Echolocation Call Sequences of the Dominican Bats *Molossus molossus* and *Tadarida brasiliensis*

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Abstract

Echolocation call sequences from *Molossus molossus* and *Tadarida brasiliensis* bats recorded near Springfield and Cabrits National Park (Dominica, West Indies) were compared. *T. brasiliensis* call sequences covered a much wider frequency range and had a more vertical structure than *M. molossus* calls. The echolocation recordings from these two bats will provide a foundation for a new library of Dominican bat calls.

Introduction

Many species of bats utilize high frequency vocalizations called *echolocation* to locate prey items such as insects. Echolocation calls have been recorded for several species of bats, but never in Dominica. As for many other species of animals, bat dialects vary from one region to another. Thus, an echolocation sequence recorded from a particular bat in Dominica may be different from a sequence recorded from a bat of the same species in another country. The following study compares echolocation call sequences from two insectivorous Dominican bat species of the family Molossidae, *Molossus molossus* and *Tadarida brasiliensis*. These echolocation sequences will be the first in a new library of Dominican bat calls.

Materials and Methods

Echolocation sequences were recorded using the Anabat II bat detector and analyzed with Anabat software version 5.4. The Analook software logarithmically transforms call sequences to allow for more efficient analysis of differing echolocation structures. *T. brasiliensis* bats were recorded near Fort Shirley at Cabrits National Park on 30 May 2000, while *M. molossus* bats were recorded at the Archbold Tropical Research Center at Springfield on 20 May 2000.

In addition, *T. brasiliensis* bats were caught with 6 meter mist nets supported by bamboo poles on either side on 26 May 2000 near Fort Shirley at Cabrits National Park. *M. molossus* bats were caught with similar mist nets on 21 May 2000 and 24 May 2000 (both dates at the Bee House at the Archbold Tropical Research Center at Springfield) and on 25 May 2000 (Stream House at the Archbold Tropical Research Center at Springfield). However, no echolocation sequences were recorded from the bats that were netted and released.

Results

The contrasts in call sequence parameters between *M. molossus* and *T. brasiliensis* are evidenced by Figures 1 and 2. The most pronounced difference was that *T. brasiliensis* calls appear more vertical and cover a much wider frequency range than *M. molossus* calls. *M. molossus* calls shown in Figure 1 ranged from 30.70 kHz to 53.65 kHz, while the *T. brasiliensis* calls shown in Figure 2 ranged from 6.89 kHz to 112.79 kHz.

Figures 3 and 4 illustrate another major difference between the echolocation call sequences of the two species, the time between calls (TBC). The histogram on Figure 3 shows that the majority of the *M. molossus* calls were between 80 and 100 ms apart, whereas most of the *T. brasiliensis* calls were between 200 and 300 ms apart (Figure 4).

Discussion

The clearest echolocation sequences were obtained from freely flying bats recorded at or just before dusk. In order to record accurate sequences from one particular species of bat, the animals must have been previously identified so that calls from only one species are recorded at a time. The present study includes results from bats recorded in close proximity to their roosting sites. Thus, only one species of bat was present at the time of data collection.

It was found that the capture and release method for recording echolocation sequences was largely unsuccessful due to two major factors. One difficulty encountered was that some bats, particularly *M. molossus*, experienced a mild state of torpor after being untangled from the mist nets. The bats did not fly for several minutes after being released and did not echolocate at all during their recovery periods. The second major problem was that it was very difficult to track the bats in the dark (after they were released from the nets) for a long enough interval to obtain complete call sequences.

Equipment dilemmas were also encountered during data collection. *M. molossus* calls were recorded directly to the computer and thus retained much of their clarity. Due to defective computer batteries and the lack of an electrical outlet near their roosting site, *T. brasiliensis* calls had to be recorded with a cassette recorder and were cluttered by extraneous background noise. Another possible problem with recording calls to a cassette recorder was that the echolocation sequences might have been distorted as the recorder's batteries drained. Thus, recording echolocation sequences directly to a computer is a better alternative than using a cassette recorder.

Conclusions

M. molossus and *T. brasiliensis* differ greatly in their echolocation call structures and range of frequencies covered. The two species also exhibit differences in the amount of time between each call within a sequence. In addition to distinguishing between species, the TBC is a useful indicator of a particular bat's behavior at the time of data collection (i.e., search, roosting, or distress behavior). In general, a bat in search phase will emit calls at uniform intervals that steadily decrease as the animal closes in on a prey item. The most useful pieces of data for distinguishing between two species of bats are the structure of the call and the call parameters calculated by the Analook software.

The main objective of this study was to provide a foundation for a more complete library of echolocation call sequences from other species of Dominican bats, particularly members of the families Noctilionidae, Natalidae, and Vesperitlionidae (*Note:* bats in the family Phyllostomidae utilize echolocation at a very low frequency that is difficult to record). Further research might involve not only collecting calls from a greater number of species, but also obtaining different call phases (e.g., search, roosting, and distress calls) from each separate species of bat.

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Figure 1: _Molossus molossus_ Call Sequence

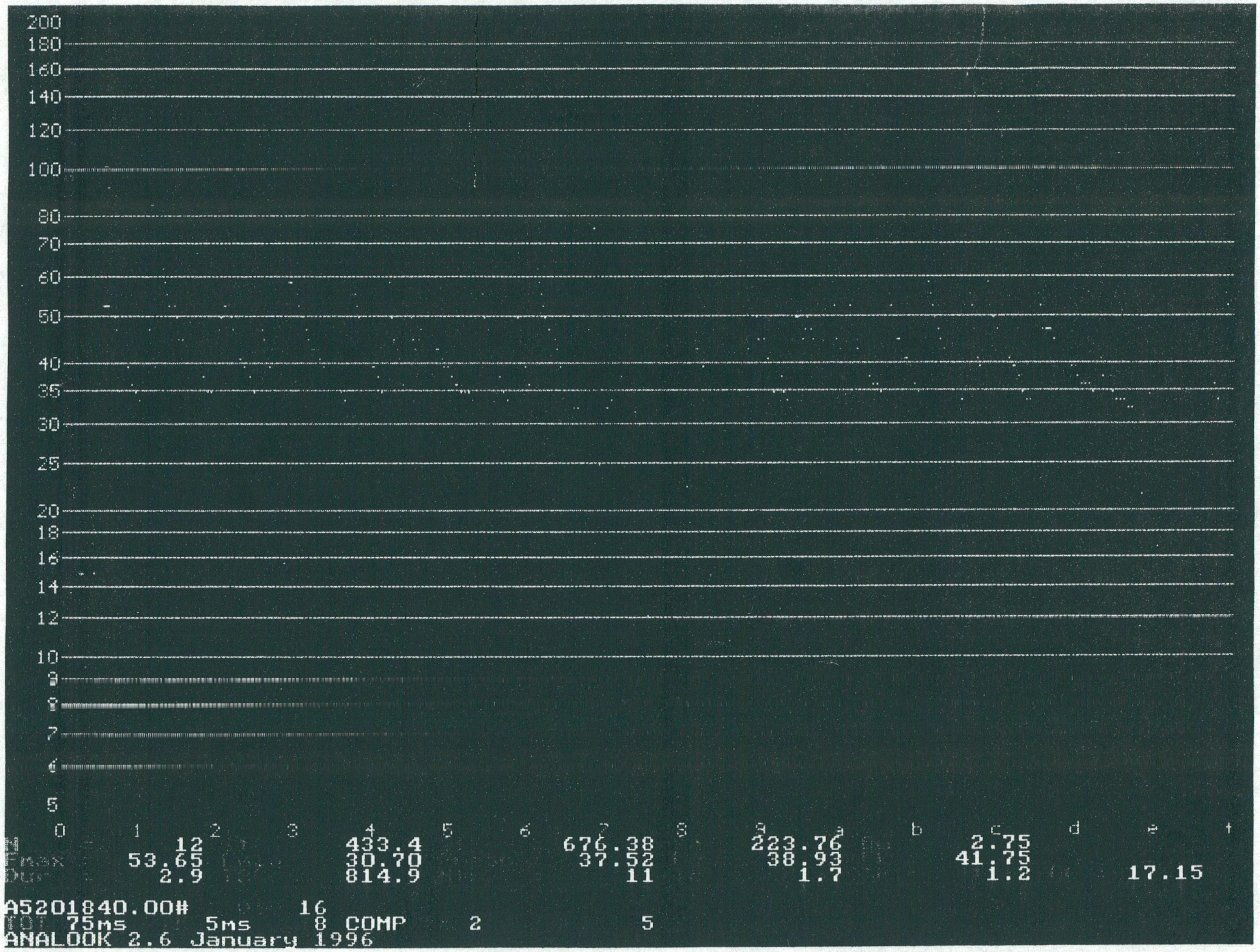

Figure 2: Tadarida brasiliensis Call Sequence

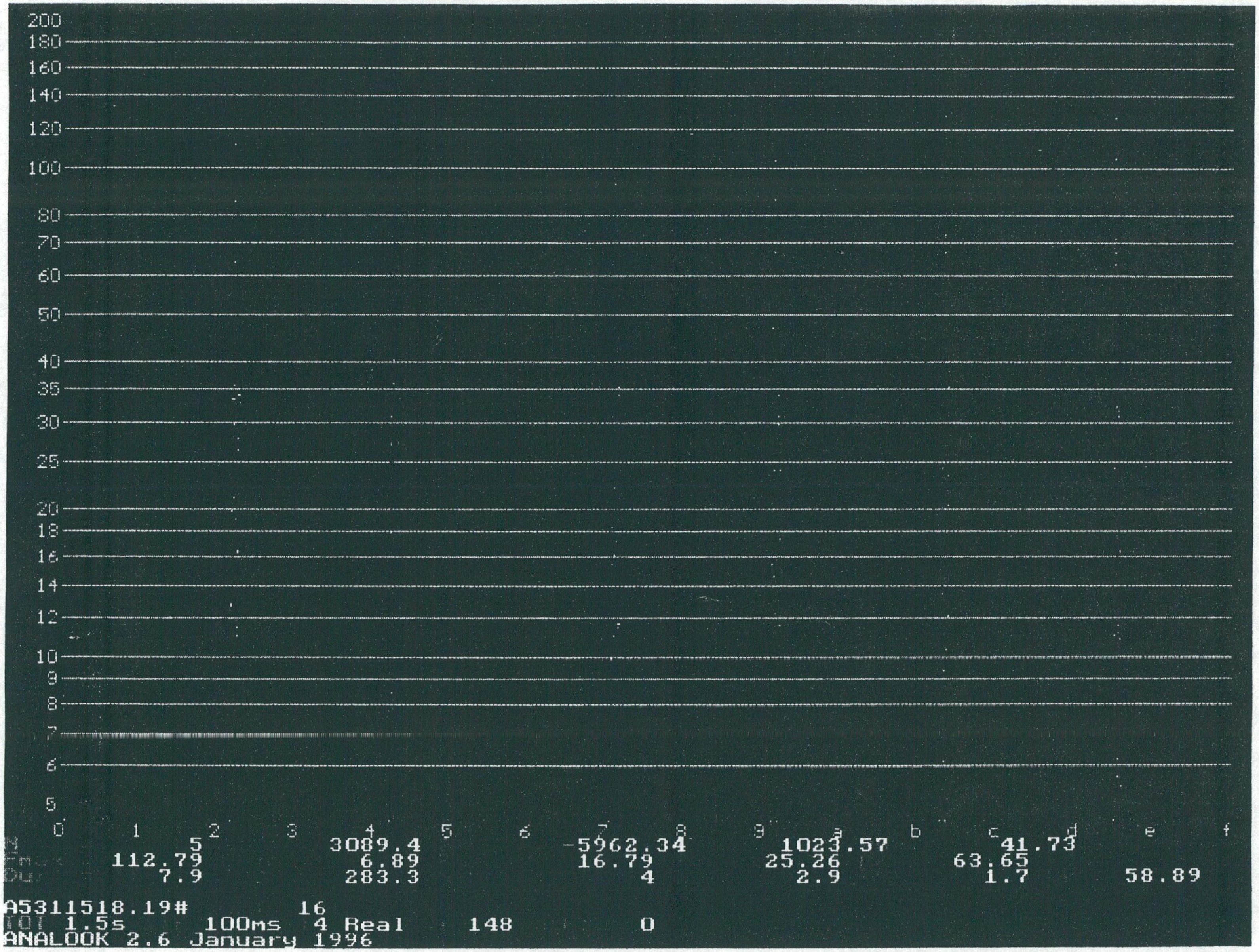

Figure 3: Molossus molossus Call Sequence and Time Between Calls

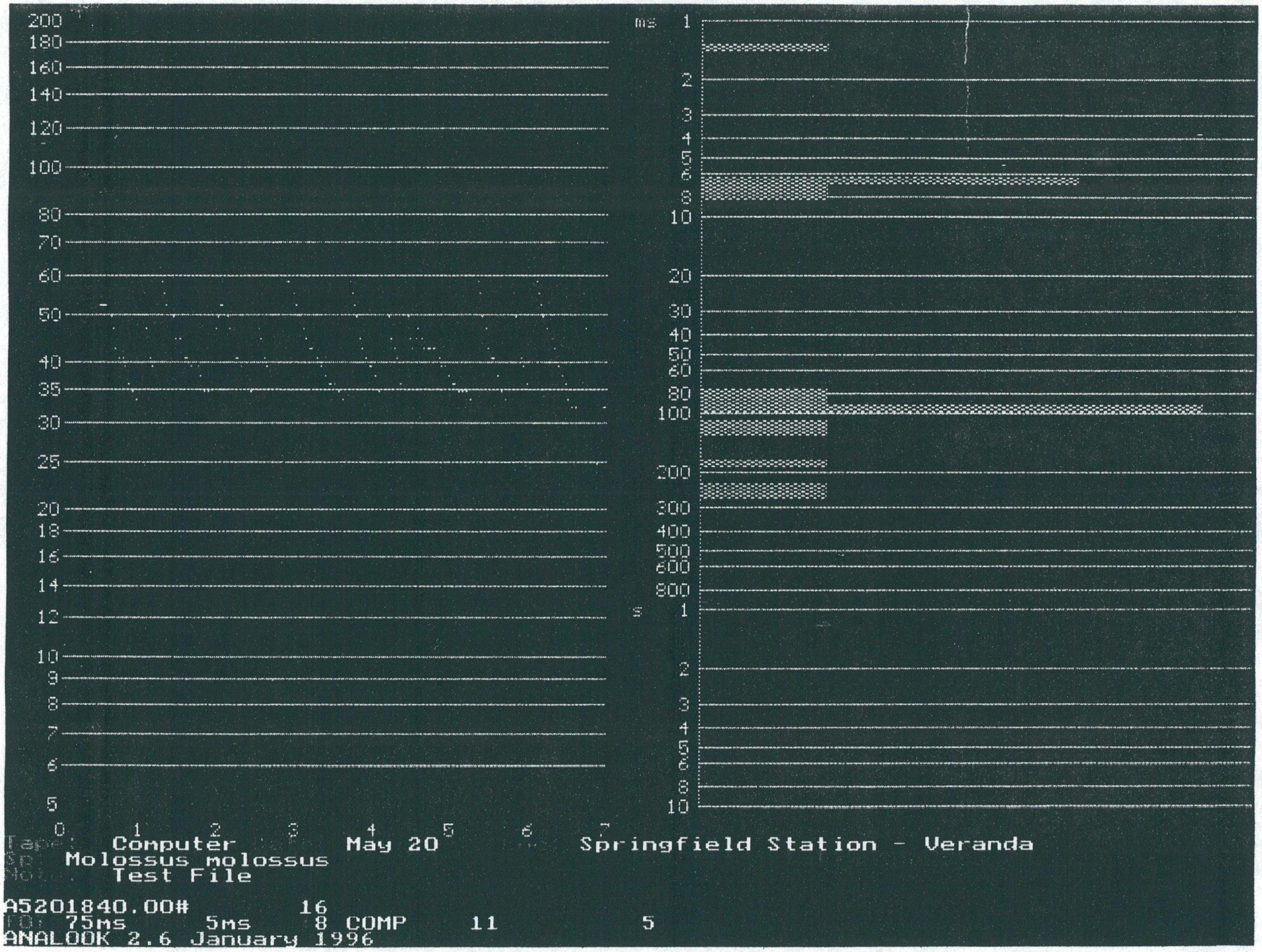

Figure 4: <u>Tadarida brasiliensis</u> Call Sequence and Time Between Calls