

## Article XXII.—A STUDY OF THE GENUS STURNELLA.

By FRANK M. CHAPMAN.

The genus *Sturnella* ranges from northern South America to the Plains of the Saskatchewan and includes two types or forms, one of which is dark, the other, light in color. The former, *Sturnella magna*, is distributed throughout northern South America, from Guiana to Bogota, and thence through Central America and Mexico, to the United States east of the one hundredth meridian and northward to the Great Lakes. It is also found in Cuba. In this wide area it is subject to considerable variation in color and size, characters which have formed the basis for the description of several races. These races, including the type form, with their ranges, are as follows :

1. *Sturnella magna* (Linn.). United States east of the one hundredth meridian, except southern Florida. (Based on Catesby's *Alauda magna*.)
2. *Sturnella magna argutula* Bangs. Southern Florida. (Type locality, Hillsboro County, Florida.)
3. *Sturnella magna hippocrepis* (Wagl.). Cuba. (Type locality, Cuba.)
4. *Sturnella magna mexicana* (Scl.). Tableland and temperate portions of southern Mexico northwards along the humid bases of the Sierras. (Type locality, Jalapa.)
5. *Sturnella magna inexpectata* Ridgw. East coast region of Central America and Mexico north to Vera Cruz. (Type locality, Segovia River, Honduras.)
6. *Sturnella magna alticola* Nels. Pacific coast of Mexico from Tonalá, Chiapas, southward through the highlands, at least to Dueñas, Guatemala. (Type locality, Ocuilapa, Chiapas.)
7. *Sturnella magna meridionalis* (Scl.). Northern South America from Guiana to Bogota. (Type locality, Colombia.)

The lighter form, currently known as *Sturnella magna neglecta*, occupies the United States west of the ninetieth meridian and

ranges northward to the Saskatchewan and British Columbia and southward to Northern Mexico. It is subject to comparatively little variation, only one form of it having been described, the *Sturnella magna hoopesi* of Stone from the lower Rio Grande (type locality, Brownsville, Texas), which, through insufficient material, Mr. Stone erroneously believed to be the northern representative of *Sturnella magna mexicana*. The variations of *Sturnella magna* and *Sturnella neglecta*, *inter se*, present no unusual complications, but the relationships of the two forms to each other have long constituted one of the leading problems in the classification of North American birds, and its solution is the object of the present paper; the greatly increased collections from previously unrepresented areas, now giving the investigator opportunities which have before been lacking.<sup>1</sup>

The radically different views which have been held by leading ornithologists, concerning the inter-relations of the eastern and western Meadowlarks, are well represented in the following quotations:

*Coues.*

Coues, 'Birds of the Northwest.'

"The case of *Sturnella magna neglecta* is settled and explained; *magna* shades directly into *neglecta*, and develops its peculiarities precisely according to the mean annual rain-fall, and consequently the average humidity of the atmosphere of the regions in which it resides. The change is imperceptibly effected; distinguishable examples sometimes occur together; the characters culminate in the most sterile regions."

*Ridgway.*

Ridgway, 'Manual of North American Birds.'

"Without much doubt a distinct species. The occurrence of both *S. neglecta* and *S. magna* together in many portions of the Mississippi Valley, each in its typical style (the ranges of the two overlapping, in fact, for a distance of several hundred miles), taken together with the excessive rarity of intermediate specimens and the universally attested radical difference in their notes, are facts wholly incompatible with the theory of their being merely geographical races of the same species."

In attempting to determine the exact relationships of *magna* and *neglecta* neither of the authors above quoted had material from which they could determine the relationships of *neglecta* to

<sup>1</sup> By far the most important of this recently collected material was secured by Dr. E. A. Mearns along our southern boundary, while acting as naturalist to the Boundary Survey; and by E. W. Nelson in Mexico, during his explorations for the Biological Survey.

the representative of *magna* on the tableland of Mexico, or at the southern limit of the range of *neglecta*, and in going into the subject in detail it at once became apparent that an attempt to learn the relationships of the Meadowlarks of the eastern and western United States involved a study of the entire group. We may, therefore, first consider *magna*, then *neglecta*, their range and variations *inter se* as a preparation for the study of their interrelations. It should be stated at the outset, however, that the material to which I have had access is far from satisfactory; and an explanation of the facts it apparently presents is to be regarded only as provisional. We need large series of breeding birds from northern Mexico, taken by a collector who is thoroughly familiar with the points involved, before we can reach conclusive results. In the meantime the following study is presented as perhaps embodying certain views not previously advanced.

#### GEOGRAPHICAL VARIATIONS OF *Sturnella magna*.

*Sturnella magna* (Linn.).—Our familiar eastern Meadowlark varies but little throughout most of the eastern United States. Specimens from the lower Mississippi Valley and eastern Gulf States, except Texas, average darker and this difference, which is slight, reaches its maximum in southern Florida. Northern birds have a longer wing but relatively shorter bill and tarsi than those from the south.

To the hardened 'splitter' these variations might seem deserving of recognition by name, but, in my opinion, with the possible exception of those of the south Florida bird, they are too intangible to warrant such a course.

*Sturnella magna argutula* Bangs.—The Florida bird, especially in the southern half of the State, is smaller than specimens from the northern States, the wing being about half an inch shorter, but the tarsus and culmen are of about the same length as in northern examples, and relatively, therefore, are longer.

A very careful comparison of specimens in the same stage of plumage fails to show any constant differences in color by which the Florida bird can always be distinguished from northern birds. The yellow of the underparts averages a shade deeper and the general tone of the upperparts is darker, particularly in

specimens from the southern part of the State, while the occasional presence of spots on the breast indicates an approach to the Cuban bird.

These differences were in part commented on by Allen in 1871, and in 1888, I referred the Florida bird to *mexicana*.

The excellent series of true *mexicana* which Mr. Nelson has since secured, and which I have been permitted to examine, shows that although agreeing with the Florida bird in size it differs in the narrowness of the pectoral crescent and in the coloration of the back, the feathers of which are less deeply tipped with chestnut and more widely bordered with bay than in Florida examples.

Mr. Stone has also pointed out these differences, and he concludes his study of the Florida bird by saying it is "certainly impossible to separate" <sup>1</sup> it, and it has remained for Mr. Bangs to exhibit the courage which his predecessors have lacked by 'splitting' the Florida form under the name *Sturnella magna argutula*. If the application of this name be restricted to the isolated Florida bird, it may prove a convenient means of expressing the slight differentiation which that form exhibits. If, however, as its proposer suggests, it be applied to Gulf Coast and lower Mississippi Valley specimens, it will only result in the confusion which always follows our attempts to definitely name differences which do not definitely exist.

*Sturnella magna hippocrepis* (Wagl.).—The Cuban bird has a shorter wing and bill than the bird from southern Florida, but the tarsus is of the same length as in birds from that State. In the color and pattern of the upper parts it resembles the south Florida form, but the sides average more heavily streaked and black spots extend to the yellow of the breast and abdomen. The breast crescent in some specimens is very narrow, but in most cases is not relatively smaller than in *magna*. While the Cuban Meadowlark is isolated by an insular home from other forms of this genus it sufficiently resembles southern Florida examples to permit of the difference between the two being bridged by individual variation.

*Sturnella magna mexicana* (Scl.).—This form is smaller than *S. magna*, the wings and tail being shorter, but the tarsus is actu-

<sup>1</sup> Proc. Acad. Nat. Sci., 1897, 150.

ally as well as relatively longer. In color, average specimens of *mexicana* resemble *magna* but differ in having the feathers of the back less widely bordered, laterally, with bay of a slightly brighter color than in *magna*.

In spring specimens of *mexicana* the chestnut tip of the back feathers largely disappears, when the greater width of the bay lateral margins and smaller black area of the dorsal feathers are more evident than in the fall, giving to specimens taken at this season a certain ruddy tinge wanting in *magna*. This difference is more evident in birds from the coast region (*inexpectata*) and less pronounced in specimens from the tableland.

The pectoral crescent in *mexicana* averages narrower than in *magna*, and the yellow of the throat shows a tendency to spread to the malar region, as in *neglecta*, this character being more strongly marked in specimens from the mountain region of southern Mexico to Costa Rica, in many of which the yellow of the throat is as widely spread as in average *neglecta*.

*Sturnella magna inexpectata* Ridgw. — This is a small form of *mexicana*, which it resembles in color, but is more ruddy.

*Sturnella magna alticola* Nels. — Mr. Nelson has lately applied this name to southern highland representatives of *mexicana*, which have been alluded to above as sometimes having the sides of the throat yellow. Birds from the range assigned to this form appear to differ little if at all in size from true *mexicana*, but, as stated above, usually have more yellow on the sides of the throat.

*Sturnella magna meridionalis* (Scl.).—Enough specimens of the South American bird are lacking to satisfactorily determine its characters. It appears to resemble *mexicana* in color, but to have a much longer bill. Much variation is shown in the distribution of the yellow of the throat, which in some specimens is as widely extended as in *neglecta*, and in others as restricted as in *magna*. It is probable that when an adequate number of specimens of the South American bird have been secured from both the coast and highlands it will be found to differ much as do examples from southern Mexico.

*Summary.*— From this brief survey of the variations of *Sturnella magna* it is evident that throughout a range which reaches from South America to Canada it presents no marked variations in color. Indeed, to the untrained eye specimens from South

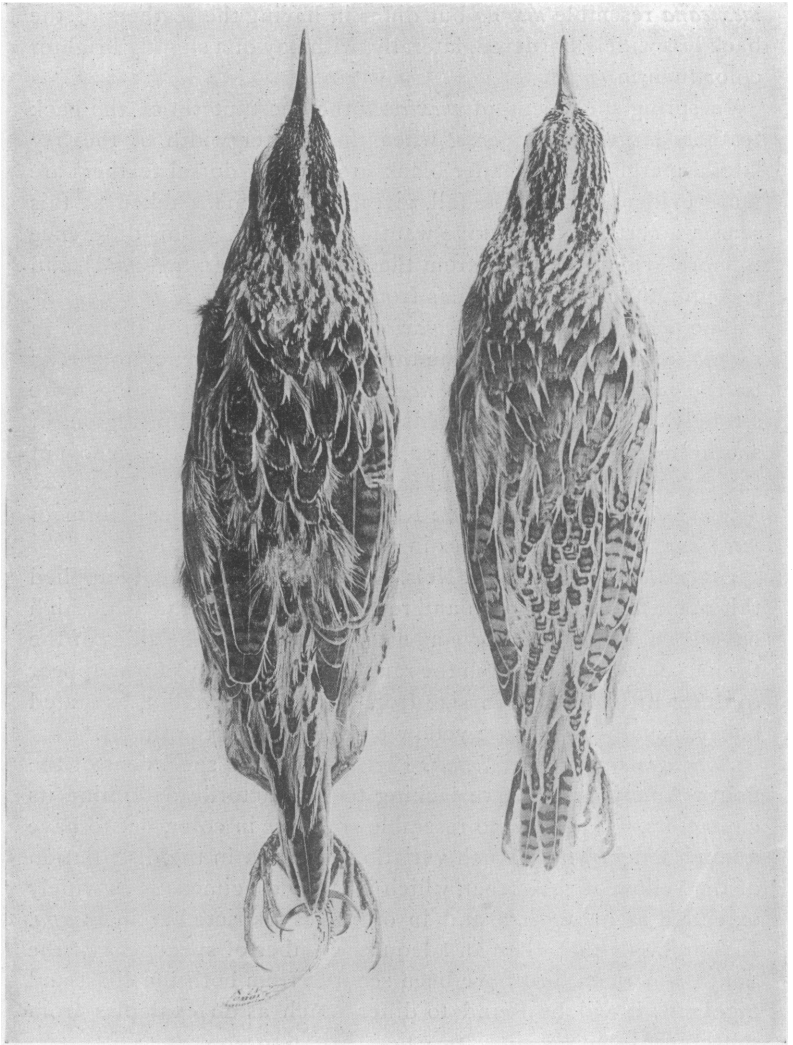


Fig. 1. Left-hand figure, *Sturnella magna*, Am. Mus. No. 25304, ♂, Sayville, L. I., Oct. 7, 1880, E. A. Mearns. Right-hand figure, *Sturnella magna neglecta*, Am. Mus. No. 52417, ♂, Ft. Verde, Ariz., Nov. 23, 1885, E. A. Mearns. Showing differences in pattern, and, approximately, intensity of color.

America do not differ appreciably from others from the northern United States. Southern specimens, as a rule, are darker in color and smaller in size, and, as is generally discovered when resident birds are compared with migratory ones of the same species, they have relatively longer tarsi.

GEOGRAPHICAL VARIATIONS OF  
*Sturnella magna neglecta.*

*Sturnella magna neglecta* (Aud.).

—Throughout its wide range the western Meadowlark exhibits surprisingly little variation in color. Pacific coast specimens from north of California are slightly darker than the normal, but the difference is inconstant or only evident when series are compared. This darker color is also shown by specimens from the *interior* of British Columbia, a fact which suggests the possibility of these birds having extended their range into this region from the coast. Specimens from along the Mexican border have no yellow on the sides of the throat, as will be noted below.

*Sturnella magna hoopesi* Stone.—Mr. Stone's type, a March bird from Brownsville, Texas, is perfectly typical of *neglecta*, except in the absence of yellow from the sides of the throat, and this character is shown by most of the specimens from the Mexican boundary line, east of the Rocky Mountains, which I have examined.



Fig. 2. *Sturnella magna neglecta*, U. S. N. M. No. 127493, ♀, Aug. 14, 1892, San Bernardino Ranch, Ariz., E. A. Mearns. Showing abrasion and fading of plumage.

*Summary.*—In view of the wide extremes of climate and greatly diversified topography of the area occupied by *Sturnella magna neglecta* the bird is remarkably constant in color, no form of this bird, with the exception of *hoopesi*, ever having received a name, a statement which implies unusual stability in size and color!

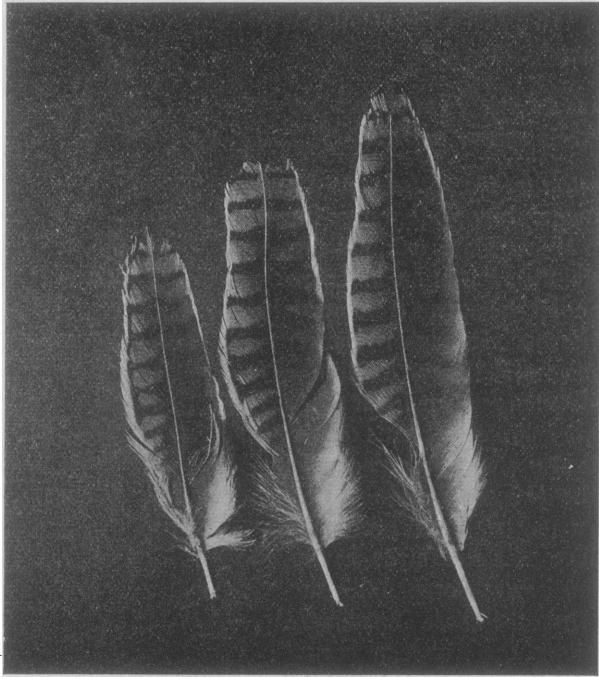


Fig. 3. Tertials of *Sturnella magna*, Am. Mus. No. 67300, Patchogue, L. I., Oct. 4, 1888, Clarence A. Smith.

#### DIFFERENCES BETWEEN *magna* AND *neglecta*.

After this review of the geographical variations of *magna* and *neglecta*, *inter se*, we may approach the real problem of this paper, the inter-relationships of *magna* and *neglecta*. Are these birds representative, geographical, intergrading races of each other or are they specifically distinct? A satisfactory reply to this question is of the first importance, its bearing on related cases being far-reaching, and we can properly approach it only through a



clear understanding of the facts involved. In the first place, therefore, we may ascertain in detail the differences between typical examples of *magna* and *neglecta*.

*Color.*<sup>1</sup>—The essential differences in color between Arizona and New York Meadowlarks are as follows: In *magna* the

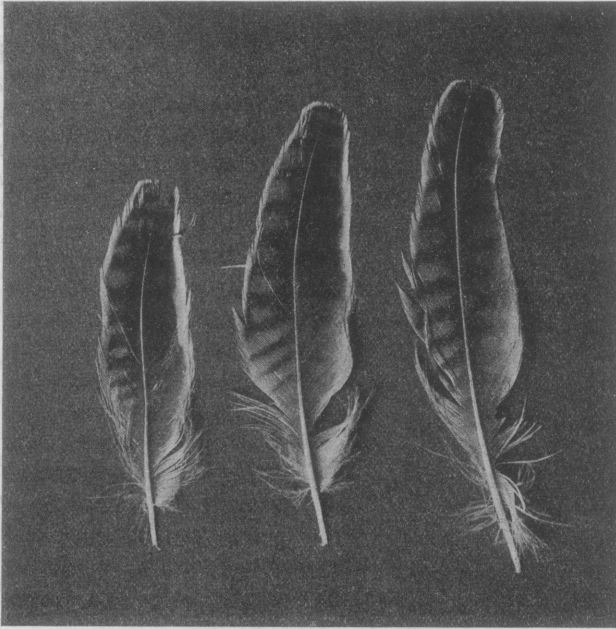


Fig. 4. Tertials of *Sturnella magna neglecta*, Am. Mus. No. 52423, ♂, Ft. Verde, Ariz., Dec. 26, 1887, E. A. Mearns.

median and post-ocular stripes, the sides of the head and neck, margins of the feathers of the back, wings, and tail, the flanks, thighs, and under tail-coverts are mostly ochraceous; in *neglecta* they are cream-buff. In *magna* the black markings occupy a larger part of the feathers in which they appear than in *neglecta*, in which the brown areas are proportionately increased. In *magna* these brown areas are chestnut-russet; in *neglecta*, brocoli brown and raw umber. In *magna* the yellow averages deeper, and this difference is intensified by the ochraceous instead of the cream-buff fringe to the feathers of the underparts.

<sup>1</sup> Cf. Ridgway's 'Nomenclature of Colors.'

For five months after the post-nuptial molt is completed, in September, the differences in color above mentioned are perfectly diagnostic but later in the year they are less tangible.

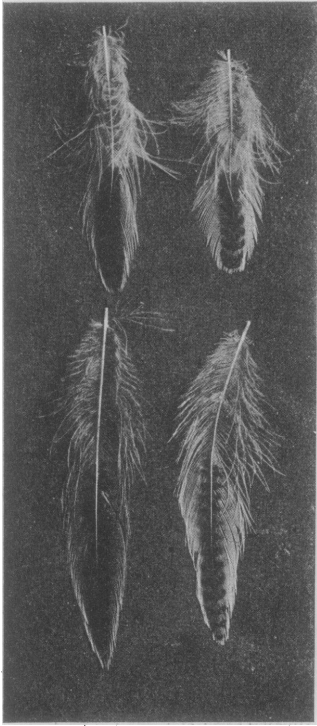


Fig. 5. Left-hand figures, rump feather and upper tail-covert of *Sturnella magna*, Am. Mus. No. 67300, ♂, Patchogue, L. I., Oct. 4, 1888, Clarence A. Smith. Right-hand figures, rump feather and upper tail-covert of *Sturnella magna neglecta*, Am. Mus. No. 52418, ♂, Ft. Verde, Ariz., Nov. 25, 1884, E. A. Mearns.

*Pattern.*—Comparison of freshly plumaged specimens of *magna* and *neglecta* presents the following differences in pattern of marking: In *neglecta* the feathers of the interscapular region are more often crossed by two or three generally incomplete bars than in *magna*, but in both forms there is much variation in this respect. In *neglecta* the basal black of these feathers is more frequently laterally spotted with brown than in *magna*. In breeding birds the subapical bars have generally disappeared through abrasion, but in *neglecta* the incipient lateral bars are usually evident. In the tertials, and, more especially, the rump, upper tail-coverts, and median tail-feathers, the bars are much better defined and more constant in *neglecta*, the pattern of marking of the three last named areas, taken together, constituting the best single character separating the two birds, the differences in the disposition of the black color in the feathers of these areas being well shown by the accompanying photographs, Figs. 3-7. In *neglecta*

spots on the sides and flanks average rounder, and the yellow of the throat spreads laterally to the malar region. In adult males the latter character is constant and characteristic except along our Mexican boundary (see *antea* under *S. m. hoopesi*).

*Young birds.*—Young birds, in juvenal plumage, present essentially the same differences in color which distinguish the adults

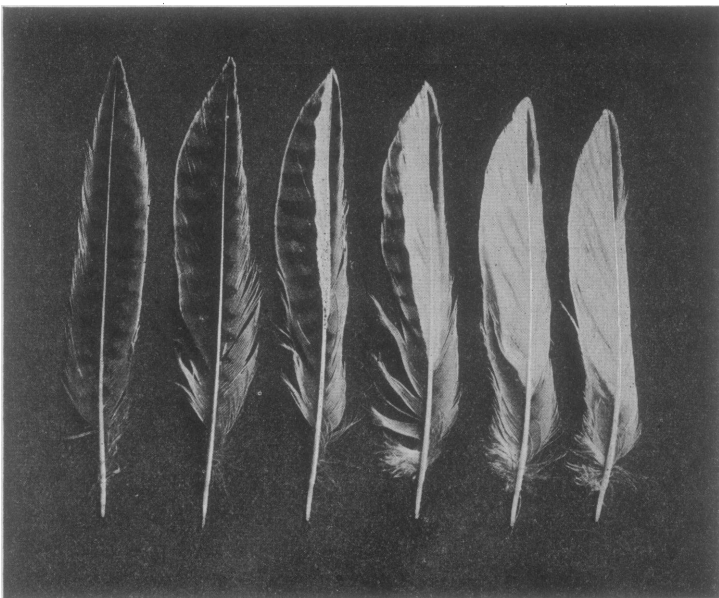


Fig. 6. Tail-feathers of *Sturnella magna*, Am. Mus. No. 67300, ♂, Patchogue, L. I., Oct. 4, 1888, Clarence A. Smith.

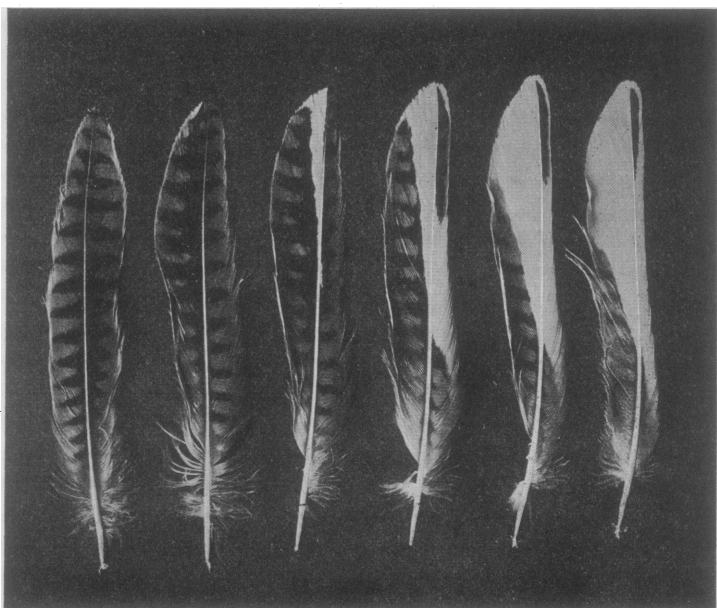


Fig. 7. Tail-feathers of *Sturnella magna neglecta*, Am. Mus. No. 52423, ♂, Ft. Verde, Ariz., Dec. 26, 1887, E. A. Mearns.

In pattern, however, it is worthy of special note that in this plumage the median tail-feathers and coverts in *magna* show a strong tendency toward the barred pattern of *neglecta*; five out of fourteen specimens of *magna* agreeing with *neglecta* in this respect,

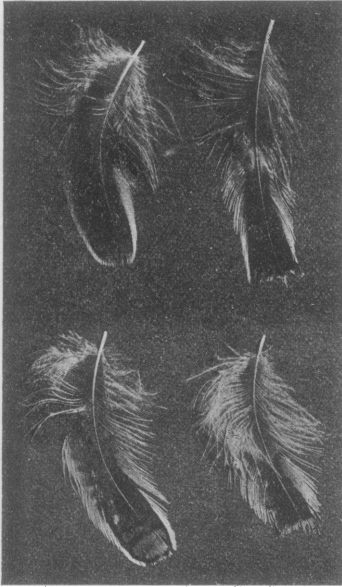


Fig. 8. Upper figures, interscapular feathers of *Sturnella magna*, at left, Am. Mus. No. 49229, ♂, Morristown, N. J., Oct. 3, 1886, E. C. Thurber; at right, Am. Mus. No. 69606, ♂, Trenton, N. J., May 29, 1886, M. M. Green. Lower figures, interscapular feathers of *Sturnella magna neglecta*, at left, Am. Mus. No. 52416, ♂, Ft. Verde, Ariz., Nov. 23, 1884, E. A. Mearns; at right, No. 52413, ♂, Yavapai Co., Arizona, Mch. 18, 1884, E. A. Mearns. To show seasonal abrasion.

while of five young specimens of *mexicana* all have the tail-feathers and coverts barred as in *neglecta*; a fact which suggests that the barred type of marking is the older.

*Seasonal change in color and pattern.*—

The fact that Meadowlarks have only a post-nuptial molt and that when the breeding season arrives, wear and fading have deprived their plumage of its most characteristic colors and markings, greatly complicates the study of their relationships. The fall molt is concluded in September and from that month until January there is not sufficient change in plumage to interfere with the proper identification of specimens. After January, however, fading and wear often so alter a bird's appearance that its identity cannot be determined with certainty. It follows, therefore, that the differential characters of these birds are best exhibited in the fall and

are least apparent in the breeding season, an unfortunate condition of affairs as every systematist will readily recognize.

*Song.*—Some advocates of the specific distinctness of the eastern and western Meadowlarks have attached much importance to the marked and well-known differences in the songs of these birds, and while these differences are doubtless of value in making field identifications, they should not, I think, be given

importance by the systematist. Song is largely if not wholly an uninherited character and is subject to great individual and geographical variation. In both *magna* and *neglecta* this statement is unusually well illustrated by the wide range of variation occurring in their respective songs. Dozens of strikingly different songs of *neglecta* have been recorded, its vocal powers have been described as being "a husky whistle" and as excelling those of the Nightingale; and while this difference is no doubt partially in the ear of the hearer, it nevertheless attests a wide range of variability.

Similar differences are to be observed in the eastern Meadowlarks. The song of about one tenth of the birds in south Florida is decidedly unlike that of the average type of song of the northern Meadowlark, and is said to approach that of *neglecta*. In Cuba, however, although the Cuban bird so closely resembles the southern Florida form, the Meadowlark song is only a wheezy chuckle, resembling more the song of a Dickcissel than that of a Meadowlark, though, as I have lately been informed by Mr. William Palmer, it improves toward midsummer.

If we were to rely on song, therefore, we should suppose the southern Florida and Cuban birds to be widely separated, whereas they are closely related.

#### RELATIONSHIPS OF *magna* TO *neglecta*.

Having ascertained the characteristics of *magna* and *neglecta* and the differences between typical representatives of these two forms we are prepared to approach the subject of their relationships by an examination of specimens from the area where their ranges come together.

#### *Minnesota.*<sup>1</sup>

Fort Snelling.—*S. magna*, Am. Mus. Nos. 55706–55709, April 17, four specimens; No. 55710, April 23; No. 55699, May 8; No. 55711, May 18.

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#### <sup>1</sup> *Explanation of Abbreviations.*

Am. Mus. = American Museum of Natural History.  
 B. S. = Biological Survey.  
 F. M. C. = Coll. Frank M. Chapman.  
 G. B. S. = Coll. George B. Sennett.  
 O. B. = Coll. E. A. and O. Bangs.  
 U. S. N. M. = U. S. National Museum.  
 W. B. = Coll. William Brewster.

*S. m. neglecta*, Am. Mus. No. 55714, April 14; No. 55705, April 17; No. 55715, May 15; No. 55716, May 31; No. 55705, Oct. 17.

Non-typical specimens: Am. Mus. No. 55712, ♂, May 18, has the tail of typical *neglecta*, but the tail-coverts, rump, and rest of the plumage are those of true *magna*. Am. Mus. Nos. 55702, 55704, 55713, all males taken September 30, approach *neglecta* in the pattern of tail markings and in being somewhat paler than average *magna*. Am. Mus. No. 55703, ♂, September 30, approaches *neglecta* more closely than the preceding, in the pattern of the tail, tail-coverts, and rump, and in color; in fact, it may be described as one-third *neglecta* and two-thirds *magna*. This exceedingly interesting and important Fort Snelling series was collected by Dr. E. A. Mearns, who writes me concerning the manner of occurrence of Meadowlarks at Fort Snelling as follows: "This locality has two floras, Campestrian along the Minnesota River and Alleghanian (or Transition mixed with Canadian) in the Mississippi Valley. Fort Snelling is at the junction of these rivers, and the small reservation has a correspondingly great variety of plant-life. Driving toward Minneapolis one has the dry plains on the left and the alluvial river-bottom, with Pine Island, etc., on the right. *Sturnella neglecta* occupies and breeds in the former and *Sturnella magna* in the latter. I have often heard the totally distinct songs of both species at once when driving along this road."

Madison.—U. S. N. M. No. 127566, ♂, April 10; *neglecta* approaching *magna* in the pattern of its tail and its coverts.

*Wisconsin.*

Camp Douglas.—*Magna*, Am. Mus. No. 55700, ♂, July 15; *neglecta*, Am. Mus. No. 55701, ♀, juv.

*Iowa.*

*Magna*, Am. Mus. No. 36504, Spring; no locality. Mitchell Co., U. S. N. M. No. 28077, Aug. 1.

*Nebraska.*

Ft. Kearney.—*Magna*, U. S. N. M. No. 13054, June 20; *neglecta*, B. S. No. 139409, Sept. 9.

- Republican Fork.—*Magna*, U. S. N. M. No. 170735, May 24.  
 Loup Fork.—*Magna*, U. S. N. M. No. 9319, Aug. 3, juv.; *neglecta*, U. S. N. M. No. 9318, July 28, juv., No. 9309, July 27.  
 Omaha.—*Neglecta*, U. S. N. M. No. 88102, March 14, ♂; No. 159366, April 19, ♀; No. 159367, April 19, ♂.  
 Columbus.—*Neglecta*, B. S. No. 139402, Aug. 27, juv.  
 Ft. Union.—*Neglecta*, U. S. N. M., No. 5342, July 19.  
 Pole Creek.—*Neglecta*, U. S. N. M., July 18.  
 Valentine.—*Neglecta*, B. S. No. 155878, ♂, April 25.

#### *Kansas.*

- Council Grove.—*Magna*, Am. Mus. No. 26776, ♀, July 2.  
 Belle Plaine.—*Magna*, B. S. No. 139423, ♂, July 23.  
 Cairo.—*Magna*, B. S. No. 139433, ♂, Aug. 1; B. S. No. 139424, July 30.  
 Trego Co.—*Neglecta*, W. B. No. 11310, May, 1889; B. S. Nos. 139413, 139404, 139432.  
 Garden City.—*Neglecta*, Am. Mus. Nos. 36752, 36762, Sept. 30.

#### *Missouri.*

- Golden City.—B. S. No. 142087, ♂, July 13, *S. magna* apparently approaching *neglecta*, but in too worn plumage to be satisfactorily determined. B. S. No. 139430, July 13, juv. Apparently intermediate; the central tail-feathers abnormally marked with white.

#### *Indian Territory.*

- 18 miles west of Cable.—*Magna*, U. S. N. M. No. 19102, ♂, May 30.  
 Ft. Gibson.—*Magna*, B. S. No. 139429, ♂, June 18.  
 Hartshorne.—*Magna*, B. S. No. 139426, ♀, Aug. 29.  
 Savanna.—*Magna*, B. S. No. 139427, ♀ juv., Aug. 23.

#### *Texas.*

- Gainsville.—*Magna*, Aug. 12, two males, one female; Aug. 8, ♀. March 21, ♂, *magna*, approaching *neglecta* in paleness and closely resembling it in the pattern of the tail, tail-coverts, and rump; an evident intermediate.

Henrietta.—*Magna*, B. S., April 13, ♂, typical in all respects except in pattern of the tail, tail-coverts, and rump which are more barred than in average *magna*. B. S., April 11, ♂, *neglecta*, typical.

Concerning the Meadowlarks of Henrietta, Mr. Harry C. Oberholser writes me : “ During the summer of 1900 both species (*Sturnella magna* and *S. neglecta*) were found at Henrietta, Texas, in the proportion of about eight or ten of the former to one of the latter. They inhabited often the same ground, apparently fraternizing freely ; and both were leading young late in June. The song of each was always easily distinguishable and perfectly characteristic.”

Vernon.—*Neglecta*, B. S., April 27, ♂.

Corpus Christi.—A series of thirty specimens from Corpus Christi collected in the spring of 1891 proves of exceptional interest ; indeed, I may add, it was the attempt to name these birds which involved me in a study of this genus. Both the *magna* and *neglecta* types of Meadowlark are present in the Corpus Christi region. The former is the breeding bird in the immediate vicinity of the town on the coast, where, in April, I found it to be common and heard many individuals (some of which were collected) sing the characteristic song of *magna*. True *neglecta* apparently does not breed at Corpus Christi but, like certain other western forms,—*Pyrocephalus* for example,—it may possibly be found breeding about fifteen miles west of the town up the Nueces Valley. This, however, is a mere supposition to account for the presence of brown-billed, apparently non-breeding specimens of *neglecta* in April and May, and, more especially, of intermediates.

An analysis of this series presents the following result.

*Magna*, ten specimens, eight males, two females, April 14 to 23. These birds agree very well in color with average eastern specimens of *S. magna*, but it is interesting to observe that, although from further south, they are larger than specimens from the coast of Louisiana. In length of wing they resemble examples from Illinois, the tarsus and bill, however, being somewhat longer.

The exceedingly close resemblance between these birds and two May males in Mr. Sennett's collection from Xicotencatl, near Tampico, shows, as might be expected, that they are the



northern representatives of *mexicana*, which here appears to be restricted to the humid coast region.

*Neglecta*.—Twelve specimens, including two females, March 19 and 31; two males, six females, April 7 to 16; two specimens (unsexed) May. None of these specimens has the blue bill of a breeding bird and all but one have the throat-patch fringed with ashy. The extent of yellow on the side of the throat is not very clearly defined; in this respect some specimens agree with typical *neglecta*, others with *hoopesi*.

*Intermediates*.—The extremes mentioned above under the names *magna* and *neglecta* are connected by a series of intermediates to which, for one reason or another, I would refer eight of the thirty Corpus Christi specimens. They may be described as follows: Am. Mus. No. 67308, ♂, April 1; pattern of back, rump, and tail as in *neglecta*, color above as in *magna* but more ruddy in tone; yellow confined to throat. Am. Mus. No. 54952, ♀, April 2; pattern of back and rump as in *neglecta*; tail intermediate in pattern; color above as in *magna* but more ruddy in tone; yellow confined to throat. Am. Mus. No. 54947, ♀, April 14; above intermediate in pattern and color; yellow inclined to extend to the malar region. Am. Mus. No. 54950, ♂, April 14; in pattern, color, and extent of yellow on the malar region fairly intermediate between *magna* and *neglecta*. This bird has the blue bill of a breeding bird and was found associated with *magna*. Am. Mus. No. 67312, ♀, April 16; above, pattern of *neglecta* but intermediate in color; yellow confined to the throat. Am. Mus. No. 67320, ♂, April 23; interscapulars intermediate in pattern; rump and tail with pattern of *neglecta*; color approaching that of *magna*, yellow confined to throat. Am. Mus. No. 67321, ♀, April 23; pattern of back and rump as in *neglecta*, tail intermediate; yellow confined to throat; color of *magna*. G. B. S. No. 3452, May; intermediate in pattern; color of *magna*; yellow confined to throat.

Opinion would no doubt vary in regard to the exact determination of these specimens, but as a series there can be no doubt that they prove the complete intergradation of *magna* and *neglecta* in southeastern Texas. Whether this intergradation is geographical, that is, correlated with climatic conditions, or whether it is due to the interbreeding of typical examples of

*magna* with typical examples of *neglecta*, can only be determined by further field work.

The scarcity of breeding birds and of field observations from our Mexican border is greatly to be deplored, for here it is that the status of *hoopesi* and its relationships to *magna* and *mexicana* are to be determined. However, the specimens at hand are listed as follows :

Brownsville.—*Magna*, B. S. No. 139388, August 4. *Hoopesi*, U. S. N. M. No. 74327, August 21 ; Josiah Hoopes Coll. No. 786, ♂, March 13 (type of *hoopesi*).

Rio Grande City.—*Neglecta*, G. B. S. No. 1470, ♂, April 2 ; bill brown, yellow extending to malar region ; apparently not a breeding bird.

Lomita.—*Neglecta*, G. B. S. No. 1469, ♀ ; yellow extending slightly on sides of the throat.

Laredo.—*Mexicana*, G. B. S. No. 3455, March ; G. B. S. No. 3456, ♀, March ; G. B. S. No. 3454, ♂, March.

Altuda.—*Mexicana*, B. S. No. 139389, August 9.

Marfa.—*Mexicana*, G. B. S. No. 5056, ♂, July 11 ; G. B. S. No. 5057, ♀, July 11.

The narrow pectoral crescent of these Marfa specimens places them with *mexicana* rather than with *magna* but their plumage is too worn to permit of a satisfactory understanding of their relationships with *neglecta*.

Pecos City.—*Mexicana*, G. B. S. No. 4832, ♂, June 2 ; G. B. S. No. 4833, ♀, June 2. Both specimens have the color and narrow pectoral crescent of *mexicana* but in the pattern of the back, rump, and tail they resemble *neglecta* ; the yellow is confined to the throat.

#### *New Mexico.*

San Bernardino Ranch.—*Mexicana*, U. S. N. M. No. 127492, ♂, Aug. 4 ; *hoopesi*, U. S. N. M. No. 127823, ♂, Aug. 3 ; U. S. N. M. No. 130504, ♂, Aug. 18 ; U. S. N. M. No. 130503, ♂, Aug. 24. Yellow confined to the throat.

#### *Mexico.*

Chihuahua, San Diego.—*Mexicana*, Am. Mus. No. 56792 ; no date, worn breeding plumage, bill blue ; Am. Mus. No.

56793; worn breeding plumage, bill blue. Four other specimens from this locality, two taken in September and two in February, are referable to *hoopesi*; or, in other words, are *neglecta* without yellow on the malar region.

Coahuila, Saltillo.—*Neglecta*, B. S. No. 144506, ♀ jvr., August 17.

Coahuila, Carneros.—*Neglecta*, B. S. No. 144507, ♂, August 12.

Sides of throat yellow.

Tamaulipas, Miquihuana.—*Neglecta*, B. S. No. 158880, ♀, June 7. Sides of throat yellow.

Tamaulipas, Xicotencatl.—*Magna*, G. B. S. No. 7384, ♂, May 10; G. B. S. No. 7385, ♂, May 13.

These birds agree exactly with specimens of *magna* from Corpus Christi.

#### MEASUREMENTS OF MALES.

##### *Atlantic Coast.*

Locality.	When Collected.	Wing.	Tail.	Culmen.	Collection.	Number.
Brandon, Vt.,	Apl. —	4.90	1.60	1.35	U. S. N. M.	159684
Amherst, Mass.,	" 8	4.75	1.50	1.28	"	128914
Barnstable, "	" 4	4.92	1.70	1.32	O. B.	36
Fishkill, N. Y.,	" 18	4.65	1.60	1.32	Am. Mus.	25305
Springs (L. I.), N. Y.,	" —	4.85	1.58	1.25	"	65446
Englewood, N. J.,	May 30	4.82	1.62	1.30	F. M. C.	88
Trenton, N. J.,	" 29	5.04	1.68	1.38	Am. Mus.	69696
Washington, D. C.,	June 4	4.98	1.62	1.40	U. S. N. M.	122043
" "	" 8	4.85	1.62	1.32	"	122044
Gainesville, Fla.,	May 20	4.47	1.40	1.20	F. M. C.	860
" "	" 19	4.37	1.40	1.22	"	848
Pellicier's Creek, Fla.,	" 20	4.31	1.50	1.25	U. S. N. M.	133095
" " "	" 20	4.40	1.60	1.35	"	133096
Near Kissimmee "	Mch. 3	4.28	1.60	1.21	"	150023
" " "	" 3	4.20	1.56	1.20	"	150022
" " "	" 21	4.34	1.62	1.30	"	152058
Sebastian River, Fla.,	" 14	4.45	1.60	1.25	Am. Mus.	39033
" " "	" 12	4.30	1.55	1.23	"	39030
" " "	" 12	4.42	1.50	1.28	"	39031

##### *Cuba.*

Locality.	When Collected.	Wing.	Tail.	Culmen.	Collection.	Number.
Trinidad,	Mch. 18	4.00	1.46	1.25	Am. Mus.	57234
" "	" 17	3.98	1.46	1.25	"	57233
" "	" 23	3.98	1.46	1.23	"	57243
" "	" 21	4.00	1.45	1.26	"	57241
" "	" 17	3.97	1.45	1.28	"	57232

*Mississippi Valley.*

Locality.	When Collected.	Wing.	Tail.	Culmen.	Collection.	Number.
Fort Snelling, Minn.,	May 8	4.75	1.48	1.25	Am. Mus.	5699
" " "	" 18	4.95	1.62	1.31	" "	55711
" " "	" 18	4.92	1.53	1.18	" "	55712
Eric, Pa.,	Mch. 31	4.88	1.51	1.41	G. B. S.	51465
" " "	Apl. 14	4.98	1.55	1.25	" "	1467
" " "	" 16	4.75	1.50	1.40	" "	1468
Sugar Creek Prairie, Ills.,	June 3	4.50	1.41	1.28	U. S. N. M.	118461
" " "	" 7	4.60	1.45	1.22	" "	133317
" " "	" 3	4.90	1.36	1.28	" "	118462
Gibson, Ind.,	Apl. 10	4.62	1.50	1.30	W. B.	12804
Golden City, Mo.,	July 13	4.60	1.58	1.28	B. S.	142087
Ft. Gibson, Ind. Terr.,	June 18	4.80	1.58	1.28	" "	139429
Iowa Station, La.,	Apl. 8	4.32	1.60	1.25	" "	164802
Avery's Island, La.,	June 10	4.40	1.62	1.28	U. S. N. M.	150735
" " "	" 10	4.25	1.58	1.28	" "	150736
" " "	" 11	4.40	1.58	1.26	" "	150734
Corpus Christi, Tex.,	Apl. 14	4.65	1.55	1.40	Am. Mus.	67306
" " "	" 14	4.55	1.65	1.32	" "	67311
" " "	" 23	4.55	1.66	1.35	" "	67319
" " "	" 14	4.55	1.69	1.35	" "	54951
" " "	" 23	4.70	1.70	1.38	" "	67320
" " "	" 14	4.80	1.65	1.35	" "	54949
" " "	" 14	4.78	1.70	1.38	" "	54948

*Mexico and Southward.*

Locality.	Wing.	Tarsus.	Culmen.	Collection.	Number.
Chihuahua, San Diego,	4.84	1.50	1.30	Am. Mus.	56792
Durango, Papasquiario,	4.90	1.52	1.24	B. S.	164019
Tepic, Santiago,	4.48	1.52	1.19	" "	157472
" Tepic,	4.55	1.55	1.22	" "	156064
Guanajuato,	4.78	1.65	1.22	U. S. N. M.	105269
" "	4.65	1.50	1.19	" "	74350
Jalisco, Etzatlán,	4.65	1.70	1.30	B. S.	144526
" Mesquitic,	4.60	1.55	1.21	" "	156969
Puebla, Metaltoyuca,	4.40	1.63	1.24	" "	158882
Orizaba,	4.35	1.58	1.15	U. S. N. M.	42502
Jalapa,	4.25	1.61	—	" "	13653
" "	4.20	1.62	1.21	Am. Mus.	42254
" "	4.35	1.55	1.20	" "	42257
Tamaulipas, Xicotencatl,	4.65	1.60	1.26	G. B. S.	7385
" " "	4.65	1.45	1.25	" "	7384
Vera Cruz, Minatitlán, <sup>1</sup>	4.04	1.56	1.10	B. S.	144519
" " "	4.14	1.62	1.22	" "	144516

<sup>1</sup> *Sturnella magna inexpectata.*

Locality.	Wing.	Tarsus.	Culmen.	Collection.	Number.
Vera Cruz, Minatitlan,	4.00	1.61	1.15	B. S.	144518
" "	4.10	1.60	1.17	"	144523
Oaxaca, Tapana,	4.60	1.69	1.20	"	144510
Chiapas, Ocuilapa, <sup>1</sup>	4.56	1.68	1.24	"	144524
" "	4.56	1.70	1.18	"	144512
" "	4.65	1.66	1.20	"	144514
Chiapas, San Cristobal,	4.40	1.62	1.18	"	144503
" "	4.35	1.48	1.12	"	144501
Guatemala, Hda. Chaucol,	4.46	1.50	1.18	"	144522
" Dueñas,	4.45	1.75	1.18	U. S. N. M.	33604
Honduras (coast region?), <sup>2</sup>	3.96	1.48	1.12	"	50524
" "	4.00	1.45	1.12	"	11981
" Segovia River, <sup>2</sup>	3.85	1.44	1.10	"	112126
" " "	3.81	1.51	1.15	"	112127
Costa Rica, San Jose,	4.38	1.50	1.18	"	33380
" "	4.30	1.62	1.22	"	42807
Venezuela, Valencia,	4.50	1.64	1.40	"	153885
Colombia, 'Bogota,'	4.52	1.62	1.40	Am. Mus.	35382
" "	4.50	1.65	1.40	"	36666
" "	4.65	1.70	1.50	U. S. N. M.	147159

*British Columbia and Pacific Coast.*

Locality.	When Collected.	Wing.	Tarsus.	Culmen.	Collection.	Number.
Clinton, B. C.,	July 6	5.05	1.50	1.30	Am. Mus.	30994
Ashcroft "	June 4	5.22	1.50	1.25	"	30989
Comox "	" 4	5.11	1.54	1.35	B. S.	39400
New Westminster, B. C.,	May 22	4.80	1.44	1.40	Am. Mus.	47579
Vancouver, Washington,	Apl. 13	4.98	1.51	1.28	"	57697
Ft. Walla Walla, "	Feb. 13	4.86	1.42	1.25	"	42251
Ft. Klamath, Oregon,	May 27	4.90	1.46	1.22	"	25306
" "	Spring	5.10	1.52	1.35	"	54796
Red Bluff, Calif.,	Mch. 24	5.05	1.51	1.30	"	98346
Calito, "	May 3	4.82	1.49	1.26	"	152611
Nicasio, "	Apl. 23	4.80	1.48	1.28	U. S. N. M.	83852
Owen Lake, "	June 9	4.88	1.51	1.25	B. S.	139405
Death Valley, Calif.,	June 19	4.88	1.50	1.31	"	139406
Jacumba, "	May 26	5.00	1.50	1.35	U. S. N. M.	133902
" "	" 26	4.88	1.52	1.24	U. S.	133624
" "	" 26	5.00	1.52	1.25	"	133900
" "	" 26	5.00	1.46	1.35	"	60948

*Summary.*—It appears from this review of the available material from the regions where the ranges of *neglecta* and *magna* come together, that in the Mississippi Valley, between the meridians of 90° and 100°, both *magna* and *neglecta* are typically

<sup>1</sup> Type of *Sturnella magna alticola*.

<sup>2</sup> *Sturnella magna inexpectata*.

<sup>3</sup> Type of *Sturnella magna inexpectata*.

represented, that they are sometimes found associated during the breeding season, that their ranges overlap for a distance of several hundred miles, and that intermediates between them, while not proportionately common, do occur, sometimes in connection with typical representatives of both forms.

In southeastern Texas, at Corpus Christi, the fusion of these birds seems to be more complete, though it is not probable that both forms breed there.

On our Mexican boundary, east of the Rocky Mountains, *neglecta*, as a whole, shows an approach to the *magna* type in the absence, usually, of yellow from the sides of the throat. Specimens of *magna* in the lower Rio Grande, and of *mexicana* further west, also occur in this region, and there are also intermediates between the two forms and *neglecta*. Specimens, however, are lacking to show the exact relationships of *mexicana* to *neglecta*, or to its representative *hoopesi*.

*Conclusions.* — Before proceeding further I take pleasure in acknowledging the assistance which Mr. E. W. Nelson has rendered me in explaining certain apparently anomalous cases in the distribution of Meadowlarks in northern Mexico. Mr. Nelson's unequalled field experience in Mexico has given him that knowledge of the topography and climate of the country which is so essential to a proper understanding of the distribution and geographical variation of species, and until he had informed me of the climatic conditions prevailing at certain places, I was at loss to account for the occurrence there of birds included in the collections studied.

As has been previously stated, the material available for examination is not of a nature to permit of wholly satisfactory conclusions being drawn from it. It, however, warrants the presentation of a theory which further research must prove or disprove.

Assuming that Meadowlarks originated in the humid tropics, we have, as the ancestral form, a dark bird which, spreading northward along the coast and over the Mexican tablelands, retained its dark colors in humid regions and acquired a paler color in arid regions. The *neglecta* type originated, therefore, in arid portions of the tableland of Mexico, where its range is bounded on the south by the humid valley of Mexico. On either

side of the tableland it is flanked by a northward extension of the range of *mexicana* along the humid portions of the Sierra Madre, as is shown by the occurrence of dark birds at San Diego in Chihuahua, and perhaps also in the humid mountainous region of western Texas.

Breeding specimens of *neglecta* from the southern parts of the tableland or areas adjoining the Sierras are wanting to show the relationships of the birds in these regions, but it is probable that where an arid region passes into a humid region *neglecta* passes into *mexicana*, as is suggested by the intergradation of specimens at Corpus Christi.

The absence of proper material and of field observations also prevents us from determining whether the specimens of *neglecta* from our southern boundary, which lack yellow on the sides of the throat, and which Mr. Stone has named *hoopesi*, are, as might be supposed, a step in the differentiation of the light bird from the dark one.

The extension of the range of the dark bird northward along the narrow strip of humid coast region is well shown by specimens from near Tampico and from Corpus Christi. A further advance northward has probably been made, as in the case of other specimens still largely restricted to it — *e. g.*, *Quiscalus macrourus* — along the coast region and perhaps up the Mississippi Valley until it has eventually occupied the United States east of the one hundredth meridian.

The extension of the range of the light bird has been northward over the tableland into the western United States, and would appear to have been comparatively rapid, since it is now found occupying humid regions without as yet evincing any decided change in color.

If the assumption of the origin of both birds from a common ancestor be accepted and if their geographical intergradation at the southern limits of the range of *neglecta* be established, we are then in a position to explain their apparent association as species in the more northern parts of their range, on the ground that while their ranges originally diverged like forks of a Y, the ends have finally come together, not as geographical intergrades, but as two forms, both of which have occupied the region where they are found associated at so recent a date that neither shows

the effect of the climatic conditions under which it lives, but exhibits the characters earlier acquired.

In the Mississippi Valley, therefore, we have the apparent anomaly of two geographical races or subspecies of the same species breeding at the same place, and, occasionally associated with them, are certain intermediate specimens showing in varying degrees the characters of both extremes.

Since it is out of the question to suppose that the same environment could produce three phases of the same species at the same place, that is, *neglecta*, *magna*, and intermediates between the two, we can only suppose that such connecting specimens are not geographical intergrades but the results of a union between *neglecta* and *magna*. In fact, loosely speaking, these connecting specimens would be termed hybrids, but, accepting as a definition of this word "the offspring of animals of different species," it is evident that in a strict sense it cannot be applied to these intermediates, which are the progeny of parents not specifically distinct.

While it is greatly to be regretted that the present paper cannot be more conclusive, it is hoped that the theory herein advanced, of the descent from a common ancestor of both *magna* and *neglecta*, of their continued geographic or climatic intergradation on the Mexican tableland, of their independent range extension northward and subsequent meeting and interbreeding in the Mississippi Valley, may at least prove suggestive to students of the genus *Sturnella*.

It remains to acknowledge my indebtedness for the loan of the material on which this paper has been so largely based, and I therefore very gladly express my thanks to Mr. Robert Ridgway, Dr. C. Hart Merriam, Mr. William Brewster, Mr. Witmer Stone, Dr. Louis B. Bishop, and Mr. Outram Bangs for their kindness in sending the specimens included in the appended statement.

*Specimens Examined*.—Collection of United States National Museum, through Robert Ridgway, Curator of Birds, 315; American Museum of Natural History, 240; Biological Survey, through Dr. C. Hart Merriam, Chief of the Survey, 84; George B. Sennett, 37; William Brewster, 25; Philadelphia Academy of Natural Sciences, through Witmer Stone, Conservator of Birds, 21; Outram Bangs, 6; Louis B. Bishop, 6. Total, 734.



## INDEX TO VOLUME XIII.

[New names of genera, species, and subspecies are printed in **heavy-faced** type.]

- ACCIPITER bicolor, 130.  
 tinus, 130.
- Aceratherinæ, 229, 240, 265.
- Aceratherium, 230, 241.  
 bicornis, 232.  
 blanfordi, 245, 249.  
 croizeti, 237.  
 filholi, 240, 242, 265.  
 gannatense, 244.  
 incisivum, 230, 242, 247, 248,  
 253, 265, 267.  
 lemanense, 240, 242, 243, 253,  
 265.  
 perimense, 249.  
 platycephalum, 240.  
 platyodon, 245, 265, 267.  
 simus, 232.  
 tridactylum, 240, 242, 246,  
 247, 253, 265, 267.
- Acestrura astreans, 120, 137.  
 mulsanti, 120, 137.
- Actinocrinus **semimultiramosus**,  
 23.
- Actitis macularia, 125.
- Ægialitis collaris, 126.
- Agamia agami, 125.
- Akodon caliginosus, 226.
- Alce americanus, 47.  
 gigas, 49.
- Allen, J. A., the Mountain Caribou of northern British Columbia, 1-18; note on the Wood Bison, 63-67; list of Bats collected by Mr. H. H. Smith in the Santa Marta Region of Colombia, with descriptions of new species, 87-94; list of birds collected in the district of Santa Marta, Colombia, by Mr. Herbert H. Smith, 117-183; note on the generic names *Didelphis* and *Philander*, 185-190; descriptions of new American Marsupials, 191-199; on Mammals collected in Southeastern Peru by Mr. H. H. Keays, with descriptions of new species 219-227. See also Stone, A. J.
- Alouata nigra, 227.
- Amazilia fuscicaudata, 139.  
 warszewiezi, 139.
- Amazona amazonica, 132.  
 mercenaria, 132.
- Amizillis fuscicaudata, 139.  
 sp., 139.  
 warszewiezi, 139.
- Anabazanops striaticollis, 158.
- Anthocephala floriceps, 118, 140.
- Antrostomus rufus, 137.
- Aphelops, 241.
- Ara chloroptera, 133.  
 militaris, 133.
- Aramides axillaris, 125.  
 cajanus, 125.
- Arapaho Indians, symbolism of,  
 69-86.
- Arbelorhina cærulea microrhyncha, 173.  
 cyanea eximea, 173.
- Ardea agami, 125.
- Arremon schlegeli, 167.
- Arremonops caneus, 121, 164.  
 venezuelensis, 163
- Artibeus femurvillosus, 89.  
 palmarum, 89.
- Astragalinus psaltria columbianus,  
 165.
- Asturina magnirostris, 129.  
 nitida, 129.
- Atelodinæ, 229, 265.
- Atelodus, 230.  
 antiquitatis, 265.  
 bicornis, 253, 265.  
 merckii, 265.  
**neumyri**, 263, 265.  
 pachygnathus, 265.  
 simus, 253, 265.
- Atticora cyanoleuca, 171.
- Attila cinnamomeus, 154.  
**parvirostris**, 121, 153.  
**rufipectus**, 121, 153.
- Aulacorhampus albivittatus, 120,  
 133.

- Aulacorhampus calorhynchus*, 133.  
*lautus*, 120, 133.  
*Automolus rufipectus*, 121, 158.
- BADACTHERIUM**, 241, 244.  
*Bartramia longicauda*, 125.  
 Bartres, D. Leopoldo, 201.  
*Basileuterus cabanisi*, 176.  
*cinereicollis*, 120, 175.  
*conspicillatus*, 120, 175.  
*mesochrysus*, 176.
- Bats, list of, collected at Santa Marta, Colombia, 87-94.
- Bear, Barren Ground, 57.  
 Glacier, 58.  
 Grizzly, 58.  
 Kadiak, 58.  
 Polar, 58.  
 Sitka, 58.  
 Yakutat, 58.
- Beaver, 61.  
*borbonicum*, 244.
- Bellerophon, sp., 21.
- Bensley, B. Arthur, a cranial variation in *Macropus bennetti*, 109, 110.
- Bison bison, 63, 67.  
*bison athabascæ*, 41, 63.
- Bison, American, 63, 67.  
 Plains, 63, 67.  
 Wood, 41, 63-67.
- Brachypodinae*, 229, 249, 265.
- Brachyspiza capensis peruviana*, 164.
- Brotogeris jugularis*, 132.  
*tovi*, 132.
- Buarremon assimilis, 167.  
*basilicus*, 121, 167.  
*melanocephalus*, 120, 167.
- Bucco ruficollis*, 135.
- Busarellus nigricollis*, 130.
- Buteo latissimus*, 130.  
*pennsylvanicus*, 130.
- Butorides cyanurus*, 125.  
*striata*, 125.  
*virescens*, 125.
- CALAPÆCIA borealis**, 20.
- Calcite crystals, 95; diagrams of, 95, 96.
- Calliste cyanoptera*, 170.  
*desmaresti*, 169.
- Calospiza articapilla*, 169.  
*cyanoptera*, 170.  
*desmaresti*, 169.  
 sp., 170.
- Caluromys**, 189.  
*affinis*, 189.
- Caluromys alstoni**, 189.  
*cicur*, 189.  
*cinereus*, 189.  
*derbianus*, 189.  
*derbianus ornatus*, 189.  
*laniger*, 189.  
*laniger guayanus*, 189.  
*laniger pallidus*, 189.  
*philander*, 189.  
*trinitatis*, 189.
- Campephilus malherbii*, 137.
- Campylopterus phainopeplus*, 120, 138.
- Campylorhynchus griseus*, 180.
- Canal Louis Napoleon III, 40.
- Cancroma cochlearia*, 124.
- Caribou, Barren Ground, 2, 50, 53.  
 Mountain, 4, 51.  
 Newfoundland, 9.  
 Woodland, 2.
- Caribous, 49-57; comparative measurements of skulls of, 6.
- Carigueya, 188.
- Cassicus persicus*, 163.
- Cassidix oryzivora*, 163.
- Catamenia*, sp., 164.
- Cathartes aura*, 129.
- Cathartes aurantiirostris*, 183.  
*fuscater*, 183.
- Centurus tricolor*, 120, 136.
- Ceophloeus lineatus*, 136.
- Ceratorhinæ*, 229, 256, 265.
- Ceratorhinus*, 230.  
*etruscus*, 265.  
*leptorhinus*, 265.  
*platyrhinus*, 265.  
*sansaniensis*, 248, 265.  
*schleiermacheri*, 265.  
 • *simorrensis*, 265.  
*steinheimensis*, 265.  
*sumátranus*, 265.
- Certhiola luteola*, 173
- Ceryle amazona*, 136.  
*americana*, 136.  
*torquata*, 136.
- Chaetura spinicauda*, 137.
- Chalybura buffoni*, 141.
- Chamæpelia rufipennis*, 128.
- Chamæpetes gundoti*, 126.
- Channel, Allen, named, 41.
- Chapman, Frank M., a study of the genus *Sturnella*, 297-320.
- Chimpanzee, a bilateral division of the parietal bone in, 281-295.
- Chiroderma jesupi*, 88.
- Chiromachæris manacus*, 121, 155.

- Chironectes minimus*, 219.  
*Chiroxiphia lanceolata*, 155.  
*Chloronerpes yucatanensis uropygialis*, 136.  
*Chlorophonia frontalis*, 170  
*Chlorostilbon hæberlini*, 141.  
 sp., 141.  
*Chrotopterus auritus*, 91.  
*Chrysolampis moschitus*, 140.  
*Chrysomitris columbiana*, 165.  
   *mexicana*, 165.  
   *spinescens*, 165.  
*Chrysoptilus guttatus*, 136.  
*Chrysotis amazonica*, 132.  
*Cinclodes fuscus albidiventris*, 159.  
*Cinclus rivularis*, 121, 181.  
*Claravis pretiosa*, 128.  
*Coccyzus americanus*, 134.  
   *landsbergi*, 134.  
   *melanocoryphus*, 134.  
*Cœreba cœrulea*, 173.  
   *cyanea*, 173.  
   *luteola*, 173, 184.  
*Colopterus pilaris*, 150.  
*Columba albilineata*, 129.  
   *gymnophthalma*, 129.  
   *rufina*, 129.  
   *speciosa*, 129.  
*Columbigallina passerina granatina*, 128.  
   *passerina pallescens*, 128.  
   *rufipennis*, 128.  
*Compsothlypis pitiayumi pacifica*, 178.  
*Conirostrum rufum*, 174.  
*Conopophaga browni*, 121, 161.  
*Contopus borealis*, 143.  
   *brachytarsus*, 143.  
   *virens*, 143  
*Conurus wagleri*, 132.  
 Cope, E. D., quoted, on *Mosasaurus maximus*, 25-28.  
*Crax alberti*, 127.  
*Crotophaga ani*, 134.  
   *sulcirostris*, 134.  
 Cruciform structures at Mitla, Mexico, 201-218.  
*Crypturus columbianus*, 124.  
   *pileatus*, 124.  
   *souj*, 124.  
*Cyanerpes cæruleus microrhynchus*, 173.  
   *cyaneus eximius*, 173.  
*Cyanocompsa concreta sanctæ-martæ*, 121, 165.  
*Cyanocorax affinis*, 162.  
*Cyclarhis flavipectus canticus*, 171.  
*Cyclorhis flavipectus*, 121, 171.  
*Cyclorhis flavipectus canticus*, 121.  
*Cyclospira bisulcata*, 21.  
 sp., 21.  
*DACNIS napæa*, 121, 174.  
   *plumbea*, 174.  
*Dactylomys dactylinus*, 221.  
   *peruanus*, 220.  
 Decorative art of Arapaho Indians, geometric designs in, 69.  
*Dendrocincla meruloides*, 156.  
   *olivacea anguina*, 121, 156.  
   *olivacea lafresnayi*, 156.  
*Dendrocolaptes validus*, 156.  
*Dendroeca æstiva*, 177.  
*Dendroica æstiva*, 177.  
   *blackburniæ*, 178.  
   *cærulescens*, 177.  
   *castanea*, 177.  
   *striata*, 177.  
*Dendromanes meruloides*, 156.  
*Dendroplex picirostris*, 157.  
*Dendronis nana*, 157.  
   *susurrans*, 157.  
*Dermanura quadrivittata*, 87.  
 Designs, symbolic tendency in Arapaho Indians, 69; animal, 70; parts of body in, 70; of buffalo paths, 72; derived from plants, 73; from inanimate nature, 74; human figure in, 80; color in, 81; combinations in, 81; narrative symbolism in, 82.  
*Desmodus murinus*, 87.  
   *rufus*, 87.  
*Diceratheriinae*, 229, 232, 265.  
*Diceratherium croizeti*, 236.  
   *douvillei*, 239.  
   *minutum*, 236, 237, 238.  
   (Pleuroceros) *minutum*, 258.  
*Didelphis*, 185-189.  
   *aurita*, 185, 187.  
   *azaræ*, 187, 189.  
   *brachyura*, 188.  
   *breviceps*, 187.  
   *californica*, 187.  
   *cancrivora*, 188.  
   *cayopollin*, 188.  
   *cinerea*, 189, 190.  
   *dorsigera*, 188.  
   *karkinophaga*, 185, 187, 188, 191.  
   *karkinophaga caucæ*, 192.  
   *karkinophaga colombica*, 193.  
   *marmosa*, 186.  
   *marsupialis*, 185-188.

- Didelphis memmina*, 188.  
*murina*, 188, 189.  
*nudicauda*, 188, 189.  
*opossum*, 186, 188, 195.  
**pernigra**, 191, 219.  
*philander*, 186, 189,  
*pusilla*, 188.  
*quica*, 195.  
*virginiana*, 185, 186, 188.  
(Metachirus) *opossum*, 195.  
(Micoureus) *murina*, 197.  
*Didelphys cinerea*, 189.  
*myosurus*, 195, 196.  
*virginiana*, 269.  
*Diglossa albilateralis*, 174.  
*aterrima*, 174.  
*nocticolor*, 121, 174.  
*sittoides similis*, 174.  
*Diphylla ecaudata*, 87.  
*Doleromyia fallax*, 140.  
*Dolichonyx oryzivorus*, 163.  
*Dolichophyllum macrophyllum*, 91.  
*Donacobius atricapillus*, 180.  
  
**ELÆNEA albiceps**, 147.  
*browni*, 121, 123, 147.  
*pagana*, 147.  
*pagana sororia*, 147.  
*sororia*, 121, 123, 147.  
**Elasmotheriine**, 229.  
*Emberizoides macrourus*, 163.  
*Embernagra conirostris*, 121, 164.  
*conirostris caneus*, 164.  
*Empidonax cabanisi*, 144.  
*Empidonax ridgwayi*, 144.  
*virescens*, 143.  
*Equus caballus*, 111, 115, 116.  
*eous*, 114.  
*intermedius*, 114.  
**scotti**, 111-116.  
*Ereunetes pusillus*, 126.  
*Eriodora intermedia*, 160.  
Eskimo methods of capturing  
game, 54, 61.  
*Eucometis cristata*, 168.  
*Euphonia crassirostris*, 170.  
*laniirostris*, 170.  
*trinitatis*, 170.  
*Eupsychortyx leucopogon*, 127.  
*Euscarthmus granadensis*, 150.  
*impiger*, 150.  
  
**FALCO rufigularis**, 131.  
Flève MacFarlane ou Ennaki,  
40.  
la Roucière ou Kkay-flôh-  
nliné, 40.  
*Floricola longirostris*, 139.  
  
*Florisuga mellivora*, 138.  
*Fluvicola pica*, 151.  
*Formicivora caudata*, 160.  
*intermedia*, 160.  
Foxes, 59.  
*Furnarius agnatus*, 159.  
  
**GALBULA ruficauda**, 120, 135.  
*ruficauda pallida*, 120, 135.  
*Gallinago jamesoni*, 183.  
*Gampsonyx swainsoni*, 131.  
*Geothlypis agilis*, 177.  
*formosa*, 177  
*philadelphia*, 176.  
*Geotrygon linearis infusca*, 120,  
128.  
*montana*, 128.  
*Geranoëtus melanoleucus*, 130.  
*Geranospizias cærulescens*, 130.  
Gidley, J. W., a note on an inter-  
esting specimen of *Calcite*  
from the staked plains of Texas, 111-  
116.  
*Glaucidium ferox*, 132.  
*Glaucis hirsuta*, 142.  
*Glossophaga longirostris*, 89.  
*soricina*, 89.  
Goat, Rocky Mountain, 47.  
Gorget, shell, from Huasteca,  
Mexico, 99-103.  
*Grallaria bangsi*, 159.  
*spatiator*, 183.  
*spiator* (in error), 121, 159, 183.  
*Grallaricula ferrugineipectus*, 159.  
Gratacap, L. P., a note on an inter-  
esting specimen of *Calcite*  
from Joplin, Missouri, 95-97.  
*Gulo luscus*, 59.  
*Gypagus papa*, 129.  
  
**HADROSTOMUS homochrous**, 154.  
Halysites **agglomeratiformis**, 20  
*agglomeratus*, 19.  
*Hapalocercus paulus*, 121, 150.  
*Haplospiza nivaria*, 121, 164.  
*Hedymeles ludovicianus*, 164.  
*Heleodytes griseus*, 180.  
*nuchalis*, 180.  
*Helianthea*, sp., 139, 183, 184.  
*Helicotoma planulata*, 21.  
*Heliochera rubrocristata*, 152.  
*Heliolites macrostylus*, 20.  
**perelegans**, 21.  
*Helminthophaga chrysoptera*, 178.  
*peregrina*, 178.  
*Helminthophila chrysoptera*, 178.  
*peregrina*, 178.  
*pinus*, 178.

- Hemiderma brevicauda, 90.  
 Hemiprocne zonaris, 137.  
 Henicorhina anachoreta, 121, 180, 183.  
     leucophrys, 180.  
 Herpetotheres cachinnans, 131.  
 Heteropelma veræpaci, 155.  
 Hrdlička, Aleš, a bilateral division of the parietal bone in a Chimpanzee, with special reference to the oblique sutures in the parietal, 281-295.  
 Huastecan, Mexico, 99-103; on cruciform structures near Mitla, Mexico, 201-218.  
 Hylocharis cyanea, 138.  
 Hylocichla alicieæ, 183.  
     fuscescens, 182.  
     ustulata swainsoni, 182.  
 Hylophilus aurantiifrons, 172.  
     aurantiiostris, 172.  
     brunneus, 121, 171.  
     flavipes, 172.  
     hypoxanthus, 172.  
     viridiflavus, 172.  
 Hypuroptila buffoni, 140.  
 ICTERUS auricapillus, 162.  
     baltimore, 162.  
     galbula, 162.  
     icterus, 162.  
     mesomelas, 162.  
     vulgaris, 162.  
     xanthornus, 162.  
 Ictinea plumbea, 131.  
 Ile Gibbs, 40.  
     de Lesseps, 40.  
     de la Société de Géographie, 40.  
 Indian methods of capturing game, 55, 61.  
 Island, Brownlee, named, 41.  
 JACANA nigra, 126.  
 Jesup, Morris K., expedition to Oklahoma Territory, provided by, 69; mammals from Santa Marta, Colombia, presented by, 87; birds from Santa Marta, Colombia, presented by, 117.  
 KROEBER, Alfred L., symbolism of the Arapaho Indians, 69-86.  
 LAFRESNAYA gayi, 138.  
 Lagidium peruanum, 220.  
 Lake, Esquimaux, 38.  
 Lampornis violicauda, 141.  
 Lasius pallescens, 94.  
 Legatus albicollis, 147.  
 Lemming, 61.  
 Leptasthenura andicola, 159.  
 Leptodon cayanensis, 131.  
     uncinatus, 131.  
 Leptopogon amaurocephalus, 149.  
     amaurocephalus pileatus, 149.  
 Leptotila verreauxi, 128.  
 Leucuria phalerata, 121, 139, 184.  
 Limnofelis, 278.  
 Lophotriorchis isidorii, 130.  
 Lutra canadensis, 69.  
 Lynx canadensis, 60.  
 Lynx, Canada, 60.  
 MACHETORNIS rixosa, 151.  
 Macropus bennetti, cranial variation in, 109.  
 Malacoptila mysticalis, 134.  
 Manacus manacus, 155.  
     manacus additivus, 183.  
     manacus abdivitus (in error), 121, 155, 183.  
 Margarornis brunnescens, 157.  
 Marmosa, 189.  
     chapmani, 197, 198.  
     klagesi, 198.  
     murina, 197.  
 Marmose, 188.  
 Marsupials, new South American, 191-199.  
 Marten, 59.  
 Megarhynchus pitangua, 145.  
 Melanerpes wagleri sanctæ-martæ, 120, 136.  
 Mellisuga mellivora, 139.  
 Merula albiventris fusa, 121, 182.  
     gigas cacozela, 121, 181.  
     grayi lurida, 181.  
     incompta, 121, 181.  
     olivatra, 181.  
     phæopyga minuscula, 121, 182.  
 Metachirus, 186, 189.  
 Metachirus fuscogriseus, 194.  
     nudicaudatus, 197.  
     nudicaudatus colombianus, 195.  
     opossum, 195.  
     quica, 195.  
     tschudii, 195.  
 Metallura districta, 121, 140.  
     smaragdnicollis, 121, 140.  
 Micrastur ruficollis, 130.  
     semitorquatus, 130.  
 Microcerculus marginatus, 180.  
 Micronycteris hypoleuca, 90, 91.  
     megalotis, 90.  
 Micropalama himantopus, 126.

- Milvago chimachima*, 131.  
*Milvulus tyrannus*, 142.  
*Mimus gilvus*, 180.  
     *gilvus columbianus*, 180.  
 Mink, American, 59.  
*Mionectes oleagineus*, 149.  
     *olivaceus*, 149.  
 Mitla, Mexico, explorations near,  
     201-218.  
*Mniotilta varia*, 178.  
*Molossus nasutus*, 92.  
*Molothrus cassini*, 163.  
     *discolor*, 163.  
*Molucca Opossum*, 188.  
*Momotus subrufescens*, 135.  
 Monte Alban, Mexico, excavations  
     at, 201.  
 Moose, 47.  
*Mosasaurus giganteus*, 27.  
     *maximus*, 25.  
 Mouse, Porcupine, 223.  
*Murchisonia (Lophospira) tricarinata*, 21.  
*Muscivora mexicana*, 145.  
 Musk-Ox, 42.  
 Muskrats, 61.  
*Mustela americana*, 59.  
*Myiarchus crinitus*, 142.  
     *erythrocerus*, 143.  
     *ferox*, 142.  
     *nigriceps*, 143.  
     *tyrannulus*, 142.  
*Myiobius assimilis*, 121, 144.  
     *erythrurus*, 144.  
     *nævius*, 145.  
     *viellotioides*, 144, 145.  
*Myiodynastes audax*, 145.  
     *audax nobilis*, 145.  
     *chrysocephalus*, 146.  
     *nobilis*, 145.  
*Myiopagis gaimardi*, 148.  
     *macilvainii*, 148.  
     *placens*, 148.  
*Myiopatis semifusca*, 149.  
     *montensis*, 121, 149.  
*Myiospiza manimbe*, 164.  
*Myiotheretes striaticollis*, 152.  
*Myiozetetes texensis colombianus*,  
     146.  
 Myodes, 188.  
*Myotis nigricans*, 94.  
     sp., 227.  
*Myrmeciza boucardi*, 160.  
*Myrmecophaga*, 185.  
*Myrmotherula sanctæ - martæ*,  
     121, 160.  
 NASUA nasua, 226.  
*Neacomys spinosus*, 222.  
*Nectomys garleppii*, 222.  
*Nemosia pileata*, 167.  
*Neocrex colombianus*, 120, 125.  
*Nuttalornis borealis*, 143.  
*Nycticorax nycticorax nævius*, 125.  
*Nyctidromus albicollis*, 137.  
*Nyctinomus*, sp., 226.  
 OAXACA, Mexico, explorations in,  
     201-218.  
*Ochthodiæta pernix*, 121, 152.  
*Ochthoeta jesupi*, 121, 151.  
     *olivacea*, 121, 152.  
     *poliogastra*, 120, 151.  
*Odontophorus atrifrons*, 121, 127.  
 Oklahoma Territory, Arapaho In-  
     dians of, 69-86.  
*Oncoceras plebium*, 21.  
*Onyx jar from Mexico, in process*  
     of manufacture, 105-107.  
 Opossum, 187.  
     Amboyna, 188.  
     Common, 188.  
     Dwarf, 188.  
     Long-haired, 188.  
     Merian, 188.  
     Mexican, 188.  
     Murine, 188.  
     North American, 188.  
     Short-tailed, 188.  
     Thick-tailed, 188.  
     Virginia, 187.  
     Virginian, 188.  
 Orang, division of the right parietal  
     in, 382.  
*Oreamnos montanus*, 47.  
*Ornithion inerme*, 149.  
     *pusillum*, 148.  
*Ortalis garrula*, 126.  
*Orthis (Dalmanella) testudinaria*,  
     21.  
     (*Plectorthis jamesoni*), 21.  
*Oryænidæ*, 274-278.  
*Oryænodon*, 278.  
*Oryzoborus funereus*, 165.  
*Oryzomys keaysi*, 225.  
     *obtusirostris*, 225.  
 Osborn, Henry Fairfield, phylogeny  
     of the Rhinoceroses of  
     Europe, 229-267; *Oxyæna*  
     and *Patriofelis* restudied, 269.  
*Ostinops decumanus*, 163.  
 Otter, 59.  
     Little, 188.  
*Ovibos moschatus*, 42.  
*Ovis dalli*, 34, 43-47.  
     stonei, 33, 34, 42.

- Oxyæna*, 269-279.  
   *lupina*, 269.  
*Oxymycterus apicalis*, 224.  
   *juliacæ*, 223, 224.  
*Oxypogon cyanolæmus*, 120, 138.
- PACHYRHAMPHUS** *cinereiventris*, 154.  
   *niger*, 154.  
*Panychlora russata*, 141.  
   *sp.*, 141.  
*Parula pitiayumi*, 178.  
*Patriofelis*, 269, 279.  
   *ferox*, 269.  
   *ulta*, 278, 279.  
*Penelope argyrotis*, 126.  
   *cristata*, 126.  
*Peropteryx canina*, 93.  
*Peruvian skull, quadrilateral fontanel bones in*, 293.  
*Petasophora anais*, 140.  
   *cyanotis*, 140.  
   *delphinæ*, 140.  
   *iolata*, 140.  
 Petitot, Emil, copy of portion of his chart of Arctic coast of North America, 39; corrections of, 40.  
*Phaëthornis anthophilus*, 138.  
   *longirostris*, 138.  
*Phalacrocorax vigua*, 124.  
*Phalanger*, 186, 187, 188.  
*Pharomacrus festatus*, 120, 135.  
   *fulgidens*, 120, 135.  
*Philander*, 186, 188, 189.  
*Phonipara bicolor*, 165.  
*Phrygilus unicolor*, 121, 164.  
*Phyllomyias semifusca*, 149.  
*Phyllostoma hastatum*, 90.  
*Piaya cayana*, 134.  
   *cayana mehleri*, 134.  
*Picolaptes lachrymiger*, 156.  
*Pictographs of Arapaho Indians*, 70-84.  
*Picumnus cinnamomeus*, 137.  
*Pionus menstruus*, 132.  
   *sordidus*, 132.  
*Pipra auricapilla*, 154.  
*Pipreola auripectus decora*, 121, 155.  
*Piranga faceta*, 121, 168.  
   *hæmælea*, 168.  
   *rubra*, 168.  
*Pitangus derbianus*, 146.  
   *derbianus rufipennis*, 146.  
   *lictor*, 146.  
*Planesticus luridus*, 182.  
*Platycichla flavipes carbonaria*, 181.
- Platyrhynchus albogularis*, 150.  
*Pœcilothraupis melanogenys*, 120, 169.  
*Polioptila bilineata*, 181.  
   *nigriceps*, 181.  
*Polyborus cheriway*, 131.  
*Porzana albigularis*, 125.  
*Pouches, adaptation of, to animal or other forms in Arapaho art*, 73.  
*Premnoplex brunnescens*, 157.  
*Procnias tersa*, 173.  
   *tersa occidentalis*, 184.  
   *viridis*, 173.  
*Proechimys simonsi*, 222.  
*Promops affinis*, 91, 92.  
   *milleri*, 92, 93.  
   *nasutus*, 93.  
*Protonotaria citrea*, 178, 184.  
*Protopsalis*, 278.  
   *tigrinus*, 277.  
*Pseudochloris citrina*, 163.  
*Psittacula cyanoptera*, 132.  
   *guianensis*, 132.  
*Pteroglossus torquatus*, 133.  
*Putorius (Lutreola) vison*, 59.  
*Pygmornis striigularis*, 138.  
*Pyranga æstiva*, 168.  
*Pyrocephalus rubinus*, 144.
- QUISCALUS** *assimilis*, 162.
- RAMPHOCÆNUS** *rufiventris sanctæ-martæ*, 160.
- Rangifer*, 49.  
   *arcticus*, 50.  
   *caribou*, 9.  
   *grœnlandicus*, 2, 6, 9, 11, 12, 13, 16.  
   *montanus*, 1, 3, 4, 6, 7, 8, 9, 11, 12, 14, 15, 16, 51.  
   *terrænovæ*, 6, 9, 10, 11, 12, 15, 16.
- Receptaculites pearyi*, 19.  
 Rehn, James A. G., quoted, on *Sarigua* Muirhead vs. *Didelphis* Linn., 185, 186.
- Rhamphastus brevicarinatus*, 133, 134.  
   *carinatus*, 133, 134.  
   *tocard*, 133.
- Rhamphocelus dimidiatus*, 168.  
*Rhamphocœlus dimidiatus*, 168.  
*Rhamphomicon dorsale*, 120, 137.  
*Rhinoceros antiquitatis*, 262, 264.  
   *austriacum*, 259.  
   *bicornis*, 262, 263, 264.

- Rhinoceros etruscus*, 261.  
*eurydactylus*, 252.  
*gaudryi*, 232, 233, 234.  
*goldfussi*, 267.  
*hemitoechus*, 262, 263.  
*indicus*, 265.  
*leptorhinus*, 261.  
*pachygnathus*, 262.  
*palæindicus*, 264, 265.  
*platyrhinus*, 253, 262.  
*pleuroceros*, 237.  
*sansaniensis*, 253, 256-258.  
*schleiermacheri*, 257, 261.  
*simorrensis*, 256, 257, 259.  
*simus*, 264.  
*sivalensis*, 265.  
*sondaicus*, 265.  
*steinheimensis*, 256, 259, 260.  
*sumatrensis*, 264.  
*tichorhinus*, 262.  
*unicornis*, 264.  
 Rhinoceroses, phylogeny of the European, 229-267.  
 Rhinocerotidæ, 232, 265.  
 Rhinocerotinæ, 229.  
*Rhyacophilus solitarius*, 126.  
*Rhynchocyclus æquinoctialis*, 146.  
*flaviventris*, 146.  
*sulphureus*, 146.  
*Rhynchonella increbescens*, 21.  
 River, Constable, named, 40.  
 Hornaday, named, 41.  
 Jesup, named, 40.  
*Ronzotherium gaudryi*, 233, 234.  
*velaunum*, 232, 234.  
*Rostrhamus sociabilis*, 131.  
*Rupornis leucorrhœa*, 129.  
*magnirostris*, 129.  
 SACCOPTERYX *bilineata*, 93.  
*leptura*, 94.  
*Saltator albicollis*, 166.  
*magnus*, 166.  
*olivaceus*, 167.  
*striatipectus*, 166.  
 Santa Marta, Colombia, list of bats collected at, 87-94; list of birds collected at, 117-183.  
*Sarigua*, 186, 187, 188, 189.  
*brachyura*, 188.  
*cayopollin*, 188.  
*crassicaudata*, 188.  
*marsupialis*, 188.  
*memmina*, 188.  
*murina*, 188.  
*opossum*, 188.  
*pusilla*, 188.  
*virginiana*, 188.  
*Saucerottia warszewiezi*, 139.  
 Saville, Marshall H., a shell gorget from the Huasteca, Mexico, 99-103; an onyx jar from Mexico, in process of manufacture, 105-107; cruciform structures near Mitla, 201-218.  
*Sayornis cineracea*, 151.  
*Scardafella squamosa*, 129.  
*Schistochlamys atra*, 166.  
*Sciurus æstuans cuscinus*, 226.  
*Sclerurus albigularis*, 221, 157.  
*albigularis propinquus*, 157.  
*Scytalopus latebricola*, 121, 162.  
*sylvestris*, 162.  
*Seiurus motacilla*, 177.  
*noveboracensis*, 177.  
*noveboracensis notabilis*, 177.  
*Serpophaga cinerea grisea*, 149.  
*Setophaga flavivertex*, 176.  
*ruticilla*, 176.  
*verticalis*, 176.  
 Sheep, Black, 42.  
 Dall's Mountain, 43-47.  
 Stone's Mountain, 42.  
 White Mountain, 43.  
 Shell gorget, from the Huasteca, Mexico, 99-103.  
*Simia silenus*, 287.  
*Siptornis antisianensis*, 158.  
*wyatti*, 158.  
*Sittasomus olivaceus*, 157.  
*Spermophila grisea*, 166.  
*luctuosa*, 166.  
*plumbea*, 166.  
*plumbea colombiana*, 166.  
 Spermophiles, 61.  
*Spinus spinescens capitaneus*, 121, 165.  
*Spiza americana*, 164.  
*Sporophila grisea*, 166.  
*gutturalis*, 166.  
*luctuosa*, 166.  
*minuta*, 166.  
*plumbea colombiana*, 166.  
 Starr, Frederick, quoted, on a shell gorget from Mexico, 99.  
*Steatornis caripensis*, 137.  
*Stelgidopteryx uropygialis*, 171.  
 Stone, A. J., some results of a natural history journey to northern British Columbia, Alaska, and the Northwest Territory, in the interest of the American Museum of Natural History, 31-62.  
*Streptelasma*, sp., 21.



- Strophomena planumbona*, 21.  
*Sturnella*, a study of the genus, 297-320.  
*Sturnella ludoviciana*, 163.  
     *magna*, 297-320.  
     *magna alticola*, 297, 301.  
     *magna argutula*, 297, 300.  
     *magna hippocrepis*, 297, 300.  
     *magna hoopesi*, 298, 303.  
     *magna inexpectata*, 297, 301.  
     *magna meridionalis*, 297, 300.  
     *magna mexicana*, 297, 300.  
     *magna neglecta*, 297-320.  
     *meridionalis*, 163.  
     *neglecta*, 298.  
*Sublegatus glaber*, 147.  
     *incanescens*, 147.  
     *platyrhyncha*, 147.  
Swastica, on an ear ornament, 102.  
*Sycalis browni*, 121, 165.  
     *flaveola*, 165.  
Symbolism of Arapaho Indians, 69-86.  
Symbols of abstract ideas, 77.  
*Synallaxis albescens*, 159.  
     *antisiensis*, 158.  
     *candæi*, 158.  
     *cinnamomea*, 158.  
     *fusco-rufa*, 159.  
     *wyatti*, 158.  
*Syrnium perspicillatum*, 131.  
     *virgatum*, 132.
- TACHYPHONUS rufus, 168.  
*Tanagra cana*, 169.  
     *cya노cephala auricrissa*, 168.  
     *palmarum*, 169.  
     *palmarum melanopectera*, 169.  
Teoceras, 250.  
     *aurelianusis*, 249, 250, 253, 265.  
     *brachypus*, 249, 251, 265.  
     *eurydactylus*, 252.  
     *fossiger*, 249, 267.  
     *goldfussi*, 249, 255, 265.  
*Tellinomya alta*, 21.  
*Thalarctos maritimus*, 58.  
*Thalaurania columbica*, 141.  
*Thamnophilus doliatus*, 161.  
     *leucauchen*, 161.  
     *melanonotus*, 161.  
     *nævius*, 161.  
     *pulchellus*, 161.  
*Thripadectes flammulatus*, 158.  
*Thryophilus minlosi*, 179.  
     *rufalbus*, 179.  
     *rufalbus castanonotus*, 179.
- Thyroptera tricolor*, 94.  
*Thryothorus lætus*, 121, 179.  
*Thylamys keaysi*, 198, 199, 219.  
*Tigrisoma salmoni*, 125.  
*Tinamus ruficeps*, 124.  
*Tinnunculus sparverius*, 131.  
*Tityra albitorques*, 155.  
     *personata*, 154.  
     *semifasciata*, 154.  
*Todirostrum cinereum*, 150.  
     *nigriceps*, 150.  
     *schistaceiceps*, 150.  
*Totanus flavipes*, 126.  
     *solitarius*, 126.  
*Trachops cirrhosus*, 90.  
*Trigonia osborni*, 236.  
*Tringa maculata*, 126.  
     *minutilla*, 126.  
*Trochoceras*, sp., 21.  
*Trocholites*, sp., 21.  
*Troglodytes monticola*, 121, 178.  
     *musculus rufulus*, 179.  
     *rufulus*, 179.  
     *tessellatus*, 179.  
*Trogon caligatus*, 135.  
     *personatus*, 135.  
*Tryanniscus chrysops*, 148.  
     *elatus*, 148.  
     *griseiceps*, 148.  
     *nigricapillus*, 148.  
*Tryngites subruficollis*, 125.  
*Turdus aliciae*, 183.  
     *gigas*, 121, 181.  
     *grayi*, 181.  
     *swainsoni*, 182.  
*Tylosaurus proriger*, 29.  
*Tyrannus griseus*, 142.  
     *melancholicus*, 142.  
     *melancholicus satrapa*, 142.  
     *pipiri*, 112.  
     *tyrannus*, 142.
- URODERMA bilobatum, 89.  
     *planirostris*, 87.  
*Ursus dalli*, 58.  
     *emmonsii*, 58.  
     *horribilis*, 58.  
     *middendorffi*, 58.  
     *richardsoni*, 57.  
     *sitkensis*, 58.  
*Urubitinga anthracina*, 130.  
     *zonura*, 130.
- VAMPYRUPS lineatus, 87.  
     *vittatus*, 88.  
*Vireo acuticauda*, 172.  
     *calidris barbatula*, 173.  
     *chivi agilis*, 172.

- Vireo flavifrons*, 173.  
*flavoviridis*, 173.  
*josephæ*, 172.  
*olivaceus*, 173.  
*Vireosylva flavifrons*, 173.  
*olivacea*, 173.  
*Volatina jacarini*, 165.  
*jacarini splendens*, 165.
- WALLABY, Bennett's, 109.  
 Whitfield, R. P., observations on  
 and descriptions of arctic fos-  
 sils, 19-22; description of a  
 new Crinoid from Indiana,  
 23, 24; note on the principal  
 type specimen of *Mosasaurus*
- maximus* Cope, with illustra-  
 tions, 25-29.  
 Wolverine, 59.  
 Wolves, 59.
- XENOPS *genibarbis*, 157.  
*rutilus*, 158.  
*Xiphocolaptes procerus*, 157.  
 Xoxo, Mexico, excavations in  
 mounds at, 201.
- YAPOCH, 188.
- ZAMELODIA *ludoviciana*, 164.  
*Zaphrentis*, sp., 21.  
*Zonotrichia pileata*, 164.

## ERRATA.

- Page 115, explanation of Fig. 4, for *E. scotti* read *E. caballus*.  
 Page 121, No. 15, for *Pipreola auripectus decorus* read *Pipreola auripectus*  
*decora*.  
 Page 121, No. 35, and p. 183, line 6 from bottom, for *Henicorhina anchoreta*  
 read *Henicorhina anachoreta*.  
 Page 121, line 12 from bottom, for *Myiotherula* read *Myrmotherula*.  
 Page 138, line 5 from top, before the word BANGS insert *Florisuga mellivora*.  
 Page 142, line 3 from bottom, before the word BANGS insert *Myiarchus ferox*.  
 Page 173, No. 332, for *Cyanerpes cyanea eximea* read *Cyanerpes cyaneus eximius*.  
 For additional corrections see pp. 183 and 184.

(Continued from 4th page of cover.)

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