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A PRELIMINARY SURVEY OF THE SPARROWS OF THE GENUS AIMOPHILA

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Even when one is aware that the taxonomy of birds is far from completed, it comes as a distinct surprise to discover in the field that a species is strikingly different in voice, behavior, and ecological preferences from several of the better-known species of the genus in which it has long been placed. I had such an experience in the summer of 1950 when I found the Rufous-tailed Sparrow, *Aimophila ruficauda acuminata*, common in the lowlands of southern Michoacán, México. From brief or casual field experience with the Pine-wood Sparrow (*Aimophila aestivalis*), the Cassin Sparrow (*A. cassinii*), the Botteri Sparrow (*A. botterii*), and the Rufous-crowned Sparrow (*A. ruficeps*), I had come to think of birds of the genus *Aimophila* as strictly territorial, the pairs being spread out during the breeding season and the males giving their "sparrowy" songs from low perches on trees, bushes, or weed stalks in their essentially grassland habitats; *A. cassinii* and *A. aestivalis* also perform song flights. From the literature, it also appears that the nests of these four species are placed on the ground and are tightly woven of fine grasses. Not so of *Aimophila ruficauda acuminata*. Even in the breeding season, birds of this species tend to be gregarious. The loud, rattling song is not infrequently sung in duets, the singers perching as close as two feet from each other in thorn scrub, which is their preferred habitat. Finally, the loosely constructed nest of twigs is placed in a thorn bush (fig. 1), and the bob-tailed juveniles, unlike those of the northern aimophilas, have only a few faint streaks on the breast.

Later in the same summer, I found the Black-chested Sparrow (*Aimophila humeralis*) in the tall, thorny vegetation on the west side of Cañon de Zopilote in Guerrero. In choice of habitat, flocking behavior, and voice, this species appeared to be strikingly similar to *A. r. acuminata*.

Subsequently, an examination of a series of skins of the Sumichrast Sparrow (*Aimophila sumichrasti*) in the Shufeldt Collection showed that the young of that species is only faintly streaked below and that the adult, in plumage characters at least, is similar in many respects to *A. r. acuminata* and quite different from the Rufous-winged Sparrow (*A. carpalis*), to which Ridgway (1901:231-233) stated it was closely related and with which Hellmayr (1938:522) indicated it might prove to be conspecific.

These considerations suggested the desirability of a survey of the species which have been included in the genus. Accordingly, material in the form of skins of both adults and juveniles and skeletons was borrowed from the United States National Museum, the Museum of Comparative Zoology, and the Museum of Vertebrate Zoology. Other specimens were examined at the American Museum of Natural History and the British Museum (Natural History); and the use of material from the private collections of R. W. Shufeldt (on deposit at the University of Michigan Museum of Zoology) and G. M. Sutton is also gratefully acknowledged. Thus, in the course of this survey, I examined skins of adults of all the species of *Aimophila*, juveniles of all except *quinquestriata*

and *strigiceps*, and skeletons of all except *quinquestriata*, *mystacalis*, *notosticta*, *botterii*, and *petenica*.

Within the limits of the genus *Aimophila*, Hellmayr (*op. cit.*) included the following species: *quinquestriata*, *mystacalis*, *humeralis*, *ruficauda*, *carpalis*, *sumichrasti*, *notosticta*, *rufescens*, *ruficeps*, *aestivalis*, *botterii*, *petenica*, *cassinii*, and *strigiceps*. Ridgway (*op. cit.*) listed the same forms within the genus except for the last, the range of which is geographically outside the scope of his work. Of these species, *aestivalis*, *botterii*, *petenica*, and *cassinii* form a natural group and have been placed in a separate genus, *Peucaea*, of which *aestivalis* is the type species. The species *ruficeps*, *carpalis*, and *notosticta*, have also been placed in *Peucaea*, but they are less closely related to *aestivalis* than are *botterii*, *petenica*, and *cassinii*.

Aimophila quinquestriata, the Five-striped Sparrow, differs from all other species now placed in *Aimophila* in being unpatterned above and in having a black spot in the center of the breast. Superficially it resembles the Black-throated Sparrow (*Amphispiza bilineata*) and it was placed in the same genus by Salvin and Godman (1886:368). However, *quinquestriata* differs from *bilineata* in having much stouter tarsi, a coarser texture to the plumage, and broader central rectrices which are tapered rather than nearly truncated terminally, all of which characters are shared by most aimophilas. I have not encountered this species in the field nor have I seen skins of juveniles or skeletons. Until more information on this species is forthcoming, I think it best to keep it in *Aimophila*.

Table 1

Variations in Proportions in Three Subspecies of *Aimophila ruficauda*

Subspecies	No.	Sex	Averages				Ratios		
			Wing	Tarsus	Tail	Wing/tarsus	Tail/wing	Tail/tarsus	
<i>ruficauda</i>	3	♂	70.0	24.8	79+	2.83	1.15 ¹	3.19+	
<i>ruficauda</i>	1	♀	69.4	24.3	76+	2.86	1.10+	3.13+	
<i>lawrencii</i>	6	♂	74.5	24.9	90	3.00	1.21 ²	3.61	
<i>lawrencii</i>	5	♀	71.1	24.6	87.5+	2.98	1.24+ ³	3.55	
<i>acuminata</i>	6	♂	64.1	24.8	77	2.59	1.20+ ³	3.09	
<i>acuminata</i>	4	♀	63.0	24.4	75.5	2.58	1.19+ ¹	3.05+	

¹ Two specimens; ² five specimens; ³ four specimens.

Aimophila ruficauda appears to be the most variable species of the genus, at least as regards size and proportions. Three of the subspecies, *ruficauda*, *lawrencii*, and *acuminata*, differ conspicuously in size, *lawrencii* being the largest and *acuminata* the smallest. Surprisingly, the three races have tarsi of nearly equal length (see table 1). Measurements of six skeletons of *ruficauda* and two of *acuminata* corroborate this, the skull, sternum, humerus, ulna, carpometacarpus, femur, and tibiotarsus of the former being significantly larger than the corresponding elements of the latter. However, the tarsometatarsi are nearly equal in length. Thus, tarsal length is of no value as an indicator of body size in this species.

A nest of *A. r. acuminata* was found near Coalcomán, Michoacán, by E. K. Miller in early August of 1950. It was three and one-half feet up in a thorn bush surrounded by other thorn bushes and acacias and 20 to 25 feet from a ditch choked with water hyacinths. As can be seen from the photograph of this nest (fig. 1), it was loosely constructed of twigs and lined with a few finer twigs and rootlets. The three eggs were bluish

white. The begging young, observed on August 12, displayed bright pinkish red mouth linings with brilliant yellow margins around the bill.

I know of only two other descriptions of the nest and eggs of *A. ruficauda*. Miller (1932:17) found a nest of the nominate race at Sonsonate, El Salvador, on July 19, 1925. It was in "a crotch five feet from the ground in dense bushes six feet high near the stream and also near a small grassy meadow" and was "composed chiefly of sticks and hair and was deeply cupped and neatly built." The clutch consisted of three pale blue, immaculate eggs. Except for the nest's being neatly built, Miller's description corresponds rather closely with the nest of *A. r. acuminata* found in Michoacán. Zimmerman and Harry (1951:313) mention two nests of *A. r. acuminata* found July 27, 1949, at Autlán, Jalisco. These were about five feet up in low acacias and were lined with horse hair.



Fig. 1. Nest and eggs of the Rufous-tailed Sparrow (*Aimophila ruficauda acuminata*). Photograph taken in early August, 1950, at Coalcomán, Michoacán, México, by E. K. Miller.

A nearly fledged nestling of *A. r. acuminata*, taken on August 8, 1950, represents a plumage which is apparently undescribed (fig. 2). This plumage in general resembles that of the adult but is duller in color and softer in texture. Below, there are some fine streaks across the region of the breast which may be more or less gray in the adult. The flank feathers are reddish buff, somewhat redder than those of the worn adult, and the head pattern, although dull, is well indicated. The feathers of the median crown stripe are dull grayish ochre with dusky centers, and the lateral crown stripes are plain brownish sooty. The black auricular and subocular regions of the adult are indicated by black

skin and a few dark feathers around the ear opening. The white superciliary stripe is also indicated by two small patches of white feathers, one above the eye and one posterior to the nostrils.

This species is a notably gregarious bird. As mentioned previously, even in the breeding season, they give their chattering song in duets and also choruses. H. O. Wagner said (oral communication) that he has seen five different adults feeding one young. In voice, habits, structure and placement of the nest, faintly streaked young, red lesser wing coverts, and lack of yellow at the wrist joint, this species differs strongly from *aestivalis* and its allies, *botterii*, *petenica*, and *cassinii*. Dickey and van Rossem (1938: 577) stated: "although so listed here, we do not believe for a moment that this sparrow is an *Aimophila*."

Aimophila humeralis is closely related to *ruficauda*. Although the two species are rather differently marked, the broad black breast band and reduced streaking on the back of *humeralis* are suggested in the southern forms of *ruficauda*. Like *A. r. acuminata*, *humeralis* is a bird of arid tropical scrub, and it is common in this type of vegeta-

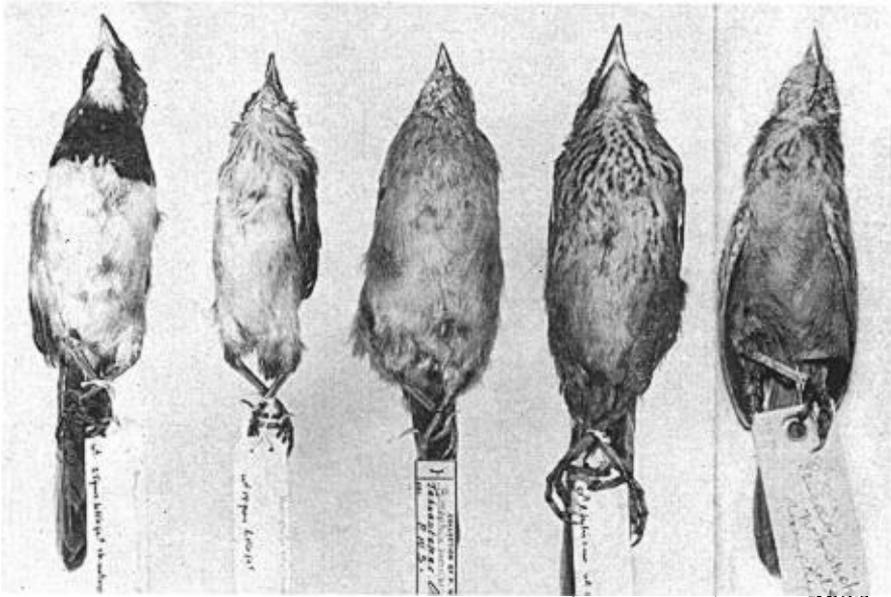


Fig. 2. *Aimophilas* in juvenal plumage. Left to right: *A. humeralis* (UMMZ 130,905), *A. ruficauda acuminata* (UMMZ 130,913), *A. sumichrasti* (Shufeldt Coll.), *A. rufescens subvespera* (UMMZ 130,922), and *A. notosticta* (Brit. Mus.). Photographs by W. L. Brudon and the author.

tion in Cañon de Zopilote, Guerrero. I have not seen a bob-tailed juvenile of this species, but a young bird in postjuvenal molt was taken in Cañon de Zopilote on August 29, 1950 (fig. 2). The central part of the breast band of this specimen consists of black feathers of the adult plumage, but the feathers of the lateral portions of the band and the top of the head are unmarked Drab (Ridgway, 1912) and belong to the juvenal plumage. Some buffy juvenal feathers are present on the flanks, and the remaining juvenal feathers on the back and rump are unmarked. Apparently the juvenal plumage of this species has few or no streaks.

In call notes and gregariousness, as well as in habitat preference, *humeralis* resembles *ruficauda*, but apparently little or nothing is known about its breeding habits. H. O. Wagner (*in litt.*) told me that he found both *humeralis* and *ruficauda* molting at Lake Tequesquitengo, Morelos, between May and July, prior to the breeding season, which in both species in this region occurs in July and August.

In the configuration of the skull and in skeletal proportions, *humeralis* is very much like *ruficauda*, the only significant difference being that the leg elements, especially the tibiotarsus and tarsometatarsus, are shorter in *humeralis*.

Aimophila mystacalis, the Bridled Sparrow, has a rather limited distribution along the southeastern edge of the Mexican Plateau in the states of Veracruz, Puebla, and Oaxaca. It resembles *humeralis*, *ruficauda*, and *sumichrasti* in having bright flanks, rump, and undertail coverts, rufous lesser wing coverts, a light mandible and dark maxilla, and a dark breast band. Like *sumichrasti* and *ruficauda*, the back is heavily streaked. *A. mystacalis* differs from all three of these related species in having a black throat and tail and a gray crown streaked with sooty but without definite crown stripes.

Two specimens in juvenal plumage have light throats with broad sooty margins. They differ markedly from the young of *ruficauda*, *sumichrasti*, and *humeralis* in having the breast heavily but diffusely streaked.

I have seen no skeleton of this species and have been unable to discover anything concerning its habits or habitat preference. However, in spite of the streaking of the juvenal plumage, it is most probably a close relative of *humeralis*, *ruficauda*, and *sumichrasti*.

A. mystacalis, *A. humeralis*, and *A. ruficauda acuminata* have all been taken at Chietla, Puebla (Hellmayr, 1938:517, 518, 521). A comparative study of these three species at such a place would add much to our knowledge of this section of the genus.

Aimophila sumichrasti is a little-known species apparently confined to the arid tropical zone of Oaxaca. In the Shufeldt Collection there are six adults and one fully-grown juvenile, all taken at Tehuantepec in the months from August through October. Most of the adults show evidence of wing and/or tail molt. Apparently it is not known whether or not this species has a spring molt, and nothing has been recorded about its habits.

The juvenal plumage of this species has not been described. The juvenile in the Shufeldt Collection (fig. 2) is beginning the postjuvenal molt in the scapular tract and on the throat and upper breast. The pattern of the streaks of the crown and back of the adult is present in the juvenile, but the streaks are much fainter and less well defined. The pattern of the side of the head, involving the superciliary, transocular, subocular, and moustache stripes, is present, but the dark stripes are lighter and browner and the light ones are darker than those of the adult. There are a few faint streaks on the upper breast; otherwise the under parts are unmarked. The juvenal flank feathers are warm buff, similar to but lighter than those of the adult. On the original label the color of the iris is recorded as "brown," the maxilla as "sepia," and the mandible, legs, and feet as "flesh." For the adults in Shufeldt's series, the colors of the soft parts are given variously as follows: iris, "brown," "burnt sienna," or "Vandyke brown"; maxilla, "sepia" or "light sepia"; mandible, "flesh"; and legs and feet, "flesh" or "light flesh."

I believe that *sumichrasti* is most closely related to *ruficauda*, which it resembles in proportions, except for its relatively shorter tail, as well as in many features of its plumage. Both species have warm buff flanks and under tail coverts, a broad gray breast band (pale in *sumichrasti* and varying from dark to obsolescent in *ruficauda*). In *sumichrasti* the phaeomelanins are more, and the eumelanins less, conspicuous, especially in the bill, head, wings, and tail; in *ruficauda*, the reverse is true, although *A. r. lawrencii*, which

is sympatric with *sumichrasti*, shows a tendency toward a reduction in eumelanins and an increase in phaeomelanins over the other subspecies. The juvenal plumage of *sumichrasti*, like that of *ruficauda*, resembles that of the adult in pattern and has few streaks on the under parts. In contrast, juveniles of *carpalis* are strongly streaked below like those of the "peucaeas" and spizellas. The general similarity of the pattern of *sumichrasti* and *carpalis* is, I think, fortuitous. Indeed, the retention by two species of what may be a relatively primitive color pattern for the group is not necessarily an indication of close relationship. *A. sumichrasti* may be a "primitive" member of its group, as it lacks the bold patterns on the head and breast which characterize *ruficauda*, *humeralis*, and *mystacalis*. Its relative scarcity with respect to *ruficauda* where the two occur, as indicated by specimens collected, corroborates this, as does the fact that it has a much restricted range.

Since writing the foregoing, I have been able to examine skeletal material of *A. sumichrasti* through the courtesy of Dr. Pierce Brodkorb. The skulls of *A. sumichrasti*, *A. humeralis*, and *A. r. acuminata* are very similar. This similarity is particularly evident in the auditory bulla and the side of the cranium. *A. sumichrasti* differs from the other two species in having a somewhat narrower bill and interorbital space and a slightly less extensive area of muscle attachment on the side of the cranium. The limb proportions of *A. sumichrasti* are quite similar to those of *A. humeralis*. The evidence from the skeleton strengthens my belief that *A. sumichrasti* is closely related to *A. ruficauda* and *A. humeralis*.

Aimophila strigiceps is the only South American species of the genus. Its range is entirely within the northern half of Argentina and thus is separated from that of its nearest congeners by more than two thousand miles.

A. strigiceps resembles birds of the *sumichrasti-ruficauda-humeralis* group rather closely. In pattern it is closest to *sumichrasti*, having similar crown and transocular stripes and a dark moustache streak. *A. strigiceps* also has a faint gray breast band, light buffy flanks, and a light base to the mandible. In skeletal proportions it resembles *ruficauda* and *humeralis*; the auditory bullae of *strigiceps*, however, are somewhat smaller than those of the other two species. Wetmore (1926:424) compared *strigiceps* with *rufescens* and remarked that it differed "from that bird [*rufescens*] structurally mainly in its smaller more delicate feet." This difference is borne out by skeletal material, as is a resemblance between the feet of *strigiceps* and those of *ruficauda* and *humeralis*.

As to habitat, Wetmore (*op. cit.*:13) described the country around Tapia, where he collected this species, as "covered with a low scrub forest in which occasional clearings had been made." In discussing this species, he later (p. 425) remarked that it is "found associated with chingolos (*Brachospiza*) in growths of more or less open brush and weeds Those taken uttered a sharp, chipping note." Thus in habitat, and probably also in voice, *A. strigiceps* shows a resemblance to the *sumichrasti-ruficauda-humeralis* group, which may be thought of as having a center of differentiation in southern Mexico. The peripheral distribution, small auditory bullae, and the relatively unspecialized color pattern of *A. strigiceps*, as compared with that of *A. humeralis*, suggest that it is a relict of an early dispersal of the group.

Chapman, following Wetmore's comparison of *strigiceps* with *rufescens*, stated (1940:385): "If, as seems probable, it [*strigiceps*] has been properly placed in the northern genus *Aimophila*, the nearest species of which inhabits the highlands of Costa Rica, its distributional history may, in part, resemble that of *Zonotrichia capensis*." In spite of the fact that *strigiceps* occurs with *Zonotrichia* [*Brachospiza*] *capensis* at Tapia, I do not think that the distributional histories of these two groups could have

been similar. Birds of the group to which *strigiceps* belongs are inhabitants of arid tropical scrub; the zonotrichias are essentially boreal species. In fact, if Wetmore had compared *strigiceps* with *ruficauda*, which ranges south into the lowlands of Costa Rica, Chapman might never have been led to suggest a similarity in the distributional histories of the two groups.

In this connection, it is of interest to note the close resemblance between *sumichrasti* and *Rhynchospiza stolzmanni* of Ecuador and Perú, a similarity which led Chapman (1926:625) to consider the possibility that this monotypic genus had a Middle American origin. *Rhynchospiza stolzmanni* differs from *sumichrasti* and its close relatives

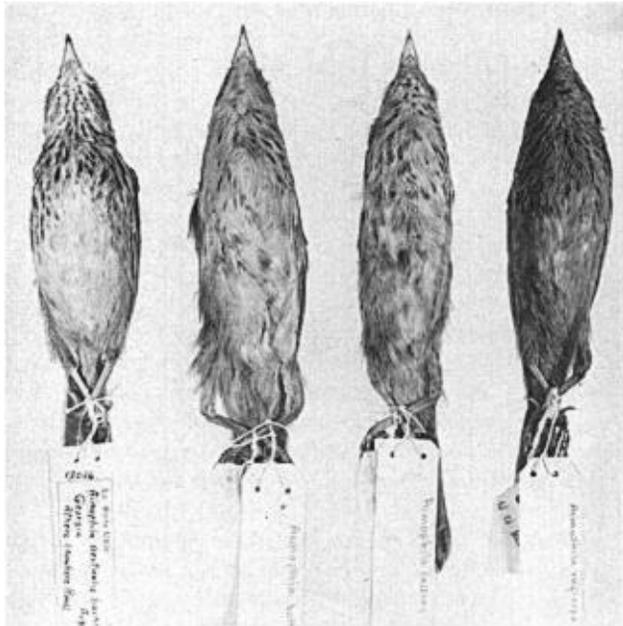


Fig. 3. Aimophilas of the "peucaeae" group in juvenal plumage. Left to right: *A. aestivalis bachmani*, *A. botteri*, *A. cassini*, and *A. ruficeps scotti*, all specimens from Peet Collection in the UMMZ. Photograph by W. L. Brudon.

by having a much larger bill and a patch of yellow under the bend of the wing, a character shared by the "peucaeae" group of aimophilas. If Chapman was correct in postulating an origin of *Rhynchospiza* from the *sumichrasti* group, it seems probable that the aimophilas had a much earlier dispersal into South America than did *Zonotrichia capensis*.

Aimophila carpalis is a species which does not appear to have any close relatives. Hellmayr (1938:522) suggested that *sumichrasti* may prove conspecific with it. However, for reasons mentioned earlier, I believe that *sumichrasti* is related to *ruficauda* and *humeralis* rather than to *carpalis*.

Recently, Pitelka has suggested (1951:47-48) that *carpalis* may be a *Spizella*, largely on the basis of its habits. However, there are certain structural characters which I think prevent its being placed in that genus. Foremost of these is the configuration of

the cranium. In *carpalis* the auditory bullae are quite small, and there is a relatively broad U-shaped area for the attachment of the jaw muscles immediately dorsal and anterior to the bulla. In *Spizella*, the bullae are much larger, and the area for muscle attachment is narrower and V-shaped. *A. carpalis* also differs from *Spizella* in having the posterior end of the palatines broad rather than pointed, and in having broad and blunt central tail feathers like those of *Aimophila ruficeps*.

In the size and form of the auditory bullae, *carpalis* resembles *ruficauda*, *humeralis*, and *rufescens* most closely, and in the configuration of the side of the cranium it is again closest to *humeralis* and *ruficauda* although somewhat different from both. The broad expansions of the posterior end of the palatines are perhaps most like those of *ruficeps* but in some respects are unique. The juvenal plumage of *carpalis* is said by Pitelka (*in litt.*) to be "*Spizella*-like" and thus somewhat like the comparable plumage of *ruficeps* and the *aestivalis* group. Hence, *carpalis* appears to occupy a taxonomic position somewhere between *ruficeps* and *rufescens* on the one hand and members of the *ruficauda* group on the other. Although in superficial pattern it resembles *sumichrasti* rather closely, it is certainly not closely related as Hellmayr indicated. The juvenal plumages, the proportions, and several plumage characters of the adults are strikingly different.

Aimophila rufescens, the type species of the genus, ranges from northern México to northwestern Costa Rica and is common in the temperate zone. As might be expected from the discontinuous distribution of its habitat, it is divided into several races, eight being recognized by Hellmayr (1938). In many respects the plumage resembles that of *sumichrasti*. It lacks, however, the rufous at the bend of the wing and the black sub-loral streak of the latter; the whole tone of the plumage is more olive-brown and less rufous, especially on the rump, tail, and flanks; and the median crown stripe and the streaks on the back are less well defined. In fact, the latter are almost or even quite, obsolete in some individuals and some races. *A. rufescens* is also a larger bird with relatively heavier bill and feet and broader rectrices.

The juvenal plumage of *rufescens* appears to be unique in the genus in having a strong yellow wash on the sides of the head and on the under parts, a character which it shares with *Oriturus superciliosus* and several other neotropical buntings. In this plumage the under parts are streaked like those of *ruficeps*, *carpalis*, and the "peucaeas."

The skull of *rufescens* differs from those of *ruficauda* and *humeralis* in the relatively greater development of the auditory bullae. In this character it approaches *ruficeps* and the "peucaeas," although it differs from these forms in several other details of this region of the skull. Large auditory bullae appear to be correlated with terrestrial habits, although the connection is by no means understood. This character reaches a much greater degree of development in *Oriturus* than in any of the aimophilas which I have examined.

A. rufescens does not appear to be as close to *sumichrasti* and its relatives as the resemblance of the adult plumage suggests, nor is it particularly close to the "peucaeas." In some respects it resembles the smaller species *ruficeps*, with which it shares much of its range. A comparative study of these species should prove extremely interesting. The closest relative of *rufescens* may prove to be *notosticta*, but the juvenal plumage of that species lacks the characteristic yellow of the young of *rufescens*.

Aimophila notosticta has a limited range in the mountains of Oaxaca. Goldman (1951:379) listed it as an inhabitant of the Lower Austral Zone. The adult of this species resembles that of *rufescens* most closely, but it is smaller and relatively longer tailed and smaller billed. The dark streaks on the back are more pronounced and the

general tone of coloration is less rufous than that of *rufescens*. According to Ridgway (1901:242), the mandible of *notosticta* is black like the maxilla, and this is certainly true of the old skins which I have examined. As mentioned earlier, the juvenal plumage lacks the yellow found in the juveniles of *rufescens*. The streaking on the breast is bolder, There being fewer but heavier streaks (fig. 2). As far as I can determine, the habits, habitat preference, and skeleton of this species are unknown. Until more is known about it, I prefer to place it next to *rufescens*.

CONCLUSION

The genus *Aimophila* as now constituted is not a natural assemblage. Two groups of species stand out as discrete. The first contains the species *mystacalis*, *humeralis*, *ruficauda*, *sumichrasti*, and *strigiceps*, which inhabit arid tropical scrub; and the second includes the species *aestivalis*, *botteri*, *petenica*, and *cassinii*, which are found in temperate grassland or savanna. The remaining species, *quinquestriata*, *carpalis*, *ruficeps*, *notosticta*, and *rufescens*, cannot, on the basis of our present knowledge, be readily placed in either of the two groups. Eventually it will probably be advisable to split *Aimophila* into two genera, but if this were done now and the four species of uncertain affinities were divided between the two genera, we would have two unnatural groups instead of one. This is hardly justifiable. What is most needed is a series of studies on the life history and anatomy of the little-known members of the group. Until these have been made, I think that the *status quo*, unsatisfactory as it is, should be maintained.

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