Condor, 82:344–345

ENORMOUS CONCENTRATION OF MARTINS (*PROGNE* SPP.) IN IQUITOS, PERU

DAVID C. OREN

Martins (*Progne* spp.) are known for their tendency to flock in enormous concentrations, a phenomenon that is well documented for the Purple Martin (*P. subis*; Allen and Nice 1952), and the Brown-chested Martin (*P. tapera*; Meyer de Schauensee and Phelps 1978). I give here the first such report for wintering Southern Martins (*P. modesta*), which have recently begun to roost in a concentration of up to 250,000 individuals in the Peruvian Amazon town of Iquitos. This flock includes Purple Martins, constituting approximately 5% of the total. This is the first record of the Purple Martin in Peru. During a visit (13–16 September 1978), I collected seven specimens (deposited at the Museu Goeldi in Belém, Brazil) and investigated the history of both species in the Iquitos region.

The birds roost in the Plaza de Armas, an isolated patch of grass and eugenia trees (*Eugenia malaccensis*, Myrtaceae) at one edge of the commercial district of the city, one block from the Rio Amazonas. Other species of swallows frequently choose small woods near water for roosting (Skutch 1960), and this site agrees with the usual preferred roosts of the family. The larger Plaza 28 de Julio, approximately 2 km from the Plaza de Armas, and 1 km from the river, is ignored by the birds.

The daily arrival of the birds in the evening is spectacular. The following is taken from my field notebook:

14 September 1978

"17:35 Approximately 500 martins catching insects in the air between the plaza and the middle of the river. Another 100 roosting on the façade of a six-story building at the northeastern side of the plaza.

"17:55 I hear the distant sound of thousands of high voices approaching. Dark birds appear from all directions at 50–100 m altitude. The birds steadily increase until the sky is darkened by their numbers, circling counter-clockwise in an enormous wheel. Just as the cathedral bell chimes 18:00, the first birds descend in a finger from the wheeling flock, continuing the circling motion as they approach the plaza. More follow and the spectacle resembles a virtual tornado of birds. The sound is continually louder. When the first birds reach the plaza, they brake their descent quickly as they settle on their roosts. The rest of the birds follow quickly and the plaza is full of martins in a few minutes.

"18:07 End of the arrival of the birds. Sunset."

The martins spend the night in the plaza and leave with the first light of dawn. When they are disturbed during the night, small flocks leave their perches, fly around the perimeter of the plaza, and return to the original perches. They roost on twigs, wires, and roofs and ledges of buildings.

The martins were unknown in Iquitos before 1976, when 300–600 spent three months in the plaza, arriving in April and leaving in July (Rogerio Castro, pers. comm.). In 1977 approximately 25,000 arrived in April and remained until the end of September or beginning of October. In April 1978 an estimated 250,000 individuals arrived over the course of a few days. All of these birds remained until the third week in August, when the flock was severely disturbed and more than half the birds died or left. During that week the mayor of the city had the trees in the plaza pruned of all their branches in an attempt to drive the martins away.

FIGURE 1. View of the Plaza de Armas in Iquitos, Peru, filled with martins at 05:50 on 15 September 1978. The trapeze-like structures were put up to replace the perches that were lost when the trees were trimmed.

Although many people in Iquitos like the martins and visit the plaza regularly to watch them arrive at dusk, others believe that the large concentration of dark birds is an omen of bad luck for the future of the city. The droppings produced by the birds require a daily cleaning of the plaza, and had partly defoliated the upper branches of the eugenias. Following the mayor's order, the trees were pruned around August 15. When the martins arrived to spend the night, their perches had disappeared. They circled around the plaza until they tired completely and fell from the sky, hitting vehicles, buildings and people. Thousands apparently died. The people of Iquitos ate many of the birds, and the martins even appeared for a short time on the menu of the city's Chinese restaurant.

Personnel from the Projecto Primates, headquartered in Iquitos, coordinated quickly with volunteers to replace the lost perches. Imitation trees of boards were erected and parallel ropes with sticks strung between them were slung from the bare trunks of the eugenia trees (Fig. 1). This construction took several days, and when completed, the number of martins had been reduced to the approximately 100,000 that I encountered.

In September approximately 80% of the martins were in female and juvenile plumage of *Progne modesta*. Another 5% were juvenile or female *P. subis*. The remaining 15% were adult males, but it is impos-

sible to say for sure what proportion belonged to each species, as the two species appear identical in the field. I speculate that all the adult males were *P. modesta*, because *P. subis* adult males would be expected to be in Central America or northern-most South America during this time. The adult male that I collected is definitely *P. modesta*. The single specimen of *P. subis* I collected is a juvenile male. First-year *P. subis* males normally do not breed (Allen and Nice 1952). It may be that all the *P. subis* in the Iquitos flock are such birds, which remain in South America rather than migrate north for a non-reproductive summer.

Despite the severe disruption in 1978, the birds returned in 1979 (McDowell 1979). The eugenias apparently regrew many of their branches and the artificial perches were removed.

ACKNOWLEDGMENTS

This report was made possible through the cooperation of the following people in Iquitos: R. Castro, G. Cetraro, P. Huijing, R. Ruiz, and L. Verdi; and through financial support from The Charles A. Lindbergh Fund, The Museum of Comparative Zoology (Cambridge, Mass.), and the National Geographic Society.

LITERATURE CITED

ALLEN, R. W., AND M. M. NICE. 1952. A study of the breeding biology of the Purple Martin (*Progne subis*). Am. Midl. Nat. 47:606–665.

MCDOWELL, E. 1979. Swallows jam Peruvian plaza. New York Times, July 17, 1979.

MEYER DE SCHAUENSEE, R., AND W. H. PHELPS, JR. 1978. A guide to the birds of Venezuela. Princeton University Press, Princeton, N.J.

SKUTCH, A. F. 1960. Life histories of Central American birds, II. Pac. Coast Avif. 34:1–573.

Department of Biology, Harvard University, Cambridge, Massachusetts 02138. Accepted for publication 4 February 1980.

Condor, 82:345–347

VARIATION IN *PEENT* CALLS OF AMERICAN WOODCOCK

DONALD W. THOMAS

AND

T. G. DILWORTH

Birds are capable of identifying conspecific individuals by their vocalizations in various contexts (e.g., neighbor/non-neighbor discrimination—Weeden and Falls 1959, Goldman 1973, Brooks and Falls 1975, Falls and Brooks 1975, Harris and Lemon 1976; mate recognition—Beer 1970; parent-offspring mutual recognition—Beer 1970, Evans 1970, Stevenson et al. 1970). The basis for individual recognition presumably lies in some combination of the frequency-time-amplitude patterns of the calls and/or in the individuality of the syllable sequences in complex vocalizations. Many species use simple calls of one or few syllables and in these the former is probably the most important. Studies of variation within and among individuals (e.g., Marler and Isaac 1960, Borror and Gunn 1965, Hutchinson et al. 1968, White and White 1970, White et al. 1970) have all shown that variation within individuals is lower than that among individuals, suggesting that researchers may be able to identify individuals through laboratory analysis of their calls. However, only two studies have successfully done this. White et al. (1970) used computer matching of the amplitude patterns of calls of Sandwich Terns (*Sterna sandvicensis*). Beightol and Samuel (1973) relied on two techniques involving visual matching of sound spectrograms of *peent* calls of American Woodcock (*Philohela minor*) and statistical analysis of five measured parameters. One of us (TGD) attempted to apply the latter approach of Beightol and Samuel to a field study of American Woodcock in Maine and New Brunswick and found the technique not always capable of separating individuals in this geographic region.

Our purposes in the current study were to examine intra- and inter-individual variation in *peent* calls of territorial male American Woodcock and to attempt to identify individuals on the basis of inherent components of the calls.

METHODS

We conducted this study from 22 April to 21 May 1974 near Hanwell (45°51′N, 66°42′W), 9 km southwest of Fredericton, New Brunswick. Each evening we recorded at least nine *peent* calls from each of one or more males using a 90-cm sound parabola and microphone (Grampian Reproducers, Feltham, Middlesex, England). We standardized the distance between the bird and the microphone (9 m) and maintained an obstacle-free sound path.

Eleven recordings of nine captured and marked males were used in the analyses. The recordings were processed using a model 7029 Kay sonagraph coupled with a model 6070A contour display unit (Kay Elemetric Co., Pine Brook, N.J.; wide band filter, FL-1 circuit, 80–8,000 Hz range). The contour display unit modifies the conventional sound spectrogram to portray amplitude in seven contour intervals (6 dB apart) descending from a standardized 42 dB. Such displays provide objective frequency-time-amplitude position markers for measurements. From each spectrogram we measured five parameters. Four of these were based on the 30 dB or second contour line: (1) maximum frequency; (2) minimum frequency; (3) frequency span; and (4) duration. The fifth parameter was a measure of the area enclosed by the 24 dB (third) contour. Measurements of the first four parameters were made from a plastic overlay grid and were accurate to 0.1 cm, representing 80 Hz on the frequency scale and 7 ms on the time scale. The area measurements were made with a planimeter accurate to 0.05 cm^2.

To calculate the intra- and inter-individual variation for each parameter, a matrix was constructed. Each row contained values for nine calls from one bird and, hence, each column contained one call from each of nine birds. We calculated the coefficients of variation for rows to estimate the intra-individual variation (V_{intra}) and for columns to estimate the inter-individual variation (V_{inter}). We subsequently calculated the coefficient of individuality ($I = \bar{V}_{intra}/\bar{V}_{inter}$; cf. Williams 1971) to provide a relative comparison of the two measures. Values of I approaching unity indicate a random