specimens are large, the Tiflis specimen has a wing of 121 mm. and the other two both have 121+ mm. In the other specimens (table 22) the series taken outside the breeding season in Armenia, Azerbaijan, Kermanshah, Luristan, and Iraq all contain larger birds as well as birds that are no larger than in *cantarella* from Italy, and these birds, whether large or small, do not differ in coloration from the latter. The size difference is too small and the individual variation and overlap too great to warrant the recognition of *armenica*.

In addition to the specimens mentioned, other specimens have been examined from the northern Caucasus (Wladikawkas), southern Caspian, Elburz, Karaj, Fars, Isfahan, Kirman, Khuzistan, and the shores of the Gulf.

All were taken before April 15, those from the southern Caspian from March 4 to April 11, but they all match *cantarella* very well in size and in similar plumage.

Nominate *arvensis* is said to occur in the Caucasus in winter. No specimen of this race was examined from this region, but I have seen a specimen, apparently of this race, taken on March 3 at Kislowodsk about 175 kilometers northwest of Wladikawkas.

***Alauda arvensis dulcivox* Brooks, 1873**

Not preoccupied by *A. dulcivox* Horsfield and Moore, 1856; *nomen nudum* quoted in synonymy of *A. arvensis* by Horsfield and Moore (1856, A catalogue of the birds in the museum of the . . . East India Company, vol. 2, p. 466).

Type locality here designated as Djarkent, Russian Turkestan. Neotype, A.M.N.H. No. 555411, Rothschild Collection; adult male, March 10, 1900 [Russian calendar, corrected to March 23]; N. Zarudny, collector.

SYNONYMS: *Alauda cinerea* Ehmcke, 1903; type locality, Barnaul; *Alauda cinerascens* Ehmcke, 1904, new name for *A. cinerea* Ehmcke.

*Alauda schach* Ehmcke, 1904; type locality, Nison, eastern Persia.

*Alauda beludshistana* Ehmcke, 1904; type locality, Dus-Ab [Zahidan], Persian Baluchistan.

*Alauda arvensis almásiyi* Keve, 1943; type locality, Naryn Kol, Russian Turkestan.

This race, taken in series, is slightly paler than *cantarella*, with a sandy cast in fresh specimens or specimens that are not too badly worn. More large specimens occur in the range of *dulcivox* than in the populations of *cantarella* from the Mediterranean.

No member of the *arvensis* group breeds in India, and I agree with Ticehurst (1922, Ibis, p. 149) that Brooks gave an adequate description of the winter visitors that occur in the plains of northern India, for examination shows that these visitors are identical with specimens in comparative plumage from Russian Turkestan. However, Brooks' statement, a "well marked Alpine lark," cannot be construed as fixing a type locality, and since he did not select a type I have thought it preferable to appoint one and to select a definite type locality.

The characters given by Ehmcke (1904, Ann. Hist. Nat. Mus. Natl. Hungarici, vol. 2, p. 299) for *schach* and *beludshistana* do not separate the birds of Khorasan and Persian

Baluchistan from *dulcivox* of Russian Turkestan. Furthermore, Ehmcke's specimens were few and, with one exception (a molting specimen taken on August 5 at Kalender Abad in Khorasan), were taken from October 27 to January 7 and may have been winter visitors.

In the case of *schach*, Ehmcke had but two specimens, the type, collected on October 27, and the specimen from Kalender Abad. As stated in the discussion of *cantarella*, Hartert changed his opinion as to the validity of *schach*. In 1921 (*loc. cit.*) he had stated that its breeding grounds were unknown and that it appeared in eastern Persia only as a winter visitor. The specimens in the Rothschild Collection identified as *schach* by Hartert were taken in November and March in Khorasan. They are not, I find, referable to *cantarella* (synonym *armenica*) but are instead absolutely identical in size and coloration with *dulcivox* in similar plumage from Russian Turkestan. The August 5 specimen of Ehmcke from Kalender Abad undoubtedly shows, as stated by Zarudny (1911, Jour. Ornith., vol. 59, p. 212), that *A. arvensis* breeds in Khorasan, but there is no proof so far that the population of this region differs from *dulcivox*.

In the case of *beludshistana*, Ehmcke had five specimens, all collected by Härms at Zahidan on January 7. One specimen that I have examined, also collected by Härms on January 14 at Ladis, 80 kilometers south of Zahidan, is identical with Russian Turkestan specimens in comparative plumage.

Keve's *almásiyi* (1943, Anz. Akad. Wiss. Vienna, vol. 80, p. 17) is based on September specimens in very fresh plumage. They are said to be larger than *dulcivox*, but the measurements given all fall within the range of variation of this form. Breeding specimens (May 12 to June 2) that I have examined from Naryn are identical with *dulcivox* from other parts of Russian Turkestan.

The breeding specimens of *dulcivox* examined range from Orenburg in the west (April through August) to Yeniseisk and Krasnojarsk in the east (June 7) and Bakty in Chuguchak in northeastern Dzungaria (May 21), south from Zaisan Nor (April through May 30) along the borders of Russian Turkestan through the Tarbagatai, Issyk Kul, and the Ili River region, western Tian Shan, Ferghana, and Pamirs to Gan-

dacheshma in northeastern Afghanistan (July 9). No breeding specimens have been examined from Afghan Turkestan, northwestern Afghanistan, and Khorasan. According to Zarudny (*loc. cit.*) it breeds (as "*schach*") in Khorasan (see also Ehmcke's specimen from August 5 cited above). It may therefore breed in Afghan Turkestan and in northwestern Afghanistan, and probably in suitable localities to the north in Transcaspia, Bukhara, and Samarkand as it does on the Kirghiz Steppes. Still farther north it is reported from Tobolsk and still higher at Berezow by Dementiev.

With the exception of the specimen from the northeast, all the other specimens collected by Koelz in Afghanistan were taken out of the breeding season and may have been migrants. I have also examined it, as a migrant, from Persian Baluchistan, Seistan, the region of Quetta, Gilgit, Kashmir, North-West Frontier Province, Punjab, and from Roorkee in western United Provinces. It probably does not go much farther east than Roorkee.

***Alauda arvensis kiborti* Zaleski, 1917**  
(Formerly *intermedia*)

TYPE LOCALITY: District of Kansk [about 200 kilometers east of Krasnojarsk].

SYNONYMS: *Alauda arvensis alticola* Sushkin, 1925; type locality, eastern Chui Steppe, southeastern Altai.

*Alauda arvensis sushkini* Domaniewski, 1933; type locality, Tschikoï River [Outer Mongolia-southwestern Transbaikalia border].

Less sandy than *dulcivox*, darker and grayer above and with the streaks of the upper parts better developed. It becomes smaller in size than *dulcivox* as it ranges farther east. *A. a. kiborti* differs from *cantarella*, of which it is the eastern counterpart, by its generally heavier streaking and by a fairly constant tendency towards a browner, less grayish tone.

This race, which replaces *dulcivox* east of the Yenissei, is distinguished by all the Russian authors but recognized under the name *intermedia*. This name was given by Swinhoe to a winter migrant taken in Shanghai, and Ivanow (1928, Ann. Mus. Zool. Leningrad, vol. 29, p. 282), who had not seen the type and states that the original description is too short, restricted *intermedia* to southern cen-

tral Siberia from Krasnojarsk to the upper Amur. However, examination of the type in the British Museum shows definitely that the name *intermedia* applies instead to the small dark population of Ussuriland. The oldest available name in the region defined by Ivanow is *kiborti*.

Sushkin's *alticola* is recognized by the Russian authors, Ivanow (*loc. cit.*) stating that it is very similar to *kiborti* but less rusty above. But Meinertzhagen (1951) who has examined the type and a large topotypical series in Leningrad does not recognize it. I have examined only two specimens of *alticola*, but these (in the collection of the Museum of Comparative Zoölogy) are both paratypes and one is a topotype as well, collected on the same day as the type. These two specimens were collected on June 18 and July 6 (Russian calendar, corrected to July 1 and July 19) and are extremely worn. It is quite meaningless to describe a new skylark on fine points of coloration with such specimens. I have treated *alticola* as a synonym of *kiborti*, for Sushkin states that *alticola* is "Very similar . . . [to] the skylark of NW Mongolia, Minussinsk district, and the southern parts of Irkutsk province," regions from which I have examined breeding specimens of *kiborti*.

In 1933, Kozlova (Ibis, p. 82) remarked that in northern Mongolia south of Khangai and Kentei where *intermedia* [= *kiborti*] breeds, there seemed to breed another paler and somewhat larger form. Later in the year, Domaniewski (Acta Ornith. Mus. Zool. Polonici, vol. 1, p. 168) took up this clue and, using the same characters, described as *sushkini* three specimens collected on the Tschikoï River on March 29-30. The Tschikoï is somewhat farther north and east than the area indicated by Kozlova, but there is no proof that Domaniewski's specimens were on their breeding grounds, for he reports the collector as stating that these larks were passing through "en masse" in this region on the thirtieth.

I have examined in the Stockholm museum two specimens collected in northern Mongolia south of Kentei from May 15 to June 6. The specimens of *A. arvensis* from this region are said by Lönnberg to vary individually (1909, Arkiv för Zool., vol. 5, no. 9, p. 16).

I cannot separate the two specimens from breeding specimens of *kibortii* taken in the region of Irkutsk. The situation in northern Mongolia needs further study, but until then one should follow Kozlova in refraining from proposing new names from this region.

Specimens of *kibortii* taken during the breeding season have been examined from Irkutsk, northern Mongolia, Zeya River, and Great Khingan. Specimens from these regions are not separable, but populations from Yakutsk on the middle Lena and Korea which are perhaps referable to this race depart from the specimens from the regions above and are discussed below.

The limits of the range of *kibortii* in the northeast and southeast are not clear. In the region of Yakutsk in the northeast Ivanow (*loc. cit.*) states that *kibortii* is replaced by a larger and darker form which he identifies as *buxtoni*, a name that Dementiev correctly states is a synonym of *pekinensis*. I have but three specimens from Yakutsk; they show a tendency to be larger than *kibortii* and appear to have wider and darker shaft streaks, but they were collected on June 21 to 24 and are too badly worn for comparison.

In the southeast, according to Ivanow, and Stegmann (1931, Jour. Ornith., vol. 79, p. 171), true *kibortii* is found on the Shilka River, but from Dzhalinda on the upper Amur to Blagoveshchensk on the middle Amur the populations are intermediate between *kibortii* and *intermedia* (formerly *nigrescens* or *pusilla*). According to Meise (1934, Abhandl. u. Ber. Mus. Dresden, vol. 18, no. 2, p. 25) this is also the case in northern and central Manchuria and, according to Ivanow also, for the population on the Poset Bay on the border of Ussuriland and Korea.

The status of the populations in Korea, whether *kibortii* or *intermedia*, has been disputed. An examination of a good series of 18 specimens taken during the breeding season (12 from May 1 to 11, one on April 27, and five from July 7 to 19) shows without question that the population of Korea is not separable from *kibortii*. The July specimens are too worn and were not used for comparison; the April and all the May specimens were taken in the north from Taikando on the west to Genzan on the east coast. Two March specimens, one in the British Museum and the other in the

Stockholm museum, are darker and smaller and match almost exactly the type of *intermedia*, but at this date these specimens may have been migrants on their way to Ussuriland. It is perhaps the occurrence of such specimens which led some authors to refer the population of Korea to *intermedia*.

I have also examined four specimens from the Great Khingan, one taken on April 24 and the others from May 20 to June 10. They are not separable from *kibortii* from Irkutsk. One of the Khingan specimens was taken on June 10 at Dolon Nor and is the southernmost breeding specimen of *A. arvensis* examined in the east.

#### *Alauda arvensis intermedia* Swinhoe, 1863

TYPE LOCALITY: Shanghai.

SYNONYMS: *Alauda arvensis quelpartae* Momiyama, 1927; type locality, Quelpart Island.

*Alauda arvensis nigrescens* Kistjakowsky and Kotschubei, 1929; type locality, Lake Xanka [southern Ussuriland].

*Alauda arvensis pusilla* Ivanow, 1929; type locality, Lake Xanka.

Smaller and much darker than *kibortii*, very dark, almost blackish in worn plumage. The streaks on the crown are well developed and very sharply marked.

The type of *intermedia* matches perfectly in every detail of coloration and size a specimen taken at Lake Xanka in southern Ussuriland on June 1. Although the type was taken in January, both specimens show a similar degree of wear. The name *intermedia* therefore applies, as stated under *kibortii*, not to the birds of eastern central Siberia but to those of Ussuriland instead. Lake Xanka is also the type locality of *nigrescens* and *pusilla*, both names being aptly descriptive. The description of *nigrescens* was not seen, but Ivanow's description of *pusilla* matches perfectly the characters of the type of *intermedia* and of the June 1 specimen from Lake Xanka.

In treating *quelpartae* as a synonym I am guided by the "Handlist of Japanese birds" (1942, p. 25) which considered *nigrescens* and *pusilla* as synonyms. No specimens from Quelpart Island have been examined. This list gives *intermedia* as being the breeding form of Korea, but, as stated, I find that it is not separable from *kibortii*.

According to Ivanow the range of *intermedia*

is all of Ussuriland west to Blagoveshchensk on the middle Amur. I have examined a series taken on Amur Bay in northern Ussuriland, but these specimens were unfortunately taken on March 3 to 4. They agree well in size, are a little less blackish, but they are less worn. These specimens have no red brown as in neighboring *lönnerbergi* and *pekinensis* and with more wear would probably become like the type of *intermedia* and the June 1 specimen from Lake Xanka.

Since specimens intermediate between *kibortii* and *intermedia* are found north of Blagoveshchensk and in northern and central Manchuria, the breeding range of *intermedia* seems to include, in addition to Ussuriland, northeastern Manchuria and the region west of the lower Amur, perhaps as far as the Zeya.

Migrants have been examined from Shawshean Island at the mouth of the Yangtze (March 18 to 19), Shanghai (November 7 and January 15), and Anchin in Shantung (November 15). The November birds are less blackish but are in fresh plumage. One of the Shawshean specimens and the January specimen from Shanghai are identical (in the case of the first, or very similar for the second) with the type and the specimen from Lake Xanka.

If there is no error on the original label, *intermedia* may stray to Sakhalin. I have examined a specimen identical with the type from this island. This specimen was taken on July 14 at "15 M. N. W. Korsakoff." Two Korsakoff's have been located on Sakhalin, one ("Korsakowsk") at the tip of southern Sakhalin, and the other ("Korsakow Bay") at latitude 50° N. on the west coast opposite Ussuriland.

***Alauda arvensis pekinensis* Swinhoe, 1863**

TYPE LOCALITY: Peking.

SYNONYMS: *Alauda blakistoni* Stejneger, 1884; type locality, Kamchatka and Bering Island. *Alauda buxtoni* Allen, 1905; type locality, Gizhiga [Shelekhova Gulf, northern Okhotsk Sea].

Very strongly pigmented with rich brown and black markings, and the largest of all skylarks; in fresh fall plumage the birds look buffier, the feathers being bordered with broad, strongly buffy edges.

The type, a November migrant from Peking, is a long-winged bird in very fresh, fall plum-

age and is very buffy. It is an old specimen and looks quite faded and may be aberrant, as it cannot be matched exactly by any specimen from northeastern Siberia and neighboring islands. Nevertheless, its coloration is approached closely by an August 28 specimen from Kamchatka in the very last stages of the molt and by a September 7 specimen from Gizhiga in very fresh plumage.

Ivanow (*loc. cit.*) distinguishes between the coastal populations which he calls *pekinensis* and the inland populations westward to the middle Lena, middle and upper Yana, and upper Indigirka, and southward "apparently" to the upper and middle Zeya. An April 22 specimen from the Zeya that I have examined is, however, identical in size and coloration with *kibortii*. Ivanow calls the inland populations *buxtoni*, but the type and the original series of this form from Gizhiga on the shores of the Okhotsk Sea are not separable from breeding specimens taken on Kamchatka from May 10 to July 23. Ivanow in ascribing the inland populations to *buxtoni* says that the Gizhiga specimens were migrants, but these specimens, with the exception of the September specimens, were collected from April 30 to May 5, the type on May 3, and probably were on their breeding grounds. The Gizhiga specimens are not quite so dark as the Kamchatka birds, but most of the latter were taken later and are more worn.

I have not examined inland specimens from the regions given by Ivanow and it is quite possible that these differ from the coastal populations and those of Kamchatka, Bering, and the Kuriles by being paler. If so, the name *pekinensis* could perhaps be restricted to the inland population, which show a trend towards *kibortii*, while the others can be called *blakistoni*.

Breeding specimens from Bering Island (May 9 to 29) and the southern Kuriles (Kunashiri and Etorofu, April 24 to July 15) are identical in coloration with the specimens from Kamchatka, but some southern Kuriles specimens are smaller, although the range of variation and averages are virtually identical (table 22) between Kamchatka and the southern Kuriles. The "Handlist of Japanese birds" (1942, p. 25) lists both *pekinensis* and *japonica* as breeding in Hokkaido, the first in the eastern parts. However, *japonica* is



the only breeding form mentioned as occurring in Hokkaido by Jahn (1942, Jour. Ornith., vol. 90, p. 105). The island is relatively small, and specimens of *japonica* may have been misidentified as *pekinensis*, for, as stated in the Introduction, the Hokkaido population of *japonica* has the wing longer and more pointed than do the populations of *japonica* from Hondo south.

In the extreme north *pekinensis* is said by Dementiev to range as far as the Chukotski Peninsula or the extreme tip of eastern Siberia.

Winter migrants have been examined by me from Askold Island (November) and the mouth of the Amur (September 17 to 29 and April 11). Ivanow reports them from the upper Lena and Ussuriland.

***Alauda arvensis lönnbergi* Hachisuka, 1926**

TYPE LOCALITY: Chepisani, Sakhalin.

Smaller than *pekinensis*, above somewhat darker and more heavily streaked.

This race is not recognized by Meinertzhagen (1951) on the grounds that it is merely an intermediate between *pekinensis* and *japonica*. However, I agree with Ivanow that it is separable from the former not only in size but in coloration. The latter is smaller and also is not so heavily streaked, and has, as stated in the Introduction, a variable but differently shaped wing tip.

The specimens examined consist of the type and the original series in the Stockholm museum and of one other specimen. All of the specimens, with the exception of the type which was taken on October 1 and the additional specimen which has no date, were taken from May 15 to June 28, mostly in southern Sakhalin. Ivanow states that *lönnbergi* is the breeding form of the Shantar Islands, and perhaps that at the mouth of the Amur.

***Alauda parvensis japonica* Temminck and Schlegel, 1848**

TYPE LOCALITY: Japan, restricted to northern Hondo by Yamashina (1939, Bull. Brit. Ornith. Club, vol. 59, p. 135).

SYNONYM: *Alauda arvensis kagoshimae* Yamashina, 1939; type locality, Sakurajima, Kagoshima Prefecture, southern Kyushu.

Similar in coloration to *pekinensis* but considerably smaller; smaller than *lönnbergi* and not quite so heavily streaked above; differs from both by its variable but definitely more rounded wing tip.

This perplexing form has been discussed in the Introduction.

Yamashina described *kagoshimae* as having wider and more sharply defined shaft streaks than *japonica*, but admits that his specimens are very variable, only 10 of 15 specimens showing the difference. This difference does not seem constant enough to warrant separation. Two specimens that I have examined from Kagoshima and two from Kyushu have identical streaks with others from Hondo and Hokkaido.

***ALAUDA GULGULA***

Eleven races are recognized in this revision. These, starting in the east, are: *weigoldi* (Yangtze Valley), *coelivox* (southeastern China), *wattersi* (Formosa and Philippines), *sala* (Hainan), *herberti* (Siam and Cambodia), *vernayi* (northwestern Yunnan-Burma border to Bhutan), *inopinata* (northern Kansu to southeastern Tibet), *lhamarum* (Gilgit, Kashmir, northern Punjab), *gulgula* (Burma to eastern, central, and southern India to Ceylon), *australis* (southwestern India), and *inconspicua* (from United Provinces and western India through Baluchistan and Afghanistan to Russian Turkestan and Transcaspia).

As, with some exceptions, the geographical variation is rather slight, it is impossible in every instance to give a clear-cut diagnosis for each race that will separate it at once from all the others. The following synopsis is offered as a help to visualize the differences:

A. *vernayi*, *australis*, and *gulgula*

Richest coloration, dark above and most rufous. The first is whitish on the belly, and the other two are distinctly rufous. Of these two, *australis* is larger and, in series, a little darker above.

B. *weigoldi*, *coelivox*, *sala*, and *herberti*

Rufous, but not so rich, duller and less dark above. The first two are larger and differ mainly in size, *coelivox* being smaller and with a rounder, less variable wing tip. *A. g. sala* and *herberti* are smaller than either *weigoldi* or *coelivox* and have distinctly longer bills; *herberti* is more "pinkish gray" above and very "pinkish" below.

C. *wattersi*

Darker above than B but less rufous than either A or B. In this race the population from Formosa has a variable bill and contains many specimens in which the bill is as long as in *sala* and *herberti*.

D. *inopinata* and *lhamarum*

Distinctly grayer and less rufous than A or B, grayer and larger than C. Of these two, *inopinata* is larger, the largest race in *A. gulgula*.

E. *inconspicua*

Sandy and very distinctly paler than all the preceding.

***Alauda gulgula weigoldi* Hartert, 1922**

TYPE LOCALITY: Hankow.

Duller and less heavily streaked above than *japonica*. The spots on the upper breast vary individually but average smaller and are more reduced in numbers. The shape of the wing tip is less variable and averages distinctly rounder. The bill is thinner and longer.

According to the specimens examined this race ranges in the Yangtze Valley from Chinkiang at the mouth of the Yangtze to Chengtu at the foot of the Szechwan Mountains. In the mountains from the Tsingling Range and northern Kansu westward to southeastern Tibet it is replaced by the larger and grayer and paler *inopinata*. Mayr (1941, *Ibis*, p. 376) found that specimens from the mountainous parts of Szechwan were about intermediate. In southern China from Foochow to southern Kwangtung and southern Yunnan, *weigoldi* is replaced by the smaller *coelivox*.

***Alauda gulgula coelivox* Swinhoe, 1860**

TYPE LOCALITY: Amoy, Fukien.

SYNONYM: *Alauda gulgula pescadoresi* La Touche, 1922; type locality, Fisher Island, Pescadores Islands.

Smaller than *weigoldi* but similar in coloration and with the same bill: the shape of the wing tip is more rounded.

La Touche separated *pescadoresi* on the basis of being more rufous and of having a shorter bill than the population of Formosa (*wattersi*), but this diagnosis does not separate *pescadoresi* from *coelivox*, a form not mentioned by La Touche. The latter is resident all year in southeastern China, but apparently

occasional individuals wander to the Pescadores and Formosa. I have examined one specimen from each taken on February 14 in the Pescadores and on September 26 in Formosa which are identical with specimens of *coelivox* in similar plumage taken at the same time of the year in Fukien. *A. g. pescadoresi* may have been based on such specimens; the type, the only specimen mentioned by La Touche, was taken on February 10.

Mayr (*loc. cit.*) found that specimens from Mengtsh in southern Yunnan are intermediate between *coelivox* and *vernayi* from northern Burma. Inland, *coelivox* replaces *weigoldi* somewhere south of the Yangtze Valley. I lack inland specimens of *coelivox*, but Yen (1934, *L'Oiseau*, p. 497) found it common in the plains of Kwangsi but lacking in the mountains.

**THE RACES OF THE SOUTH CHINA SEA**

The populations of Formosa (*wattersi*), Philippines (*wolfei*), Hainan (*sala*), and Siam (*herberti*) have occasionally been treated as one form, the oldest name of which is *sala*. However, this lumping obscures a constant degree of geographical variation.

These populations are short winged, and the wing measurements are similar or show but slight variations. There are, however, differences in the bill and in coloration, the latter being taxonomically the most important. *A. g. sala* is distinctly more rufous, while in the other three, the populations of Formosa and the Philippines are least rufous, darkest, and most heavily streaked above, and the population from Siam is more "pinkish-gray" above than rufous and is especially "pinkish" below.

All the populations, with the exception of the population of the Philippines, are long billed or contain many specimens with long bills. The bill is consistently long in the population of Hainan, a little more variable in the population from Siam, and still more variable in the population of Formosa. The population of the Philippines appears to have shorter bills, but I have only a few specimens and in these the bill is not shorter than in the specimens from Formosa with the shorter bills. Since the Philippine and Formosan populations are otherwise identical, they can be treated as one form (*wattersi*), while the pop-

ulation of Hainan (*sala*) and that of Siam (*herberti*) are retained as separate forms.

***Alauda gulgula wattersi* Swinhoe, 1871**

TYPE LOCALITY: South Formosa and the Pescadores.

SYNONYM: *Alauda arvensis wolfei* Hachisuka, 1930; type locality, Luzon.

Differs from *coelivox* by being distinctly less rufous, more heavily streaked above, and distinctly darker. The wing averages slightly shorter, and, in series, the population of Formosa has a longer bill.

Specimens have been examined from Formosa and Luzon and Bohol in the Philippines.

A specimen taken on January 13 at Hon Gay on the shores of the Bay of Along in southern Tonkin matches the coloration and size of *wattersi*. No conclusions can be drawn from a single specimen which may have been a stray. Delacour and Jabouille (1940, L'Oiseau, p. 210) in their revised list of the birds of Indochina identify the populations of the Bay of Along and central Annam as *coelivox*.

***Alauda gulgula sala* Swinhoe, 1870**

TYPE LOCALITY: Hoihow, western Hainan.

SYNONYM: *Alauda arvensis hainana* Hartert, 1922; type locality, Kiung Chan, Hainan.

A rufous form, similar to *coelivox* in coloration but slightly smaller and with a distinctly longer bill.

The type locality is Hainan, not Formosa as formerly cited, and Hartert's *hainana* is a pure synonym.

This race is also found on the mainland, at least in extreme southern Kwangtung opposite Hainan, for a series taken at Kwang Tcheou Wan from April 27 to July 7 is identical in coloration and its bill is identical in length and shape with that of the population of Hainan.

***Alauda gulgula herberti* Hartert, 1923**

TYPE LOCALITY: Bangkok.

More "pinkish-gray" above and more "pinkish" below than *wattersi* and *sala*. Paler and duller above than nominate *gulgula*, the rufous of the under parts more "pinkish." In size (wing) *herberti* averages very slightly smaller

than *wattersi*, *sala*, and *gulgula*.

This race has been examined from Bangkok and Soairieng in Cambodia. The population of Cochinchina belongs to this race, according to Delacour and Jabouille (*loc. cit.*).

According to Ticehurst (1938, Ibis, p. 631) the population of Pegu in Lower Burma is "doubtfully separable" from nominate *gulgula*. However, a single specimen taken at Pegu on November 16 matches perfectly the type and paratypes of *herberti*. Again, I cannot draw conclusions from a single specimen, but if the breeding birds of Lower Burma should prove to be inseparable from those of lower Siam, the name *herberti* must be replaced by the older *peguensis* Oates, 1873; type locality, Pegu.

***Alauda gulgula vernayi* Mayr, 1941**

TYPE LOCALITY: Changyinhku, northern Burma-Yunnan border (1941, Ibis, p. 375).

A very dark and richly colored form, with broad and heavy markings. Together with *australis* from southwestern India the darkest and reddest skylark, but differing from it by its shorter and weaker bill, and from *australis* and nominate *gulgula* by having the under parts distinctly whiter from the breast down.

Specimens from Tengyueh are identical with, or even more rufous than, the population of the Burma-Yunnan border. The population of eastern Bhutan is also very richly colored and not separable from *vernayi*. Whistler (1939, Ibis, p. 554) identifies with the greatest assurance the population of eastern Bhutan as *weigoldi*, but his appreciation of *weigoldi* is not correct. Examination of the type of *weigoldi*, the paratypes, and other topotypes shows, as Mayr states, that this race is very distinctly duller and less rufous and less heavily marked than *vernayi*. It is true that when Whistler made his statement, the latter had not been described, but the contrast between the birds of eastern Bhutan and the Burma-Yunnan border on the one hand and topotypical *weigoldi* on the other is unmistakable.

The specimens from eastern Bhutan examined were those of Ludlow which Kinnear (1937, Ibis, p. 482) reported as "much richer coloured" or "all too dark for *inopinata*." This latter is considerably larger than either *weigoldi* or *vernayi* and in all plumages is very

much grayer than *vernayi* and distinctly grayer than *weigoldi* except in very fresh plumage. The specimens of Ludlow were taken from June 27 to July 25, the additional specimens of Whistler, which I have not seen, "in May and the first half of June." An additional specimen examined by me, taken in eastern Bhutan on February 29, is identical with toptotypical *vernayi* from early March.

*Alauda g. vernayi* has also been examined from Phari in extreme southern Tibet between Sikkim and Bhutan, and from Weihsi in upper Yunnan. The Phari specimen, taken on October 2, is very richly colored, two Weihsi specimens taken in "April-June" being worn and less richly colored. Neither the Phari nor the Weihsi specimens are separable from *vernayi*. The range of *vernayi* can then be tentatively drawn as from the borders of western Yunnan from Tengyueh to Weihsi westward in the mountains across Bhutan to southern Tibet. Specimens taken east of Weihsi in the Likiang Range from June 19 to October 12 are redder than *inopinata* and, as Mayr states, about intermediate between this form and *vernayi*.

***Alauda gulgula inopinata* Bianchi, 1905**

TYPE LOCALITY: Eastern Tibet.

Larger than *vernayi* or *weigoldi*. Not so heavily streaked and much grayer in all plumages than *vernayi*, distinctly grayer than *weigoldi* except in very fresh plumage.

This montane form extends from northern Kansu westward through "Nan Shan, Kuku Nor, and upper Mekong" to southeastern Tibet. It has been examined from a number of localities in southeastern Tibet, the southernmost being Chayul Dzong (May 5) north of Bhutan, a little to the north of latitude 28° N., and the westernmost, Gyantse (June 26) west of longitude 90° E.

This is the only race of *A. gulgula* that is migratory. It is reported from the plains of northern India in winter, and winter or spring specimens have been examined from Thankot in Nepal (April 8 to 12), Darjeeling, and northern Burma at Panwa Pass and Chang-yinhku (March 10 to 15). The specimen reported but not identified by Mayr (*loc. cit.*) was taken at the Panwa Pass. It is very grayish but in coloration and size falls within the range of variation of *inopinata* from south-

eastern Tibet. Owing to the late date the Nepal specimens may or may not have been on their breeding grounds, but the altitude of Thankot in the Katmandu Valley seems to be too low.

***Alauda gulgula lhamarum* Meinertzhagen, 1926**

TYPE LOCALITY: Ladak.

SYNONYM: *Alauda guttata* Brooks, 1872; type locality, Srinagar, Kashmir (preoccupied by *Alauda guttata* Lafresnaye, 1839).

Smaller than *inopinata*, similar in coloration except in fresh plumage when it is a little darker and slightly more rufous.

A large series in all stages of plumage has been examined from the western Himalayas in Gilgit, Kashmir proper and in Baltistan, Ladak, and Zaskar, and in northern Punjab from Spiti and Lahul. The various populations show no evidence of geographical variation.

***Alauda gulgula gulgula* Franklin, 1831**

TYPE LOCALITY: "The Ganges between Calcutta and Benares" as restricted by Whistler (1936, *in* Ali, Jour. Bombay Nat. Hist. Soc., vol. 38, p. 767).

A small and dark form; smaller than *lhamarum*, darker above and much more rufous below; smaller than *vernayi*, less richly colored above but distinctly more rufous below.

This is a lowland form or a bird of the lower altitudes. Its range is very extensive from Burma into eastern, central, and southern India to Ceylon. Specimens have been examined from northern Burma, Chin Hills, Manipur, Assam, Bengal, Bihar, Central Provinces, southern Bombay Presidency, Madras Presidency (Godavari Delta and Madras), and southern Mysore (Bangalore), these last two localities being the southernmost on the peninsula. In the hill ranges to the southwest and in Cochin and Travancore it is replaced by the larger and slightly darker *australis*, but specimens from Ceylon appear not to be separable from nominate *gulgula* in either size or coloration, a conclusion already reached by Whistler (1944, *Spolia Zeylanica*, vol. 23, p. 195).

Whistler (*in* Ali, 1936, *loc. cit.*) states that "throughout the Punjab and the United Provinces as far east as Mogulserai and Dinapore"

it is replaced by the paler and larger *punjaubi* [= *inconspicua*]. Mogulserai was not located, but Dinapore is in western Bihar on the Ganges well to the east of Benares. If the paler *inconspicua* occurs at Dinapore it would seem advisable to restrict the vague type locality of nominate *gulgula* closer to Calcutta, from where I have typical specimens.

No specimens are available from western Bihar, but specimens from Gorakhpur and its district in eastern United Provinces and specimens from west of Jubbulpore and farther west at Bheraghat in northern Central Provinces show signs that the populations of these regions begin to intergrade with *inconspicua*. These specimens are still much closer in coloration to nominate *gulgula* from Calcutta and are identical in size but average slightly paler and grayer. In Bhopal to the west of Bheraghat and in the region of Jhansi to the north, *inconspicua* is reported by Ali (1939, Jour. Bombay Nat. Hist. Soc., vol. 41, p. 105). The easternmost specimen typical of *inconspicua* that I have examined is from Etawah north of Jhansi in western United Provinces.

At present only one specimen each is available to me from northern Burma and the Chin Hills. The specimen from northern Burma, a typical nominate *gulgula*, was taken in the Myitkyina District but at a low altitude of 450 feet at Katcho on November 15. The specimen from the Chin Hills was "shot off the nest" at 6500 feet at Hulla on April 30. This altitude seems to be too high for nominate *gulgula*, and the specimen is not typical of this race. It is a female with a wing of 96 mm., too large for nominate *gulgula*, in which the wing length in the females measured varies from 82 to 89 mm. The wing length of the Hulla specimen is the same as in female *vernayi*, and its coloration, though not quite so rich, is very close to that of *vernayi*. It is possible that more specimens may show that the population of the Chin Hills, which lives at higher altitudes than nominate *gulgula*, is intermediate between this race and *vernayi*.

***Alauda gulgula australis* Brooks, 1873**

TYPE LOCALITY: Ootacamund, Nilgiri Hills.

Larger than nominate *gulgula* and, in series, darker and more richly colored; differs

from *vernayi* by its longer and heavier bill and by being distinctly more rufous below, especially on the belly and flanks.

This very dark race seems to be restricted to the southwestern Indian hill ranges and to Cochin and Travancore. It has been examined from Ootacamund and Coonor in the Nilgiris and from Kodaikanal in the Palni Hills. These localities are at high altitudes, but Ali (1936, *loc. cit.*) states that in Cochin and Travancore it also occurs in the low country. As stated, the population of Ceylon is not separable from nominate *gulgula*.

***Alauda gulgula inconspicua* Severtzow, 1873**

TYPE LOCALITY: Turkestan.

SYNONYMS: *Alauda transcaspica* Ehmcke, 1904; type locality, Tedjen, Transcaspia.

*Alauda gulgula punjaubi* Whistler, 1936; type locality, River Sutlej, Ferozepore, Punjab.

Larger than nominate *gulgula*, differing from this as well as from all other races of *A. gulgula* by its much paler and sandy coloration.

This very well-marked race has an enormous range, replacing nominate *gulgula* in western India, with the exception of northern Punjab and Kashmir (*lhamarum*), westward and northward through Baluchistan, Afghanistan, Russian Turkestan, and Transcaspia. According to Dementiev (1943, L'Oiseau, p. 600) it occurs as far north as Tomsk in western Siberia, and, accidentally, as far west as the Caucasus. The distribution in the regions where it overlaps with *A. arvensis* is discussed in the Introduction.

Specimens of *inconspicua*, which is sedentary, have been examined from western United Provinces, Punjab, Sind, Afghanistan south and north of the Hindu Kush, Transcaspia, and Russian Turkestan. These populations vary very little geographically, and individual variation is very slight except in measurements. Specimens in similar plumage are identical in coloration, but in northeastern Afghanistan, north of the Hindu Kush, the population appears to be a little darker. The difference may be due to the state of the plumage, as the specimens from this region are either in very fresh plumage and richer, or badly worn down to the edge of the shaft streaks. However, as this region is more humid, its populations are often darker, and

TABLE 22  
MEASUREMENTS IN *Alauda arvensis* AND *Alauda gulgula*

Season <sup>a</sup>	Form, Region and/or Locality	N	Wing	Bill from Skull
B	<i>A. a. harterti</i>			
	Morocco, Algeria, Tunisia	10 ♂ 4 ♀	106-111 (112.6) 100, 101, 105, 106	16-17.5 (16.8) 15.8, 15.8, 16, 16.5
	Type of <i>harterti</i>	♂	114	17.5
B*	<i>A. a. arvensis</i>			
	Sweden	6 ♂ 1 ♀	111-116 (113.0) 104	15-17 (15.9) 15.5
*	<i>A. a. cantarella</i>			
	Italy, Sardinia	10 ♂ 2 ♀	112-119 (114.3) 104, 105	15-16 (15.7) 14.5, 16
*	N. Caucasus (Wladikawkas)	8 ♂ 2 ♀	106-119 (115.0) 114, 118	14-17.5 (16.0) 16, 16
		1 ♂	121	16.5
B	Transcaucasia (Tiflis)	1 ♂	123	16.8
*	Armenia	14 ♂	113-123.5 (118.0)	15-16.7 (15.9)
B	S. Caspian (Elburz)	6 ♀	105-112.5 (109.0)	14.5-16.5 (15.4)
		2 ♂	121+, 121+	17, 17.5
*	S. Caspian and Elburz	6 ♂	113-120 (116.8)	16-17 (16.8)
		3 ♀	104, 107, 108	15, 15.5, 16
*	Karaj	3 ♂	114, 114, 115	15, 16, 16.2
		1 ♀	108	15.2
*	Kermanshah	5 ♂	114-120 (116.7)	14.5-17.5 (15.7)
		2 ♀	110, 117.5	14.8, 15.5
M?	Iraq (Kurdistan and Tigris)	5 ♂	114-124 (119.2)	16.5-17.5 (17.0)
*	Luristan and Bakhtiari <sup>b</sup>	3 ♀	106, 107.5, 108	15, 15, 16
		9 ♂	113-121 (116.6)	15-17.5 (16.0)
*	Fars	12 ♀	102-109 (105.5)	14.2-15.8 (15.1)
		1 ♂	114	15.5
*	Kirman	2 ♀	106, 108	14.5, 15.8
		2 ♂	114.5, 118	15.2, 17
		5 ♀	105-111 (107.1)	14.5-15.5 (15.1)
B	<i>A. a. dulcivox</i>			
	Urals (Orenburg)	7 ♂	106-119 (117.0)	15.5-17 (16.2)
		3 ♀	102, 106, 106	14.5, 16, 16.2
*	Khorasan	5 ♂	114-123 (118.0)	17-18 (17.5)
		1 ♀	107	17
B*	Samarkand and Bukhara	3 ♂	119, 121.5, molt	16, 16, 17.5
M?	N. and N. W. Afghanistan	2 ♀	108, 118	15.5, 16
		7 ♂	114-119 (116.2)	15-16 (15.7)
M	Afghan Seistan	3 ♀	107, 107, 108.5	14.5, 15, 15
		1 ♂	114	16
M	Persian Baluchistan	6 ♀	101-109 (107.0)	14.5-16 (15.1)
B	N. E. Afghanistan	2 ♂	117, 118	17, 17.5
B	Ferghana	1 ♂	110++ (very worn)	17+ (tip broken)
B <sup>c</sup>	Russian Turkestan (Issyk-kul, W. Tian Shan)	1 ♂	118	17
B*	Russian Turkestan (Zaisan Nor)	16 ♂	114-120 (116.6)	15-18 <sup>d</sup> (16.9)
		9 ♀	105-109 (107.2)	15.5-16.5 (16.1)
B	Krasnojarsk	11 ♂	112-121 (116.0)	15.2-18.2 (16.7)
		4 ♀	103, 106.5, 108, 114	15, 17, 17, 17.2
B	Yeniseisk	4 ♂	113, 116, 116, 119	17, 17, 17.2, 18
		2 ♀	108, 116	16, 16
B		1 ♂	118	17

TABLE 22—Continued

Season <sup>a</sup>	Form, Region and/or Locality	N	Wing	Bill from Skull
M	Punjab (Lahore)	2 ♂ 2 ♀	114, 115 102, 105	15.5, 16.5 15.5, 16.5
	Neotype of <i>dulcivox</i>	♂	116	17
	<i>A. a. kibortii</i>			
B*	S. E. Altaï	2 ♂	111+, 116+	16, broken
B	Irkutsk	3 ♂ 1 ♀	108, 109, 115 115	16.2, 16.8, 17 17
B	N. Mongolia	2 ♂ 1 ♀	109, 112 114	17, 17 17
B	Great Khingan	4 ♂	108, 109, 111, 112	17, 17, 17, 18
B	Middle Lena (Yakutsk)	2 ♂ 1 ♀	117+, 117+ 109+	17, 17 17
B	Zeya River	1 ♂	110	16
B	Korea	13 ♂ 5 ♀	106–114 (109.9) 100–112 (106.4)	14.5–17 (16.2) 15–16.5 (15.8)
	<i>A. a. intermedia</i>			
B	Ussuri (Lake Xanka)	1 ♂	109	17
*	Amur Bay	4 ♂	106.5, 110, 110, 113	15.5, 16.5, 17, 17
M	Shantung	1 ♀	106	15.5
M	Shaweishan Island	2 ♀	101, 106	15+, 16
M	Shanghai	2 ♀	99, 102	15, 15.5
	Type of <i>intermedia</i>	♂	110	17
	<i>A. a. pekinensis</i>			
M	Askold Island	1 ♂	124	17
M	Amur Bay	3 ♂	117, 124, 124	16, 16.5, 17.5
B	Gizhiga	3 ♂ 2 ♀	117, 122, 122.5 110, 112	16.5, 17.5, 18.5 16, 16.2
B	Kamchatka	11 ♂ 2 ♀	116–120 (118.3) 110, molt	16–18 (17.0) 17, 17.5
B	Bering Island	1 ♂ 2 "♀"	122 121, 124	17.2 17.2, 17.5
B	S. Kuriles	6 ♂ 5 ♀	114–121 (118.0) 106–114.5 (109.1)	16.5–19.5' (18.0) 17–19 (17.7)
	Type of <i>pekinensis</i>	♂	120	17
	Type of <i>buxtoni</i>	♂	122.5	18.5
	<i>A. a. lönnerbergi</i>			
B*	Sakhalin	8 ♂	106–119 (113.5)	15.5–17 (16.4)
	Type of <i>lönnerbergi</i>	♂	115	15.5
	<i>A. ?a. japonica</i> <sup>b</sup>			
B	Hokkaido	3 ♂	105, 105, 106	15, 16, 17
B*	Hondo <sup>c</sup>	18	94–105 (99.4)	15–16.5 (15.6)
*	Kagoshima, Kyushu	4 ♂	93, 100, 107, 108	15.5, 16.5, 17, 17
	<i>A. g. weigoldi</i>			
	Yangtze Valley (mostly Hankow)	12 ♂ 6 ♀	96–101 (99.0) 91–97 (93.4)	16–17.5 (16.7) 16–17 (16.4)
	Type of <i>weigoldi</i>	♂	100	17.5
	<i>A. g. coelivox</i>			
	Fukien (mostly Amoy)	10 ♂ 8 ♀	90–99 (94.6) 85–97 (88.8)	15–17 (15.9) 14.5–16.5 (15.4)
	Pescadores <sup>i</sup>	1 ♂	94	16
	Formosa <sup>j</sup>	1 ♂	93	17
	<i>A. g. wattersi</i>			
	Formosa	16 ♂ 9 ♀	85–97 (91.3) 84–92 (87.4)	16.2–19 (17.2) 15.5–17.5 (16.8)

TABLE 22—*Continued*

Season <sup>a</sup>	Form, Region and/or Locality	N	Wing	Bill from Skull
	Formosa	14 <sup>k</sup>	85-96 (91.5)	15-18 (16.8)
	Philippines (Luzon)	3 ♂	85, 86, 89	16, 16.5, 17
		1 ♀	82	15.5
	Bohol	1 ♂	85	16
	<i>A. g. sala</i>			
	Hainan	12 ♂	89-95 (91.8)	17-19 (18.2)
		2 ♀	85, 88	17.2, 18
	Kwang Tung			
	(Kwang Tcheou Wan)	7 ♂	87-97 (92.6)	16.5-19 (18.0)
		4 ♀	87, 87, 89, 89	16.5, 17.2, 17.5, 18
	Type of <i>sala</i>	♂	85	19
	Type of <i>hainana</i>	♂	90	19
	<i>A. g. herberti</i>			
	Lower Siam (Bangkok)	6 ♂	84-91 (87.9)	17-18.5 <sup>l</sup> (17.7)
		2 ♀	86, 88	16.5, 17
	Cambodia	1 ♂	85	16.5
		1 ♀	80	15.5
	Burma (Pegu <sup>m</sup> )	1 ♂	90	16.5
	Type of <i>herberti</i>	♂	89	18
	<i>A. g. vernayi</i>			
	N. Burma-Yunnan border	4 ♂	96-100 (98.0)	15-16.5 (15.8)
		6 ♀	90-92.5 (91.2)	14-16 (14.6)
	N. W. Yunnan (Tengyueh)	1 ♂	98	16.2
		2 ♀	94, 95	15.5, 16.2
	N. Yunnan (Weihsi)	1 ♂	103	17
		1 ♀	97	15.5
	E. Bhutan	3 ♂	101, 104, 105	17, 17.5, 18
		1 ♀	95	16
	S. Tibet (Phari)	1 ♀	99	16.2
	Type of <i>vernayi</i>	♂	98	16.2
	<i>A. g. inopinata</i>			
B	S. Tibet	11 ♂ <sup>n</sup>	106-112 (109.7)	16-18 (17.0)
		2 ♀	99, 100	16, 16.2
*	N. Kansu	2 ♂	107, 109	16, 17
		2 ♀	96, 99	15.5, 16.5
B*	N. W. Yunnan			
	(Likiang Range) <sup>o</sup>	2 ♂	101, 102	16.2, 16.5
		3 ♀	92, 94, 97	15.5, 15.5, 16
M	Nepal	2 ♂	102, 105	15.5, 16.5
		2 ♀	97, 99	15.5, 16.5
M	N. Burma-Yunnan	3 ♀	100, 101, 101	15, 15.5, 15.5
	<i>A. g. lhamarum</i>			
	Zaskar	5 ♂	100+-106+ (102+)	15-16.5 <sup>p</sup> (16.1)
		2 ♀	94+, 95+	14.5-16.5 <sup>q</sup> (15.4)
	Ladak	10 ♂	99+-104+ (102+)	14-17 <sup>r</sup> (15.7)
		6 ♀	92+-95+ (93+)	14.5-16.2 <sup>s</sup> (15.2)
	Kashmir	7 ♂	98+104+ (101+)	15.5-18 (16.6)
		3 ♀	92+, 94, 96+	15.5, 16, 17
	Gilgit	2 ♂	101, 108	15.5, 15.5
	Type of <i>guttata</i>	♂	98	16.5
	Type of <i>lhamarum</i>	♂	102	17.5



TABLE 22—Continued

Season <sup>a</sup>	Form, Region and/or Locality	N	Wing	Bill from Skull
	<i>A. g. gulgula</i>			
	Bengal	7 ♂	90–95 (92.1)	15.5–18 (16.8)
		3 ♀	82, 87, 89	15.5, 16.2, 18
	United Provinces	5 ♂	89–91 (90.4)	14.5–17 (16.0)
	Central Provinces	11 ♂	88–95 (91.0)	14.5–17.5 (16.5)
		2 ♀	82, 87	15.5, 16.2
	<i>A. g. australis</i>			
	S. W. India	17 ♂	91–102 (96.0)	17–18.5 (17.5)
		10 ♀	88–92 (90.0)	16–17.5 (16.8)
	<i>A. g. inconspicua</i>			
	W. United Provinces	1 ♂	97	16
		1 ♀	90	15.5
	Punjab (Lahore)	1 ♂	97	17
	Punjab <sup>t</sup>	10 ♂	92.5–97	—
		5 ♀	86.5–94	—
	Sind	18 ♂	87–97 (95.0)	15.5–17.5 (16.5)
		4 ♀	85, 86, 86, 87	15.5, 16, 16.2, 16.5
	E. Afghanistan	12 ♂	91+–97+ (94+)	15.2–17.5 (16.2)
		5 ♀	88+–90+ (89+)	15–16.5 (15.9)
	N. E. Afghanistan	7 ♂	95+–102+ (101+)	16–17.5 (16.2)
		3 ♀	91+, 96, molt	14.5, 16, 16
	N. and N. W. Afghanistan	1 ♂	98.5	17
		2 ♀	91, molt	16.2, 17.5
	Transcaspia (Tedjen)	3 ♂	96, 107, 108	16, 16.5, 16.5
	Kyzyl Kum	1 ♂	100	16
	Bukhara	1 ♂	94	17
	Outer Mongolia <sup>u</sup>	1 ♀	96	14.5
	Type of <i>punjaubi</i>	♂	92	17

<sup>a</sup> In *Alauda arvensis* and *Alauda gulgula inopinata*: B denotes breeding specimens or specimens taken on the breeding grounds from April 15 to September 1; \*, specimens characteristic of the race and taken on the breeding range but before April 15 or after September 1; B\*, mixed series; M, migrants. Although the north African and Mediterranean populations are not migratory, the season is indicated. The season is not indicated for *Alauda gulgula*, for this species (with the exception of *A. g. inopinata*) is sedentary.

<sup>b</sup> Twenty specimens from Luristan, one from Bakhtiari.

<sup>c</sup> Twenty-one collected in breeding season, six others before April 15 or after September 1.

<sup>d</sup> Eighteen specimens.

<sup>e</sup> Paratypes of *alticola*.

<sup>f</sup> Seven specimens.

<sup>g</sup> Type taken on October 1, one specimen without date.

<sup>h</sup> For status of *japonica*, see text.

<sup>i</sup> Series of five males, four females, and nine unsexed is from Hondo or "Japan" without further locality.

<sup>j</sup> Wanderers; see text.

<sup>k</sup> Unsexed.

<sup>l</sup> Eight specimens.

<sup>m</sup> See text.

<sup>n</sup> Includes five unsexed, apparently males.

<sup>o</sup> Intermediate between *inopinata* and *vernayi*.

<sup>p</sup> Twelve specimens.

<sup>q</sup> Five specimens.

<sup>r</sup> Sixteen specimens.

<sup>s</sup> Eleven specimens.

<sup>t</sup> Whistler (1936, Jour. Bombay Nat. Hist. Soc., vol. 38, p. 767).

<sup>u</sup> Wanderer; see text.

it is possible also that a certain amount of gene flow takes place from the darker *thamarum* which replaces *inconspicua* in neighboring Gilgit. The populations of Afghanistan, north of the Hindu Kush, and those of Transcaspia and Russian Turkestan appear to be larger, but they include specimens that are as small as in the populations of India and the populations of Afghanistan south of the Hindu Kush.

One specimen of *inconspicua* was collected by Koelz at Kang on November 5 in Afghan Seistan. This specimen and some from Tedjen in Transcaspia are the westernmost specimens of *inconspicua* examined by me. But, as stated in the Introduction, Zarudny lists *inconspicua* as breeding farther west, in Kirman and Kuhistan in Iran. Another extreme record consists of a single specimen examined in the Stockholm museum. This specimen, correctly identified as *A. gulgula* by Lönnberg (1909, Arkiv för Zool., vol. 5, no. 9, p. 17), was taken at Kiran in northern Mongolia on May 25, 1909. Lönnberg thought it might be *inconspicua*. This is also the opinion of Gyldestolpe, and I cannot identify it as other than a stray *inconspicua*. This record is quite extraordinary, for Kiran, not located but in the region of Iro, south of Kentei, north of Ulan Bator, is about 1500 kilometers to the east of Zaisan Nor where *inconspicua* is known to breed.

Neither Ehmcke nor Whistler in describing *transcaspica* and *punjaubi* makes any mention of *inconspicua*, a form the existence of which they apparently overlooked. Specimens examined from Tedjen (type locality of *transcaspica*) and from Lahore, not far from Ferozepore (type locality of *punjaubi*), are identical in coloration and show the same size variation as specimens from Russian Turkestan.

***Alauda arvensis cantarella* Bonaparte**

IRAN: Azerbaijan: Gharibdasht, October 25, 1940, 1 ♂; Sarab, November 1-8, 3 ♂, 2 ♀; Ardebil, November 2-4, 6 ♂, 1 unsexed ad. [♂], 3 ♀; Namin, November 6, 1 ♀; Rezaieh, December 8, 2 ♂; Khoi, December 11, 2 ♂. Region of Tehran: Karaj, January 2, 1945, 1 ♂, October 30-31, 1 ♂, 1 ♀, November 24, 1943, 1 ♂. Kermanshah: Kermanshah, December 25, 1940, 1 ♂; Shahabad, December 27, 1 unsexed ad.; Qasr i Shirin, January 2-8, 1941, 4 ♂, 2 ♀. Luristan:

Durud, January 23-24, 2 ♂, 1 ♀, March 4-28, 4 ♂, 10 ♀, November 30-December 13, 1942, 1 ♂, 1 ♀; Burujird, December 31, 1941, 1 ♂. Bakhtiari: Ti, February 11, 1 ♂. Fars: Eglit, March 8, 1940, 1 ♂; Jahrum, March 22, 1 ♀, 1 unsexed ad. Isfahan: Isfahan, March 3, 1 ♀. Kirman: Chaharfarsakh, January 9-14, 3 ♀; Tomogaon, February 3-5, 1 unsexed ad. [♂], 2 ♀; Bahramabad, February 18, 1 ♂.

***Alauda arvensis dulcivox* Brooks**

AFGHANISTAN: Seistan: Farah, October 30-November 9, 1937, 1 ♂, 5 ♀; Kang, November 5, 1 ♀. Northwest: Andkhui, October 25, 1939, 1 ♀. North: Balkh, November 29-December 3, 1937, 6 ♂, 1 unsexed ad. [♂], 2 ♀. Northeast: Gandacheshma, July 9, 1 ♂. East: Jalalabad, December 19, 1 ♂.

BALUCHISTAN: Spezand Junction, January 19, 1946, 1 ♀; Quetta, November 26, 1 ♂, 1 ♀, 1 unsexed ad.

INDIA: Punjab: Lahore, February 12-21, 1933, 2 ♂, 2 ♀.

***Alauda gulgula inopinata* Bianchi**

NEPAL: Thankot, April 8-12, 1947, 2 ♂, 2 ♀.

***Alauda gulgula thamarum* Meinertzhagen**

INDIA: Kashmir: Tangola, Purig, July 26, 1933, 1 ♂; above Tarakbal, July 31, 1936, 1 ♂, 2 ♀; Munarg, August 4, 1 ♂, 1 ♀; Deosai Plains, August 9, 1 ♂. Kashmir, Baltistan: Skardo, August 12-16, 2 ♂, 1 imm. ♂, 1 ♀; Hundar, September 10, 1 ♂. Ladak: Sakti, August 1-2, 1931, 3 ♂, 2 ♀; "Tog" [?], August 7-8, 3 ♂, 2 ♀; Spitug, August 22, 1 ♂; Shyok Valley, Kampuk, September 8-9, 1936, 3 ♂, 3 imm. ♂, 2 ♀; Leh, September 16, 1 ♀; Pitug, August 6, 1933, 1 imm. ♂, September 19-21, 1936, 2 ♂, 2 ♀. Zaskar: Abring, September 15, 1931, 4 ♂, 1 ♀, 2 unsexed ad.; Hamiling, September 16, 1 ♂, 1 ♀; Phe, September 16, 2 ♂, 1 ♀; Kargiak, July 15, 1933, 1 ♂; Mune, July 17, 1 ♂, 1 ♀; Padam, July 19, 1 ♂; Phe, July 21, 1 ♂; Abring, July 22, 1 ♂, 1 ♀. Northern Punjab, Lahul: Tsambok, June 30-July 1, 1936, 1 ♂, 1 unsexed imm.; Gundla, July 3, 1933, 1 ♂. Northern Punjab, Spiti: Kahze, September 13, 1 ♂, 3 juv.? ♂, 1 juv. ♀; Lidang, September 17, 1 ♂.

***Alauda gulgula gulgula* Franklin**

INDIA: Central Provinces: Bheraghat, January 15-16, 1947, 2 ♂, May 1, 1946, 1 ♀; 7 miles W. of Jubbulpore, February 23-24, 3 ♂.

***Alauda gulgula australis* Brooks**

INDIA: Southern Madras: Nilgiri Hills, Ootacamund, February 15-16, 1937, 2 ♂, 1 ♀, March

2-3, 1948, 2 ♂; Palni Hills, Kodaikanal, March 10-14, 1937, 2 ♂, 2 ♀.

***Alauda gulgula inconspicua* Severtzow**

AFGHANISTAN: Seistan: Kang, November 5, 1937, 1 unsexed ad. [♂]. North: Balkh, September 5, 1 ♀; Aq Cha, September 8, 1 ♂, 1 juv. ♂, 1 ♀. Northeast: Gandacheshma, July 9, 1 ♂; Zebak, July 20-22, 5 ♂, 1 ♀; Sanglich, July 27, 1 nestling ♂, 2 nestling ♀; Rustak, August 26, 2 ♀, 1 unsexed ad.; Khanabad, August 31, 1 ♂. East: Kabul, May 16-18, 5 ♂, 2 ♀; Laghman, May 26, 2 ♂; Gardez, June 20, 2 ♂, 1 ♀; Bagrami, September 28-October 2, 3 ♂, 1 ♀, 1 unsexed ad. [♀]; Kalat i Ghilzai, October 13, 1 unsexed ad.

INDIA: Punjab: Lahore, February 12, 1933, 1 ♂. Sind: Khinjar Lake, January 17-February 26, 1934, 17 ♂, 4 ♀; Soneri Lake, December 7, 1939, 1 ♂. United Provinces: Kalnahi, February 17-23, 1947, 5 ♂.

GENUS *LULLULA*

***Lullula arborea pallida* Zarudny**

IRAN: Azerbaijan: Tabriz, October 30, 1940, 1 ♀; Livan, November 16, 1 ♀. Northern Iran, region of Tehran: Karaj, November 1, 1943, 1 ♀, January 20, 1944, 2 ♀, December 8, 1 ♀, November 8-December 25, 1945, 1 ♂, 3 ♀. Kermanshah: Qasr i Shirin, January 1-8, 1941, 5 ♂, 3 ♀; Kermanshah, January 13, 1 ♂. Luristan: Chamchid, February 21-22, 2 ♂; Durud, February 28-March 9, 3 ♀, May 21, 1940, 2 ♀, August 13-17,

1941, 2 ♂; Qadi Sar, June 4, 1940, 1 ♀. Bakhtiari: Imarat, February 15-18, 1941, 2 ♂, 1 ♀; Pashmshurun, May 10, 1940, 1 ♂, 1 ♀; Siachal, 1 imm. ♂. Mazenderan (region of Gorgan): Karimserai, July 21, 2 ♂. Khorasan: Kotaliyekchinar, August 4-5, 2 juv. ♀, 1 unsexed juv.

Compared to nominate *arborea* examined from Sweden, this form, described from the mountains of the Transcaspian region (probably on the borders of Khorasan) is distinctly paler, grayer and less richly pigmented above, whiter and less yellowish below. There is no size difference (table 23) other than a slight tendency towards a longer bill in the populations of Iran and Transcaspia.

These populations represent the eastern end of the range of the species, with Khorasan-Transcaspia in the northeast and Luristan-Bakhtiari in the southwest. In comparative plumage the Transcaspian and all the Iranian populations are identical in coloration. With wear these populations become quite dull and grayish above, as the rufous edges of the feathers wear off.

MOLT, CLASS A: In Iran, specimens show that the molt begins towards the end of July (July 21 at Gorgan) and is from one-half to two-thirds complete by August 13 to 17 in Luristan. Juvenals molt at the same time as the adults, August 4 to 5 in northern Khorasan.

TABLE 23  
MEASUREMENTS OF ADULTS IN SOME POPULATIONS OF *Lullula arborea*

Region	N	Wing	Tail	Bill from Skull
Sweden	5 ♂	98 -101 (99.4)	47-56 (51.4)	14.5-16 (15.4)
	7 ♀	92 -100 (95.6)	42-53 (47.6)	14 -15 (14.7)
Azerbaijan	2 ♀	92, 95.5	50, 51	14.5, 15
N. Iran (Karaj)	1 ♂	98	49	16
	7 ♀	91 -100 (95.1)	42-52 (48.7)	14 -16 (15.0)
Kermanshah	6 ♂	98 -103 (99.9)	47-56 (50.7)	15 -16.2 (15.3)
	3 ♀	93, 95, 97	47, 49, 50	14.5, 15, 15.2
Luristan and Bakhtiari	5 ♂	97 -102.5 (99.9)	47-55 (50.0)	15 -16 <sup>a</sup> (15.8)
	8 ♀	94 - 98 (95.5)	44-52 (47.5)	15 -16.5 (15.8)
Gorgan	2 ♂	99+, 102+	53+, 54+	16, 16.2
N. Khorasan	1 ♂	98+	49+	16
Transcaspia	1 ♂	99+	50+	16.2

<sup>a</sup> Seven specimens.

## SUMMARY

THIS PAPER is a review of the larks breeding in Iran, Afghanistan, and India. In the case of *Alauda*, a formal review of all the forms east of the Caucasus is presented.

Ten genera, treated in the following order, occur in Asia: *Mirafra*, *Eremopterix*, *Ammomanes*, *Alaemon*, *Calandrella*, *Melanocorypha*, *Eremophila*, *Galerida*, *Alauda*, and *Lullula*. The generic characters, which are briefly discussed, show much convergence.

Twenty-three species breed in Iran, Afghanistan, and India. A key to the species and a table of distribution are given. Habitat preferences are mentioned. Some species have strict ecological requirements, and in these the limiting factor appears to be aridity. In others where the habitat seems more varied it is suggested that habitat preferences vary or may vary geographically.

The correlation between the coloration of the plumage and the soil (cryptic coloration) is discussed. A large series of 73 samples from southern Europe, Mediterranean islands, Africa, and India shows that the correlation is strongest in Africa. A comparison of the desert species (*Ammomanes deserti*) and the semi-desert species (*Galerida cristata*), common to both Africa and the Iranian region, shows that in Africa these species have many more races and show abrupt variations in coloration. In the Iranian region the variation is conspicuously slight, although the physical factors of the environment are substantially the same and the background as variable as in Africa. It is postulated that the Iranian forms may wander more in search of suitable conditions and that general inconspicuousness in shade rather than close adaptation in hue is the determining factor in the protection

against predation. The experiments of Dice are cited.

The species characters are discussed. Differences in the wing formula and in the pattern of the plumage appear to be excellent species characters. A number of closely related forms that have been treated as conspecific are shown conclusively to be separate species. In every instance where these species are separated by a difference in the wing formula or shape of the wing they are found also to overlap and breed in the same regions, or, in one instance where there is no overlap, they are separated by abrupt differences in both the wing formula and the pattern of the plumage. In some cases all three factors are present.

The forms hitherto treated as conspecific but thus separated are: *Ammomanes phoenicurus* and *A. cincturus*, *Calandrella cinerea* and *C. acutirostris*, probably *C. rufescens* and *C. leucophaea*, *Melanocorypha bimaculata* and *M. calandra*, and *Alauda arvensis* and *A. gulgula*.

Molt and plumages are discussed. Larks show several types of molt. In most species there is only one molt a year, a complete postnuptial and a complete postjuvenal molt, and first winter birds are indistinguishable from adults. But in other species the postjuvenal molt is partial and is limited to that of the body feathers. In other species there is a double annual molt, a complete postnuptial and postjuvenal molt and a partial prenuptial molt, very full or limited to the feathers of the head. In still other species the first winter plumage differs from that of the adult.







