

some of the vocalizations of several species of *Parus*. In particular, there are resemblances among elements of the "sitchowee" of *P. sclateri*, "T-slink" of *P. carolinensis* (Smith 1972:24-26), "musical call" and components of the "trilled call" of *P. hudsonicus* (McLaren 1976), and one of the songs of the Plain Titmouse (Dixon 1969:Fig. 2a). A more general trait is the tendency for repetition of a syllable several times within an utterance, a pattern that Thielcke (1968) found characteristic of the organization of songs of many species of *Parus*. Such repetition is evident in *P. sclateri* in which the loudness of the songs and the pattern of boundary defense appear to parallel those of the Plain Titmouse (Dixon 1969). In both species loud song advertises the presence of males and serves for repelling intruders at a distance or for defending boundaries in close encounters. In the Black-capped Chickadee, song is less readily located (Ficken et al. 1978:44) and territories are not proclaimed regularly (Brewer 1961:355). Furthermore, the boundaries shrink as the breeding cycle advances (Stefanski 1967). From the structural features of the songs of the Mexican Chickadee and the manner of response of the males to their neighbors' singing, we infer in this species a system in which territorial boundaries are more precise than those of the Black-capped Chickadee, and are maintained by repeated signalling from a distance rather than by recurring skirmishes.

SUMMARY

Vocalizations of Mexican Chickadees, tape-recorded in the Chiricahua Mountains, Arizona, are described with the aid of audiospectrograms. The "chickadee dee" call is characterized by buzzy introductory notes, and the energy in the "dee" notes is not concentrated in distinct bands. Several signals exchanged by breeding males consist of repetitions of complex syllables. The same utterances that attract rivals to a common boundary are used in the skirmishes that follow, and one also in dawn singing. Accordingly, these are considered the territorial advertising songs of this species. Thus the pattern of singing in the maintenance of territories differs from that of the other gray-backed North American chickadees in which a "whistled" song attracts neighbors to boundaries but more complex vocalizations are delivered in the subsequent encounters. A "whistled" song has not been confirmed in the Mexican Chickadee.

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INCIDENCE OF DISTRESS CALLS IN MIST-NETTED BIRDS

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In most species of passerine birds some individuals give distress calls when captured by a predator or when handled by a human in a mist net. Distress vocal-

izations are distinct from the mobbing and alarm calls of free birds, being typically harsh and easily located (Stefanski and Falls 1972). The percentage of individuals that call differs widely among species (Norris and Stamm 1965, Rohwer et al. 1976, Balph 1977, Perrone, in press). We asked whether this percentage also differs between samples of a single species when handled by different observers.

We analyzed the behavior of mist-netted birds at Finca Las Cruces (1,300 m elevation), 6 km south of San Vito, Puntarenas Province, Costa Rica. Sebastian Patti worked in late February and Andrea Meyer continued at the same place from 18 March-11 April 1975. These are dry-season dates, when breeding is minimal.

TABLE 1. Incidence of distress calls in species handled separately by two workers.

Species	Handler A		Handler B	
	N	% callers	N	% callers
White-ruffed Manakin <i>Corapipo altera</i>	6	0	23	0
Bicolored Antbird <i>Gymnopithys leucaspis</i>	6	100	8	50
White-breasted Wood-Wren <i>Henicorhina leucosticta</i>	6	100	6	33
Silver-throated Tanager <i>Tangara icterocephala</i>	11	74	6	0

Birds were captured and subsequently released. They were considered callers if they gave a distress call as the handler approached the net, during removal from the net or during handling afterwards.

Four species yielded samples large enough for statistical comparisons among handlers (Table 1). In these species the percentage of birds that called was highly significantly affected by who handled each bird (the appropriate contrast in a 3-way G-test of independence [Sokal and Rohlf 1969], $G = 23.504$, $P < .005$). Presumably the differences in caller percentages occurred because the workers handled birds differently. We do not know what kinds of handling differences occurred. They may have included length of time in the net, duration of handling, position of birds during handling or gentleness of handling.

The handler effect emerges as an influence on the incidence of distress calls by netted birds. Of 26 species with samples of 4 or more handled by Meyer, Patti and the authors in Costa Rica, 9 (35%) called with a frequency of 26–75% and should be classified as "intermediate." In the study by Rohwer et al. (1976), 9 of 29 species (31%) would be similarly classified. Clearly this category may be a result of the differences between handlers discussed herein.

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THE RELATIONSHIP BETWEEN HABITAT AND SONG IN THE WHITE-THROATED SPARROW

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Habitat acoustics have played an important role in the evolution of long-distance avian vocalizations (Ficken and Ficken 1963, Morton 1970, 1975, Chappuis 1971, Jilka and Leisler 1974, Marten and Marler 1977, Marten et al. 1977). In tropical forested environments songs tend to be lower pitched, span a narrower range of frequencies, and to be more tonal than songs given by birds of open fields (Morton 1970, 1975, Chappuis 1971). Morton was able to predict these results from sound propagation tests he made in forest and grassland in Panama.

Recently, Marten and Marler (1977) tested sound attenuation in various temperate zone habitats. They found that the height from which a vocalization is given,

Recognition of the handler effect demands that workers standardize their methods before comparing or combining results. The incidence of calling may be as much a result of the method of handling as it is a characteristic of the species. Future examination of distress-call behavior should involve observations of captures by a variety of natural predators, each of which may handle birds differently and elicit a different response. The reasons why some individuals of some species call and others do not are still obscure.

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en, the frequency (Hz) of the signal, and the habitat affect sound transmission. Upon close examination of their results, one can predict that birds living in a forested temperate zone environment are more likely to sing lower frequency songs than conspecifics residing in a field.

In Danbury and Wilnot counties, New Hampshire, White-throated Sparrows (*Zonotrichia albicollis*) breed in fairly homogeneous habitats which are in various stages of forest regeneration. In this paper I investigate intraspecific differences in songs associated with these habitats, and test the prediction that birds living in forests sing lower frequency songs than those living in fields.

MATERIALS AND METHODS

Male White-throated Sparrows sing songs of only one, or occasionally two, patterns. From 1973 to 1976, using a Uher 4000 Report-L tape recorder and a Dan Gibson (model P-200) parabolic microphone, I recorded 146 song patterns from 141 White-throated Sparrows (five birds sang two patterns). I base my results on this sample, disregarding the problem of more than one pattern