A NEW RACE OF THE PURPLE MARTIN FROM UTAH

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The Purple Martin (*Progne subis*) has long been known to show geographic variation in certain of its characters, and much has been said about the nature and degree of the variation (Brewster 1889:92; Mearns 1902:919; Ridgway 1904:35; Dwight 1905:37; Miller 1906:177; Grinnell 1928:123; van Rossem 1931: 269 and 1945:164; Hellmayr 1935:13; Brandt 1951:669; A.O.U. Check-list 1957:365; Miller, Friedmann, Griscom, and Moore 1957:107; Mayr and Greenway 1960:86; Phillips, Marshall, and Monson 1964:102; Johnston 1966). It seems certain that the species is weakly polytypic. Only two infraspecific differentiates are currently recognized. The race *P. s. subis* ranges through the eastern and midwestern United States, while *P. s. hesperia* occupies Lower California, Sonora, and extreme southern Arizona. Size differences are apparent between these two races in both sexes, but color differences are confined to females. Johnston (1966) suggests an adaptive basis for the pattern of geographic variation in the color characteristics, concluding that the color of the feather coats of females and first-year males is not only cryptic, but is also of value in regulating heat flow between the bird and its environment. In contrast, the uniform color of adult males from all sectors of the range of the species presumably signifies selection for display plumage.

Grinnell (1928:123) detected clinal variation in Purple Martins along the Pacific Coast consisting of decrease in size from north to south in both sexes, as well as an increase in whiteness in females. He somewhat arbitrarily fixed the dividing line between *subis* and *hesperia* as the California-Baja California border. In Arizona Brandt (1951:669) noted a population of large birds occurring in mountainous areas in the pine-fir zone that he considered typical of the eastern race *subis*. Another smaller form inhabiting the Lower Sonoran desert region, where the giant saguaro cacti were used for nesting sites, he designated as a new race, *P. s. oberholseri*. While this was synonymized with *hesperia* in the 5th edition of the A.O.U. Check-list (1957), Phillips, Marshall, and Monson (1964:102) took a less positive stand, stating: ". . . we are not in a position to judge the validity of this separation. Certainly Arizona highland and lowland birds do not differ in color (though both are paler on the forehead, in females and young, than true *subis* of the eastern states). Our use of the name *hesperia* is thus tentative."

In the course of field work in Utah over many years a large series of Purple Martins has accumulated from several localities. The great majority are breeding birds. They show the features of large size and purer, more extensive white in females, such as Brandt noted for his Arizona birds from the pine-fir zone. The Utah and northern Arizona birds are not typical of the eastern race *subis* as supposed. Rather they represent a new race, which is described as follows.

Progne subis arboricola, new subspecies

Characters. Differs from *Progne subis subis* in larger size in both sexes; females whiter on the forehead and underparts, the white being more extensive and clearer. Similar to *P. s. hesperia* but much larger in size in both sexes.

Measurements. These are given in table 1 not only for this new race but for the other two races as well.

Type. Adult female No. 10938, University of Utah, Payson Lakes, 8300 feet elevation, 12 miles southeast Payson, Utah County, Utah, 10 July 1950, Robert K. Selander, original number 836.

Distribution. Breeds locally in the Wasatch and Pavant mountains of Utah, south in the mountains of northern Arizona to the Mogollon Plateau and to the Chiricahua Mountains of southeastern Arizona; probably also the mountainous portions of New Mexico and western Colorado and the western mountainous portions of Wyoming and Montana.

Specimens of *P. s. arboricola* examined: Total 74. *Utah*: *Cache Co.*: Tony's Grove, Logan Canyon, 12 July 1935, 1 male and 4–5 August 1956, 3 males, 2 females; Box Spr., Cowley Canyon Summit, Logan River drainage, 26 June 1960, 1 male; nr. Danish Dugway, Blacksmith Fork Canyon, 8–9 miles E Hardware Ranch, 2 June 1940, 2 males, 2 females; Hyrum, 8–9 miles NE Helme Ranch, 2 June 1940, 1 male. *Weber Co.*: Monte Cristo, 9 July

TABLE 1. Measurements of three races of the Purple Martin.

Race	N	Mean ± 95% confidence interval	SD	Range	CV, %
		Adult Breeding Males			
Wing Length					
arboricola	31	150.1 ± 0.87	2.37	146.0–155.7	1.58
subis	49	144.2 ± 0.96	3.35	134.3–151.9	2.32
hesperia	22	139.5 ± 1.69	3.82	132.0–146.5	2.74
Tail Length					
arboricola	31	74.8 ± 1.00	2.72	70.0– 79.7	3.64
subis	49	71.4 ± 0.72	2.50	65.4– 76.5	3.50
hesperia	22	69.2 ± 1.09	2.45	64.6– 73.8	3.54
Exposed Culmen					
arboricola	30	11.7 ± 0.23	0.61	10.8– 13.5	5.24
subis	49	11.4 ± 0.19	0.66	10.0– 12.8	5.82
hesperia	21	11.4 ± 0.23	0.51	10.0– 12.0	4.45
Bill from Nostril					
arboricola	26	9.1 ± 0.21	0.52	8.0– 10.1	5.69
subis	49	8.8 ± 0.93	0.32	8.3– 9.4	3.68
hesperia	21	8.7 ± 0.15	0.33	7.8– 9.3	3.81
Bill Width					
arboricola	25	8.8 ± 0.28	0.68	7.5– 10.4	7.74
subis	49	8.2 ± 1.82	0.63	6.9– 9.6	7.71
hesperia	22	8.2 ± 0.19	0.44	7.4– 9.0	5.30
Tarsal Length					
arboricola	30	15.7 ± 0.45	1.21	14.2– 19.5	7.69
subis	48	15.6 ± 0.27	0.94	14.3– 18.2	6.04
hesperia	22	16.1 ± 0.35	0.78	15.0– 17.4	4.84
		Adult Breeding Females			
Wing Length					
arboricola	17	145.6 ± 1.58	3.07	141.1–154.1	2.11
subis	34	141.0 ± 1.03	2.96	136.1–146.4	2.10
hesperia	14	136.4 ± 1.44	2.49	132.6–140.2	1.83
Tail Length					
arboricola	17	70.7 ± 1.53	2.95	66.2– 77.7	4.18
subis	34	69.2 ± 1.11	3.19	64.4– 75.7	4.61
hesperia	15	68.6 ± 1.09	1.96	65.4– 72.1	2.86
Exposed Culmen					
arboricola	17	11.5 ± 0.26	0.50	10.8– 12.5	4.34
subis	34	11.2 ± 0.17	0.48	10.0– 12.5	4.28
hesperia	15	11.2 ± 0.38	0.69	10.0– 12.5	6.18
Bill from Nostril					
arboricola	15	8.9 ± 0.27	0.48	8.0– 9.5	5.41
subis	34	8.7 ± 0.13	0.38	7.9– 9.4	4.36
hesperia	13	8.7 ± 0.26	0.48	8.2– 9.6	5.49
Bill Width					
arboricola	15	8.6 ± 0.27	0.48	8.0– 9.6	5.57
subis	34	8.5 ± 0.20	0.56	7.5– 9.9	6.61
hesperia	13	8.4 ± 0.35	0.63	7.6– 9.6	7.53
Tarsal Length					
arboricola	15	15.9 ± 0.70	1.27	14.3– 19.0	7.98
subis	33	15.4 ± 0.26	0.73	13.5– 16.6	4.75
hesperia	13	15.4 ± 0.36	0.66	14.4– 17.1	4.29

1950, 2 males. *Utah Co.*: Payson Lakes, Mt. Nebo, 10–12 July 1950, 11 males, 3 females. *Millard Co.*: Robins Valley, 9200 ft., 2 miles S Coffee Peak, Pavant Mts., 28–30 July 1965, 10 males, 13 females; Clear Lake, 23 May 1965, 14 males, 6 females. *Arizona*: *Coconino Co.*: Flagstaff, 10 June 1935, 1 male; 3 miles NW Flagstaff, 2 August 1939, 1 female; Mormon Lake, 2 May 1937, 1 male.

DISCUSSION OF VARIATION

This newly named, montane population is distinctive in its large size in both sexes. The white coloration pattern of females is shared with that of the neighboring race to the south, *hesperia*, but this is the smallest of the races. The large size of *arboricola* is indicated by wing length in both sexes and the tail length

TABLE 2. Analysis of variance.

Character	Source	d.f.	F-ratio
♂ ♂ wing	locality	2,99	72.479[a]
♀ ♀ wing	locality	2,62	35.914[a]
♂ ♂ tail	locality	2,99	101.720[a]
♀ ♀ tail	locality	2,63	2.298[b]

[a] $P < 0.01$.
[b] $P > 0.05$.

in males. The data for these two characters were subjected to a completely randomized design test. Treatment means were analyzed by the Student's *t*-test whenever the calculated *F*-ratio was shown to be significant. As indicated in tables 2 and 3, the measurements are statistically significant with the exception of the tail length of females. No statistical analysis was carried out on measurements of tarsal and middle toe length or bill size.

Body-weight data are lacking for breeding examples of the montane form, but data for a sample of spring-taken examples are available that suggest a correlation between body size and length of extremities. Fourteen spring migrants of *arboricola* averaged 59.1 grams. Fifteen adult breeding males of *hesperia* have an average weight of 46.2 grams. Sixteen breeding males of *subis* average 54.4 grams. In all three lots there was much individual variation in the amount of fat present, as indicated on the labels. Even so, the figures offer corroboration that *hesperia* is a small race while *subis* is intermediate and *arboricola* large. The environmental or behavioral feature with which the large size of *arboricola* may be correlated is not evident. Nothing is known of wintering range or migratory movements of this new race.

As to variation in color characters, note has been made of the lack of geographic variation in males. Nor has regional variation been detected in the color of the dorsum of females. Of the color characters that are geographically variable, the whiteness of the forehead is a highly variable character and furthermore is influenced by wear. Even so, the mass effect in series shows geographical variation. Eastern birds representing the race *subis* have quite uniformly dark foreheads. Indeed, only one of 21 adult females had a "silvery" forehead. Representatives of the race *hesperia* from Lower California and Kino, Sonora, México, in contrast show much white on the forehead. Of 13 examples, nine are white. Two are dark extremes, as dark as eastern examples of *subis*. The other two are intermediate. While Utah birds are closest to *hesperia* in the amount of whiteness in the forehead, individually they show more variation than in the series studied of *hesperia*. Of 11 adult females of *arboricola*, four are as extensively white as in *hesperia*, two are as dark as in *subis*, and the remaining five have an intermediate white appearance. Corroboration of a regional difference in this character between *subis* and *arboricola* is afforded by a small sample of subadult females. Three from Utah have whitish foreheads, whereas in four representatives of *subis*, three are dark and only one is light. Of three young from the range of *hesperia*, two are intermediate white but one is dark as in *subis*.

TABLE 3. Comparison of wing and tail measurements in three races of the Purple Martin.

Character	Populations compared	t value[a]
♂ ♂ wing	*arboricola* with *subis*	8.163
	arboricola with *hesperia*	11.857
	hesperia with *subis*	5.711
♂ ♂ tail	*arboricola* with *subis*	10.241
	arboricola with *hesperia*	13.896
	hesperia with *subis*	5.930
♀ ♀ wing	*arboricola* with *subis*	4.988
	arboricola with *hesperia*	8.500
	hesperia with *subis*	4.995

[a] In all cases, $P < 0.001$.

Variation in coloration of the ventral surface involves both the extent and clearness of the white. Individual variation is again considerable, but regional differences show up in large series. Eastern birds representing *subis* are essentially dark-bellied. The white of the lower belly is less extensive and furthermore is obscured in many birds by a slight wash of tan. The result is a dull white. Representatives of *hesperia* from Kino, Sonora, and Baja California, México, are, for the most part, conspicuously white-bellied. Not only is the white clearer by virtue of being undiluted, but it is more extensive. However, an occasional example of *hesperia* is as dusky as average examples of *subis*. Specimens of *arboricola* from Utah have the whiteness of the underparts essentially the same as in *hesperia* in contrast to the darker eastern birds. A few extreme individuals are dark, but the mass effect shows a light-bellied population. In the material at hand, representatives of the eastern race *subis* are more uniform, being mostly dark, with only a few white extremes. In contrast, western examples representing both the races *hesperia* and *arboricola* are more variable. While most are lighter, dark extremes are fairly numerous. In other words, there are more dark extremes in populations of *hesperia* and *arboricola* than there are white extremes in *subis*.

In Utah the general ecological situation where Purple Martins occur as breeding birds

includes forested areas from 6800 to 8500 feet near lakes. The martins nest in cavities in aspens, spruces, and firs excavated by woodpeckers of various species. Their distribution is irregular, but where they occur they are usually fairly abundant. It is to be expected that the Purple Martins throughout the entire Rocky Mountain region will eventually be found to represent this race.

ACKNOWLEDGMENTS

Comparative material for this study was made available by the curators of birds at the United States National Museum, University of Kansas Natural History Museum, Utah State University Museum of Zoology, and the Museum of Northern Arizona, to all of whom thanks is expressed. For help in the statistical analysis I am indebted to Gary L. Worthen.

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Accepted for publication 15 August 1967.