THE ROLE OF IN-FLIGHT VOCALIZATIONS OF THE CHIMNEY SWIFT, *CHAETURA PELAGICA*.

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1. INTRODUCTION

From the elaborate songs of birds to the echolocating bat acoustic signals represent an efficient and rich medium for sending and receiving information (Hauser 1997). Varied as these systems are, there remains a great deal to learn about animal acoustics.

This gap in knowledge is illustrated by the Chimney swift, *Chaetura pelagica*, the basic biology of which is poorly known (Cink and Collins; 2002). While the swifts are not uncommon, they are among the most aerial of land birds, feeding on aerial insects, they land to roost and breed, often in abandoned chimneys (Blodgett and Zammuto; 1979) , but remain airborne otherwise; making them difficult subjects to study.

While it is known that the Chimney swift is extremely vocal while in flight (Chantler and Driessens; 2000), the full vocal repertoire of the bird has yet to be recorded. The first objective of my study was to catalogue the full vocal array. In addition, I was also interested in deducing what role these acoustic signals play in the lives of the birds.

Chimney swifts are remarkably fast as they course for flying insects in the air. They are also highly gregarious and have been known to roost and sometimes forage in large groups. I hypothesized that individuals were using their calls as a means of traffic control. In other words, in situations where several fast-flying individuals are together in space, an acoustic signal could be used to indicate one's presence; a sort of collision avoidance tactic.

In echolocating bats, a form of jamming avoidance is observed whereby individuals will change the frequency at which a signal is broadcast so as to avoid jamming of returning echos. This jamming avoidance may also serve to prevent collision among aerial foragers (Ulanovsky *et al*; 2004).

2. METHOD

Audio and visual recordings of chimney swifts while in-flight were obtained from June to October of 2005. Recordings were made from various elevations (from ground level to 6 stories up) at various sites in London, Ontario. The audio recordings were obtained using a Sennheiser K6 microphone and Avisoft Recorder (version 2.9). This system allows for immediate spectrogram and energy displays while providing flexibility in the range of recording frequencies.

Visual recordings were obtained using two digital cameras (Panasonic PV-GS35) placed on either side of the microphone at 1.5, 2 or 2.5 meter distances. By simultaneously recording audio and visual data, the acoustic signals of individuals at a given time and the position of individuals relative to each other can be captured.

A notebook was used to catalogue various behaviours, number of individuals, call type and time.

3. RESULTS

Over 500 useable call sequences and approximately 15 hours of video recordings were obtained.

Preliminary foraging observations made in June, indicated that chimney swifts forage mainly alone (n=49), during the breeding season, or in pairs (n= 65) and infrequently forage in groups (n=6). In addition, vocalizations were seldom recorded in all three scenarios.

The majority of call sequences were obtained while the birds prepared for entry into their roost at dusk, or after they left their roost at dawn. Call structure within a sequence was at times uniform, however individual calls within a structure often varied greatly in structure as well.

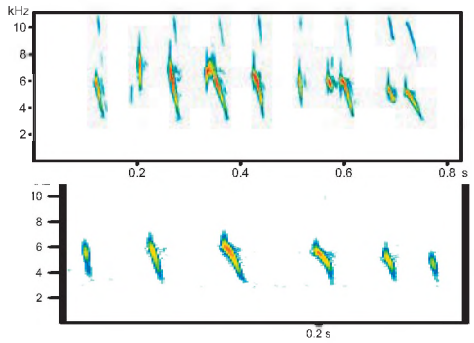

Figure1. Spectrogram of individual call sequences. Sequences ranged from varying calls (top) to more uniform calls (bottom)

In addition, individuals often synchronized their calls, producing overlapping sequences. At times, individuals seem to avoid overlap, and produced instead sequences of calls separated in time.

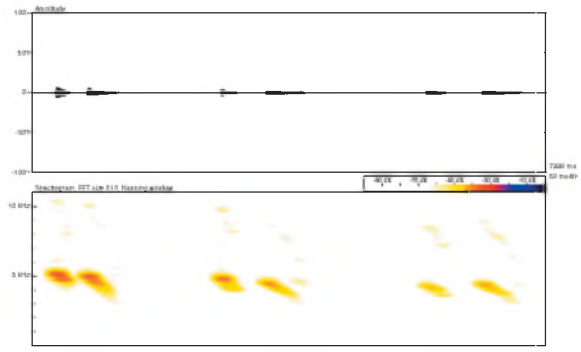

Figure 2. Ocsillogram (top) and spectrogram (bottom) of sequence of 3 calls produced by two individuals. Note that calls are separated in time.

Interestingly, individuals in the act of descending into the chimney opening were almost never observed vocalizing.

4. DISCUSSION

While the results discussed above are preliminary, it would appear as though chimney swifts are employing their acoustic signals not as a means of collision avoidance while foraging, but instead while entering and exiting their roosts. While the swifts are foraging and returning to the roost alone throughout the day, the dusk and dawn periods are marked by entire groups entering and exiting the chimneys. The risk of collision is hence heightened at this time especially in the fall when swifts occupy large roosts that can hold over 600 individuals. It is perhaps not surprising then that at these precarious times the swifts vocalize most intensely.

By staggering their calls in time, individuals may be able to keep track of one another's positions. Overlapping calls on the other hand, may serve to aid individuals in synchronizing their movements and in maintaining group cohesion.

The in-flight vocalizations of chimney swifts may also serve an important social function. Calls emitted by others circling the roost may serve as a beacon to individuals arriving from foraging. In addition, synchronized calls seem to occur in groups of 2-4 individuals flying closely together. Call synchrony may thus allow pairs (Kaiser; 1997) and small social groups (perhaps related) to maintain contact amidst the chaos of hundreds of roosting birds.

If the vocalizations of Chimney swifts do indeed server an important function, we can ask how the birds manage to roost in areas with high levels of noise. Are they capable of changing the frequency at which they send out their signals in order to remain distinct from city noise (Hans and Peet; 2003)?

The calls of chimney swifts appear to be quite variable in structure as is the context in which they are used. Further analysis is needed to shed light on both call characteristics and their role in chimney swift vocalization.

5. REFERENCES

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