

Territorial Behavior of Common Nighthawks in an Urban Habitat

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Abstract

Common Nighthawks are well known for their use of urban roofs for nesting. Behavioral consequences of this adaptation were examined in Boston, Massachusetts, in 1998 and 1999. Birds were observed from ground level and from roofs to examine territorial and foraging behavior. Various types of chase and calls were observed and described. Unlike previous studies of nighthawks in natural habitats, birds remained within their territories and exhibited territorial behavior and foraged throughout the night. This suggests the possibility of a different territorial system for urban nighthawks compared with nighthawks in natural habitats.

Introduction

The Common Nighthawk (*Chordeiles minor*) is a crepuscular insectivore that breeds throughout most of North America (Poulin et al. 1996). In natural habitats this species nests in open areas, such as fields (Gross 1940), burned areas (Fowle 1946) and sandy beaches (Latham 1946). In the mid 1800s, nighthawks were reported nesting on gravel roofs in cities (Gross 1940). There have been few studies of the effect of this behavior on nighthawk ecology.

This study focused on territorial behavior of male Common Nighthawks in Boston, Massachusetts, during 1998 and 1999. Previous studies have primarily focused on behavior of nesting females (Bowles 1921, Brigham 1989, Dexter 1952, 1956, 1961, 1977, Fowle 1946, Gross 1940, Parks 1946, Rust 1947, Sutton and Spencer 1949, Tomkins 1942, Walbeck 1989, Weller 1958). Little is known about male behavior. Male nighthawks are known to be highly territorial (Gross 1940), maintaining large territories throughout the breeding season. Armstrong (1965) observed unmarked individuals from street level in Detroit. He determined average territory size to be 10.4 hectares (range 4.14 to 22.8) for 13 territories. He also concluded that territory size and location are determined by conspecific population pressures and density of suitable roofs (Armstrong 1965). Common Nighthawks will nest communally if population pressures become great enough, but this is uncommon (Gross 1940). Territorial boundaries are usually asserted at dawn and dusk (Caccamise 1974) as males perform a series of *peent* calls and *booming* dives (Gross 1940). Territorial interaction is not reported to occur during noncrepuscular periods (Poulin et al. 1996). The *booming* of the male is one of the most recognizable behavioral characteristics of this species. The sound is the result of the primaries vibrating as the male pulls out of a steep aerial dive. This display is used in territorial interactions as well as antipredator contexts; it is performed over the female during courtship, as well as over fledged young, humans, predators, and both intraspecific and interspecific invaders of a territory (Miller 1925, Dexter 1952, 1961, Sutherland 1963, Weller 1958).

Roth and Jones (2000) discussed flexibility of nighthawk territorial behavior in relation to food abundance. Nighthawks have been reported to forage either communally outside of their territories (Brigham and Fenton 1991, Rust 1947, Sutherland 1963), or exclusively within their territories (Armstrong 1965, Caccamise 1974). Factors that influence which behavior is manifested have not been previously investigated.

Methods

This study was conducted in the Back Bay area of Boston, Massachusetts. The study area was approximately 73 hectares in area and bounded by the MBTA Orange Line, U.S. Route 1 south, Massachusetts Avenue, and the Museum of Fine Arts. It included the Back Bay Fens, Fenway Park, Northeastern University Campus, and surrounding neighborhoods.

Territorial behavior of a nesting pair near Northeastern University (NU) and a pair nesting near the Boston Conservatory of Music (BCONS) was observed. Birds were observed on 107 nights, for a total 200 observation hours during the breeding seasons of 1998 (55 nights) and 1999 (52 nights). Observations were made from ground level and from rooftops. A total of 60 ground-level observations were made (36 in 1998 and 24 in 1999). A total of 47 rooftop observations of the NU pair were made (13 in 1998 and 34 in 1999). Observation periods were during peak activity times (Brigham 1989), beginning 15 to 20 minutes before sunset and generally ending 90 minutes after sunset. Ten all-night observation periods (from just before dusk to just after dawn) were made of the NU pair from roof level in 1999. Roof observations were made with Swarovski SLC 10x50 binoculars. These binoculars amplified the ambient light of the city and facilitated observation of the entire territory.

Territorial boundaries were determined from observations of display and conflict. Number and intensity of conflicts were recorded. Intensity of conflict was determined by the frequency and tempo of calls during chase, and the volume of the *boom* at the end of the dive. These were determined only when interactions occurred near the observation point. Volume was not precisely quantified; however, changes in volume were apparent. Intensity of interspecific conflict was compared with that of intraspecific conflict.

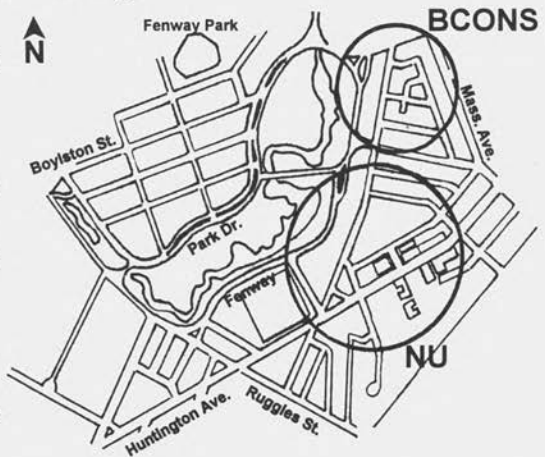
Individuals were identified by behavioral traits while on their territories. Resident males were identified by the act of territorial display. A male exhibiting territorial behavior within a territory was assumed to be its owner according to the methods of Armstrong (1965) and Wedgwood (1973). If a male was observed near the border of a territory or outside a territory, it was observed until it flew to the center of its own territory. Resident females and young were identified by their association with the male territory owner. Sex of individuals was determined by the presence of a white throat patch and white tailband on males. Hatch year birds (HY) were identified by their slightly smaller size and relatively unsteady flight. Foraging was indicated when an individual ceased calling and executed several erratic deviations while in flight (Brigham 1988).

Results

Intraspecific, territorial behavior was exhibited only by males. Birds established territories quickly upon arrival on the breeding grounds. In 1998, the NU male performed displays at his territorial boundaries on May 28, two days after the first observations of Common Nighthawks in Boston for the year. In 1999 the NU male held territorial boundaries on May 27, the day of first observation.

The two territories were estimated to be roughly circular and differed in size (Figure). Diameter of the NU territory was 500 meters, with an area of 196,350 m² (19.6 hectares) in both years. Diameter of the BCONS territory was 300 meters, with an area of 70,686 m² (7.1 hectares) in 1999, and not measured in 1998. Both territories bordered the Back Bay Fens/Victory Gardens and contained mostly flat-roofed buildings from five to seven stories high.

The males did not hold territories for the same amount of time. The NU male maintained territory until fall migration during both years. At the end of the 1998 breeding season, the NU male was observed defending his territory against a migrating flock of conspecifics (Roth and Jones 2000). This pair was seen with young at the end of both seasons. The BCONS male abandoned his territory by July 21, 1999, and the pair was never seen with young.



Activity generally followed a similar nightly pattern for both males. There was a strong correlation between sunset and the time of first observed activity (correlation coefficient = 0.83, $n = 37$ nights). Display activity began an average of nine minutes after sunset (standard deviation = 9.2, $n = 37$ nights) near the male's diurnal roosts in the trees of the Back Bay Fens/Victory Gardens. Both the NU and BCONS males began displaying and foraging high above the edge of the park, calling every two to three seconds and periodically diving. During this period, foraging attacks were observed between dives. After a period of time, ranging from several seconds to several minutes, the birds moved farther into the interior of their respective territories. Territorial behavior continued, periodically, throughout the night. Foraging also continued throughout the night (Roth 2000), but was not associated with display dives. During nocturnal periods foraging was only observed as directed fly-catching runs over artificial light sources (Roth 2000). During the ten mornings on which dawn behavior was observed, activity included roosting, foraging, aggressive territorial display, and chases. Activity ended before sunrise. At this time the male would execute a low, roof-level pass around several buildings, then fly to the Fens. There was strong correlation (correlation coefficient = 0.973) between the time of last activity and sunrise.

No communal feeding areas were found. Foraging was observed nearly exclusively within territorial boundaries. During the 107 nights of observation, nighthawks were observed foraging off territory on only six nights. On these nights, they foraged over the Back Bay Fens, about 100 to 200 meters from their territorial boundary. This occurred at dusk. The birds eventually returned to the NU territory. It is unlikely that the male left his territory undetected since males rarely flew without calling.

Territorial behavior was manifested in three ways - display dives, calls, and chases. Display dives were similar to those described by other researchers, with one exception. Males were observed to give the *peent* call at the same moment in the dive that the *booming* was generated by the primaries. This has not been reported by previous observers. Two types of territorial calls were observed. The most common was the *peent* call, given by both males and females. Males emitted this call approximately every two to three seconds while exhibiting territorial display and between foraging attacks. During agonistic interaction, the tempo of *peent* calls became more rapid, more than one call per second. The other call was a rapid *clucking* emitted by the NU male during some intraspecific chases. Chases varied in intensity and apparent purpose.

Chases were observed in four different contexts. Each type was observed on several occasions, with the exception of the interspecific chase. Chases were observed throughout the night, but were most common at dusk and dawn. The contexts were as follows:

Expulsion of nonresident male from a territory by resident male: All territorial conflicts observed were in the form of rapid tail-chasing. The resident male would chase the intruder from the territory in a fast, zigzag fashion while uttering rapid calls. Once they reached the border of the territory, the chase ended. These chases were always followed by vigorous display dives over the area where the conflict originated. The *booming* generated by these dives was noticeably louder than that produced during other such dives.

Resident male chases of resident female: Two types of male/female chases were observed. One type was a slow circular chase in which the male followed the female within two to three meters as they flew in a tight circular fashion. The male did not call during this type of chase. The second type was a short zigzag chase, similar to the male/male chase, but not as aggressive or as directed. The male did call during this chase; however, unlike the male/male chase, the tempo of the call was not faster than during nonchase periods. These chases usually ended near the center of the territory, not at the edge as in male/male chases.

Resident male chases of resident young: These chases were similar to the second type of male/female chase.

Interspecific chase: Only one observation of this type was made (Roth 1999). It occurred when the NU pair chased a Red-tailed Hawk (*Buteo jamaicensis*). This was the only response to an avian predator observed during this study. Other possible

avian predators (e.g., gulls, crows, herons) were ignored during this study. There was no observed interaction with other aerial insectivores (e.g., swifts, bats).

Discussion

Territory sizes determined in this study are within the range found by Armstrong (1965). He found urban territories to be an average 10.5 hectares (range = 4.14 to 22.80).

Territorial vocalizations reported here are the same as previously reported (Gross 1940). Previous papers have disagreed about whether or not the female of the species uttered the *peent* call (Gross 1940, Poulin et al. 1996). During this study *peenting* females were observed on more than one occasion. Lack of observation of this behavior in other studies is most likely due to the more secretive nature of the female and the difficulty of sexing birds in flight from ground level. The fact that both sexes give this call and that it was given during flights in which no territorial activity was observed brings into question the purpose of the call. Armstrong (1965), Wedgwood (1973), and Caccamise (1974) stated that this call is territorial in nature. Observations in this study, as well as those of Gross (1940) suggest that the tempo of the call may be very important to territoriality. Tempo of calls increased during male/male conflicts. Tempo did not increase during male/female chases or male/HY chases. *Peenting* during the territorial *boom* may also be territorial. The volume of the call was markedly louder after territorial conflict than during normal display times. The *clucking* call given by the male during some territorial conflict in this study was reported by Gross (1940) as *dick-a-dick-a-dick*. This call is apparently exclusive to territorial behavior. It was heard only during male/male chases.


Variation in chases was apparently associated with the object of the chase. The purpose of the male/male chase was clearly territorial defense. These chases were faster and apparently more intense and more directed than the others. The purpose of male/HY chase is unknown, but may be instructive. Adult males may simply be teaching the young males to chase. Unfortunately, it is unknown whether males chase HY males more than HY females. The purpose of the male/female chase and the reasons behind the two different types of male/female chases are also not known. The only interspecific chase observed in the present study was also the only observed instance of a female and male chasing together. The purpose of this chase was apparently defense of the nest from an aerial predator (Roth 1999).

What caused the BCONS male to abandon his territory is unknown. Wedgwood (1973) reported similar abandonment of territory in an urban area, but causal factors were not determined. However, it is apparent that this pair did not successfully breed.

As previously mentioned, Common Nighthawks exhibit flexibility in territorial behavior. Nice (1941) divided territoriality into six categories: A) use of territory for mating, nesting and feeding, B) mating, nesting, but not feeding, C) mating only, D) restricted to immediate nesting area, both colonial and solitary, E) winter territory, F) roosting territory. Males in this study exhibited type A, although both types A and B have been reported for Common Nighthawks.

The distinguishing factor between types A and B territoriality is whether foraging occurs on or off the territory. Therefore, variation of this characteristic within a species is apparently influenced by either food availability or the animal's ability to utilize food resources located within its territory. In the absence of artificial light, nighthawks may only forage at dawn and dusk due to the specialized chordeilid eye (Brigham 1988). Because of the narrow time period during which nighthawks are able to forage under natural conditions, a predictable source of abundant food is imperative (Brigham 1988). Thus, when sufficient food is not available on territory, nighthawks will leave their territories to use communal feeding areas (Poulin et al. 1996), resulting in the type B territoriality.

Reports of type A territoriality are exclusive to urban studies (Armstrong 1965, Gross 1940, Roth and Jones 2000, Wedgwood 1973), with the exception of Caccamise (1974) who reported type A territoriality in a natural habitat. In previous studies of this species in natural habitats (Brigham and Fenton 1991, Rust 1947, Sutherland 1963), males began each night with a period of exclusive territorial display before commuting to communal feeding areas where no agonistic behavior occurs. Urban studies (including this study) report no communal feeding, with males remaining within individual territories throughout the night. Caccamise (1974) reported that this species foraged on or near its territory in a natural habitat and made no mention of communal feeding areas.

It can be assumed that successful type A territories contain ample, exploitable food resources. In this study, the ability to exploit food resources was aided by the presence of artificial light (Roth 2000). Artificial light may have an effect on territorial behavior of Common Nighthawks. Males were observed asserting territorial boundaries at dawn and dusk in a manner similar to previous studies (Caccamise 1974, Gross 1940, Rust 1947). However, unlike those studies, foraging and territorial display occurred simultaneously, and both foraging and display continued throughout the night. This observation contradicts current literature which states that this species neither forages at night nor engages in nocturnal territorial behavior (Poulin et al. 1996). Artificial light may ensure a predictable food source that can be exploited throughout the night, thus removing temporal and energetic constraints on this species. The time available for territorial behavior and foraging is extended, and individuals do not have to leave their territories to fulfill nightly energy. This enables males to guard their territories continuously throughout the night, potentially resulting in a different territorial system for nighthawks in urban habitats. 

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News from MassWildlife

Sandy Point Watchable Wildlife — The Department of Environmental Management (DEM) has added a boardwalk and two wildlife viewing platforms at Sandy Point State Reservation, at the southern tip of Plum Island in the town of Ipswich. Sandy Point and the adjoining Parker River National Wildlife Refuge are among the 67 prime wildlife viewing sites identified in the Massachusetts Wildlife Viewing Guide, available at MassWildlife offices and major bookstores across the state. Both DEM and the U.S. Fish and Wildlife Service, managers of the Parker River Refuge, are partners in Massachusetts' Watchable Wildlife Program. The boardwalk and platforms afford visitors access to the Bar Head drumlin and the high-water edge of the tidal zone for wildlife watching with minimal impact to the habitat. A recent trip by DEM's Jack Lash revealed 44 species of birds including northern shrike, sharp-shinned hawk, dunlin, sanderling and a variety of sea ducks present on the Reservation along with a host of bellowing harbor seals. The lower platform and boardwalk are universally accessible. Sandy Point also features interpretive programs from Mother's Day through Labor Day, composting toilet facilities, and collaborative projects with the Parker River staff.

