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Notes About the Distribution of *Pauxi pauxi* and *Aburria aburri* in Venezuela

José L. Silva[1,2]

ABSTRACT.—In this paper I review the current distribution of the Northern Helmeted Curassow (*Pauxi pauxi*) and the Wattled Guan (*Aburria aburri*) in Venezuela. The historical range of *P. pauxi* was reduced as a result of human population growth and habitat perturbations. The current distribution corresponds principally with 18 national parks located from the northern coastal mountains of central Venezuela to the Andes Cordillera and Sierra de Perijá. *Pauxi pauxi* was recorded only in three localities outside national parks and may have expanded from its historical distribution in the eastern part of the country. *Aburria aburri* was recorded in Sierra de Perijá and western Mérida to southern Táchira, including four new localities; three in national parks. Both species are endangered in Venezuela and their survival will depend on environmental education programs and enforcement of the law. *Received 9 Feb. 1998, accepted 20 July 1999.*

[1] NYZS The Wildlife Conservation Society, 185th & Southern Blvd., Bronx, New York 10460-1099.

[2] Current address: Univ. of Florida, Wildlife Ecology and Conservation Dept., P.O. Box 110430, 303 Newins—Ziegler Hall, Gainesville, FL 32611-0430; E-mail: joselugo@ufl.edu

The Wildlife Conservation Society of the New York Zoological Society funded a study on human impacts on game species in protected areas of Venezuela from 1985 to 1990 (Silva and Strahl 1991, 1994, 1996, 1997). During 1985–1996, censuses and interviews were conducted and new data about the distribution of *Pauxi pauxi* (Northern Helmeted Curassow) and *Aburria aburri* (Wattled Guan) were collected. My objective in this paper is to present these data and review the status of *P. pauxi* and *A. aburri* in Venezuela.

In Venezuela *Pauxi pauxi* ranges from the northern coastal mountains of central Venezuela to the Andes Cordillera and Sierra de Perijá in rain forest and cloud forest. Most authors (Wetmore and Phelps 1943; Phelps and Phelps 1958, 1962; Delacour and Amadon 1973; Meyer de Schauensee and Phelps 1978; Collar et al. 1992; Rodriguez and Rojas-Suarez 1995) cited the states and localities of the historical range as follows: *P. p. pauxi*: southern Miranda state in Cerro Negro (Guatopo National Park); north Caracas in El Calvario; Distrito Federal; coastal mountains in Aragua state (Henri Pittier National Park); Carabobo state in Valencia, San Esteban, and Montalbán; east Falcón to Yaracuy state in Tucacas, Nirgua, mountains inland from Aroa, and Lagunita de Aroa; Lara state in Cubiro, and Yacambú National Park; from northern Mérida to southern Táchira state in Montaña de Limones, La Azulita, and Burgua. *Pauxi p. gilliardi*: Zulia state from southern Sierra de Perijá (Sierra de los Motilones) to southern Rio Tucuco, in Fila Macoíta, Campamento Avispa, Cerro Yin-taina, upper Río Negro, and La Sabana. A continuous distribution in the historical range was assumed (Fig. 1A) because of historical records, and Central Cordillera and Los Andes Cordillera were almost a continuous forest in the past.

The habitat available for *P. pauxi* has been greatly reduced as a result of deforestation, fragmentation, and habitat alteration. Almost all the remnant forest available in northern Venezuela was decreed as national parks by the Venezuelan government. Consequently, these national parks are isolated. I found that the current distribution of *P. pauxi* mainly coincided with the distribution of national parks situated in its historical range (Fig. 1B), as well as new localities such as Sierra de San Luis, Cueva Quebrada del Toro, and Tirgua National Parks. Although it was reported in Morrocoy National Park (Collar et al. 1992, Wege and Long 1993), according to the rangers, it was no longer present in the park in 1996.

Pauxi pauxi is rare in national parks and almost extinct outside national parks because hunting pressure is highest outside the parks (Silva and Strahl 1991, 1996, 1997). The few locations where *P. pauxi* was found outside national parks included the Sanchón River Hydraulic Reserve (10° 24′ N, 68° 09′ W), the Cojedes River Protectoral High Basin (10° 24′ N, 68° 15′ W) and Finca El Jaguar (10° 26′ N, 68° 59′ W).

From interviews with hunters I found that *P. pauxi* probably existed or may still live in eastern Venezuela. A hunter in Teresén (Monagas State) narrated the size, color pattern, and helmeted color of this species, and imitated its booming song. He recognized the bird from a set of cracid pictures. *Pauxi pauxi* was seen in La Hormiga (9° 54′ N, 62° 58′ W), Caño Payanuco, Guarapiche Forest Reserve (Sucre and Monagas States) between 1968 and 1973. Because only 1 of 25 interviewed hunters in Teresén saw a *P. pauxi,* and saw it only once, this should not be interpreted as range extension. The nearest locality of the historical distribution (Guatopo National Park) is approximately 405 km from Guarapiche Forest Reserve, and this separation is settled with towns and cities. More likely the former distribution record was incomplete. *Pauxi pauxi* is very likely to be extinct in Guarapiche because of high hunting pressure.

An interesting characteristic of *P. pauxi* is the brown phenotype that sometimes occurs in females. Males and females are typically black with a white belly. Hunters call the brown morph "Canaguey" or "Paují Amarillo." It was reported in the Sierra de Perijá, where two specimens were collected between 1941 and 1957 (Delacour and Amadon 1973). Here I report 26 new localities of the brown morph seen between 1949 and 1993 (Table 1). Of the 34 birds sighted, a single brown phenotype was seen with one black phenotype at Fila Real (1975), one with two black phenotypes at Casa de Tejas (1980), and one with seven black phenotypes at El Corazón (1988). Two brown phenotypes were seen with two

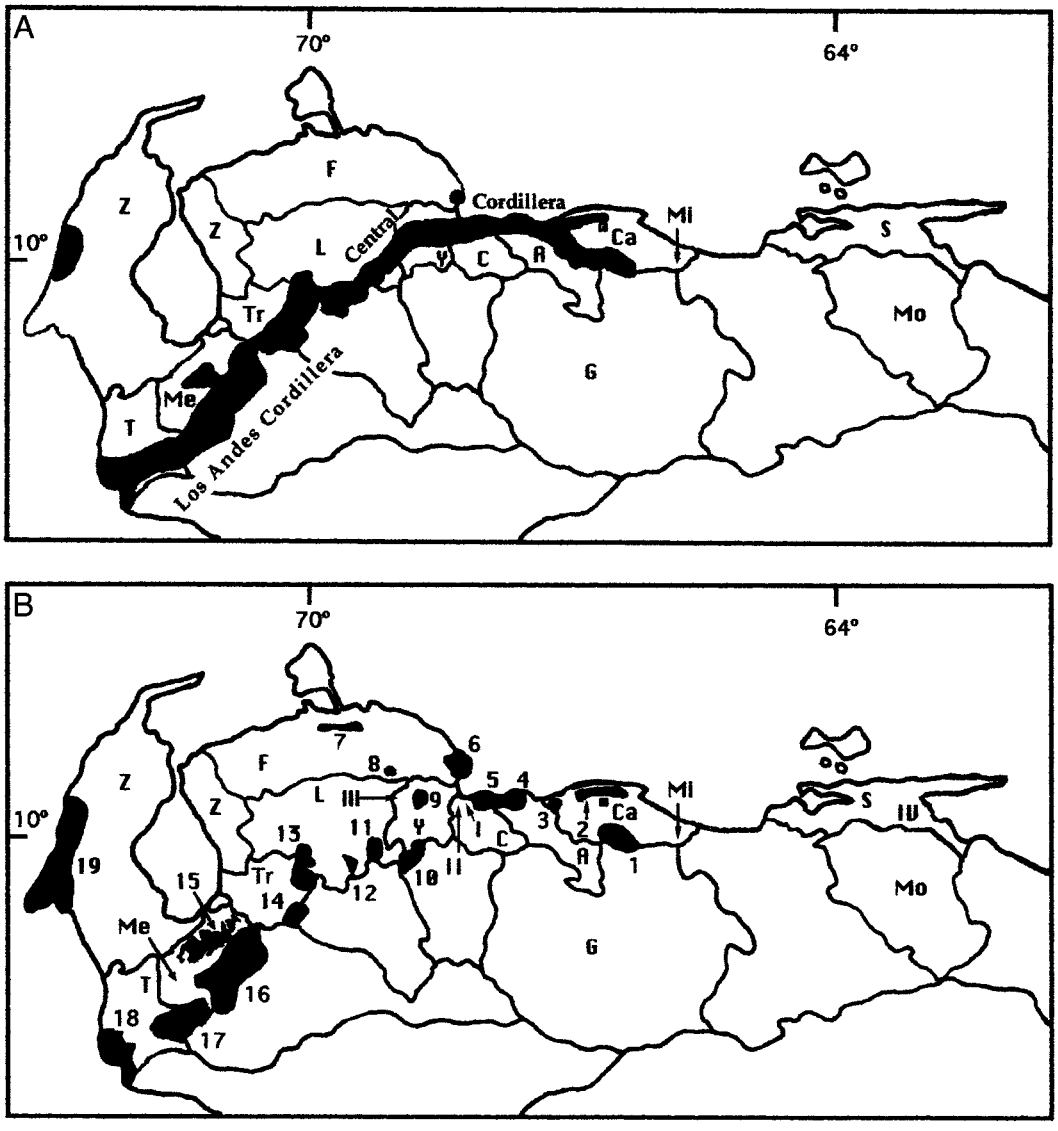

FIG. 1. A. Historical range of *Pauxi pauxi* according to Delacour and Amadon (1973), Meyer de Schauensee and Phelps (1978), Collar and coworkers (1992), and Rodriguez and Rojas-Suarez (1995). B. Current range of *Pauxi pauxi* in Venezuela. Boundaries of national parks are shown, but the species may not be distributed through the entire park. Numbers are national parks, Roman numerals are other localities, and letters are states with the exception of Caracas (Ca), the capital of Venezuela. Code: 1 = Guatopo (122,464 ha). 2 = El Avila (81,800 ha). 3 = Macarao (15,000 ha). 4 = Henri Pittier (107,800 ha). 5 = San Esteban (43,500 ha). 6 = Morrocoy (32,090 ha). 7 = Sierra de San Luis (20,000 ha). 8 = Cueva Quebrada del Toro (4,885 ha). 9 = Yurubí (23,670 ha). 10 = Tirgua. 11 = Terepaima (18,650 ha). 12 = Yacambú (14,580 ha). 13 = Dinira (42,000 ha). 14 = Guaramacal (21,000 ha). 15 = Sierra de La Culata (200,400 ha). 16 = Sierra Nevada (276,446 ha). 17 = Tapo—Caparo. 18 = El Tamá (109,000 ha). 19 = Sierra de Perijá (295,288 ha). I = Sanchón River Hidraulic Reserve (8,100 ha). II = Cojedes River Protectoral High Basin (276,000 ha). III = Finca El Jaguar (16,000 ha). IV = Guarapiche Forest Reserve (576,500 ha). Mo = Monagas. S = Sucre. G = Guárico. Mi = Miranda. Ca = Caracas. A = Aragua. C = Carabobo. Y = Yaracuy. F = Falcón. L = Lara. Tr = Trujillo. Me = Mérida. T = Táchira. Z = Zulia.

TABLE 1. Brown phenotype of *Pauxi pauxi* recorded in Venezuela.

Locality	Date	Location	Coordinates	*n*
Henri Pittier	1975	La Glorieta	10° 28′N 67° 45′W	1
Henri Pittier	03/1984	La Regresiva	10° 22′N 67° 44′W	1
Henri Pittier	1993	El Saltico	—[a]	2
Henri Pittier	1993	Los Riitos	—	2
San Esteban	1955	Burro Sin Cabezas	—	1
San Esteban	1960	Burro Sin Cabezas	—	1
San Esteban	1986–87	Flor Amarillo	—	1
San Esteban	1987	Flor Amarillo	—	1
San Esteban	07/1989	El Tanque	—	1
San Esteban	1991	San Felipe	—	1
San Esteban	?	El Dique	10° 18′N 67° 59′W	1
San Esteban	?	La Panta (Qda. Yaguas)	—	1
San Esteban	?	Ranchitos	—	2
San Esteban	?	La Manguera	—	2
Terepaima	1949	Los Portones	9° 52′N 69° 20′W	1
Terepaima	1975	Fila Real	9° 55′N 69° 16′W	1
Terepaima	04/1992	Fila Real	9° 53′N 69° 17′W	1
Yacambú	1979	El Blanquito, Qda. La Toma	9° 42′N 69° 34′W	1
Yacambú	1983	Barro Amarillo	—	1
Yacambú	1988	El Corazón	—	1
Yacambú	1988	La Cañada	—	1
Yacambú	06/1992	El Blanquito	9° 42′N 69° 34′W	1
Yacambú	?	La Escalera	9° 42′N 69° 30′W	1
Yacambú	?	La Postora	9° 41′N 69° 37′W	1
Yacambú	?	El Blanquito	9° 42′N 69° 34′W	1
Yacambú	?	Cerro Blanco	9° 37′N 69° 30′W	1
Sierra Nevada	?	Alto de la Aguada	8° 37′N 70° 40′W	1
Sierra Nevada	?	San Benito	8° 40′N 70° 37′W	1
Rio Sanchón	1980	La Cumbre del Cacho	—	1
Rio Sanchón	11/1980	Casa de Tejas	—	1

[a] Name of localities do not appear on maps because they are local names used by hunters and the exact locations are unknown.

black phenotypes at El Saltico and Los Riitos in 1993.

Aburria aburri was mainly recorded in the western part of Venezuela (Fig. 2). The historical range was reported to be in the Sierra de Perijá and west Mérida to southern Táchira in rain and cloud forest (Delacour and Amadon 1973, Meyer de Schauensee and Phelps 1978, Rodriguez and Rojas-Suarez 1995). The current distribution of *A. aburri* indicates that the record of the historical range may have been incomplete. *Aburria aburri* was recorded in Sierra Nevada National Park (54 interviewed hunters), in Terepaima National Park (observed), and in Yacambú National Park and the basin of Yacambú River (S. Boher, pers. comm., and 338 interviewed hunters). These were new distribution records, but they did not suggest an extension of the historical range because hunters over 60 years old hunted *A. aburri* since they were young. Perhaps, the historical range was continuous. Although Rodriguez and Rojas-Suarez (1995) stated that *A. aburri* probably was found in the eastern part of Costa Cordillera, they did not mention the source of their information.

The present status of *P. pauxi* and *A. aburri* is worrisome. According to the population censuses (Silva and Strahl 1991, 1997) and the interviews (Silva and Strahl 1996), *P. pauxi* and *A. aburri* have very low densities with *A. aburri* being more rare than *P. pauxi*. Both species were considered Endangered by the Cracid Specialist Group (Strahl et al. 1994) and by researchers of a recent study in Venezuela (Rodriguez and Rojas-Suarez 1995). Habitat destruction and illegal hunting are the principal causes of the decline in population of both species, and their conservation will rely on hunter education (Silva and Pel-

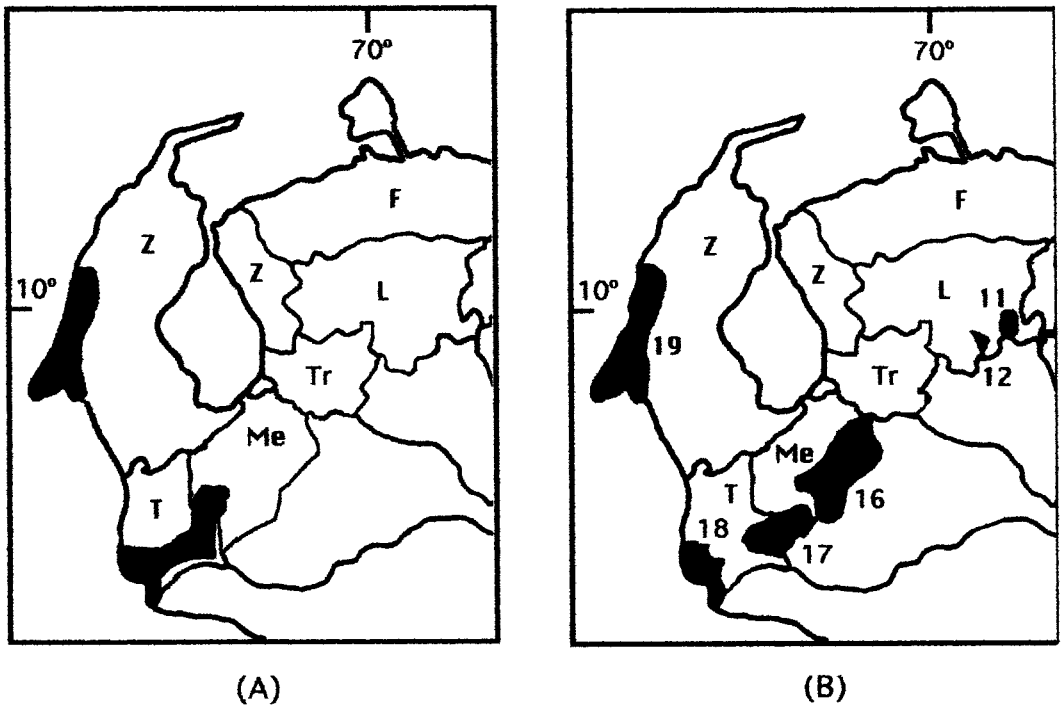

FIG. 2. Historical (A) and current distribution (B) of *Aburria aburri* in Venezuela. Abbreviations are the same as Fig. 1.

legrini 1996, Silva 1997) and enforcement of the law.

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Western Burrowing Owls in California Produce Second Broods of Chicks

Jennifer A. Gervais[1,2] and Daniel K. Rosenberg[1]

ABSTRACT.—We present the first evidence that western Burrowing Owls are capable of raising a second brood of chicks within a nesting season once their first brood successfully fledges. Two pairs of owls in central California known to have successfully fledged chicks from a first brood renested in 1998, with one pair producing five additional fledglings. *Received 29 March 1999, accepted 15 July 1999.*

Western Burrowing Owls (*Athene cunicularia*) are thought to be declining throughout much of their range (DeSante et al. 1997, James and Espie 1997). The potential causes of these declines vary with location, but likely include large-scale habitat destruction from farming or development, reductions in species such as ground squirrels that create the burrows that the owls use, and agricultural chemicals (James and Espie 1997, Gervais et al. in press). Because of the perceived threat to the viability of Burrowing Owl populations, the species has been listed as endangered, threatened, or of special management concern in a number of North American states and provinces (Haug et al. 1993).

Effective conservation at the species level requires understanding the population dynamics of the species in question, which in turn means accurate estimation of demographic parameters such as survival and reproductive rates. These can be used in simplified models that allow the examination of the effects of possible management actions or environmental perturbations on population persistence. Such an approach has recently been used for the northern Spotted Owl (*Strix occidentalis*; Noon and Biles 1990), and for predicting the effects of pesticide exposure on wildlife populations (Caswell 1996, Calow et al. 1997).

Simulations of generalized life history strategies have shown that for a species with relatively low adult survivorship and a short life span, reproductive success may be most influential in maintaining population viability (Emlen and Pikitch 1989). This is likely to be generally true for Burrowing Owls. They are capable of producing up to 12 eggs in a clutch (Haug et al. 1993), and we have observed up to 10 young fledged per nest in good reproductive years. In addition, Burrowing Owl annual adult survivorship appears to be quite low, with between-year return rates ranging from 33–58% (Haug et al. 1993), and a longevity record for a wild banded owl of 8 years and 8 months (Kennard 1975). If sensitivity analyses prove that the Burrowing Owl fits the predictions of the Emlen-Pikitch model (Emlen and Pikitch 1989) for a small, relatively short-lived species, then accurate assessment of reproductive potential of Burrowing Owls is essential to evaluating population processes.

Only Florida Burrowing Owls have been known to produce second broods within a season (Millsap and Bear 1990). We report two

[1] Oregon Cooperative Fish & Wildlife Research Unit, Dept. of Fisheries and Wildlife, Oregon State Univ., Corvallis, OR 97331.

[2] Corresponding author; E-mail: gervaisj@ucs.orst.edu