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A NEW GRACKLE OF THE *CASSIDIX MEXICANUS* GROUP

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The relationship of the grackles belonging to the *Cassidix mexicanus* group has been the cause of considerable discussion in late years. This discussion has centered largely about the highly controversial matter of eye color, and has precipitated the description of two new subspecies, *Cassidix mexicanus westoni* Sprunt,<sup>1</sup> the brown-eyed bird of Florida, and *Cassidix major torreyi* Harper,<sup>2</sup> the yellow-eyed bird of the northern Atlantic coast.

Prompted by the conflict of opinion regarding the relationship and status of the described forms, the writer undertook a careful analysis of the problem. Through the generosity of the museums from which loan material was requested, and aided by several expeditions from the Louisiana State University Museum of Zoology to Texas and Mexico, some 600 specimens, representing all the known forms of the genus, have been at the writer's disposal. As an immediate result of this study it has become evident that the birds of the Gulf coast of southeastern Texas and northeastern Mexico represent an undescribed race, which the writer proposes to call:

*Cassidix mexicanus prosopidicola*,<sup>3</sup> subspecies nova

<sup>1</sup> *Charleston Museum Leaflet*, No. 6, February 24, 1934, p. 1.

<sup>2</sup> *Proceedings of the Academy of Natural Sciences of Philadelphia*, Vol. LXXXVI, March 8, 1934, p. 1.

<sup>3</sup> From *Prosopis*, the generic name of the Texas mesquite, and Latin *colere*, to inhabit. This new grackle is very fond of the typical mesquite country.

## MESQUITE GRACKLE

*Subspecific Characters*.—Resembling *Cassidix mexicanus mexicanus* (Gmelin) more closely than any other form, but wing, tail, exposed culmen, and tarsus shorter; male in color almost indistinguishable, but female conspicuously different from *C.m. mexicanus*, the under parts being decidedly lighter, ranging from Light Brownish Olive<sup>4</sup> to Buffy Olive; also the pileum, sides of head and neck much lighter, tending toward olive rather than brown.

From *Cassidix mexicanus major* (Vieillot),<sup>5</sup> *C.m. prosopidicola* differs markedly in both size (see Table 1) and color. The male is purplish over the entire body, while in *C.m. major* only the head, upper breast, and upper back are of this color, the other parts being greenish or greenish blue. The female of *prosopidicola* is altogether a much darker bird, and inclines to greenish brown rather than to yellowish buff.

From the more distantly related forms, *prosopidicola* differs as follows: from *Cassidix mexicanus obscurus* (Nelson)<sup>6</sup> by its larger size and much lighter female; from *Cassidix mexicanus graysoni* (Sclater)<sup>7</sup> as from *obscurus*, but also in that the male *graysoni* is less extensively violet anteriorly, the breast, sides, and back being chiefly steel blue, and in that the female of *graysoni* is much lighter in color, being in this respect almost identical with *major*; from *Cassidix mexicanus nelsoni* (Ridgway)<sup>8</sup> as from *graysoni*; from *Cassidix mexicanus torreyi* (Harper) and from *Cassidix mexicanus westoni* Sprunt, by size and color as from *major*.

*Type*.—Adult female; No. 1568, Louisiana State University Museum of Zoology; Brownsville, Cameron County, Texas; October 25, 1937; George H. Lowery, Jr.; (original number 619).

*Measurements*.—Adult male:<sup>9</sup> wing, 172-200 (average 184.9) mm.; tail, 190-224 (204.3); exposed culmen, 36.5-41.5 (38.8);

<sup>4</sup> Capitalized color names are those of Robert Ridgway, *Color Standards and Color Nomenclature*. Washington, D. C. Published by the author, 1912, color plates, 1-53, pp. 1-44.

<sup>5</sup> Vieillot, *Nouv. Dict. Hist. Nat.*, nouv. ed., Vol. XXVIII, 1819, p. 487.

<sup>6</sup> Nelson, *The Auk*, Vol. XVII, 1900, p. 267.

<sup>7</sup> Sclater, *Ibis*, 5, Vol. II, 1884, p. 157.

<sup>8</sup> Ridgway, *Proc. Wash. Acad. Sci.*, Vol. III, 1901, p. 151.

<sup>9</sup> Fifty-six specimens.

width of bill at base of exposed culmen, 9.9-11.9 (10.9); depth of bill at base of exposed culmen, 12.9-14.5 (13.8); tarsus, 44-52 (49.2). Adult female<sup>10</sup> wing, 140-150 (average 144.9) mm.; tail, 136-152 (145.5); exposed culmen, 30-34 (32); width of bill at base of exposed culmen, 8.6-10.5 (9.4); depth of bill at base of exposed culmen, 10.8-12.4 (11.5); tarsus, 36.5-42.1 (39.9).<sup>11</sup>

*Range.*—Gulf Coast region of central southern Texas, north to at least Port Lavaca, and south into northeastern Mexico in the states of Tamaulipas, Nuevo Leon, and Coahuila. In Texas it is closely associated with the range of the mesquite (*Prosopis glandulosa* Torrey).

*Remarks.*—In the fresh unworn type, the lower breast and upper abdomen are Deep Grayish Olive; the chin and throat, Ivory Yellow to Cream Buff. The color of the iris of the male *prosopidicola* is Straw Yellow. While the color of the iris of the female was not compared with Ridgway's plates in the field, as was the male, the term "yellow" is written on the label of the type specimen.

Birds from Fort Clark, Del Rio, and the mouth of the Devil's River in Texas have been tentatively referred to *prosopidicola*, inasmuch as the females agree closely in color with the type, although in measurements birds from this region are closer to *mexicanus*, and evidently are intergrades. Likewise, two adult males from Chihuahua, Chihuahua, might be provisionally referred to either form; but the examination of females from that region would show clearly to which form they belong. One juvenile male from Loving, New Mexico, was examined, but because of its immaturity and state of plumage could not be assigned to either *mexicanus* or *prosopidicola*, though it probably belongs to the latter. Two specimens from Altamira and Tampico in southern Tamaulipas are tentatively referred to *C.m. mexicanus*. Specimens from southeastern Texas at Matagorda, Virginia Point, Sandy Point (30 miles south of Houston), and High Island (17 miles east of Galveston) are definitely intermediates between *prosopidicola* and *major*. Birds of a

<sup>10</sup> Twenty-four specimens.

<sup>11</sup> Measurements were made with dividers and a vernier caliper. The wing was measured on a chord from the bend of the wing to the tip of the longest primary without straightening these feathers. The tail was measured with dividers from the insertion of the middle pair of tail-feathers to its tip.

series from Lake Charles in southwestern Louisiana are interesting in that they are not typical *major* because they show a perceptible tendency toward *prosopidicola* by reason of their more purplish color and, on the average, longer tail.

Specimens of *Cassidix mexicanus prosopidicola* numbering 119 have been examined from the following localities:

*Texas*.—Calhoun County (Port Lavaca, 8); Refugio County (Tivoli, 3); Colorado County (Eagle Lake, 2); Aransas County (Rockport, 2); Nueces County (Corpus Christi, 28); Bee County (unspecified, 1; Beeville, 1; Skidmore, 1); Cameron County (unspecified, 8; Brownsville, 20; Santa Maria, 2; Port Isabel, 1; Fort Brown, 3; Harlingen, 1); Hidalgo County (Lomita Ranch, 1); Webb County (Laredo, 2); Maverick County (Eagle Pass, 1); Dimmit County (unspecified, 1); Kinney County (Fort Clark, 9); Valverde County (Del Rio, 1; Mouth of Devil's River, 2).

*Tamaulipas*.—Matamoros, 5; Camargo, 3; Mier, 4.

*Nuevo Leon*.—Montercy, 5; Montemorelos, 3.

*Coahuila*.—Monclova, 1.

In describing *Cassidix mexicanus prosopidicola* it has become desirable to restrict the type localities of both *Cassidix mexicanus major* and *Cassidix mexicanus mexicanus*. Vieillot mentioned the indefinite term "Louisiana" as the home of *major*; but, as pointed out previously, all Louisiana birds are not exactly the same, because southwestern Louisiana birds approach *C.m. prosopidicola*. Since it is logical to suppose that Vieillot's type came from New Orleans or close by, and since birds from this area show what might be considered the maximum differentiation for this region, the writer therefore suggests New Orleans, Orleans Parish, Louisiana, for the restricted type locality of *Cassidix mexicanus major* (Vieillot).

Likewise, Mexico is given by Gmelin<sup>12</sup> as the locality for *Cassidix mexicanus mexicanus*. It is highly probable that Hernandez's "Hocitazanatl," which was the ultimate basis of Gmelin's *Corvus mexicanus* (= *Cassidix mexicanus mexicanus*),<sup>13</sup> came from the region about Vera Cruz, Vera Cruz, Mexico. This locality is therefore designated by the present writer as the type locality of *Cassidix mexicanus*

<sup>12</sup> *Corvus mexicanus* Gmelin, *Syst. Nat.*, Vol. I, part 1, 1788, p. 375.

<sup>13</sup> Peters, *Proc. Biol. Soc. Wash.*, Vol. XLII, 1929, pp. 121-122.

*mexicanus* (Gmelin). In describing *C.m. prosopidicola*, critical comparisons were made with New Orleans and Vera Cruz birds respectively.

Since intergradation between *Cassidix mexicanus prosopidicola* and *C.m. major* takes place in southeastern Texas and southwestern Louisiana, it is evident that Harper was incorrect in considering *Cassidix major* a distinct species, and current authors are therefore correct in treating this race as a subspecies of *C.m. mexicanus*. It is true that actual geographical intergradation is not known to occur between Gulf coast birds and Florida or more northern Atlantic coast birds, since there is a distinct gap in the range of the boat-tailed grackle between the mouth of the Escambia River in western Florida and the mouth of the Apalachicola River. The writer, as well as Mr. T. D. Burleigh of the United States Biological Survey, has traversed that area several times without seeing any evidence of the presence of grackles of this species. Nevertheless, it would be unwise to give full specific rank to Virginia and Florida peninsula birds on this trivial point, because they are distinguishable from *Cassidix mexicanus major* only with considerable difficulty, and intergrade by individual variation notwithstanding the lack of continuity of range.

The writer has had at his disposal a large series of Florida birds, as well as a fair series of Atlantic coast specimens from farther north. Attempts to compare *Cassidix mexicanus torreyi* from Virginia with *Cassidix mexicanus westoni* from Florida have been hindered by the lack of definitely breeding birds from the latter state. Since it is reported that *torreyi* winters extensively in Florida, birds collected even in late March might well be of northern origin. Of 94 adult male and female specimens from Florida which were studied, only a very few can be definitely considered Florida bred individuals.

Sprunt designates *Cassidix mexicanus westoni* as a longer and slenderer-billed and more "iridescent" bird than *C.m. major*. Since *C.m. torreyi*, from farther north along the Atlantic coast, had not been described at the time, and since all Atlantic coast birds were then referred to as *major*, Sprunt possibly used more northern Atlantic coast birds as his criterion for that race. However, comparison should have been made with Louisiana birds, for it was from there

that Vieillot described *Cassidix m. major*. Harper wisely used Louisiana birds for comparison when he described *Cassidix m. torreyi*, and consequently the diagnostic characters that he sets forth easily distinguish his bird from *C.m. major*. As shown by Harper, Virginia birds are clearly separable from those of the Gulf coast on the character of wing length, but this is true also of Florida birds. Thus we are left with only the rather insignificant color difference and bill proportions to separate *C.m. westoni* from *C.m. torreyi*. In color, *westoni* is sometimes separable from *torreyi* by more extensively purplish head, back, and sides of the abdomen, but in this character it is indistinguishable from true *C.m. major* of Louisiana.

The recognition of both *torreyi* and *westoni* is debatable. However, until more actually breeding birds from Florida can be studied, it seems wisest to recognize both on the basis of the following characters:

*Cassidix mexicanus torreyi*: Distinguished from *C.m. westoni* by more greenish head, back, and breast, and relatively shorter and thicker bill; and from *C.m. major* by the more greenish head, back, and breast, and by the significant difference in wing-length (over 180 mm. rather than less).

*Cassidix mexicanus westoni*: Distinguished from *C.m. torreyi* by more purplish head, neck, back, and sides of the abdomen, and relatively longer and slenderer bill; from *C.m. major* by greater wing length alone (over 180 mm. rather than less).

The matter of eye color in *Cassidix mexicanus* has been the source of considerable difference of opinion. Histological studies of the variation in eye color in this species are in progress in our laboratory here and will be published when completed. It is considered significant, however, to point out at this time that in *Cassidix mexicanus prosopidicola* both the male and the female have yellow eyes. As shown by McIlhenny,<sup>14</sup> the true eye color of adult male *C.m. major* in Louisiana is a combination of yellow and brown. The region of the iris immediately surrounding the pupil is brown, but the periphery of the iris is yellow. The female of *Cassidix m. major* possesses a brown eye. The eye color of *C.m. mexicanus* as observed by the writer throughout eastern and southern Mexico is yellow in both the male and the female.

<sup>14</sup> *The Auk*, Vol. LIV, 1937, p. 276.

TABLE 1.  
TABLE OF COMPARATIVE MEASUREMENTS

<i>males</i>	<i>wing</i>	<i>tail</i>	<i>exposed culmen</i>	<i>width of culmen</i>	<i>depth of culmen</i>	<i>tarsus</i>
<i>C.m. major</i> from the New Orleans region	167-184 (172.3)	161-193 (172.3)	37.0-41.6 (39.3)	9.7-10.8 (10.2)	12.0-14.0 (13.2)	48.0-52.0 (49.2)
<i>C.m. prosopidicola</i> from the Brownsville region	180-200 (185.8)	194-222 (204.8)	37.6-41.2 (39.4)	9.9-13.0 (10.9)	10.5-14.5 (13.5)	47.0-52.0 (49.3)
<i>C.m. mexicanus</i> from the Vera Cruz region	185-210 (193.9)	203-229 (215.2)	38.4-46.0 (41.2)	10.6-12.2 (11.2)	13.0-15.3 (14.4)	49.0-52.5 (50.9)
<i>females</i>						
<i>C.m. major</i> from the New Orleans region	129-138 (134.3)	120-135 (126.1)	29.0-34.0 (31.9)	8.0-9.0 (8.5)	9.5-11.8 (10.8)	39.0-43.0 (40.6)
<i>C.m. prosopidicola</i> from the Brownsville region	142-153 (145.6)	138-152 (145.6)	30.0-34.1 (32.1)	8.6-10.5 (9.4)	10.8-12.2 (11.5)	36.5-42.1 (40.0)
<i>C.m. mexicanus</i> from the Vera Cruz region	146-164 (154.7)	143-170 (156.3)	31.3-36.0 (33.5)	8.9-10.2 (9.3)	10.5-12.3 (11.6)	41.0-45.0 (42.9)

*Statistical Analysis of Measurements.*—In the course of studying and measuring some 600 specimens of grackles, the writer was impressed by the mass of data at his disposal. At the time it was suggested by Dr. W. H. Gates that a statistical analysis of the variations in measurements between the subspecies might prove of value. Such an analysis would accordingly give a statistical indication as to whether the difference as shown by the measurements were the result of random sampling or actually true genetic differences. It is to be admitted that in any quantitative study of variation based on a relatively few individuals, difference might well be due to random sampling. Thus, the application of statistical methods is decidedly useful in determining the degree of significance of the apparent differences.

Two statistical methods were employed. The data were analyzed by the Analysis of Variance Method as outlined by Snedecor<sup>15</sup> and others.<sup>16</sup> It is deemed unnecessary to describe in detail the methods

<sup>15</sup> G. W. Snedecor, *Calculation and Interpretation of Analysis of Variance and Covariance*. Collegiate Press, Inc., Ames, Iowa, 1934.

<sup>16</sup> R. A. Fisher, *Statistical Methods for Research Workers*.

used, as that part is adequately covered in the aforementioned references. All of the measurement characters studied were analyzed as shown in Table 2. The tail length character is used for example.

TABLE 2.

Source of variation	Degrees of freedom	Sum of the squares	Mean squares	Value of <i>F</i>	<i>smd</i>
Total	23	9768.6			
Locations	2	8134.7	4067.3	52.2	
Within locations	21	1633.9	77.8		4.4

Values of *F* for 2 and 21 degrees of freedom are 3.47 and 5.78. Since 52.2 is decidedly larger than the first value as well as the second value, the data are interpreted as showing significant differences for tail measurement among the birds at different localities. To show a 5 per cent or significant difference, the latter number must be larger than the first value of *F* for the 2 and 21 degrees of freedom. If it is larger than the second value, the difference is then considered highly significant.

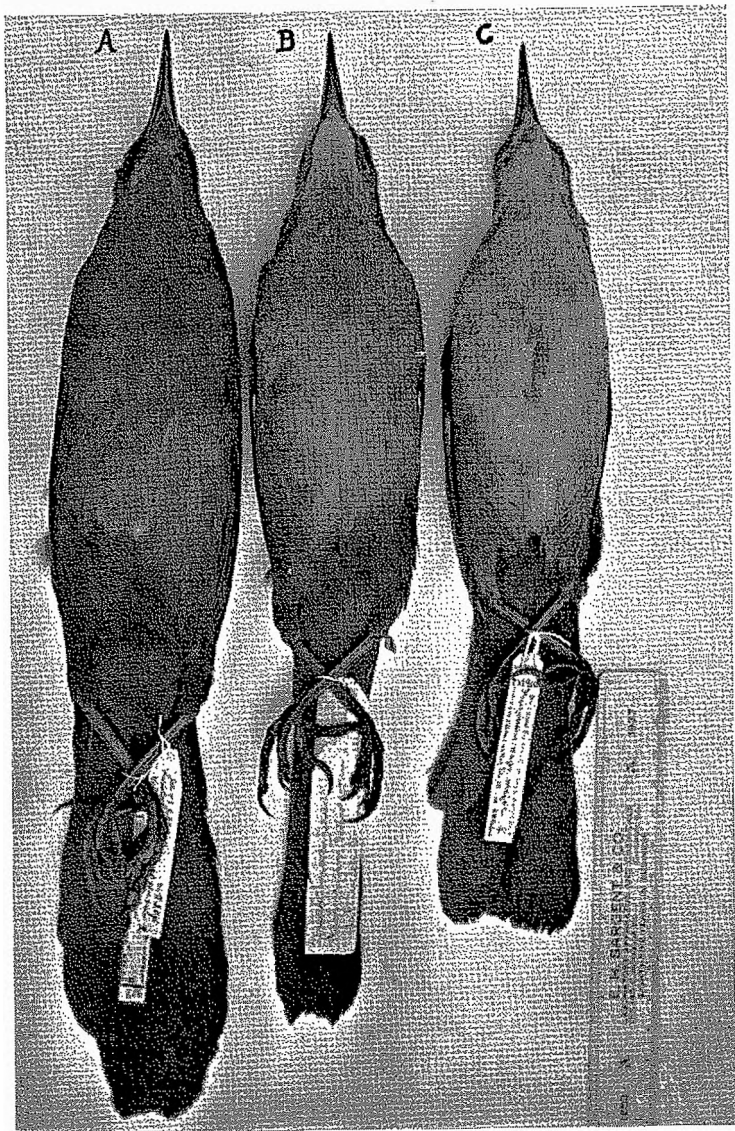
As additional proof of significance, the *smd* for locations was determined as follows:

$$smd = \sqrt{\frac{2 \times 77.8}{8}} = 4.4$$

Values of "t" for 21 degrees of freedom are 2.080 and 2.831. By multiplying each value by 4.4, the figures 9.15 and 12.45 are obtained, and constitute the two levels of significance. To be significant, the difference between the means must be larger than the first figure. To be very highly significant, the difference between the means must be larger than either figure. In this case, the differences are larger than either figure, and therefore give another proof of the significance of the differences occurring between the birds of the different locations.

*Statistical Summary.*—The following table summarizes the *F* values and *smd* for the 12 characters studied, showing the statistical significance of the differences between the birds of the three locations, namely, Vera Cruz, Brownsville, and New Orleans regions, respectively.





Photograph indicating the differences between females of (A) *Cassidix mexicanus mexicanus*, (B) *C. m. prosopidicola*, and (C) *C. m. major* (made in daylight with Panatomic film by J. Harvey Roberts).

TABLE 3.

Character	Number of birds	Value of <i>F</i>	Minimum significant value for " <i>t</i> "	Means		
				Vera Cruz	Brownsville	New Orleans
Male:						
wing.....	8	42.30*	5.20	193.9	184.5	170.0
tail.....	8	52.20*	9.10	215.2	201.2	171.1
exposed culmen.....	9	2.20†	2.02	41.2	39.6	39.3
width of culmen.....	9	8.69‡	0.48	11.3	10.9	10.3
depth of culmen.....	8	21.40†	0.54	14.4	13.9	13.0
tarsus.....	8	9.46†	1.16	50.9	48.6	48.9
Female:						
wing.....	7	1.80†	9.45	154.7	144.4	135.7
tail.....	7	273.30*	3.15	156.3	144.4	125.0
exposed culmen.....	7	3.90†	1.47	33.5	31.7	31.7
width of culmen.....	7	1.90‡	1.01	9.3	9.6	8.7
depth of culmen.....	7	6.50‡	0.56	11.6	11.7	10.9
tarsus.....	6	6.90†	1.91	42.9	40.0	40.3

Key: \*Significant differences between birds of all three localities.

†Significant differences between Vera Cruz and Texas, and between Vera Cruz and New Orleans birds.

‡Significant differences between New Orleans and Brownsville, and between Vera Cruz and New Orleans birds.

‡Very low significance or no significance at all.

In order to simplify the mechanics of the foregoing statistical analysis, the same number of individuals were used within each location. However, the selection of individual measurements was done at absolute random. Furthermore, rather than use all of the available measurements for the three different subspecies, it was considered more important to use birds from three specific localities, namely, the type localities. Thus, only Vera Cruz, Brownsville, and New Orleans birds were used in this analysis, these specimens being topotypes of the three respective races. If larger samples had been available, the significance of variation might have been more pronounced. Nevertheless, the foregoing analysis indicates conclusively from a statistical

standpoint that the differences are true differences and are not due to random sampling.

It might also be mentioned that in order to test statistically the variations in measurements between *mexicanus*, *prosopidicola*, and *major*, the Probable Error of the Difference of the Means Method<sup>17</sup> was also applied. The results thereby indicated were the same as those shown by the Analysis of Variance Method, and thus further verify the significance of the differences in measurements.

In summary, it can be restated that the application of these statistical tests proves that *Cassidix m. prosopidicola* differs from *C. m. mexicanus* in shorter wing, tail, exposed culmen, and tarsus.

For the loan of important comparative material, I am indebted to the following institutions and individuals: United States Biological Survey, 146 specimens; United States National Museum, 139 specimens; Museum of Comparative Zoology, 87 specimens; Field Museum of Natural History, 84 specimens; University of Michigan Museum of Zoology, 44 specimens; Max M. Peet Collection, 6 specimens. For valuable advice on important points in this study, I wish to express my appreciation to Dr. Josselyn Van Tyne, Mr. James L. Peters, and Mr. Thomas D. Burleigh. Especially do I wish to thank my friend Dr. Harry C. Oberholser who has not only aided in this particular study and critically reviewed the type series while on a visit to this museum, but has for many years prior helped and advised me in a multitude of ways.

Deans Fred C. Frey and Charles W. Pipkin of the Louisiana State University have made funds available to finance two expeditions from this museum to the Lower Rio Grande Valley for the purpose of collecting additional material.

<sup>17</sup> L. H. Snyder, *The Principles of Heredity*, D. C. Heath & Co., New York, 1935, Chapter XXIII.