

A REVISION OF THE BOTTERI SPARROW

By J. DAN WEBSTER

The grass-loving Botteri Sparrow (*Aimophila botterii*) is a primarily Mexican species that has been studied infrequently by taxonomists. Since the classic revision by Ridgway (1901), only Hellmayr (1938) has reviewed all the forms. However, Van Tyne (1935) discussed the rounded-winged southeastern races *petenica* and *vulcanica*, which he regarded as belonging to a separate species. In the most intensive revision thus far, Phillips (1943) described two new races and presented evidence that *botterii* intergrades with *petenica*. Further evidence that *botterii* intergrades with *petenica* in Chiapas was noted by Edwards and Lea (1955).

The systematic arrangement of the populations of *Aimophila botterii* is difficult for at least two reasons: (1) The birds are such late migrants, especially the Mexican races, that many collectors have left the field before the birds begin breeding. The very late breeding season (June to September) means that all certain breeding specimens are badly worn. Some September specimens have been marked by careful collectors as parents of unfledged young although they are well along in the "postnuptial" molt. Other September specimens were incubating birds. (2) The species has eluded fall and early winter collection almost entirely. The only October specimens (to October 20) which I have examined are from Arizona, Texas, and Yucatán. A single specimen from Nayarit collected on November 11 is the only specimen that I have seen which was taken between October 20 and January 19.

In the course of the present study, I first examined a series of 86 skins (many of them borrowed) at the California Academy of Sciences in January, 1956. Later, in 1956 and 1957, I assembled a loan series of 188 skins, including only two duplicates of the group previously examined; and at the University of Michigan, I studied their series of 147 skins, including 21 duplicates of the preceding. Altogether, these 398 specimens included virtually all of the study skins of this species in the United States, except for those in the Moore Collection.

I must thank the curators of the following museums for the loan of specimens: Academy of Natural Sciences of Philadelphia, American Museum of Natural History, California Academy of Sciences, Carnegie Museum, Chicago Museum of Natural History, Museum of Comparative Zoology, Dickey Collection of the University of California at Los Angeles, University of Kansas Museum of Zoology, Louisiana State University Museum of Zoology, University of Michigan Museum of Zoology, Minnesota Museum of Natural History, Peabody Museum (Yale University), United States National Museum, and the Museum of Vertebrate Zoology. In addition, Allan R. Phillips, George M. Sutton, and Lewis D. Yaeger generously loaned me specimens from their personal collections. Dr. Alexander Wetmore courteously examined the type of *vantynnei* at my request and gave me his opinion of the authenticity of the specimen. Financial aid was received from the American Association for the Advancement of Science (through the California Academy of Sciences) and from the Hanover College Faculty Research Fund.

ECOLOGY

The Botteri Sparrow is, with qualifications, a bird of the grasslands. It requires grass, but bushes, trees, or stone walls are also necessary. In Zacatecas, Durango, Jalisco, and Guanajuato, I found the race *mexicana* most numerous at elevations of 6400 to 7500 feet. In these regions the sparrows were sheltered in stone walls or scattered bushes (*Prosopis* or *Acacia*, usually) or hedgerows or bushes along a creek, wash or irrigation

ditch, but they did most of their feeding in the grassy (*Bouteloua* sp.) or weedy fields. Breeding pairs were collected in an outlying group of piñon pines (alt. 7900 feet) west of Fresnillo, Zacatecas, and in a thicket of morning glory trees (*Ipomoea* sp.), north of Colotlán, Jalisco, at 6100 feet. These areas apparently represented marginal habitats, but at both spots there was considerable open grass nearby.

I collected the race *botterii* near Oaxaca City, Oaxaca, in heavily grazed grassland with scattered cacti and *Acacia* bushes, a habitat very similar to that in which *mexicana* is common. To the southeast *A. b. botterii* breeds in more tropical localities, although I

Table 1
Wing Length of Adult Male Specimens of the Botteri Sparrow*

Population group number	Race	Sample size	Range	Mean with standard error	Standard deviation
4	<i>arizonae</i>	21	63-69	65.14 ± 0.36	1.64
5		1	67		
6		3	62-64	63.3	
1	<i>texana</i>	45	65-71	67.53 ± 0.29	1.96
2		8	64-66	64.5	
3		15	63-68	66.07 ± 0.36	1.39
7, 8, and northern part of 9	<i>mexicana</i>	27	65-70	66.59 ± 0.25	1.34
Southern part of 9		5	69-72	70.6	
10, 11		10	63-69	66.20 ± 0.58	1.83
12		2	64		
13, 14	<i>goldmani</i>	9	61-64	62.7	
16, 17	<i>botterii</i>	13	64-69	65.92 ± 0.45	1.62
15		15	64-67	65.20 ± 0.31	1.22
18		12	59-67	62.68 ± 0.63	2.17
19	<i>vantynei</i>	1	67		
20	<i>vulcanica</i>	1	62		
21	<i>petenica</i>	7	55-60	57.3	

* Migrants omitted.

have not seen it there myself. On the Isthmus of Tehuantepec, Brown (*vide* Bangs and Peters, 1928; also data entered on specimen labels) found a nest under a pine tree on a "pine ridge" 1000 feet in altitude at Chivela, and he collected an immature individual in similar habitat at Cacoprieto. In western Chiapas (Edwards and Lea, 1955; Goldman, 1951), the habitat of *botterii* is tall grass savannahs in the broad valleys, which are generally classified as arid tropical. In southeastern Arizona, stands of tall grass (*Sporobolus wrightii* and *S. cryptandrus*) with scattered bushes (*Prosopis juliflora*, *Acacia greggii*, *A. constricta*) provide the habitat for the race *arizonae*, according to Monson (1947). The race *texana* is, or was, common on the lush coastal prairie near Brownsville, Texas, where mesquite bushes dot the tall bluestem. The race *petenica* inhabits a tropical, palm-dotted savannah near Coatzacoalcos, Veracruz, and in coastal Tabasco (Zimmerman, 1957; Ernest P. Edwards, personal communication). The race *goldmani* inhabits tropical, palm-dotted savannah near sea level on the coast of Nayarit and near-tropical grassland with scattered *Acacia* bushes near Compostela, at 2500 feet (Allan R. Phillips, personal communication, and my observation).

SUMMARY OF GEOGRAPHIC VARIATION

The most prominently variable character is dorsal coloration. Basically, the dorsal pattern is of the common "sparrow" type, with black, brown, and gray stripes alternating.

The hue, degree of pigmentation, and relative area covered by all three colors vary both individually and geographically. Thus *Aimophila botterii* is predominately pale reddish brown in Arizona and northwestern México, dark reddish brown on the coast of central western México, black and gray, with the browns restricted, in the highlands of central México, pale gray in south Texas and along the coast of northeastern México, and dark brown in the eastern and southern highlands of México and on the southern side of the Isthmus of Tehuantepec. The dark reddish brown color appears again in the Great Valley of Chiapas; birds from the highlands of Guatemala are dark brown, and the birds of Nicaragua and Costa Rica are brownish black. In the Gulf lowlands, birds with very black backs, with the browns virtually absent, are found from central Veracruz to northeastern Guatemala.

Ventral coloration differs less than dorsal coloration. To the east, specimens from the lowlands along the Gulf are almost white, from Texas to Guatemala; this compares with dusky or ochraceous suffusion of the under parts in specimens from more western and highland regions. To the south, the birds of Nicaragua and Costa Rica are the most dusky.

Wing length (see table 1) is at a maximum in central México, and is only slightly less to the north, as far as Texas and Arizona, in the southern highlands to Guerrero, and in the lowlands of the southern side of the Isthmus of Tehuantepec. It is shorter along both coasts of México, reaching a minimum in the southern Gulf lowlands. The

Table 2
Tail Length of Adult Male Specimens of the Botteri Sparrow*

Population group number	Race	Sample size	Range	Mean with standard error	Standard deviation
4	<i>arizonae</i>	21	58-69	63.00 ± 0.58	2.68
5		1	64		
6		3	63-65	63.7	
1	<i>texana</i>	45	57-68	62.96 ± 0.41	2.78
2		8	58-64	61.4	
3		15	58-65	60.40 ± 0.61	2.36
7, 8, and northern part of 9	<i>mexicana</i>	29	56-68	63.00 ± 0.51	2.77
Southern part of 9		5	59-68	63.8	
10, 11		10	60-68	62.20 ± 0.83	2.64
12		2	60-63	61.5	
13, 14	<i>goldmani</i>	9	58-63	60.5	
15	<i>botterii</i>	15	56-63	59.40 ± 0.56	2.17
16, 17		12	61-66	63.42 ± 0.67	2.34
18		12	51-65	58.92 ± 0.95	3.29
19	<i>vantynei</i>	1	66		
20	<i>vulcanica</i>	1	60		
21	<i>petenica</i>	5	49-55	51.2	

* Migrants omitted.

wing is short in western Chiapas, longer again in Guatemala, but short again in Nicaragua and Costa Rica.

Tail length (see table 2) follows a different pattern, with the maximum in the highlands of central and northwestern México and Arizona. Length drops toward both coasts. To the south, the drop is at the Balsas Valley, with the minimum again in the southern Gulf lowlands. The tail is fairly long in the highlands of Central America.

Degree of sharpness of the wing was measured in millimeters by the relative lengths of primaries 9 and 3. A pointed wing, 9 longer than 3, is recorded as +, and a rounded wing, 9 shorter than 3, is recorded as — (see table 3). A pointed wing, presumably related to longer migratory flights, is found in the northern areas and central highlands, whereas a rounded wing is found in the tropical lowlands and southern highlands.

SPECIES LIMITS

Ridgway (1901) was the first to place the black form *petenica*, from the southern coast of the Gulf, as a race of *botterii*. Van Tyne (1935), with more extensive material, attempted to show that *petenica* was a distinct species. I believe that Van Tyne was mistaken in his supposition that the two forms are sympatric; the only record of *petenica* from any locality except the coastal lowlands is the specimen from Huatusco, in the foothills of Veracruz (see map, westernmost locality for *petenica*). This specimen, taken by Sartorius, is the type of *Peucaea sartorii* Ridgway, which is generally regarded as a synonym of *petenica*. It is definitely browner than four specimens of *petenica* from the lowlands of Veracruz and Petén, and I regard it as intermediate, toward *botterii*. The nearest locality from which *A. b. botterii* has been collected is Orizaba, 30 miles southwest of Huatusco; the specimen I examined was collected in 1866 by Sumichrast. Various other races of *botterii* are found near sea level along the Pacific coast and on the northern Gulf coast, south of Tampico.

The following differences have been used to separate *petenica* as a distinct species:

Author	Character	<i>botterii</i>	<i>petenica</i>
Ridgway	wing sharpness	+	—
Van Tyne	wing length	longer	shorter
	tail length	longer	shorter
	adult color	paler	blacker
	juvenal plumage color	paler	blacker

As to wing sharpness, I find (table 3) that some populations other than *petenica* have a rounded wing, and that the wing is not always very rounded in *petenica*. As to wing length (table 1) and tail length (table 2), I find a definite overlap in males of *A. b. botterii* from Chiapas and *petenica*. As to adult color, there is a definite gap between *petenica* and other races, which is only partly bridged by specimens from Ebano, San Luis Potosí (see page 143); Huatusco, Veracruz; and Monserrate, Ocozocoautla, and Meyapac, northwestern Chiapas. I anticipate that complete intergradation in adult coloration will, in the future, be found in the foothills of Veracruz and northern Chiapas and on the coastal plain of northern Veracruz. As to color of the juvenal plumage (see page 144), I am unable to distinguish between specimens of *petenica* and those of *A. b. botterii* from Chiapas.

Ridgway (1873) regarded the Bachman Sparrow (*A. aestivalis*) and the Botteri Sparrow as conspecific, but later (1901) he separated them. This action has been followed in all of the A.O.U. check-lists (including 1957). Hellmayr (1938) questioned this. My own study has not included any specimens of the Bachman Sparrow from the Texas portion of its range, which extends in east Texas to within 290 miles of the range of the Botteri Sparrow in south Texas. Specimens of *A. aestivalis illinoiensis* from the Mississippi Valley examined by me were, however, strikingly distinct from *A. botterii* in their bright rufescent coloration and in the possession of a distinct postocular stripe. Measurements overlap only if comparison of *A. aestivalis* is made with distant races of *A. botterii*, rather than the proximate *A. b. texana*. I regard *A. aestivalis* and *A. botterii* as separate species.

Table 3
Sharpness of Wing of Adult Specimens of the Botteri Sparrow*

Population group number	Race	Sample size	Range	Average
4	<i>arizonae</i>	19	0 to + 2	+ 0.7
6		4	- 1 to + 1	+ 0.2
1, 2	<i>texana</i>	23	0 to + 3	+ 1.1
3		3	+ 1 to + 3	+ 2.0
7, 8, 9, 10, 11	<i>mexicana</i>	36	0 to + 3	+ 1.2
12		2	- 1 to 0	- 0.5
13, 14	<i>goldmani</i>	10	- 2 to 0	- 0.8
15, 16	<i>botterii</i>	8	- 3 to 0	- 1.0
17		13	- 1 to + 1	+ 0.2
18		17	- 2 to 0	- 1.2
19	<i>vantynei</i>	3	- 2 to - 1	- 1.2
20	<i>vulcanica</i>	1	- 3	- 3.0
21	<i>petenica</i>	6	- 2 to 0	- 1.0

* Migrants omitted.

SYNOPSIS OF THE RACES

Aimophila botterii arizonae (Ridgway)

Peucaea aestivalis var. *arizonae* Ridgway (1873: 615).

Type.—U.S. Nat. Mus. no. 6327 (examined), Los Nogales, México (= Sonora), June, 1855, collected by C. B. Kennerly.

Diagnosis.—Generally a pale reddish race. Dorsally redder, less gray than *texana*; strikingly distinct from all but three out of 152 specimens examined from Texas and the coast of Tamaulipas (groups 1 and 2, see fig. 1), but Arizona population (group 4) somewhat closer to the population of inland Tamaulipas (group 3); paler, with browns more restricted, than *goldmani*; paler, more coppery red, less blackish, than *mexicana*. Ventrally duskiest, less whitish, than *texana*, but redder, less ochraceous brown than *mexicana* and *goldmani*. Wing moderately long (see table 1); tail rather long (see table 2); wing rather pointed (see table 3).

Variation.—To the southeast, a specimen from northern Durango (group 5) is more reddish, less blackish, than any *mexicana*, but it is darker and more blackish than any from Arizona or Sonora. To the southwest, along the Pacific coast, there is doubtless contact with *goldmani* in Sinaloa, but I have not seen specimens to demonstrate this. The color characters of *arizonae* are best exhibited in the population from southeastern Sonora (group 6).

Range.—Southeastern Arizona north to Oracle; extreme southern and northeastern Sonora; northern Durango. No doubt intermediate areas in central Sonora and in Chihuahua are inhabited. Two winter specimens were examined from Cuernavaca, Morelos, taken April 27, 1908, and April 9, 1949.

Aimophila botterii texana Phillips

Aimophila botterii texana A. R. Phillips (1943: 242).

Type.—U.S. Nat. Mus. no. 165985 adult male, Brownsville, Texas, May 2, 1900, collected by Vernon Bailey.

Diagnosis.—Generally, a pale, gray race. Dorsally, grayer and in most cases also paler than *arizonae*; paler, grayer, and less blackish than *mexicana*; paler, grayer, and less brownish than *botterii*; very much paler and less black than *petenica*. Ventrally, whiter and paler than all other races except *petenica*, from which it is indistinguishable. Wing long and pointed, tail relatively short.

Variation.—In Texas and on the northern coast of Tamaulipas (group 1), the color characters are well developed, although three aberrant extremes are a rusty brown not unlike some specimens of *arizonae*. Near Tampico, on the southern coast of Tamaulipas (group 2), the dorsal color averages slightly browner. Farther inland (group 3), in the Sierra de Tamaulipas and near Xicotencatl the dorsal color is browner and slightly darker. In fact, group 3 could almost be called a pale, grayish, short-tailed population of *botterii*. Wing length is longer in groups 1 and 3 than in 2.

Range.—A narrow strip along the coast from Los Fresnos, Cameron County, Texas, to Tampico,

southern Tamaulipas; inland Tamaulipas east of the Sierra Madre Oriental from the Sierra de Tamaulipas south to Manuel.

The only specimen taken between October and April was one from Tampico, Tamaulipas, labeled "Mar., 1888"; Phillips (1943) suggests that it might be wrongly labeled as to date. Specimens from

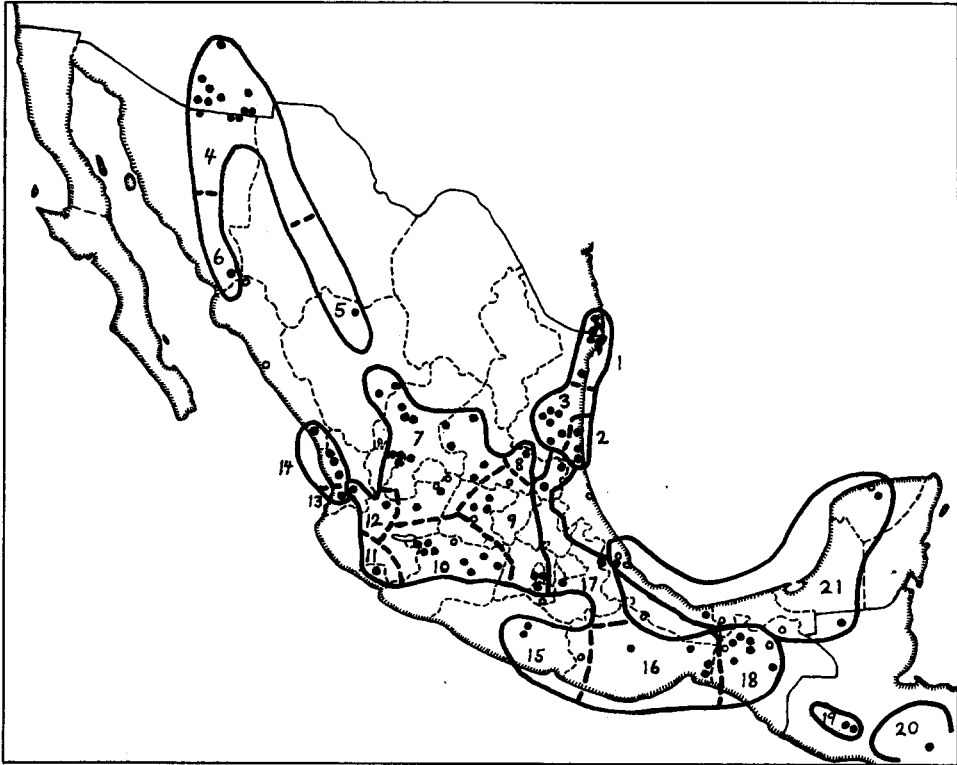


Fig. 1. Northern Middle America, showing the breeding range of *Aimophila botterii*. International boundaries = thin solid line; Mexican state boundaries = thin dashed line; approximate boundaries of the races = thick solid line; boundaries of population groups = thick dashed line. The races are: groups 1, 2, 3 = *A. b. texana*; 4, 5, 6 = *A. b. arizonae*; 7, 8, 9, 10, 11, 12 = *A. b. mexicana*; 13, 14 = *A. b. goldmani*; 15, 16, 17, 18 = *A. b. botterii*; 19 = *A. b. vantynei*; 20 = *A. b. vulcanica* (distorted somewhat to the west of actual position); 21 = *A. b. petenica*. Each solid dot marks a spot from which one or more specimens were examined. Each hollow dot marks a locality reported in the literature for the species, but from which no specimen was examined in the present study.

Los Fresnos, Texas, April 28, 1934, and Acuña, Tamaulipas, April 19, 1949, probably represent early arrivals on the nesting grounds.

Aimophila botterii mexicana (Lawrence)

Coturniculus mexicanus Lawrence (1867: 474).

Type.—U. S. Nat. Mus. no. 31825 (examined), ♀ (so marked, but size indicates probably ♂), Mountains of Colima, June 1863, collected by John Xantus.

Diagnosis.—Generally, a black and dark gray race. Dorsally, blacker and with darker browns and grays than *texana*; darker, blacker, and less ruddy than *arizonae*; grayer, blacker, less reddish brown than *goldmani*; more gray and black, less brownish than *botterii*. Ventrally, not consistently distinguishable from *botterii* and *goldmani*; darker, less whitish, than *texana*; less reddish and more ochraceous or more grayish brown than *arizonae*. Wing long and pointed; tail moderately long.

Variation.—Dorsally, a single specimen (group 8) from the east side of the desert is paler gray and less zebra-patterned (dark gray and black) than the other 27 comparable specimens; it represents a tendency toward *texana*. Group 7, from western San Luis Potosí, southern Durango, western Zacatecas, northwestern Jalisco (vicinity of Colotlán), and northeastern Jalisco, has been taken as the standard for this subspecies; the grays are paler and the browns redder than in groups 8, 9, and 10. Group 9, from Guanajuato, central San Luis Potosí, Distrito Federal, and Morelos, is slightly less zebra-patterned, with the browns browner and the grays darker than in group 7. Group 10, from Michoacán, is the blackest, darkest population of the subspecies, and in this respect is close to some of the Central American populations. Only one specimen is available from Colima (group 11), and it is, unfortunately, the holotype of the subspecies. The grays in the back of this specimen are pale, but the blacks are very black, so that it is zebra-patterned, matching best two specimens from Colotlán, northwestern Jalisco (group 7); it is, also, similar to specimens of groups 10 and 12. Group 12 is from Magdalena, Jalisco, and 7 miles east of Tepic, Nayarit; but the specimen from Tepic is browner dorsally than any other specimen of *mexicana*, although much more gray and black than any *goldmani*, including the population from Compostela, only 20 miles away. Ventral variation is not coordinated with geography, save that groups 10 and 11 tend to be more extensively suffused and with a duskier shade of ochraceous than other populations.

Wing length and tail length are greatest in the southern part of group 9 (Guanajuato, Distrito Federal, and Morelos) where the largest individuals of the species are located; wing length and tail length are shortest in group 12. The only specimen with a rounded wing (9th primary shorter than 3rd) which I have identified as *mexicana* is the specimen from Tepic, which is, of course, intermediate toward *goldmani*.

Range.—The central Mexican highlands, from southern Durango and Charcas, central northern San Luis Potosí, south to Colima, central Michoacán and northern Morelos; west to 7 miles east of Tepic, Nayarit; and east to Pendencia, San Luis Potosí, and the Valley of México.

Of wintering or migrant *mexicana* examined, there were three specimens like those from the dark breeding population from Michoacán (group 10); these were obtained at San Vicente, Chiapas, April 16 and 20, 1904, and at Chilpancingo, Guerrero, June 3, 1948. Three other specimens, from Tuxtla Gutierrez, Chiapas, May 24, 1904, and Chilpancingo, Guerrero, April 2, 1948, and May 26, 1931, represent the paler, larger group 7, from Durango, Zacatecas, and other areas. An immature specimen taken by Allan Phillips 2 miles west of Compostela, Nayarit, on November 11, 1956, belongs to group 12, the population intermediate toward *goldmani*, and might not have flown more than 20 miles from its hatching place. It was from the same area where Phillips had collected a breeding series of *goldmani* in June.

Aimophila botterii goldmani Phillips

Aimophila botterii goldmani A. R. Phillips (1943: 243).

Type.—U.S. Nat. Mus. no. 157267 adult male, Santiago, Nayarit, June 19, 1897, collected by E. W. Nelson and E. A. Goldman.

Diagnosis.—Generally, a dark reddish brown race. Dorsally, darker and browner, less pale red than *arizonae*; deeper, more reddish brown, less gray and black than *mexicana*. Ventrally, not consistently different from *mexicana*, but on the average more extensively and intensively suffused with ochraceous; duskier, less reddish brown than *arizonae*. Wing and tail short; wing rounded.

Variation.—The series from Compostela (group 13) differs slightly in color from that representing the population of the coast (group 14). Dorsally the specimens from Compostela are duller brown, with the browns duller and less reddish and the grays grayer. Ventrally, they are paler. I have not examined the specimens from northern and central Sinaloa reported by Miller (1957); those from central Sinaloa are probably intermediate between *arizonae* and *goldmani*.

Range.—Savannahs along a narrow coastal strip from Rosario, southern Sinaloa, south to Santiago, Nayarit; also a small grassland area in the vicinity of Compostela, in the uplands (2500 feet in elevation) of southwestern Nayarit. No winter or migrant specimens were examined.

Aimophila botterii botterii Sclater

Aimophila botterii Sclater (1857: 214).

Type.—In British Museum, from Orizaba, Veracruz.

Diagnosis.—Generally, a moderately dark brown race. Dorsally, browner or more reddish brown, less gray and black than *mexicana*; darker and browner than *texana*; browner or more reddish brown and less blackish than *petenica*; paler brown (Veracruz, Puebla, Guerrero) or more reddish (Oaxaca, Chiapas) than *vantynei*. Ventrally, not distinguishable from *mexicana*; more extensively suffused, and with a darker shade of ochraceous than *texana* and *petenica*; paler, less dusky than *vantynei*. Wing and tail length variable from moderate to short; wing shape variable, from slightly pointed to definitely rounded.

Variation.—This race is more variable than any of the others. Also, because of the admixture of wintering and migrant specimens in the range of this race, larger series are necessary for adequate diagnosis than in the other subspecies.

At least four population groups are distinguishable: Dorsally, the birds of eastern San Luis Potosí (La Media Luna), Veracruz (Orizaba), and Puebla (group 17) are the darkest and brownest. The series from western Chiapas (group 18) is more reddish with the grays and blacks more restricted; this is true especially of specimens from the Great Valley, Tuxtla and San Bartolomé. Breeding specimens taken in August and September in northwestern Chiapas (Monserate, Ocozocoautla, Ocuilapa, Meyapac) are darker, less reddish than material from Tuxtla, Valley of Jiquipilas, and San Bartolomé. This suggests intergradation with *petenica*, as Phillips (1943) and Edwards and Lea (1955) have pointed out. The series from Oaxaca (group 16) is slightly paler and averages more reddish than group 17, but it is not as reddish as groups 15 or 18. The series from Guerrero (group 15) is slightly darker and more reddish than group 16; it is not as reddish as group 18 and slightly more reddish and less black than group 17. Ventrally, group 17 is a duller, darker shade of brown than the southern populations.

Wing length is shorter in Chiapas (group 18) than elsewhere. Tail length is shorter in Guerrero (group 15) and Chiapas (group 18) and longer in groups 16 and 17. The wing is moderately pointed in the northern population, but it is definitely rounded in the three southern groups.

A male specimen from Ebano, on the Gulf coast plain of San Luis Potosí, was taken May 22, 1951, by Leonard Guerrero. The testes were 6 mm. long, wing 68 mm., tail 63 mm.; the 9th primary equals 3rd (Louisiana State Mus.). It is darker brown dorsally than any other specimen of *botterii*, although the measurements and the ventral coloration are in the range of the northern segment of the race. But I have examined breeding specimens of pale gray *texana* from Tampico, only 35 miles east, and a pale gray juvenile from Manuel, only 35 miles north, with no known geographic barriers intervening. It probably represents a northern outpost of a presently unknown population intermediate between *petenica* and *botterii* and found on the Gulf coast plain of northern Veracruz. I have not examined the laying specimen from Laguna Tamiahua, Veracruz, reported by Miller (1957). Perhaps it is similar to this Ebano specimen.

Range.—Highlands of southeastern México, from La Media Luna in the mountains of south-eastern San Luis Potosí south to Oaxaca City, Oaxaca, and west to Chilpancingo, Guerrero, and Atlixco, Puebla; south side of Isthmus of Tehuantepec (Oaxaca) from Chivela to Tapanatepec and Cacoprieto; interior valleys of western Chiapas (Jiquipilas, Monserate, Tuxtla, San Bartolomé, Ocuilapa, Ocozocoautla).

Of *botterii* there were nine wintering or migrant specimens examined. Group 17 (Puebla area) was represented by a specimen taken April 17, 1904, at San Vicente, Chiapas, by Nelson and Goldman. Two birds taken on March 24, 1904, from San Bartolomé, Chiapas, seemed to be wintering at or near their breeding area. The breeding population from Guerrero (group 15) was represented by three resident specimens from Chilpancingo taken on January 19, March 1, and March 2, 1948, and also by three specimens from Cuernavaca, Morelos, taken on March 19, April 6, and April 13, 1908.

Aimophila botterii vantynei new subspecies

Type.—U.S. Nat. Mus. no. 191686, female, Guatemala City, Guatemala, June 20, 1897, collected by Alfaro; wing 61 mm., tail 58 mm.

Diagnosis.—Generally, a dark brown race. Dorsally browner and less reddish than *botterii* from Chiapas and Oaxaca; darker brown than *botterii* from Veracruz, Puebla, and Guerrero; paler, browner, and less blackish than *vulcanica* and *petenica*. Ventrally, paler and less dusky-blackish than *vulcanica*;

darker and browner, less whitish than *petenica*; darker and duskier than *botteri*. Wing and tail moderately long; wing rounded. The only three specimens are identical in color.

Range.—Antigua and Guatemala City, in the highlands of southern Guatemala. No winter specimens were seen.

Remarks.—The male specimen from Antigua taken on May 17, 1924 (Amer. Mus. Nat. Hist.) has been discussed by Miller and Griscom (1925) and Van Tyne (1935). Van Tyne wrote "subsp. nov." on the label. An unsexed, undated adult from Guatemala City (Acad. Nat. Sci. Phila.) has been previously reported by Carriker and de Schauensee (1935). It has the measurements of a female.

Aimophila botteri vulcanica Miller and Griscom

Aimophila botteri vulcanica Miller and Griscom (1925: 3).

Type.—In Amer. Mus. Nat. Hist.; from Volcan de Chinandega, Nicaragua.

Diagnosis.—A very dark blackish-brown race. Dorsally, much blacker than *botteri* and *vantynei*; browner and not so intensely black as *petenica*. Ventrally, darker and duskier than any other race, in this respect departing strikingly from *petenica*, which is almost white below. Wing and tail short; wing rounded. Only one specimen was examined.

Range.—Highlands of Costa Rica and Nicaragua. No winter or migrant specimens were seen.

Aimophila botteri petenica (Salvin)

Zonotrichia petenica Salvin (1863: 189).

Type.—In British Museum; from La Libertad, Petén, Guatemala.

Diagnosis.—A black race. Dorsally, blacker than any other race and notably lacking in reddish or brownish pigmentation. Ventrally, whiter, less brownish, than any other race except *texana*, from which it is not distinguishable. Wing and tail very short; wing rounded.

Variation.—The above diagnosis fits the populations from lowland Veracruz, Petén, and Palenque. Three molting specimens taken in October from Mérida, Yucatán, have equally short wings and tails, but less rounded wings. Their dorsal color is browner than specimens from Veracruz and Petén, indeed they are hardly distinguishable from *vulcanica*; ventrally they are close to specimens from Veracruz and Petén, but they are more suffused with buffy. However, in view of the seasonal difference in the specimens involved, this comparison is tenuous. As noted previously (page 139) a specimen from the foothills of Veracruz (Huatusco), is browner than birds from the lowlands and probably represents a trend toward *botteri*. It, too, is dorsally not unlike a specimen of *vulcanica* from Costa Rica, far to the south.

Range.—Tropical savannahs near sea level, from near the city of Veracruz east to Mérida, Yucatán, and south to Palenque, Chiapas, and La Libertad, Petén. No winter specimens were seen.

JUVENAL PLUMAGE

A series of 22 specimens in juvenal plumage was examined (6 *texana*, 1 *arizonae*, 3 *mexicana*, 8 *botteri*, and 4 *petenica*). Geographic variation in color was most apparent when the specimens were laid out laterally.

Specimens of northernmost *texana* are the palest and grayest. The one of *arizonae* is slightly darker than these pale *texana*, but it is paler than the others and definitely more buffy than any. One of *botteri* from Puebla, two of southern *texana*, and two of *mexicana* are a little darker than the preceding. One of *botteri* from Guerrero is of equal darkness to those just mentioned, but it is slightly more yellowish and less ruddy, although it lacks the olive tones of some of the succeeding specimens. Three specimens of *botteri* from Puebla and the last specimen of *mexicana* (from Morelos) are darker than all of the preceding; one of these, from Puebla, shows a slight tinge of olive. *Petenica* and the *botteri* from Chiapas and Oaxaca are more black and more olive than all of the preceding; while they are equally black, the *botteri* from Oaxaca is more olive than the two Chiapas *botteri* and four *petenica*.

The specimen from Villar, San Luis Potosí (U.S. Nat. Mus. no. BS 135918), referred to by Phillips (1943) was examined. While it is marked "*A. botteri*" in a hand un-

known to me, as well as in Phillips', I disagree. I would call it *A. ruficeps boucardi*, adults of which were recorded from that locality by Ridgway (1901).

MIGRATION AND ORIGIN

The few, scattered winter and migration records seem to show that the longer, more pointed-winged northern populations spend the period from November to May in the arid tropical zone of southern México. Inasmuch as this very area is the year-round home of most of the other species in the genus, this invites speculation on the origin of the Botteri Sparrow.

I suggest that there was a common late Pliocene ancestor of *A. botteri* and *A. aestivalis* which became adapted to grasslands rather than thorn scrub like its congeners and which evolved on some isolated grassland of southern México (perhaps the Oaxaca highland). Later it spread through the highlands of México and into the eastern United States. During the Pleistocene, *A. aestivalis* differentiated in Florida and *A. b. petenica* in the Gulf coast lowlands. It was probably during the Pleistocene that the coastal plains of México were first occupied. In Recent time the species again spread north into the United States.

SPECIMENS EXAMINED

This list includes only adults taken between April and October and presumed to be on their breeding grounds. Migrants, wintering birds and juveniles have been listed previously. Four more specimens taken in March and April from Guerrero and Michoacán were examined early in this study, before these racial concepts were worked out; their racial identity is now in doubt.

A. b. arizonae.—ARIZONA, 28: Santa Cruz County, Babocomari Ranch, 2, Camp Crittenden, 12; Pinal County, 7 miles northwest of Oracle, 1; Pima County, Vail's Ranch, 1; Cochise County, Double Adobe, 1, Ft. Huachuca, 3, San Bernardino Ranch, 1, 5 miles west of Guadalupe Canyon, 1, Fairbank, 1, Huachuca Mts., 2, Cienega, 1, Niggerhead Mt., on Sonora border, 2. SONORA, 7: Los Nogales, 1 (type), Guirocoba, 6. DURANGO, 1: Resolana.

A. b. texana.—TEXAS, 138: Cameron County, Brownsville, 10, Los Fresnos, 128. TAMAULIPAS, 32: Matamoros, 4, La Carbonera, 1, Nuevo, 2, Tampico, 7, Mesa Angostura, 5, 3 miles north of Mante, 2, Acuña, 8, Xicotencatl, 3.

A. b. mexicana.—DURANGO, 3: Atotonilco, 1, El Chorro, 2. ZACATECAS, 8: Sain Alto, 1, 16 miles northwest of Fresnillo, 5, 27 miles west of Fresnillo, 1, Plateado, 1. JALISCO, 11: Colotlan, 6, Jaralillo, 1, Tepatitlán, 2, Magdalena, 1, 8 miles west of Huejucar, 1. NAYARIT, 1: 7 miles east of Tepic. SAN LUIS POTOSÍ, 11: Pendencia, 1, Charcas, 1, Salinas, 1, Illescas, 4, Villa de Reyes, 2, Poso del Carmen, 2. GUANAJUATO, 3: Eupataro, 1, Guanajuato, 1, San Miguel Allende, 1. DISTRITO FEDERAL, 2: Unspecified, 1, San Nicolas, 1. MORELOS, 1: Cuernavaca. MICHOACÁN, 11: Taraqato, 2, Pátzcuaro, 2, Morelia, 1, Tacámbaro, 1, Zacapu, 1, 9 miles west of Jacona, 2, Jiquilpan, 1, Zamora, 1. COLIMA, 1: Mountains of Colima (type).

A. b. goldmani.—NAYARIT, 10: Compostela, 5, Santiago, 2, Rosa Morada, 2, Acaponeta, 1. SINALOA, 1: Rosario.

A. b. botteri.—SAN LUIS POTOSÍ, 5: La Media Luna, 4, Ebano, 1. VERACRUZ, 1: Orizaba. PUEBLA, 9: Atlíxco. OAXACA, 5: Oaxaca City, 1, Chivela, 3, Tapanatepec, 1. GUERRERO, 30: Chilpancingo, 26, Amojileca, 4. CHIAPAS, 16: Valley of Jiquipilas, 3, Tuxtla Gutierrez, 5, Ocozocoautla, 1, Ocuilapa, 2, Meyapac, 4, La Lomita, 1.

A. b. ventynei.—GUATEMALA, 3: Antigua, 1, Guatemala City, 2 (1 the type).

A. b. vulcanica.—COSTA RICA, 1: Miravalles.

A. b. petenica.—VERACRUZ, 2: 30 miles southeast of Coatzacoalcos, 1, near Huatusco, 1. YUCATAN, 3: Mérida. GUATEMALA, Petén, 3: La Libertad.

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