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VARIATION OF LADDER-BACKED WOODPECKERS IN SOUTHWESTERN NORTH AMERICA

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As part of an investigation of interactions between the Ladder-backed Woodpecker (*Dendrocopos scalaris* (Wagler)) and the Nuttall Woodpecker (*D. nuttallii* (Gambel)) it was necessary to appraise the several races of the former species occurring in the Southwest. Results of this analysis are reported herein.

The races of the Ladder-backed Woodpecker were reviewed by Oberholser (1911). Van Rossem (1942) described two new subspecies, *mojavensis* and *yumanensis*, from the Southwest. These two forms have not been generally recognized, although no one has criticized van Rossem's data or provided evidence against his tenets. I find that *mojavensis* and *yumanensis* do in fact have some basis, although they do not merit formal taxonomic recognition.

I measured and studied 550 specimens of *D. scalaris* from the Southwest including the following: *D. s. lucasanus* (southern Baja California)—60; *D. s. eremicus* (northern Baja California)—114; northern Baja California contact between *D. s. eremicus* and *D. s. cactophilus*—11; and *D. s. cactophilus*—365. Of the latter, 21 came from southwestern Utah and northwestern Arizona, 107 from central and southeastern Arizona, 25 from the upper Colorado River Valley (van Rossem's "*yumanensis*," in part), 84 from the lower Colorado River Valley ("*yumanensis*"), 26 from the Providence Mountains and vicinity, 26 from central southern California, and 76 from central and from southwestern California (van Rossem's "*mojavensis*"). Standard measurements were taken, including the

TABLE 1. A mensural comparison of southwestern male Ladder-backed Woodpeckers taken from December through March.*

Form	$\bar{X} \pm 2SE$	Range	SD	CV	N
		Wing length			
eremicus (Southern)	105.24±1.04	101.0–108.0	1.96	1.86	14
"*mojavensis*" (CS California)	105.57±1.24	101.5–110.1	2.64	2.50	18
"*yumanensis*" (Lower Col. R.)	102.91±0.96	98.5–107.1	2.38	2.31	24
cactophilus (C, SE Ariz.)	103.14±0.68	97.8–104.6	1.65	1.60	24
		Tail length			
eremicus (Southern)	69.69±0.88	67.5– 73.5	1.63	2.34	14
"*mojavensis*" (CS California)	64.74±1.16	62.0– 70.3	2.38	3.68	17
"*yumanensis*" (Lower Col. R.)	62.23±0.86	58.7– 67.8	2.09	3.36	23
cactophilus (C, SE Ariz.)	61.77±1.02	55.8– 65.8	2.47	4.00	24
		Bill length (gonys)			
lucasanus	16.31±0.32	15.0– 17.4	0.73	3.24	15
eremicus (Southern)	17.73±0.50	16.1– 19.9	1.63	5.53	15
"*mojavensis*" (CS California)	16.68±0.36	15.6– 18.5	0.75	4.50	17
"*yumanensis*" (Lower Col. R.)	15.75±0.36	14.4– 18.2	0.89	5.65	24
cactophilus (C, SE Ariz.)	14.91±0.34	13.3– 16.6	0.87	5.84	25
		*Depth of back bar**			
eremicus (Southern)	4.51±0.20	3.5– 6.0	0.59	13.08	38
"*mojavensis*" (CS California)	3.64±0.12	2.6– 4.3	0.36	9.89	42
"*yumanensis*" (Lower Col. R.)	3.13±0.12	2.4– 4.1	0.42	13.42	47
cactophilus (C, SE Ariz.)	3.61±0.12	2.8– 4.7	0.44	12.19	56

* Measurements are in millimeters, except for CV. Figures are for specimens collected from December through March, except for depth of back bar, where males from all months were utilized. Symbols and abbreviations: $\bar{X}$ = Mean, SE = Standard Error of the Mean, SD = Standard Deviation, CV = Coefficient of Variability, and N = number of specimens in the sample.

chord of the wing and the gonys of the bill. It is my experience that measurement of the gonys is more easily accomplished and involves less error in measuring than any other bill length measurement in these woodpeckers; also, in museum specimens, the lower bill (which is involved in the gonys measurement) is less often broken than the upper bill.

A comparison of mensural characters of certain samples is presented in Tables 1 and 2. The "*mojavensis*" and "*yumanensis*" samples are taken from the areas designated for these races by van Rossem (op. cit., p. 24). Only specimens taken from December through March were used in the tables because these were most numerous in the samples secured. Also, this period is represented by specimens in a state of plumage wear intermediate between fresh-plumaged fall birds (late August–November) and worn birds taken from April

TABLE 2. A mensural comparison of southwestern female Ladder-backed Woodpeckers taken from December through March.*

Form	$\bar{X} \pm 2SE$	Range	SD	CV	N
		Wing length			
eremicus (Southern)	102.43±0.86	100.0–106.9	1.42	1.39	11
"*mojavensis*" (CS California)	103.31±0.90	101.1–104.7	1.28	1.24	8
"*yumanensis*" (Lower Col. R.)	98.98±1.06	95.5–104.1	2.27	2.29	18
cactophilus (C, SE Ariz.)	100.59±0.92	96.2–106.2	2.25	2.24	24
		Tail length			
eremicus (Southern)	68.56±1.58	64.1– 73.1	2.63	3.84	11
"*mojavensis*" (CS California)	64.21±1.54	59.7– 66.1	2.21	3.44	8
"*yumanensis*" (Lower Col. R.)	61.51±1.00	58.5– 64.7	2.12	3.45	18
cactophilus (C, SE Ariz.)	61.62±0.86	58.0– 66.8	2.10	3.41	24
		Bill length (gonys)			
lucasanus	13.59±0.42	12.9– 16.0	0.77	5.67	14
eremicus (Southern)	15.82±0.60	14.7– 17.8	1.00	6.32	11
"*mojavensis*" (CS California)	14.44±0.50	13.3– 15.3	0.71	4.92	8
"*yumanensis*" (Lower Col. R.)	13.34±0.36	12.7– 14.5	0.72	5.40	18
cactophilus (C, SE Ariz.)	12.92±0.26	11.2– 14.5	0.67	5.19	25
		*Depth of back bar**			
eremicus (Southern)	4.50±0.18	3.4– 6.0	0.54	12.00	33
"*mojavensis*" (CS California)	3.42±0.20	2.3– 4.7	0.55	16.08	31
"*yumanensis*" (Lower Col. R.)	2.99±0.08	1.9– 3.8	0.39	13.04	37
cactophilus (C, SE Ariz.)	3.48±0.14	2.6– 4.8	0.49	14.08	51

* Measurements are in millimeters, except for CV. Figures are for specimens collected from December through March, except for depth of back bar, where females from all months were utilized. Symbols and abbreviations as in Table 1.

through July. Samples representing the latter periods were also utilized, and data gathered from them. Such data yielded results similar to those in Tables 1 and 2. Some of these data (from birds taken April–July) were presented in Table 3.

D. s. eremicus (Oberholser). This northern Baja California race exhibits longer wings and a longer tail than the southern peninsular Baja California *D. s. lucasanus* (Xantus), and it agrees with *lucasanus* in having a relatively longer tail than that of other southwestern *scalaris*. The male tail: wing ratio averages 0.65 to 0.67 in *eremicus*, as in *lucasanus*, versus 0.59 to 0.61 in all samples of *cactophilus*, "*mojavensis*" and "*yumanensis*." Compared with "*mojavensis*," which occupies a range contiguous with that of *eremicus* in the foothills of southern California, *eremicus* has wings of about the same length, a 7 percent longer tail, a longer bill (not significantly longer in

TABLE 3. A mensural comparison of certain samples of southwestern male Ladder-backed Woodpeckers taken from April through early July.*

Form	$\bar{X} \pm 2SE$	Range	SD	CV	N
		Wing length			
eremicus (Southern)	104.08±0.84	101.8–106.3	1.32	1.27	10
eremicus (Northern)	103.55±——	100.0–107.0	——	——	5
"*mojavensis*"	104.89±1.06	101.7–110.1	2.14	2.04	16
Providence Mt. area	101.53±1.40	98.1–103.7	1.98	1.95	8
Mecca area	104.26±1.78	101.0–108.4	2.67	2.56	9
"*yumanensis*" (Lower Col. R.)	102.00±1.08	98.2–106.5	2.22	2.18	17
"*yumanensis*" (Upper Col. R.)	102.12±1.14	99.9–104.2	1.72	1.68	9
SW Utah area	104.18±——	102.8–106.4	——	——	6
cactophilus (C, SE Ariz.)	101.74±0.88	98.4–105.3	1.88	1.85	18
		Tail length			
eremicus (Southern)	68.13±1.58	64.8– 70.8	2.23	3.27	8
eremicus (Northern)	68.36±——	65.1– 71.3	——	——	6
"*mojavensis*"	63.86±1.12	59.7– 67.1	2.26	3.24	16
Providence Mt. area	60.50±1.68	58.0– 63.5	2.23	3.69	7
Mecca area	63.38±1.72	59.5– 66.0	2.43	3.83	8
"*yumanensis*" (Lower Col. R.)	61.54±1.06	57.5– 65.1	2.24	3.64	18
"*yumanensis*" (Upper Col. R.)	62.09±1.00	60.4– 65.2	1.49	2.40	9
SW Utah area	63.97±——	60.6– 67.8	——	——	6
cactophilus (C, SE Ariz.)	60.12±1.10	56.3– 63.5	2.20	3.66	16
		Bill length (gonys)			
lucasanus	15.83±0.44	14.8– 17.0	0.73	4.61	11
eremicus (Southern)	17.21±0.50	15.6– 18.7	0.84	4.88	11
eremicus (Northern)	17.34±0.78	16.2– 19.0	1.09	6.23	7
"*mojavensis*"	16.81±0.44	15.9– 19.2	0.87	4.09	16
Providence Mt. area	16.50±0.60	15.0– 17.3	0.86	5.21	8
Mecca area	16.26±0.80	15.1– 19.1	1.19	7.32	9
"*yumanensis*" (Lower Col. R.)	15.66±0.36	14.2– 17.0	0.70	4.47	16
"*yumanensis*" (Upper Col. R.)	16.69±0.70	15.0– 18.3	1.06	6.35	9
SW Utah area	17.02±——	14.8– 18.2	——	——	6
cactophilis (C, SE Ariz.)	15.41±0.49	14.2– 17.2	0.86	5.58	18
		Length of 4th rectrix			
eremicus (Southern)	58.86±1.66	55.4– 61.8	2.35	3.99	8
eremicus (Northern)	55.42±——	51.8– 59.3	——	——	6
"*mojavensis*"	55.93±1.14	52.1– 59.5	2.29	4.09	16
Providence Mt. area	57.38±1.18	54.0– 58.8	1.68	2.93	8
Mecca area	54.30±2.18	50.4– 58.1	3.07	5.65	8
"*yumanensis*" (Lower Col. R.)	52.80±1.16	49.5– 57.6	2.40	4.55	17
"*yumanensis*" (Upper Col. R.)	54.21±2.10	49.5– 58.1	3.16	5.18	9
SW Utah area	55.17±——	51.6– 57.2	——	——	6
cactophilus (C, SE Ariz.)	53.23±1.48	48.6– 59.5	2.88	5.41	15
		Bill width at center of nostrils			
eremicus (Southern)	6.65±0.20	6.2– 7.2	0.64	4.81	11
eremicus (Northern)	6.71±0.28	6.1– 7.3	0.39	5.81	8
"*mojavensis*"	6.78±0.18	6.4– 7.4	0.36	5.31	16
Providence Mt. area	6.68±0.18	6.3– 7.0	0.25	3.74	8
Mecca area	6.66±0.24	6.3– 7.2	0.35	5.26	9
"*yumanensis*" (Lower Col. R.)	6.54±0.14	6.0– 7.1	0.32	4.89	18
"*yumanensis*" (Upper Col. R.)	6.59±0.26	6.1– 7.3	0.40	6.07	9
SW Utah area	6.90±——	6.2– 7.5	——	——	6
cactophilus (C, SE Ariz.)	6.22±0.24	5.4– 7.0	0.50	8.04	18

TABLE 3 (*Continued*)

Form	$\bar{X} \pm 2SE$	Range	SD	CV	N
	*Depth of back bar**				
eremicus (Southern)	4.51±0.20	3.5– 6.0	0.59	13.08	38
eremicus (Northern)	4.40±0.34	3.3– 6.1	0.77	17.50	21
"mojavensis"	3.64±0.12	2.6– 4.3	0.36	9.89	42
Providence Mt. area	3.49±0.26	2.5– 5.4	0.52	14.90	16
Mecca area	3.54±0.24	2.7– 4.3	0.47	13.28	14
"yumanensis" (Lower Col. R.)	3.13±0.12	2.4– 4.1	0.42	13.42	47
"yumanensis" (Upper Col. R.)	3.36±0.28	2.6– 3.9	0.42	12.50	9
SW Utah area	3.33±0.28	2.7– 3.9	0.43	12.91	9
cactophilus (C, SE Ariz.)	3.61±0.12	2.8– 4.7	0.44	12.19	56

* Measurements are in millimeters, except for CV. Figures are for specimens collected from April through early July (excessively worn specimens considered unmeasurable were disregarded), except for depth of back bar, where males from all months were utilized. Symbols and abbreviations as in Table 1.

Tables 1 and 2, but all 3 male and 3 female *eremicus* samples show a mean length of gonys greater than corresponding samples of "*mojavensis*"), and significantly deeper black back bars (hence a blacker back; Tables 1 and 2). In the latter 3 features *eremicus* differs by as much or more from other samples of *cactophilus* (including "*yumanensis*") than it does from "*mojavensis.*" Additionally, *eremicus* tends to have a slightly wider bill and less white in the primaries and wing coverts than does "*mojavensis.*" However, there is more white and less black barring in the tail of *eremicus* than in "*mojavensis*" (6 percent of *eremicus*, 38 percent of "*mojavensis*," 28 percent of "*yumanensis*," and 53 percent of Arizona *cactophilus* specimens have fully barred 5th rectrices). Analysis of the patterns found in the outermost (6th) rectrices showed that, while 80–90 percent of *cactophilus* and "*yumanensis*" specimens have the normal barred condition of *D. scalaris*, 65 percent of "*mojavensis*" and only 50 percent of *eremicus* specimens exhibited such a condition. The other patterns found in *eremicus* were particularly varied, including some tending toward the patterns of *D. nuttallii* (however, *most* of the "abnormal" patterns found in "*mojavensis*" tend toward those of *D. nuttallii*).

D. s. mojavensis (van Rossem). Specimens from Kern County, California, south through the foothills and western portion of the desert to San Diego County constituted this

sample. This putative subspecies was compared above with *D. s. eremicus.* Compared with *D. s. "yumanensis"* (van Rossem), which occupies the lower Colorado River Valley and immediately adjacent deserts, *"mojavensis"* exhibits significantly longer wings, tail and bill. The tail: wing ratio of the two samples is almost identical. The black back bars of *"mojavensis"* are significantly deeper than those of *"yumanensis,"* and hence the back of this form is blacker than that of *"yumanensis."* However, *"mojavensis"* is virtually identical to central and southeastern Arizona *cactophilus* in back barring, and both of these have shallower black bars than the blacker-backed *eremicus* (Tables 1 and 2). *"Mojavensis"* tends to have a broader bill, less barred 6th rectrices, large outer (5th) rectrices with about as much white, and blacker, less spotted primaries than *"yumanensis."*

D. s. yumanensis (van Rossem). This subspecies was based (van Rossem, *op. cit.*) entirely on its paler (whiter), less black coloration than other *D. s. cactophilus* and *D. s. "mojavensis."* Comparison of *"yumanensis"* with *"mojavensis"* and *eremicus* has been accomplished above. Compared with *cactophilus* specimens from central and southeastern Arizona, *"yumanensis"* has: wings of about the same length; a slightly longer tail; about the same tail : wing ratio; a bill which averages longer (males only); a slightly wider bill; similar 6th rectrix patterns; significantly whiter (less black-barred) 5th rectrices; and, a tendency toward more white spotting and barring in the wings. Additionally, the black back bars of *"yumanensis"* are significantly shallower than those of *cactophilus,* and hence *"yumanensis"* has a very white back (Tables 1 and 2).

D. s. cactophilus (Oberholser). A sample of this race taken in central and southeastern Arizona has been compared above with *D. s. eremicus, "mojavensis"* and *"yumanensis"* (see also Tables 1 and 2).

In Table 3 measurements of samples of the above four forms taken from April through July are compared with certain other critical samples. Only males are included in the table; available female samples gave similar results. The small sample from the northern edge (roughly the region of Baja California from Ensenada and the Sierra de Juárez south to a line passing

east from San Quintín) of the range of *eremicus* is very like that of the southern sample. However, the northern *eremicus* sample is more variable in outer rectrix markings, and both sexes tend to have longer bills and more narrow bars than do birds from the southern *eremicus* sample.

Samples from the Mecca area (Indio, Thermal and Mecca in Riverside County, California), and from the Providence Mountain region (San Bernardino County, California), and several specimens from Calexico (Imperial County, California), Calipatria (Imperial County, California) and the west side of Laguna Salada, Baja California, exhibit intermediacy between the birds of the southern California foothills and those of the lower Colorado River Valley. The Mecca area specimens average very close to "*mojavensis*" in most features, with extreme individuals appearing quite typical of "*yumanensis*," although the black back bars are deeper, like those of "*mojavensis*."

Table 3 shows variation in populations of Ladder-backed Woodpeckers inhabiting the Colorado River Valley and its tributaries. The samples are from the Lower Colorado River (from Blythe, California, south to the river's mouth), the Upper Colorado River (from Blythe north to the southern tip of Nevada), and southwestern Utah (from the Virgin River and its tributaries in western Washington County, Utah, and northwestern Mohave County, Arizona). A cline of increasing wing length from south to north is suggested by the data in Table 3, as well as by data from the female samples not included in the table. A corresponding cline is evident in tail length, as indicated in the data (Table 3) for over-all tail length and for length of the fourth rectrix. Male and female samples likewise show such a cline for bill length. The averages for length of gonys in the southwestern Utah sample (mean of 6 males = 17.02 mm, mean of 7 females = 15.07 mm) were greater than those obtained for other samples of southwestern *D. scalaris*, except *D. s. eremicus* and *D. s. lucasanus*. A south to north cline of increasing bill depth is also suggested by data from these three samples. The southwestern Utah and Upper Colorado Valley samples exhibited intermediacy in back barring between Lower Colorado Valley

"*yumanensis*," and both "*mojavensis*" and central Arizona *cactophilus*.

Although various tendencies are evident in "*mojavensis*," "*yumanensis*," and other populations of southwestern Ladder-backed Woodpeckers currently assigned to the subspecies *cactophilus*, they are not sufficiently marked to merit separate subspecific recognition for any of them. The paler-backed Colorado Valley population is otherwise very similar to that of central Arizona, and there is great overlap in their various characters. The populations assigned by van Rossem (*op. cit.*) to "*mojavensis*" have many attributes of birds from southwestern Utah, as well as from central Arizona, and even of "*yumanensis*." Moreover, all of these populations resemble one another, and differ from Baja California populations (*eremicus, lucasanus*) in having a proportionally shorter tail. They also have somewhat shorter bills, and much whiter backs (i.e., significantly shallower black bars) than does *eremicus*. These differences from *eremicus* unite these variable populations, and separate them from that form. Therefore, it seems prudent to continue to regard *mojavensis* and *yumanensis* as synonyms of *cactophilus*, while recognizing *eremicus* as a distinct subspecies.

D. s. cactophilus and *D. s. eremicus* meet along the border of California and Baja California. A tendency toward *cactophilus* has already been noted in the northern sample of *eremicus*. All specimens examined from the California side of the Mexican-United States border are definitely *cactophilus*. Specimens from the Nachaguerro Valley (Univ. Calif. Mus. Vert. Zool. no. 52146) and the west side of Laguna Salada (M. V. Z. no. 52145), Baja California, are nearest *cactophilus* in appearance, including tail : wing ratio. Two specimens from Los Palmitos at the southeast end of the Sierra de Juárez are nearer *eremicus* than *cactophilus*. A winter specimen (U. S. N. M. no. 196279) from Ensenada, Baja California, is intermediate in its features, and has a tail : wing ratio of 0.62 (*cactophilus*). It is possible that winter birds wander somewhat, so this bird may not represent the breeding population in the vicinity of Ensenada. All small samples and individual specimens from south of Ensenada, and from the east base of

the Sierra de Juárez westward are referable to *eremicus*. Three specimens from San Felipe, Baja California, are *eremicus*. The center of the area of intergradation between *cactophilus* and *eremicus* appears to extend from the Pacific Coast just south of the California-Baja California border eastward across the north edge of the Sierra de Juárez, and southward along the east edge of that range. There is probably no contact between *eremicus* and *cactophilus* in the barren region from the mouth of the Colorado River south to the vicinity of San Felipe. Hence, there exists only a narrow area of contact between the two subspecies in the foothills west, north, and east of the Sierra de Juárez.

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Literature Cited

Oberholser, H. C. 1911. A revision of the forms of the ladder-backed woodpecker (*Dryobates scalaris* [Wagler]). Proc. U. S. Nat. Mus., 41: 139–159.

Van Rossem, A. J. 1942. Four new woodpeckers from the western United States and Mexico. Condor, 44: 22–26.