

VARIATION IN THE RESIDENT SHARP-SHINNED HAWKS OF MEXICO

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One of the most interesting parts of the large Milton S. Ray collection given to the Museum of Vertebrate Zoology of the University of California is a small series of Sharp-shinned Hawks (*Accipiter striatus*) collected by W. W. Brown in the Sierra Madre del Sur of Guerrero, México. This series includes an adult male, an immature female, and two immature birds which, although labelled "♀," are, on the basis of size, almost certainly males. The extremely pale coloration of the underparts of the adult in the Ray Collection and the confusion in the literature regarding the status of the breeding Sharp-shins of México made it appear desirable to borrow the available Mexican-taken specimens. Accordingly, I assembled the following: *Accipiter striatus*: Tamaulipas, 1 (Mus. Comp. Zool.); Nuevo León, the type and 4 topotypes of *A. striatus suttoni* (G. M. Sutton Coll.); Chihuahua, 3 (Mus. Comp. Zool.), 1 (U. S. Natl. Mus.); Sonora, 2 (Dickey Coll.); San Luis Potosí, 5 (La. State Univ. Mus. Zool.); Michoacán, 1 (Chicago Nat. Hist. Mus.), 1 (Univ. Mich. Mus. Zool.), 1 (G. M. Sutton Coll.); Guerrero, 4 (Mus. Vert. Zool.), 1 (La. State Univ. Mus. Zool.). *Accipiter erythronemius chionogaster*: Guatemala, 1 (Mus. Comp. Zool.); Honduras, 8 (Mus. Comp. Zool.). To Dr. Sutton and the curators of the collections mentioned, I am deeply indebted for making possible the gathering of this material, for, small though this series is, it is by far the largest group of these hawks yet assembled.

In addition, I examined and measured five examples of Mexican Sharp-shinned Hawks at the American Museum of Natural History. These specimens came from Chihuahua (1), Jalisco (3), and "Barbicom Ranch," state unspecified (1). Through the courtesy of Dr. J. T. Zimmer, I was also able to examine specimens of typical *striatus* and of *fringilloides*, *chionogaster*, *ventralis*, and *erythronemius* in the American Museum.

Size.—In the original description of *Accipiter striatus suttoni*, van Rossem stated (1939:127) "Size apparently slightly larger than *velox*: wings of four males, 178-188 mm." Table 1 shows the extremes and means of wing and tail measurements of Sharp-shinned Hawks from southern Arizona to Guerrero compared with a series from Michigan. The latter series consisted of 40 birds, largely taken during the migration and divided equally between males and females and between birds in first-year and adult plumages. As there appeared to be no significant difference between the measurements of adult and first-year birds in the Michigan series, the age groups of both populations were combined to obtain the means presented in the table.

Table 1

	Wing and Tail Measurements of Sharp-shinned Hawks from Michigan and Southern Arizona and Mexico					
	Number	Michigan Extremes	Mean	Southern Arizona and Mexico Number	Extremes	Mean
Wing length (arc)						
Males	20	161-178	168.8	19	170-192	181.9
Females	20	191-206	200.6	9	216-229	222.4
Tail length						
Males	20	130-139	134.6	20	131-150	139.6
Females	20	149-162	156.5	9	165-177	169.3

A comparison of the measurements of the Michigan series with those given by Friedmann (1950:185) for a series of specimens from throughout the range of *A. s. velox* shows that the Michigan series is somewhat smaller. Next to the *Buteo jamaicensis* com-

plex, *Accipiter striatus* is perhaps the North American hawk most in need of a thorough revisionary study, but it is doubtful that sufficient breeding material is at present available for such a study. Until a statistical analysis of size variation in the Sharp-shinned Hawk is made, it can only be stated that the birds of the Mexican populations average larger than those of the adjacent races.

The small size of the sample of Mexican birds prevents a statistical analysis of size variation within it. However, by inspection, it appears that there is little or no significant size variation among the various Mexican populations.

It is odd that the Mexican birds should be larger than the more northern populations. One might expect the reverse to be true, not only because of Bergmann's "rule," but perhaps even more because of the migratory habit of the northern birds as contrasted with the resident status of the Mexican birds. The situation is further complicated by the related form, *chionogaster*, which ranges from northwestern Chiapas (Edwards, MS) to El Salvador and which is small; wing length (arc): 3 males, 166–175 mm. (mean, 169.7), 6 females, 198–209 (203.1); tail length: 3 males, 130–135 (132), 6 females, 156–164 (160.1). Since these data show that there is apparently no correlation between size and latitude or between size and the migratory habit, it is necessary to cast about for another explanation. It seems to me that the answer may lie in the size of the prey available and in competition with other hawks with similar feeding habits.

Raptors are near the top of the pyramid of numbers; hence, the size of a hawk population is directly dependent upon that of the species upon which it preys. A sexual difference in size in raptors has a selective advantage in permitting the existence of a denser population by increasing the size range and hence the available numbers of the prey. In parts of North America there exists a graded series of accipiters ranging from the male Sharp-shinned Hawk through the female Sharp-shin and the male Cooper Hawk to the female Cooper Hawk. These birds, occupying in part the same range, can live side by side and can take prey of a wide variety of sizes without serious competition. However, if the sexual differences in size did not exist in the genus *Accipiter*, I seriously doubt whether four species, corresponding in size to the four size groups characterized by the two sex groups of the Cooper and Sharp-shinned hawks could exist together in the same area. In the first place, there would probably be too much overlap in size of prey utilized by the various species, and secondly, the total population of each species would have to be roughly half of that of the Cooper or Sharp-shinned hawks which could exist in the same area.

The breeding range of the Mexican Sharp-shinned Hawk, *A. s. suttoni*, appears to coincide with the pine-oak belt, which possesses a characteristic avifauna and one which differs considerably from that of the breeding grounds of *A. s. velox*. Hence, it seems to me likely that the differences in size between *velox* and *suttoni* reflect overall differences in the size composition of the groups of birds available to them as prey during the breeding season. And, furthermore, although the difference in size between these two races is small, this difference would, if anything, be advantageous in lessening competition during the winter when *velox* invades the range of *suttoni*.

Color and markings.—From the northeastern extreme of its range south as far as Guerrero there appears to be no significant geographic variation in the color of the upperparts of the Sharp-shinned Hawks. Specimens of the race *perobscurus* from the Queen Charlotte Islands, however, average darker dorsally; and the form *chionogaster* of Central America is considerably darker, almost black, above.

Friedmann (1950:202) states that the tail of *chionogaster* is "crossed by five broad bands (distinctly broader than the paler interspaces)" and uses this as a key character

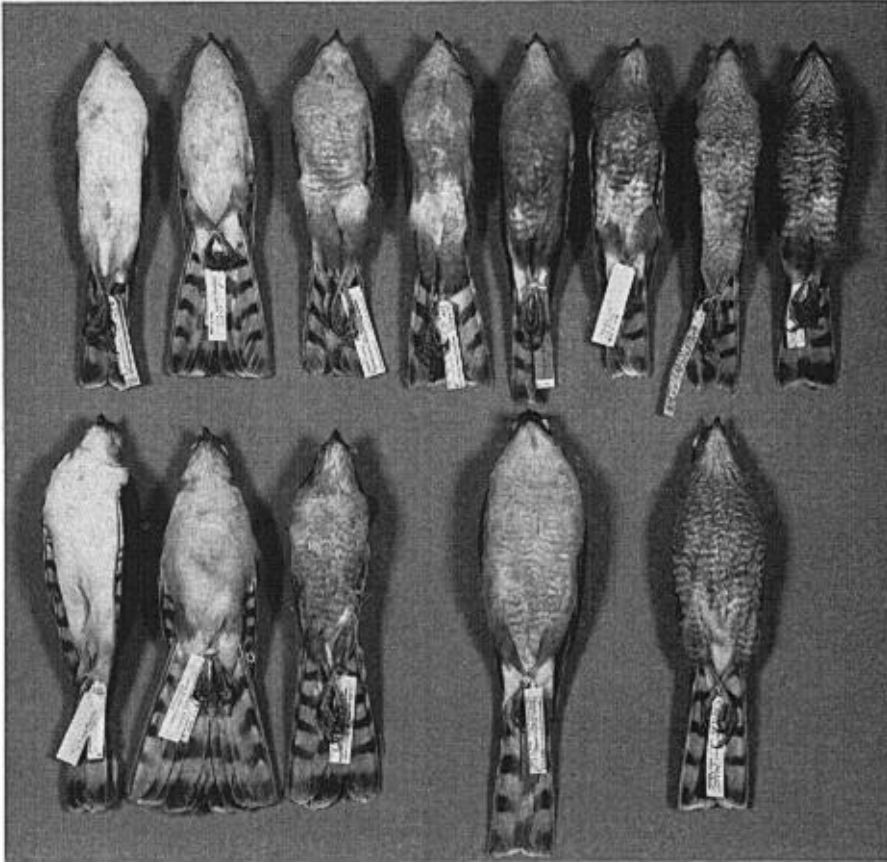


Fig. 1. Adults of *Accipiter striatus*. Top row, males; left to right: MCZ 145651, *A. s. chionogaster*, Finca La Primavera, Guatemala; MVZ 109341, *A. s. madrensis* (type), Cuapongo, Guerrero; LSU 10741, *A. striatus suttoni*, Llano de Coneja, San Luis Potosí; MCZ 48418, *A. striatus suttoni*, Galindo, Tamaulipas; GMS 7902, *A. striatus suttoni* (type), Mesa de Chipinque, Nuevo León; UMMZ 75150, *A. striatus* near *suttoni*, Huachuca Mountains, Arizona; UMMZ 59195, *A. s. velox*, Sand Point, Michigan; UMMZ 121529, *A. s. perobscurus*, Comox, Vancouver Island.

Bottom row, females; left to right: MCZ 169835, *A. s. chionogaster*, Cerro Cantoral, Honduras; LSU 14217, *A. s. madrensis*, Omilteme, Guerrero, México; LSU 10738, *A. striatus suttoni*; Llano de Coneja, San Luis Potosí; GMS 9679, *A. striatus suttoni* (topotype), Mesa de Chipinque, Nuevo León; UMMZ 114507, *A. s. velox*, Washtenaw County, Michigan.

for separating this form from *striatus* and its close relatives. Of the nine specimens of *chionogaster* which I have examined, three might be said to agree with Friedmann's description of the tail bars, five have the dark and light bars of nearly equal width, and one has the dark bars slightly narrower than the light ones. On the other hand, occasional examples of *velox* and *suttoni* have the dark and light tail bars approximately equal in width. It should also be noted that on the outer rectrices of all these forms the dark bars are much narrower than the light interspaces. Thus it will be seen that the character of the tail bars which is said to separate *chionogaster* from *velox* and *suttoni* is an average one and is not absolute as has heretofore been thought.

It is in the color and pattern of the underparts that the greatest amount of variation

is evident. Within a given population of *A. s. velox*, adults show a large amount of individual variation in the amount and intensity of rufous on the underparts. A thorough analysis of extensive series of specimens of breeding birds may prove that there is also a small amount of geographic variation in this character. On the other hand, the available material of Mexican Sharp-shinned Hawks indicates that in these birds there is considerable variation from one population to the next but relatively little variation within single populations. This is perhaps to be expected, since many of the breeding populations of these birds in México are small and discontinuous, and it is not illogical to assume that the color of the underparts is of less adaptive significance than size. In the birds from Tamaulipas and Nuevo León there is a considerable degree of sexual difference, the three adult males being darker and more solidly rufous below than the three females. This is well shown in figure 1. The three adult males and the one adult female from San Luis Potosí show little variation among themselves. All resemble the females from Nuevo León; and the males are, if anything, lighter than the female. The two adults from Guerrero have the breast and abdomen lightly washed with rufous and some of the feathers, especially those of the center of the abdomen, are faintly barred with pale rufous and white. The sides are more strongly washed with rufous. As in specimens of *velox* and *chionogaster*, skins of birds of the Mexican populations all have blackish shaft streaks on the throat and upper breast (more pronounced in the females), and the males are bluer above than the females.

In their first winter plumage, birds of the Mexican populations show a tendency to have paler and redder streaking on the underparts and more of a buffy wash on the whitish ground color. In these characters, however, they are matched by occasional individuals of *A. s. velox*. The immatures of *chionogaster* differ markedly from those of all of the more northern forms in being much more lightly streaked below (see figure 2).

The character by which specimens of the Mexican populations can best be separated from those of *velox* is the immaculate light rufous "flag" or shank feathers, which may or may not be narrowly tipped with whitish. This character appears valid for both adults and first-year birds. In specimens of *chionogaster*, the flags are washed with a very pale rufous and are unmarked. Adult Sharp-shins from southern Arizona tend to have two or three bars on some of the feathers of the flags and thus are intermediate between *suttoni* and *velox*. An adult female taken on March 21, 1948, 15 miles west of Quiroga, Michoacán, and an adult male taken on December 29, 1929, at Tesia, Sonora, also appear to be intergrades and may both be birds taken away from the breeding grounds. Two immatures taken in July, 1888, at Bravo, Chihuahua, and a third taken in July, 1905, at "Pachaco," Chihuahua, are all indistinguishable from *velox*, as is an immature female taken at Tesia, Sonora, on March 23, 1930. I have referred these to *velox* tentatively, although it is possible that in the region of intergradation between *velox* and *suttoni*, the young may resemble the former and the adults, the latter race.

Because of the scarcity of specimens of *A. striatus suttoni* in museums, a comparison of the type with the color plate of it which appeared with the original description (van Rossem, 1939:127-128) is desirable. The type specimen is much blacker above, especially on the head, than shows in the plate. The underparts are a colder cinnamon with much less yellow, and there are conspicuous, though fine, black shaft streaks on the feathers of the throat and upper breast. In the original painting, the eye color is noticeably less orange and more brown than it appears in the reproduction.

There appears to be considerable geographic variation in the color of the iris of adult Mexican Sharp-shins. The type and four topotypes of *suttoni* from Nuevo León had brown or brownish eyes. (Two adult males, iris "dark brown" and one, "dark brown

with faint reddish cast;" one adult female, iris "dark brown with reddish cast" and one, "dark brownish red.") Three adult males from San Luis Potosí had irides which were "ruby red" (2) or "reddish." Rather surprisingly, an adult male (labelled "♀" A.M.N.H. 105,303) from the Volcán de Nieve (= Nevada de Colima), Jalisco, has the "eyes, sulphur;" and the five birds from Guerrero, two adults and three first-year birds, are

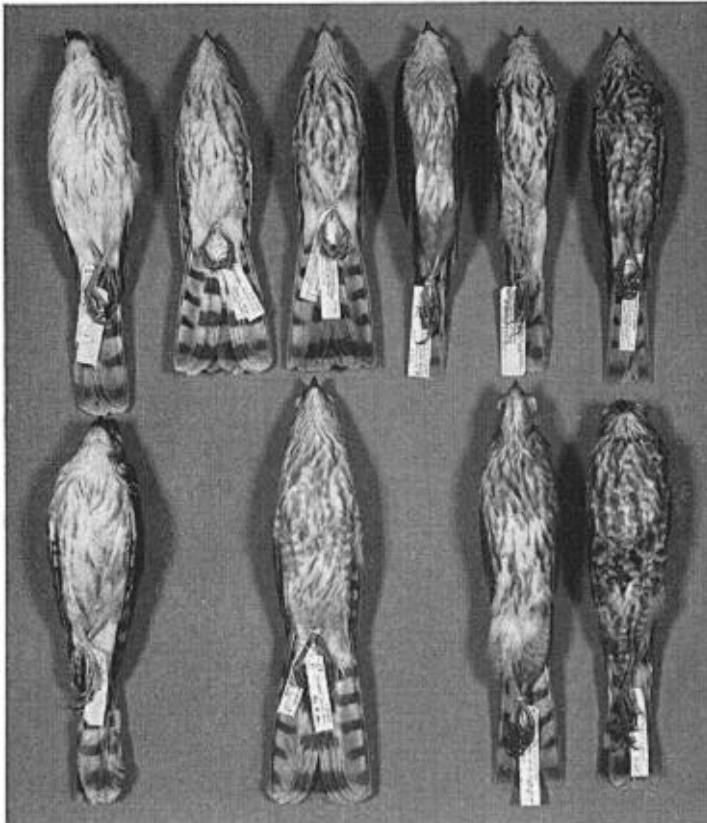


Fig. 2. Immatures of *Accipiter striatus*. Top row, males; left to right; MCZ 158083, *A. s. chionogaster*, El Derrumbo, Honduras (probably mis-sexed); MVZ 109340, *A. s. madrensis*, Cuapongo, Guerrero (labelled "♀"); MVZ 109342, *A. s. madrensis*, Cuapongo, Guerrero (labelled "♀"); LSU 14904, *A. striatus suttoni*, mt. just SE of Cañada Granada, San Luis Potosí; UMMZ 70980, *A. s. velox*, Muskegon County, Michigan; UMMZ 62426, *A. s. perobscurus*, Tillamook, Oregon.

Bottom row, females; left to right: MCZ 169836, *A. s. chionogaster*, La Laguna Cantoral, Honduras; MVZ 109343, *A. s. madrensis*, Chilpancingo, Guerrero; UMMZ 121548, *A. s. velox*, 1 mi. W Dexter, Michigan; UMMZ 62421, *A. s. perobscurus*, Cedar Hill, Vancouver Island.

all labelled as having "yellow" irides. Again, the irides of adult specimens of *chionogaster* have been variously described as "blood-red" for the male (Dickey and van Rossem, 1938:109; Friedmann, 1950:202) or "orange" for the female and "dark brown, like burnt sienna" for the male (Kaup, 1851:41).

The rather striking variation from one population to another in the colors of the underparts and of the irides contrasts sharply with the apparent lack of variation in

other characters within these groups. Quite possibly, these color characters are non-adaptive and hence subject to rapid change through the random fixation of different variations in the small isolated populations. On the other hand, size in predatory animals is an adaptive character; hence individuals of the same species living in areas which are similar as regards the available prey species and competing predators are probably subject to the same selective pressures in the control of their size.

Conclusions.—The distinctness of the Guerrero population warrants its description, and I hereby propose to call it

Accipiter striatus madrensis, new subspecies

Type.—No. 109341, Mus. Vert. Zool., adult male, taken at Cuapongo, Guerrero, Mexico, June 9, 1938, by W. W. Brown.

Diagnosis.—Adults similar to *Accipiter striatus suttoni* van Rossem, but much paler below. Underparts whitish, washed and faintly marked with pale rufous. Feathers of the sides and tibiae light rufous, unmarked. According to the collector, the iris is yellow. The first-year birds may have on the average paler streaks on the underparts than the young of *suttoni* (see figure 2), but even the limited material available indicates that there is considerable overlap between these two races in this character.

Range.—Known only from the Sierra Madre del Sur of Guerrero (specimens recorded from Chilpancingo, Cuapongo, and Omilteme); however, on geographic grounds, it might be expected to occur in Oaxaca west of the Isthmus of Tehuantepec.

A. striatus suttoni is found as a breeding bird in suitable areas throughout México north of the Rio Balsas and excluding Baja California. Birds from southern Arizona and New Mexico and from Chihuahua and Sonora appear to be intergrades with *velox*. To the south, *suttoni* may intergrade with *madrensis*, but the only evidence of this is the yellow-eyed adult male from the Nevada de Colima, Jalisco. In the color of the underparts, however, this bird is close to toptotypical material of *suttoni* and must be referred to that race. Intergrades might be expected to occur in the Sierra de Coalcomán in Michoacán, but I failed to find the species in my brief stay there in 1950. In addition to the specimens which I have examined, specimens of *suttoni* have been recorded from Coahuila and Veracruz by Friedmann, Griscom, and Moore (1950:42).

According to van Rossem (1939:128), Lesson described *Nisus pacificus* from the "area from Acapulco, Guerrero, Mexico, to California." Since van Rossem states further that "*pacificus* . . . relates to a bird definitely banded on the 'breast, sides and belly,'" this name must apply the North American form *velox*, which is not rare in the lowlands near Acapulco in winter. To date, we have no evidence that *madrensis* ever leaves its montane habitat.

The form *chionogaster* is the southern representative of the continental North American forms of *Accipiter striatus* (*perobscurus*, *velox*, *suttoni*, and *madrensis*), and its breeding range is separated from that of *madrensis*, the southernmost of these races, by the Isthmus of Tehuantepec. In the color of the upperparts and in the pale streaking of the young, *chionogaster* is distinct from the North American forms. In the relative widths of the tail bars and in size, it intergrades with these forms. Although there is as yet no evidence of gene flow in the opposite direction, the paleness of the underparts of *madrensis* suggests that there has been an influx of genes from *chionogaster* into that population. In the light of this evidence, it seems best to consider *chionogaster* conspecific with *striatus*, and since *chionogaster* has been considered conspecific with the South American forms, *erythronemius*, *salvini*, and *ventralis*, these also become subspecies of *striatus*. Therefore, I propose that the forms of *Accipiter striatus* stand as follows:

- Accipiter striatus perobscurus* Snyder
- Accipiter striatus velox* (Wilson)

Accipiter striatus suttoni van Rossem
Accipiter striatus madrensis Storer
Accipiter striatus chionogaster Kaup
Accipiter striatus salvini (Ridgway)¹
Accipiter striatus ventralis Sclater
Accipiter striatus erythronemius Kaup
Accipiter striatus striatus Vieillot
Accipiter striatus fringilloides Vigors
Accipiter striatus venator Wetmore

¹ I am not prepared to discuss the validity of *salvini*, which has been accepted by Peters (1931:221) but synonymized with *ventralis* by Hellmayr and Conover (1949:75-77). In making the above arrangement, I have departed from the usual placement of the West Indian forms (*striatus*, *fringilloides*, and *venator*) between *suttoni* and *chionogaster* for two reasons: *madrensis* forms a natural link between these two forms; and since the West Indian forms resemble *erythronemius* in the barring of their underparts, it is possible that they may be more closely related to the South American forms than to those of North America.

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