Observations of Predation and Anti-predator Behavior of Ruby-throated Hummingbirds during Migratory Stopover

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Abstract - Predation is not thought to contribute significantly to adult hummingbird mortality in temperate areas, where most reported cases of mortality are the result of accidents (e.g., window collisions and spider webs). However, the hazards encountered during migration, including the threat of predation, can impact hummingbirds while on stopover. We present one account of predation upon Archilochus colubris (Ruby-throated Hummingbird) by Accipiter striatus (Sharp-shinned Hawk) and one account of a Ruby-throated Hummingbird displaying anti-predator behavior by mobbing a Falco sparverius (American Kestrel). All observations took place in coastal Alabama during stopover in autumn.

Introduction. Migration is an essential part of the life history of many bird species. For example, over two thirds of the birds that breed in the forests of eastern North America are Nearctic-Neotropical migrants, traveling thousands of kilometers between breeding and non-breeding areas (Rappole 1995). It is rare for individuals to make non-stop flights between points of origin and destination, rather they stopover periodically during passage to rest and refuel (Moore et al. 2005). Although there is much interest in the stopover ecology of migratory birds (e.g., Moore 2000), we still have much to learn about challenges faced during stopover, including predation and other sources of mortality.

Information on mortality and predation during stopover is especially valuable because populations of migratory birds are thought to experience their heaviest mortality during the migration portion of their annual cycle (Paxton et al. 2007, Sillett and Holmes 2002). Predator-prey interactions, including ones that do not result in mortality, are interesting since raptors tend to time their migration with the migration of small landbirds (Aborn 1994). While predation and mortality during stopover have been addressed (e.g., Cimprich and Moore 2006; Cimprich et al. 2005; Dierschke 2003; Fahrig et al. 2002; Lindström 1989, 1990; Moore et al. 1990; Spendelow 1985), we know next to nothing about predation and mortality during stopover of Archilochus colubris (L.) (Ruby-throated Hummingbird), a neotropical migrant.

Miller and Gass (1985) suggest that predation is not thought to contribute significantly to adult hummingbird mortality in temperate areas, where most reported cases of mortality are the result of accidents (e.g., spider webs [Brooks 2012, Graham 1997, Kirkham 1925, McCook 1889, McKenzie 1991], window collisions [Graham 1997, Hager et al. 2008], and vegetation [Hinam et al. 2004, Nealen and Nealen 2000]). Yet, hummingbirds suffer non-accidental mortality, which includes but is not limited to predation from a variety of sources, including birds (Garcia-C and Zahawi 2006, Lowery 1938, Mayr 1966, Peeters 1963, Robinson 2003), arthropods (Butler 1949, Carigan 1988, Hofsund 1977), mammals (Lepczyk et al. 2003), frogs (Monroe 1957, Norris-Elye 1944), and fish (Lockwood 1922). Behavioral observations have determined that adult Ruby-throated Hummingbirds are predated upon

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on the wing by *Falco columbarius* L. (Merlin), *Accipiter striatus* Vieillot (Sharp-shinned Hawk), *Falco sparverius* L. (American Kestrel), and *Lanius ludovicianus* L. (Loggerhead Shrike) (Lowery 1938, Mayr 1966, Robinson et al. 1996). To our knowledge, none of these examples, to date, were explicitly known to have occurred during migration.

**Methods.** We present opportunistic observations of Ruby-throated Hummingbird predation and anti-predator behavior during autumn migration. Both accounts were observed on Fort Morgan, AL, a peninsula located between Mobile Bay and the Gulf of Mexico, which often attracts a high volume of landbird migrants. The observations took place on the Bon Secour National Wildlife Refuge (30°14’N, 88°0’W), 2 km from the end of the peninsula. At this study site, 14 artificial hummingbird feeders were setup as part of a study examining Ruby-throated Hummingbird stopover ecology. During 2012, one observer visited ten artificial feeders for at least 15 minutes each day from 9 September to 26 October, which resulted in 121.4 hours of total observation time for the season. The predation account was observed during the described systematic observations performed, while the anti-predator behavior was observed opportunistically during unrelated research activities.

The peninsula is dominated by three species of woody vegetation: *Pinus elliottii* Engelm. (Slash Pine), *Quercus geminata* Small (Sand Live Oak), and *Quercus myrtifolia* Willd. (Myrtle Oak). Other common species found throughout the peninsula are: *Ilex glabra* (L.) A. Gray (Inkberry), *Ilex vomitoria* Sol. ex Aiton (Yaupon), *Smilax* spp. (greenbrier), *Vitis rotundifolia* Michx. (Muscadine), *Myrica cerifera* L. (Wax Myrtle), *Persea borbonia* (L.) Spreng. (Red Bay), *Serenoa repens* (Bartram) J.K. Small (Saw Palmetto), and *Ceratiola ericoides* Michx. (Sand Heath). While Slash Pine may be as much as 13 m in height, most of the vegetation is less than 4 m tall, creating a mix of coastal scrub/shrub and pine forest (see Woodrey and Moore 1997). The peninsula also has a high abundance of migrating raptors, particularly Sharp-shinned Hawk and American Kestrel (Woltmann and Cimprich 2003), whose phenology often coincides with small landbird migration (Aborn 1994).

**Observations.** At 0845 (CDT) on 18 September 2012, a Sharp-shinned Hawk was observed taking a Ruby-throated Hummingbird. Previous to this incident, several hummingbirds were engaging in normal foraging activity at an artificial feeder. These foraging hummingbirds began to exhibit anti-predator behaviors, including increased vigilance (sensu Lima 1991) and increased movements in the interior portions of the vegetation, which is typical in the presence of a predator (Robinson et al. 1996). At the time this change in behavior was noticed, a Sharp-shinned Hawk was observed perched in a 7-m Slash Pine, located 15 m south of the feeder. A new Ruby-throated Hummingbird flew into sight from the west, 17 m south of the feeder. This individual was observed foraging within a Sand Live Oak, located 5–7 m east of the perched hawk, for about one minute before the hawk left its perch, flew directly at the hovering hummingbird, grasped the hummingbird in its talons, and flew out of sight due east-northeast to presumably eat the bird. The depredated hummingbird did not exhibit any anti-predator behavior prior to the initiation of the attack by the hawk.

During the mid-morning of 27 September 2012, a lone Ruby-throated Hummingbird was observed mobbing an American Kestrel flying east just north of Highway 180 at a height of 15 m, which is consistent with the hunting altitude of many raptor species. As the raptor flew over artificial hummingbird feeders in the area, a Ruby-throated Hummingbird, located 10–12 m below the kestrel, flew out of the shrub cover near an artificial feeder and mobbed the kestrel. The hummingbird made several passes at the face of the American Kestrel, jabbing with its bill each time. After initiation of the mobbing, the kestrel changed course slightly northward and proceeded to fly in an east/northeast direction. The
hummingbird persisted for 30 seconds until the kestrel was out of the area, and then flew
back into the shrub layer. Ruby-throated Hummingbirds have been reported to mob pred-
tors (Hamerstrom 1957, Mitchell and Donovan 2008) including nest predators (Robinson et
al. 1996); we could find no information in regard to hummingbirds mobbing non-predator
species. This observation is the first reported incident of a Ruby-throated Hummingbird
mobbing an American Kestrel as well as the first record of a lone Ruby-throated Humming-
bird mobbing a predator.

Conclusion. Anecdotal observations, such as the ones described, provide a foothold in
comprehending the basic ecology of stopover sites, where migrants face increased expo-
sure to predation in order to satisfy energetic demands in unfamiliar settings (Cimprich
and Moore 1999). These observations are particularly valuable when they document the
natural history of poorly understood species that can be difficult to observe systematically
in the field, such as the Ruby-throated Hummingbird. We acknowledge that the observa-
tions presented are rudimentary, yet to our knowledge similar observations are limited or
non-existent presently in the literature for this species. The lack of previous reports is not
surprising given our finding of only two instances of interactions with predators over 121.4
hours of systematic observations. In order to better understand the role of predation, a more
comprehensive study is needed to determine if these are isolated incidents or commonplace
during migration.

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