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## On the Use of Tape Recorders in Avifaunal Surveys

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The utility of tape recorders and tape playbacks for censusing birds is widely recognized (Johnson et al. 1981), but little emphasis has been placed on their importance in faunal surveys. Tape recorders are indispensable for finding rare, secretive, or patchily distributed species, and for documenting the composition of mixed-species flocks in forest canopy. Awareness of vocal differences in the field and taping has led to the discovery of several taxa new to science (Parker and O'Neill 1985, Parker and Schulenberg MS), and to the recognition of numerous species previously considered subspecies (Lanyon 1967, 1978; Pierpont and Fitzpatrick 1983).

One person equipped with a tape recorder and directional microphone can document a surprisingly high percentage of a tropical forest avifauna within 4-7 days during the proper season. Without tape recorders, several weeks (or even months) are required to locate most of the resident bird species in any lowland Amazonian locality, and such an effort would involve a large number of experienced observers using the best optical equipment and many mist nets.

On a recent Louisiana State University Museum of Zoology (LSUMZ) expedition to the Department of Pando in Amazonian Bolivia (Parker and Remsen 1987), I tape-recorded 243 species found within an area ca. 2 km<sup>2</sup> of upland rain forest in only seven days. The "final" list of forest birds for the same area, after 54 days of intensive fieldwork (including 36,804 mist-net hours) by seven experienced ornithologists, included 287 species. I tape-recorded 85% of the avifauna in just one week. Ten of the species that I missed altogether were almost certainly visitors to the site, and most of the other species not found were those typically missed during brief surveys of rain forests, such as forest raptors and canopy hummingbirds.

In an age when few ornithologists collect specimens, taping is the quickest and most practical way to build an inventory of a diverse avifauna. Locality

lists based only on sight records should be viewed with some skepticism (and are likely to be far from complete). I urge conservation organizations that fund avifaunal surveys in tropical forests around the world to require their recipients to use tape recorders systematically. Copies of all recordings should be placed in a professionally maintained sound collection that provides easy access to researchers. Survey budgets should include travel funds for investigators to visit a sound collection before or after an expedition, and funds for sound specialists to identify or verify recordings. Those unprepared to deal with bird-song identification in the tropics are simply wasting valuable, limited research funds that could better be spent elsewhere.

Fortunately, relatively few Neotropical bird songs remain unrecorded. The Library of Natural Sounds at Cornell University contains recordings of songs or calls of 671 of the approximately 770 resident forest birds found within Amazonia below 1,000 m, or 87% of the richest avifauna on earth! Other collections, such as those in the Florida State Museum Bioacoustical Laboratory (Gainesville, Florida, USA), the Arquivo Sonoro Neotropical (Universidade Estadual de Campinas, Campinas, Brazil), and the Laboratorio de Sonidos Naturales (Museo de Ciencias Naturales, Buenos Aires, Argentina), contain recordings of many additional Neotropical species. Because field ornithologists associated with these institutions can identify the majority of bird voices recorded in the Neotropics, they can greatly facilitate the compilation of locality lists from tapes.

The following guidelines will enhance one's chances of compiling an accurate locality list in a tropical forest:

1. Get up well before dawn and be out in the area to be surveyed at least 15 min before first light. Many Neotropical species (especially tinamous, puffbirds, woodcreepers, and flycatchers) sing only 1-3 songs during the first 5 min of light (often well before light enough to see), and they rarely vocalize thereafter, until an even briefer period late in the day. Nocturnal species often call just before

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- dawn or just after sunset during clear weather, and throughout the night when the moon is waxing.
2. Choose a different spot each morning from which to record, preferably areas at least 500 m apart, and let the recorder run for 15 min or more (depending on the amount of vocal activity). Point the microphone in the direction of louder sounds for at least 60 s. Try to record (at least briefly) in all directions and from the undergrowth to the canopy. This will greatly enhance chances of recording birds such as parrots, as they fly to feeding areas early in the day, and hawks, many of which vocalize during flight displays above the forest from mid- to late morning. Other groups frequently represented in "background noise" include swifts, hummingbirds (especially hermits), toucans, barbets, and woodpeckers.
 

Cover as many types of forest (e.g. *terra firme*, *varzea*, second-growth) and microhabitats (e.g. bamboo thickets, treefall gaps, streamside thickets) as possible.
  3. Find areas where mixed-species flocks are forming in the undergrowth or canopy at dawn and record for at least 10–15 min. Get 5–10 min of sounds from any large flock found at any time of day. Nearly all flock members (except austral or Nearctic migrants) vocalize throughout the day, especially in the morning. In this way, the presence of easily overlooked and rarely netted canopy species will be established.
  4. Once a comprehensive collection of recordings has been assembled for a locality, attempt to obtain additional recordings of different individuals of each species. Voucher specimens (of known sex and reproductive condition) greatly increase the value of recordings. Such material will be essential for many kinds of research (e.g. geographic variation, systematics). Record at least 60 s of "natural" or unprovoked song before playback, and then record at least an equal amount of response (songs or calls). Remember that long cuts are better than short ones for research purposes. Record at least 3–5 min of even the most common species. Record as many types of vocalizations as possible and attempt to discern their function.
  5. Record behavioral or other data on the tape at the time of observation. Locality, time of day (preferably with respect to dawn, midday, or dusk), and sex (by plumage or voice) are especially pertinent; but do not "talk over" valuable recordings. Long sections of uninterrupted singing or calling are valuable. To this end, take plenty of tape and batteries. Make sure that tape is suited to your recorder (e.g. Type I for most cassette recorders). For additional information on recording bird sounds and on sound collections, see Gulledge (1977).

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