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AVIAN PREDATION ON PURPLE MARTINS NESTING IN ARTIFICIAL HOUSING

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Avian predation on Purple Martins (*Progne subis*) at colonies using artificial housing may be significant in areas where populations of this songbird are low or declining (Great Lakes and New England states, some Gulf Coast states, Maritime provinces). Actual accounts of raids by avian predators on Purple Martins at artificial housing are largely absent from the peer-reviewed literature. Consequently, I summarized accounts found in the Purple Martin Conservation Association's *Purple Martin Update—A Quarterly Journal* as well as documented my own observations. I found accounts of raids in 20 articles and these and an additional eight articles promoted open locations and structural modifications to housing as means for mitigating losses of martins to predators. Great Horned Owls (*Bubo virginianus*) and Barred Owls (*Strix varia*) comprised over half of the accounts where a predator was identified. This information may be useful to local managers as well as those involved in conservation planning for the Purple Martin in areas where its status is of concern.

The visual and audio cues associated with colonial bird species can attract predators, including avian predators (Wittenberger and Hunt 1985; Brown and Brown 1996, Varela et al. 2007). While benefits of colonialism may compensate for costs such as increased competition for mates, nesting sites and food, and transmission of disease and ectoparasites (Alexander 1974; Hoogland and Sherman 1976; Wittenberg and Hunt 1985; Moller 1987) there is also evidence that predation risk is increased (Varela et al. 2007). Moreover, the effects of predation may be more substantial or of concern in regard to rare species or areas where populations are in decline.

The eastern subspecies of the Purple Martin (*Progne subis subis*) nests almost exclusively in artificial housing that includes those of conventional-style, multi-cavity birdhouse designs and of hollowed out gourds (Brown 1997). *P. s. arboicola*, the race of the western mountains and Pacific Northwest, are still found primarily in natural cavities, but are increasingly nesting in single-unit nestboxes and less commonly in housing typical of their eastern counterparts (Brown 1997, Kostka et al. 2008, Buker 2012).

The relatively recent shift in the eastern race's nesting tradition began prior to the arrival of the first European settlers when the derived benefits of their new existence encouraged the birds to nest

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in larger, more tightly packed nesting aggregations (Brown 1997). Purple martins are quite vocal on and around their housing, including at night (Brown 1984, Brown 1997), thus making them potentially conspicuous to predators at all hours.

Birds are reported among predators of inflight Purple Martins (Brown 1997), and this includes the capture of adults or hatch-year martins by Peregrine Falcons (*Falco peregrinus*; Tordhoff 1993; J. D. Ray, unpublished data) and Great Blue Herons (*Ardea herodias*; Peleski 1990), capture of injured adults from a highway by a Merlin (*Falco columbarius*; Haug 1989), and the remains, along with bands and radio-transmitters from Purple Martins have been found during examination of owl pellets (Kramer et al. 2008).

There is a paucity of information in the peer-reviewed literature on avian predation on Purple Martins at nest sites consisting of artificial housing. However, accounts of predation and mitigation strategies are commonplace in education materials, trade publications, and social media. Information, including mitigation strategies, are important to managers given the dependence that the species has on man for nesting cavities and that the species is declining in portions of its range (Tautin 2009; Sauer et al. 2014). My objective was to summarize published reports of avian predation on Purple Martins nesting in artificial housing.

METHODS

I conducted a literature review and summarized accounts of avian predation on colonies of Purple Martins on and around artificial housing. This included a review of articles published in the Purple Martin Conservation Association's *Purple Martin Update—A Quarterly Journal*. Although cited often in manuscripts on Purple Martins in the scientific literature, these mostly semi-technical and popular-style articles are not readily discoverable through a search of the literature. I did not include the plethora of accounts from "letters to the editor" in the *Purple Martin Update—A Quarterly Journal*, nor the photos, videos, and accounts that an Internet search reveals. I do, however, include my own observations.

RESULTS AND DISCUSION

I found 20 publications documenting avian predation on Purple Martins on, and around, artificial housing (Table 1). Many of these, and an additional eight papers, also addressed mitigation strategies that minimize the predator's ability to launch a surprise attach or to reach into the compartments. Accounts ranged from Ohio and Florida, to Alberta and Washington, and included nine avian predator species (Table 1).

Barred and Great Horned Owls were the most common (54.5%) of avian predator accounts that were reported at the species level. Owls raided martin housing at night, and visual observations included the predator reaching in and grabbing birds as well as grabbing those that exited in attempts to flee (Table 1). The morning discovery of owl feathers along with martin decoys on the ground, ripped-open compartment doors, and broken gourd entrances and perch rods serve as further evidence of larger owl species (Hill 1988, Dellinger et al. 1999). Photographic evidence of raids by Barred Owls and Great Horned Owls was captured by Dingman (2004), Chambers (2008), Allnock (2012), Chamberlin (2012), McComb (2012), and in several photographs not associated with articles. Winegar (2005) and Undorfer (1997) reported Eastern Screech Owls (*Megascops asio*) nesting in Purple Martin housing. An editorial response to Undorfer (1997) stated that screech owls "had almost wiped out a colony in North Carolina." I saw no other specific mention of Screech Owls or those other than the Great Horned and Barred Owl.

The daytime raids by Cooper's Hawks (*Accipiter cooperii*) and Sharp-Shinned Hawks (*A. striatus*) were described by several authors (Wagner 1999, Seekamp 2011, Chamberlin 2012, Mangan 2009). They, and hawks "in general" (Tautin 2005, Mangan 2009, Gerteisen and Gerteisen 2013), would usually fly in and grab adult Purple Martins (Wagner 1999, Mangan 2009, Seekamp 2011, Chamberlin 2012) off of the porches of their housing. In the case of Cooper's Hawks, these attacks may be repeated as many as two or three times per day (Mangan 2009) and may involve one grabbing a house and beating its wings against it until it is able to grab an escaping martin (Wagner 1999).

Black-billed Magpies (*Pica hudsonia*; Bowditch 1990), Fish Crows (*Corvus ossifragus*; Moore 1989), and Greater Roadrunners (*Geococcyx californianus*; Green 1994) land on housing and grab nestlings that venture close to, or out of, cavity entrances. DeVilbiss and George (1989) and Justus (1996) recorded captures of Purple Martins by Mississippi Kites (*Ictinia mississippiensis*).

Table 1. Accounts in the *Purple Martin Update—A Quarterly Journal* of avian predation on Purple Martins on or near artificial housing (state).

Topic	Citations
Predation by Falcons and Hawks	
On housing	
Sharp-shinned Hawks	Seekamp 2011 (MN)
Cooper's Hawks	Wagner 1999 (FL), Mangan 2009 (AR), Chamberlin 2012 (OH)
Falcons and hawks (general)	Tautin 2005, Mangan 2009 (AR), Gerteisen and Gerteisen 2013 (FL)
Above or Near Housing	
Cooper's Hawk	Mangan 2009 (AR), Dingman 2013 (FL)
Mississippi Kite	Justus 1996 (AR)
Predation by Owls	
On housing	
Great-Horned Owls	Dipietro 1988 (MA), Dellinger et al. 1999 (OH), McComb 2007 (TN), Justus 2008 (AR), Chamberlin 2012 (OH/photos), Dingman 2013 (FL)
Barred Owls	Fecker et al. 1996 (AR), Taylor 1998, Dingman 2004 (FL/photos), McComb 2007 (TN, photos), Justus 2008 (AR), Dingman 2013 (FL)
Undetermined/Unspecified Owls	Wilkins 1993 (MN), Fecker et al. 1996 (KS), Tautin 2005, Buker 2012 (X)
Others	
On Housing	
Black-billed Magpie	Moore 1989 (Alberta)
Greater Roadrunners	Green 1994 (TX)
Fish Crows	Bowditch 1990 (FL)
Mitigation	
Placement of housing in open settings	Tautin 2005
Wire-cages/house-mounted guards	Bowditch 1990, Bowditch and Kowalski 1996, Kostka 1998a, Kotstka 1998b, Kotska 1998c, Taylor 1998, Wagner 1999, Dingman 2004, Tautin 2005, Moser 2006, Justus 2008, Jones 2009, Mangan 2009, Chamberlin 2012, Allnock 2012, Buker 2012, Dingman 2013, Gerteisen and Gerteisen 2013
Cavity depth and design	Wilkins 1993, Fecker et al. 1996, Rogillio 1996, Kostka1998a, Taylor 1998, Tautin 2005, Allnock 2012
Decoys	Purple Martin Conservation Association 2014

Personal Observations

Sharp-shinned Hawks pursue and appear to be fairly successful in catching Purple Martins near housing in situations where nearby trees and buildings allow a cryptic approach. In contrast, Purple Martins appear to detect, evade, and even pursue approaching birds-of-prey in more-open settings.

Avian predators appear to have the ability to recognize and seek out maiden-flight and recently fledged-juvenile Purple Martins. During the weeks that the neighborhood around a large colony is full of assembled broods, Mississippi Kites have suddenly began including that neighborhood during foraging activities. As the adult martins try to lead their broods back to the housing in the evenings, individuals or as many as a half a dozen kites at a time may chase a fledgling relentlessly, although I have yet to observe a martin captured. At a location where Great-Tailed Grackles (*Quiscalus mexicanus*) nested within 10 m of a martin colony, I have observed male grackles bolt out of the nest tree, intercept departing fledglings, and force them to the ground. These, and similar captures reported by others at the same location, resulted in the consumption of the martin. Grackles were not observed attempting this on adult Purple Martins.

American Kestrels (*Falco sparverius*) are said to grab nestlings from porches of martin housing (anecdotal reports). In 2014, a kestrel was observed laboriously carrying an adult Purple Martin from the direction of a street where weather-stressed

individuals were lying about on the roadway's warmer surface during cold temperatures and high winds (J. M. Ray pers. comm.).

Predation by avian predators, particularly by owls, can be quite serious at individual Purple Martin colonies. Wilkins (1993) wrote of owls taking a bird or two each night and reports of total losses, possibly with abandonment involved, that have exceeded 100 birds (Hill 1989; Wilkins 1993, Fecker et al. 1996).

MANAGEMENT IMPLICATIONS

Raids by avian predators on Purple Martins can be problematic on small colonies, or even on large ones, particularly where owl raids are repeated and not thwarted by the addition of guards. Consistent raids or loss of broods can lead to the abandonment of the site by individual pairs and even the entire colony (Hill 1989).

Avian predation is unlikely to be a major factor on Purple Martin populations except where they are extremely low and in decline. Breeding Bird Survey data depicts that the Purple Martin is now in decline, rangewide (1966-2013; -0.9% yr^{-1} [-3.24, -0.45]; Sauer 2014) including statistically in 19 states and provinces. In particular the species is declining in the Great Lakes states and provinces, Gulf Coast and New England states, and the Maritime Provinces. Thus, it may be worthwhile to include strategies to mitigate avian predation on Purple Martin colonies as part of conservation plans in those areas.

There are mitigation strategies that can be effective for preventing avian predation on martin colonies. Owl guards or wooden decoys attached to housing, starling resistant entrances, deep cavities, off-set entrances and internal baffles are all effective strategies for reducing avian predation on Purple Martin colonies (Tautin 2005, others in Table 1). Although occasional losses to accipiters and falcons away from the housing cannot be avoided, and likely have little influence on a colony, maintaining an open area around martin housing reduces the chances of surprise attacks near the nesting site (Tautin 2005).

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MISSISSIPPI KITE STANDING IN WATER SCAVENGING EARTHWORMS

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Mississippi Kites (*Ictinia mississippiensis*) migrate into Texas from early April to mid-May and are common summer residents on the Rolling Plains and High Plains (Lockwood and Freeman 2014). Across its summer breeding range, the species typically forages while soaring high in the air catching large flying insects (Sibley 2014) or hawking from exposed perches (Parker 1999), although it will also forage on the ground and even in shallow water (Gainer 1902; Parker 1999). An examination of 26 publications reporting the diets of the Mississippi Kite revealed that medium and

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