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A REVISION OF THE MASCARENE WHITE-EYE,
ZOSTEROPS BORBONICA (AVES)

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IN THE course of field work on the island of Reunion (Fig. 1) (Indian Ocean) in the fall of 1964, we found that the well-known color variation of the "Oiseau-blanc" (*Zosterops borbonica*) on that island follows a geographic pattern, there being no fewer than four well-marked subspecies, two in the highlands and two in the lowlands. One of the former, a gray-backed, gray-flanked form, is found in the highland heaths and savannas, and the other, which has warm brown flanks and breast and a brownish back, is found in the wet upland forests. Of the two lowland forms, one, a bird with gray crown and nape, brownish back, and warm brown flanks, is found on the wet, northern side of the island, and the other, brownish on the flanks and upper parts, is found on the dry lowlands on the southern side of the island. In all forms the males average slightly larger than the females, but there are no sexual differences in color. The upland birds average somewhat larger than the lowland ones (Table 1), and there appear to be other average differences in size between the races. Color, however, is the best means of distinguishing these subspecies.

Elsewhere, the species is known only on Mauritius, where a gray-backed, brown-flanked subspecies occurs.

The names which appear to be available for two of these forms are *Motacilla borbonica* Gmelin (1789, Syst. Nat., vol. i, p. 981) and *Zosterops E. Newtoni* Hartlaub (1877, Vögel Madagascars, pp. 97-98). Gmelin's name is based primarily on Brisson's *Ficedula borbonica* (1760, Orn., vol. iii, p. 510, pl. 28, fig. 3), the description of which reads "Ficedula superne griseo-fusca, inferne sordide cinereo-albo-flavicans; reatricibus fuscis, oris exterioribus griseo-fuscis." Neither this description nor Brisson's figure is identifiable to species, although the description fits the present species better than any other native bird of Re-

union. The "griseo-fusca" of the upper parts is translated "gris-brun" in Brisson's description in French, and the rump ("crupion") is said to be this color also. (The white rump characteristic of this species is not mentioned in early accounts, possibly because these feathers were lost either in the catching or skinning process.) Brisson specifically stated that the upper parts of the head, neck, back, and rump are gray-brown, a description which could apply to at least some examples of three of the subspecies, but not the gray-headed, brownish-backed birds of the northern lowlands unless badly soiled or foxed. Gmelin also used Buffon (1786, *Hist. Nat. Ois.*, 5:280) and D'Aubenton's *Planches Enluminees* (no. 705, fig. 2) as sources of his description. Of these, the plate shows a bird most like the warm brown bird of the upland forests, but not certainly distinguishable from the dry lowland population.

Pollen and van Dam (1868, *Faun. Madag., Ois.*, p. 74) appear to be the first to point out variation within this species, describing birds resembling the two highland forms and the gray-headed, brown-flanked bird of the wet lowlands. They stated that the color of this species is more or less subject to individual variation, but not sexual variation.

Hartlaub (*op. cit.*: 95) restricted the name *borbonica* to the gray-headed, brown-flanked population and described (pp. 97-98) as *Zosterops E. Newtoni* [*sic*] both of the two upland types, the gray one first, as the probable male, and the rich brown one as the probable female.

Brisson's description was based on a bird from the Réaumur Collection. Christian Jouanin, who kindly looked into the matter for us, wrote that this specimen is no longer extant. In the absence of a type specimen, we prefer to follow Hartlaub in assigning the name "*borbonica*" to the form of the lowlands on the north side of the island. We do this because, being common in the capital, St. Denis, it is the form most likely to be encountered by a visitor to the island and because the discrepancy between the birds and the inadequate original description could easily have resulted from soiling of the type.

The cotypes of *E. Newtoni* also appear to be lost. Mrs. Susan Hubbard kindly looked for them in the Cambridge Museum, where she could find no specimens of this form and none listed in the catalogue of the Newton Collection. In order to fix the name, we hereby restrict it to the gray bird, the first described under the name. Hartlaub gave only "Bourbon" (= Réunion) as the type locality. Because gray birds are occasionally found within the range of the warm brown upland form, we restrict the type locality to Nez de Boeuf, 5 kilometers east of le Vingt-Septième, 2100 meters elevation, a locality well within the range of the gray race.

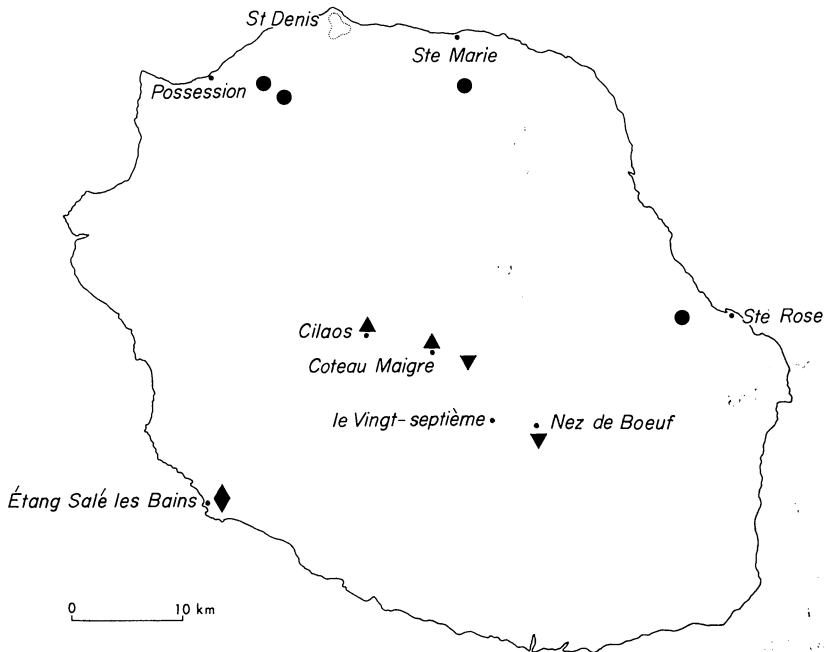


FIG. 1. Map of Reunion Island showing localities from which specimens of *Zosterops borbonica* were examined. Solid circles, *borbonica*; diamonds, *xerophila*; triangles, *alopekion*; and inverted triangles, *edwardnewtoni*.

The orthography of this name as originated by Hartlaub is currently incorrect under the present rules. Dr. Ernst Mayr writes us that as “the letter ‘E’ in *Zosterops E. Newtoni* is not ‘a Latin letter used to denote a character of the taxon’ (Article 26c) one is almost forced to assume that it should be spelt out as is demanded for numerals in Article 26b.” We therefore emend it to *edwardnewtoni*.

The five forms should therefore stand as follows:

Zosterops borbonica borbonica (Gmelin)

Motacilla borbonica Gmelin, Syst. Nat., vol. 1, p. 981, 1789 (“insulis Bourbon et Madagascar”).

CHARACTERS.—Above, the light gray (Neutral Grey¹) of the head and nape contrasts with the gray-brown (Saccardo’s Umber) of the back. The throat and upper breast are grayish white (Light Brownish Olive or

¹Capitalized colors are those of Ridgway, Color Standards and Color Nomenclature, 1912.

Pale Smoke Grey to Light Gull Grey) without the creamy wash characteristic of the next subspecies. The brownish flanks vary from Tawny Olive to Sayal Brown.

RANGE.—The slopes of the northern side of Réunion from sea level to at least 1100 meters elevation. Specimens examined from 4.6 kilometers S of Ste. Marie, 360 meters (9); 6 km. E of La Possession, 634 meters (6); 4 km. W of Ste. Rose, near sea level (1); and 8 km. SSW of St. Denis, 1100 meters (1).

REMARKS.—The single specimens from 4 km. W of Ste. Rose and from 8 km. SSW of St. Denis approach specimens from the south side of the island in the color of the crown and nape, but they do not have the creamy wash on the under parts characteristic of birds from Étang Salé les Bains.

Zosterops borbonica xerophila new subspecies

CHARACTERS.—Upper parts uniform grayish brown (Light Brownish Olive); under parts grayish white (Pale Olive Grey) with a light creamy wash (near Ivory Yellow), which is strongest on the abdomen; flanks brownish (Tawny Olive). Differs from *borbonica* in its brownish crown and nape, creamy wash on the under parts, and duller brown flanks.

TYPE.—U. S. National Museum No. 486,226, male, from Étang Salé les Bains, sea level, Ile de La Réunion, 18 November 1964, collected by Frank B. Gill, no. GI-926 (skull ossified, testes 6×4 mm., weight 6.8 grams). Wing, 55; tail, 39.5; tarsus, 18.5; culmen, 12; bill from nostril, 7.0 mm.

RANGE.—Known from only 7 specimens taken at Étang Salé les Bains, but presumably occurs over much of the lowlands on the dry south side.

REMARKS.—The single specimens from 4 km. W of Ste. Rose and from 8 km. SSW of St. Denis approach examples of this race in the color of the upper parts but do not have the creamy wash on the under parts. The subspecific name alludes to the bird's arid habitat.

Zosterops borbonica edwardnewtoni Hartlaub

Zosterops E. Newtoni Hartlaub, Vögel Madagascars, 1877, pp. 97–98 ("Bourbon"), part ("1").

CHARACTERS.—Crown, nape, and back uniformly gray (Deep Mouse Grey); breast lighter, shading to whitish on the chin and slightly paler gray on the abdomen; flanks gray or tinged with brownish.

TYPE LOCALITY.—Here restricted to Nez de Boeuf, 5 kilometers east of le Vingt-Septième, 2100 meters elevation.

RANGE.—The high heaths and savannas of the interior of the island (above 1500 meters), extending into some of the wet forested slopes of the inland ravines. Specimens examined from Nez de Boeuf (12); Pon de Sable, 6 km. ENE of le Vingt-Septième, 2100 meters elevation (2); and 6 km. NNW of le Vingt-Septième, 1600 meters elevation (6).

REMARKS.—Two specimens from Nez de Boeuf, an adult male and an immature female, are intermediate between this subspecies and the next in both the color of the back and that of the under parts. The intermediacy of these birds and the pale brownish wash on the flanks of several other specimens indicate introgression with the next form.

***Zosterops borbonica alopekion* new subspecies**

Zosterops E. Newtoni Hartraub, Vögel Madagascars, 1877, pp. 97–98 (“Bourbon”), part (“2”).

CHARACTERS.—Uniformly grayish brown above (Saccardo’s UMBER), averaging somewhat darker and richer brown than *xerophila*; below extensively warm brown (Tawny Olive) on flanks, breast, and lower throat, leaving only the chin and center of the abdomen light gray.

TYPE.—U. S. National Museum No. 486,227, female, from one km. N of Cilaos, 1500 meters elevation, Ile de La Réunion, 20 November 1964, collected by Frank B. Gill, no. GI-978 (skull ossified; ovary 5 mm., 2 collapsed follicles, brood patch; weight, 8.8 grams). Wing, 56; tail, 41; tarsus, 19.3; culmen, 14; bill from nostril, 6.9 mm.

RANGE.—Known only from near Cilaos and from a series purchased from a native bird catcher and said to have come from Coteau Maigre, approximately 5 km. E of Cilaos.

REMARKS.—Of twelve specimens taken near Cilaos, nine are as described above, two answer the description of *edwardnewtoni*, and one is intermediate, having a gray back but nearly as much warm brown on the under parts as typical *alopekion*. Of the ten birds from Coteau Maigre, all are extensively warm brown above and below, but one shows a reduction of brown on the breast. The existence of occasional gray individuals and one intermediate in the Cilaos population suggests that some mixing of the populations occurs in this region.

The name *alopekion* comes from the Greek for little fox and is an allusion to the reddish brown color of the birds.

***Zosterops borbonica mauritiana* (Gmelin)**

Motacilla mauritiana Gmelin, Syst. Nat., vol. 1, p. 981, 1789 (“in insula Francia”).

CHARACTERS.—Upper parts, except rump, light gray (Neutral Grey); flanks pinkish brown (Avellaneous); throat and upper breast white, shading to very pale gray on the lower breast.

TABLE 1
MEASUREMENTS (IN MILLIMETERS) AND WEIGHTS (IN GRAMS) OF THE SUBSPECIES OF *Zosterops borbonica*

	<i>borbonica</i>	<i>xerophila</i>	<i>alopekion</i>	<i>edwardnewtoni</i>	<i>mauritiana</i>
	12	5	12	12	9
Number					
Wing (arc)	52.0-57.0 (54.0)	54.5-56.0 (55.2)	53.0-60.0 (57.0)	55.5-60.0- (57.7) ¹	52.0-57.5 (55.7)
Tail	39.0-42.0 (40.5)	39.5-43.0 (40.7)	41.0-45.5 (42.6) ²	42.0-45.0 (43.1) ¹	37.0-43.0 (40.4)
Tarsus	17.6-19.6 (18.7)	18.4-19.5 (18.7)	18.8-20.1 (19.6)	19.3-21.1 (20.4)	17.0-18.3 (17.6)
Culmen	13.5-15.0 (14.1)	12.0-13.0 (12.8)	13.0-15.0 (14.0) ¹	12.8-14.1 (13.6)	12.0-13.9 (13.0)
Bill from nostril	6.9- 7.4 (7.1)	6.5- 7.0 (6.7)	6.7- 7.5 (7.1) ¹	6.5- 7.1 (6.8)	6.6- 7.8 (7.1)
Weight	7.5- 8.7 (8.2) ¹	6.8- 7.8 (7.4)	7.8- 9.0 (8.5) ³	7.4-10.0 (8.5)	7.6- 9.2 (8.3)
			Males		
			12		
Number					
Wing (arc)	5	2	10	9	4
Wing (arc)	52.0-54.0 (53.6)	53.0-54.5 (53.8)	51.0-58.0 (55.6)	54.0-59.0 (56.1) ⁶	53.5-56.0 (54.9)
Tail	39.5-41.0 (40.3) ⁴	39.0-39.0 (39.0)	39.0-45.0 (41.6) ⁵	39.0-44.0 (41.2) ⁶	40.0-41.0 (40.5) ⁷
Tarsus	17.1-19.2 (18.2)	17.9-18.1 (18.0)	18.9-20.7 (19.6)	19.2-22.5 (20.2)	17.5-17.9 (17.7)
Culmen	13.0-14.0 (13.8)	13.0-13.0 (13.0)	13.0-14.0 (13.9)	12.8-14.0 (13.5)	13.4-13.6 (13.5)
Bill from nostril	6.9- 7.5 (7.2)	6.5- 6.7 (6.6)	6.5- 7.8 (6.9)	6.6- 7.6 (7.1)	6.8- 7.4 (7.2)
Weight	7.3- 8.5 (7.9)	8.1- 8.3 (8.2)	8.5-10.1 (9.4) ³	7.6-11.0 (8.8)	7.8- 8.4 (8.0)
			Females		
			10		

¹ 11 specimens

⁴ 4 specimens

² 10 specimens

⁵ 9 specimens

³ 6 specimens

⁶ 8 specimens

⁷ 3 specimens

RANGE.—Found nearly throughout the island of Mauritius. Specimens examined from near the Macabe Forest (3), Bel Ombre, Savanne District (3), Plaine Champagne, Savanne District (2), and Rivière de Rempart District (5).

REMARKS.—Our thirteen specimens from various localities on Mauritius show little variation in color, aside from the intensity of the shade on the flanks. Virtually the whole range in intensity is found in the sample from one population (the Rivière de Rempart District).

The presence of four morphologically distinct populations of a species of bird within as small a geographic area as Reunion Island (1000 square miles) is a most unusual occurrence. Similar situations are found more frequently in terrestrial mammals and reptiles, but the only comparable case in birds is that of the Song Sparrows (*Melospiza melodia*) in the San Francisco Bay region of California (Marshall, 1948, Condor, 50:193–215; 233–256). Because of the unusual nature of this case we have in preparation a second paper analyzing the situation in more detail and discussing its implications at greater length.

KEY TO THE SUBSPECIES OF *Zosterops borbonica*

1. Top of head and nape gray, back brown *borbonica*
 Top of head, nape, and back concolor 2
2. Upper parts gray 3
 Upper parts brown 4
3. Throat and upper breast white, flanks pinkish brown *mauritiana*
 Under parts gray (flanks occasionally tinged with brownish) *edwardnewtoni*
4. Breast largely reddish brown *alopekion*
 Breast grayish white with creamy wash *xerophila*

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