

# The Purple Martins of Plum Island

*Sue McGrath and Alison O'Hare*

## Introduction

The Purple Martin colony at the Parker River National Wildlife Refuge on Plum Island probably had its beginnings in the 1950s and became firmly established during the 1970s. Although monitoring was done in previous years, no one was performing that task in the spring of 2003. In April 2003, armed with enthusiasm and a willingness to help, the authors volunteered to improve productivity at what had become the last Essex County stronghold of the Purple Martin. Neither of us knew what to expect or how to approach caring for the colony. During that first season we mostly evicted House Sparrows and counted martin nests, eggs, and nestlings. Today, with knowledge gained from contacts with other martin landlords and from reading and experience, we're still at it. Our fifth season will be 2007. This paper shares what we've learned and offers an in-depth look at the martin colony on Plum Island.

## Distribution, Migration, Habitat

Three subspecies of martin breed in the US: *subis*, east from the central plains states; *hesperia*, on the coast of the Pacific Northwest states; and *arboricola*, in portions of California, Arizona, and New Mexico. Martins winter in South America in lowlands east of the Andes from Venezuela to northern Bolivia and southeastern Brazil. Adult males arrive north before females and subadults. Early arrival maximizes a bird's chances of claiming the best nesting site at a former breeding spot. Martins, which are the earliest tropical-wintering migrants to return to their North American breeding grounds, usually arrive in Massachusetts during the second week of April and depart during the first week of September. They prefer open or semiopen areas near water and are locally common near salt marshes, coastal farmland, and golf courses (Brown 1997; Veit and Petersen 1993).

## Feeding and Vocalization

Martins feed exclusively on flying insects: beetles, dragonflies, damselflies, grasshoppers, crickets, moths, butterflies, wasps, and bees. Contrary to popular opinion, mosquitoes compose no more than three percent of their diet. Martins are diurnal feeders and engage in prolonged forays at a flight level generally higher than that of other swallows, 150 to 400 feet, much higher than the low-flying nocturnal mosquito. Martins usually do not forage when the air temperature is below 48°F or when it is raining. It is estimated that sustained temperatures of at least 55°F are required for martins to survive. Eleven different vocalizations have been described for the Purple Martin. These can be separated into dawn song and daytime chatter. Dawn song, used only in the early hours of the day before sunrise, is primarily for courtship and mate attraction. It consists of a rich, low-pitched liquid gurgling followed by a guttural warble. Daytime chatter, used during daylight hours, consists of a variety of calls and songs in communication between adult and young, in territorial defense, and in alarm situations (Brown 1997).

## Breeding Behavior & Nestling Development

Males are aggressive while establishing their territory, which usually consists of the area surrounding their nest box compartment entrance. A pair bond forms soon after the female selects a male and his nest box. Martins are usually monogamous. Occasionally, a male will display polygyny by mating with two or more females. Purple Martins are the only colonially nesting secondary-cavity nesters in North



T14 and T18 Purple Martin nest boxes at Parking Lot #1 on the Parker River National Wildlife Refuge. All photographs by Alison O'Hare.

America. Lacking the equipment to hollow out a cavity, they nest in preexisting cavities. In the western United States, martins use rock crevices, natural tree holes, and abandoned woodpecker holes. In the Southwest, they find holes in saguaro cacti. In the Midwest and eastern United States they rely almost exclusively on humans to provide structures for nesting. Typically, these are multiroomed wooden or aluminum boxes mounted on poles fifteen to twenty feet above the ground. In times past, Native Americans customarily attracted martins by hanging hollowed-out gourds. Today, martins still nest in gourds provided by martin

landlords; these may be plastic gourds hung in a cluster.

After their first winter in South America, martins return to their natal site every year. Subadults, first-time adult breeders, and those that failed to reproduce during the previous year may establish new colonies, often located one-half to one mile from an existing colony.

In the compartments, martins build cup nests of grasses, twigs, and pine straw. They line the nests with fresh green leaves, which may act as an insecticide to deter mites or serve to cool the nest by evaporation. The nest usually slopes toward the back corner of the compartment. Mud may be used to line the walls or the inside of the entrance. Both male and female martins participate in nest building, which usually takes three to four weeks.

Clutch size, which averages four to five eggs, may range from two to seven. Most martins raise a single brood, although they may lay a replacement clutch if eggs or young are destroyed. Incubation lasts for fifteen to eighteen days. Fledging occurs after twenty-seven to thirty days. During the nestling phase, chicks grow rapidly (see sidebar).

## Conservation

Purple Martins face a number of challenges: the hazards of migration; competition for nest cavities from House Sparrows and European Starlings; predation by owls, raccoons, snakes, weasels, and squirrels; infestation with ectoparasites such as mites, the protozoan *Haemoproteus*, or blowflies; pesticide use at their South

## Developmental Changes Observed at the Plum Island Martin Colony

Pipping egg: Hatchling's bill, with egg tooth at its tip, breaks through the shell, usually along the midline.

Day 1: Chicks are tiny, pink, and naked. They are about one inch long and weigh about three grams (the weight of a penny!). Their eyes are closed, and they can barely raise their heads. Chicks rest on their bellies with their heads and necks in the same general position as in the egg.

Day 2: Chicks have more than doubled their hatching weight.

Day 3: Chicks weigh an average of ten grams. The yolk sac, seen as a chick's large, transparent belly, still provides nutrition.

Day 6: Feather tracks begin to appear as dark blotches under the skin on the head, back, and wings. Chicks can hold their heads up and right themselves if turned on their backs, and their eyes begin to open more each day. The average weight is about twenty grams.

Day 7: Pinfeathers appear on the trailing edge of the wings.

Day 8: Chicks appear mostly gray with pinfeathers on the tail and weigh about thirty grams.

Day 10: Eyes are fully open. The outer primary feathers begin to burst their sheaths, down begins to cover the body, and the weight is up to about forty grams.

Day 12: Most of the body is covered with down, and chicks orient themselves toward the nest entrance.

Day 13: Weight is about fifty grams.

Day 14: Tips of wing feathers protrude more than an inch beyond their sheaths. Pinfeathers are still visible on the back. Chicks huddle at the back corner of the nest compartment in response to a parental alarm call or an intruder.

Day 15: White feathers on the upper middle of the back are obvious.

Day 17: Most feathers have emerged from their sheaths. White powder, a dust from breaking feather sheaths, covers the back.

Days 18, 19: A maximum weight of sixty grams is reached by this time.

Day 20: All chicks have a gray collar, regardless of sex.

Day 21: Wing feathers now extend to the base of the tail.

Days 22–26: Chicks begin to lose weight. Wings cover the white feathers on the upper middle of the back and extend to the middle of the tail.

Days 27, 28: Wings extend to the tip of the tail or beyond. The average weight is about fifty grams. Chicks are ready to fledge.

After they have fledged, young will often roost in a nest box at night (Baicich and Harrison 1997; Ehrlich 1988; Harrison 1975; Stokes and Stokes 1989; Stokes, Stokes and Brown 1997).

American wintering grounds; and weather. In the United States, logging practices that drastically reduce the availability of natural nest sites have affected western montane populations. In the eastern United States, loss of habitat appears not to be an issue, and, in general, martins benefit from a close association with people.

The Purple Martin Conservation Association, founded in 1987, is based in Erie, Pennsylvania. It is an international, nonprofit organization dedicated to the scientific study of Purple Martins, their biology, and their habitat requirements. The PMCA is trying to locate and monitor all active breeding colonies and to collect and analyze data on a large-scale, long-term basis. The efforts of PMCA have shown that proper management practices, including larger nesting compartments, protection from predators, control of nonnative species, and regular monitoring of nest boxes can increase the number of young fledged per nesting attempt. Both authors of this article are members of PMCA.

### **Historical Status of the Purple Martin in New England, Eastern Massachusetts, and Essex County**

The history of the Purple Martin clearly shows that its nesting and feeding behaviors make it uniquely susceptible to the effects of weather. In fact, adverse weather accounts for the loss of more Purple Martins than all other sources of mortality combined.

In precolonial times, the Purple Martin was abundant if always local in New England. As quoted by Brewster (1906), Nuttall wrote in 1832, “a few years ago, after a rainy midsummer, many were found dead in their boxes.” According to Forbush (1929), in the early 1860s a Professor John Russell of Salem, Massachusetts, reported that the Purple Martin was very rare in that vicinity, following a “cold rain-storm that killed them by scores.” In 1883, Samuels described the martin as the least abundant of New England’s swallows, quite rare in some localities, and distributed in single pairs through all New England. Writing in 1901, Howe and Allen listed the Purple Martin as “an uncommon and local summer resident: formerly much more common” in Massachusetts, and a “common summer visitant” in Essex County.

Then in June 1903 severe and prolonged cold rains caused most martins in eastern Massachusetts and other parts of New England to succumb to starvation and exposure. Townsend (1905) wrote, “Up to two or three years ago they bred in Georgetown, Peabody, Lynnfield, Salem, and Beverly, but in the prolonged wet storm of June, 1903, they were practically all exterminated.” He wrote later (1920), “This beautiful, useful and interesting bird is now rarely seen in Essex County. A martin-house erected for their special use at my place in Ipswich, has never been even inspected by this bird as far as I know.” Brewster (1906) described the 1903 weather event as “a calamity, similar to that chronicled by Nuttall, but apparently even more widespread and disastrous.” Forbush (1929) wrote: “Practically all of the young of the purple martin died, while in a large section of the State from Buzzard’s Bay to the New Hampshire line most of the adult birds seem to have perished . . . . We have not a single report of a living martin in Middlesex or Essex County after June 25.” As a result of the storms of June 1903, martins were nearly extirpated in Massachusetts. In

1906, Brewster wrote that martins bred “regularly and in some numbers near the town centers of Medford, Watertown and Waltham.” He spoke of a large and flourishing colony not far from the Lexington Common. He stated, however, that martins had been steadily decreasing in number for twenty years or more throughout most of southern New England. Forbush (1907) encouraged that “every effort should be made to induce these birds to again take up their abode throughout the state.”

In 1909, Allen listed the status of Purple Martins in New England as follows:

Maine, Vermont, Massachusetts – Till recently a common local summer resident.

New Hampshire – Local summer resident north to White Mt. valleys, now uncommon.

Rhode Island – Uncommon migrant and summer resident, formerly more common.

Connecticut – Uncommon migrant and local summer resident, formerly more common.

Conditions and losses similar to those of 1903 occurred in late June and July of 1914. By 1929, Forbush described the martin’s distribution in New England as “uncommon, rare or wanting.”

Bailey (1955) states that after the losses of 1903, martins were recorded only irregularly in the state during the next forty years. In May 1945, birds were reported in thirteen locations. New nesting sites were found in Plymouth County. An early spring report came from Plum Island on April 2, 1950. Two hundred birds were reported at Falmouth in May 1951. Griscom, as quoted by Clapp (1983), described the martin as a rare transient on Plum Island and cited six records there through the early 1950s. Although in 1955 Griscom and Snyder stated that the martin had never recovered to its pre-1903 abundance, they did note a “small yearly increase.” A slow recovery was underway.

A large die-off occurred in late June 1972 when Hurricane Agnes stalled over the eastern seaboard and produced days of torrential rains. Populations from Virginia to Massachusetts and west to the Great Lakes were wiped out. Between ninety and one hundred percent of nestlings and thousands of adults perished. Birds were absent from some of these areas for up to ten years afterward.

By 1993, Veit and Petersen wrote in *Birds of Massachusetts* that Purple Martins were established in two major areas in Massachusetts, Plymouth County and the Parker River National Wildlife Refuge. During the ‘50s, ‘60s, and ‘70s, martins colonized sites in interior Plymouth County, most notably in Middleboro and South Carver. In 1955 on the North Shore a single nest box at the Parker River National Wildlife Refuge on Plum Island was the site of a first local nesting record. Additional boxes were provided there in the mid-‘60s and ‘70s. The coastal colony on Plum Island has been successful since the 1970s. In 1996, a colony was started in Marshfield at the Daniel Webster Wildlife Sanctuary (Clapp 1998; Petersen and Merservey 2003).

Although small increases have been reported, weather continues to wreak havoc on the Purple Martin in New England. Mid-summer cold and rain were responsible for the loss of many nestlings during 2004 and 2005. Forbush (1904) wrote of the June 1903 storm that “One could sail a boat over the meadows along the Ipswich River,” a report that could easily have been written of the extremely wet spring of 2006. Returning adult and subadult birds faced hardship at that time. Fortunately, the severity of loss experienced at the beginning of the twentieth century was not repeated at the beginning of the twenty-first.

In spite of this difficult history, over the last three seasons, numerous martins have fledged from the Plum Island colony. Birds have returned and nested in subsequent seasons. The slow recovery is continuing.

### Methods and Materials

Nesting units are located on the PRNWR at Parking Lot #1 and at the Refuge’s Old Headquarters at the north end of Plum Island. They are set in place in mid-April and remain up through early September. Each unit is mounted on a pole approximately twenty feet high and is equipped with a pulley and crank system to permit it to be lowered for monitoring.

Two types of units are used: wooden houses and plastic gourds. Each is given a unique identifying code to indicate its location and type. Although martins at other colonies utilize gourds, they have not been popular at the Refuge. Based on recommendations from two experienced martin landlords, a cluster of twenty-four gourds was hung at Old Headquarters in 2004. Although the support structure proved to be a popular perch for the martins, none nested in the gourds the first year. In 2005, a single gourd was used and successfully fledged three young. In 2006, no gourds were used. The martins of the PRNWR have traditionally preferred wooden houses over aluminum ones. The reason they select the wooden housing is unclear. It may be fidelity to the natal site or the placement of the houses relative to sun or wind. From a management viewpoint, gourds are easier to monitor and require less maintenance. It is interesting that the gourd used in 2005 was considerably cleaner at the end of the season than any of the compartments in the wooden houses. The total number of compartments available has varied in recent years (see Table 1).



Typical martin nest made of dried grasses and lined with green leaves

Nest monitoring and data collection begin each spring, soon after the first martin returns to the Refuge. All units are checked every five to ten days from the end of April to about the end of August, usually in the evening between 5:30 and 8:00. Adult and subadult birds do not appear to be disturbed by this activity. They remain at a distance, flying over the area, their musical chortle a defining sound of spring and summer evenings. Each unit is lowered, and the compartments are opened and inspected. Nests of

**Table 1.** Results of Monitoring the Purple Martin Colony on Plum Island

		<b>2004</b>	<b>2005</b>	<b>2006</b>
Compartments available		116	108	104
Nests with eggs		45	38	21
Total eggs	(E)	225	179	96
Eggs hatched	(H)	163	101	71
Young fledged	(F)	61	50	71
Percent hatched	(H/E)	72	56	74
Percent fledged	(F/H)	37	50	100
Percent overall success	(F/E)	27	28	74
Non-PUMA nests removed		218	173	109

House Sparrows, European Starlings, or squirrels, as well as any expired martin adults or young, are removed and discarded.

Martin eggs are allowed to remain in the nest for at least seven days beyond the projected hatch date, after which they are removed and discarded. If a unit has no martin activity after several weeks, the entrance is plugged to discourage sparrows and starlings from taking over a site where martins could nest in a future season. A record is kept for each compartment, and an entry is made each time it is checked. The record for an individual compartment could have as many as fifteen to twenty entries by the end of the season.

For each compartment with a nest, the following information is entered onto the record:

- 1) Date of completed clutch. A clutch is considered complete when two consecutive nest checks result in the same number of eggs counted.
- 2) Date eggs were laid. Martins lay one egg per day around sunrise. Once the clutch is complete, we can determine the latest possible day the first egg was laid simply by counting the eggs. The earliest possible date of the first egg would be the day following the previous count.
- 3) Projected hatch date. The incubation period for Purple Martins is usually fifteen to eighteen days. We estimate an approximate hatch date by adding a sum of days equal to fifteen plus one less than the number of eggs in the clutch to the date the first egg was laid.
- 4) Actual hatch date. Once the nestlings hatch, a set of standard photographic reference cards available from the Purple Martin Conservation Association is used to age the oldest nestling and determine its actual hatch date.
- 5) Earliest possible fledge date. This date is determined by adding twenty-six days to the assumed hatch date.
- 6) Dates to band. Prior to ten days of age, a nestling's legs are too short and too fat to accommodate a band without pinching. After twenty-four days of

age, removal of nestlings from the nest compartment risks premature fledging. The actual hatch dates and earliest possible fledge dates are used to determine the window of time when nestlings can be safely banded, between twelve and twenty days of age.

Nestlings are banded according to the protocols and technique used at the banding station operated by Massachusetts Audubon Society's Joppa Flats Education Center. This is located on the Parker River Refuge. All banding records are submitted to the Bird Banding Laboratory in Laurel, Maryland. Unlike nest monitoring, banding is done during the morning hours, usually beginning at 8:00. In preparation for banding, nestlings from an individual compartment are removed and placed in a holding container. The container is an open bucket that is too deep for escape and guards against the risk of premature fledging. For comfort, it is lined with dried pine needles.

One by one, nestlings are removed from the container, examined, and banded. Each bird is banded with a size 1A or 2 standard aluminum USGS band on its right leg.

In addition, nestlings from the 2004 season received a red plastic band on the left leg. For the 2005 season blue bands were used, and green bands were applied in 2006.

Any visible parasites, such as blowfly larvae, are removed during the banding process. After the nestlings are banded, they are returned to the holding container. Their nests are replaced with a layer of fresh, dry pine needles; dry grass clippings; or cedar shavings, and the nestlings are returned to their compartment.

7) Successful fledging. Lacking any signs of predation, young gone from the nest between the date of banding and the projected fledge date are considered to have fledged (Hill 1989, 1992, 1994, 1997, 2002; Kostka 1999; Pyle 1997).



A hungry mouth



Purple Martin chick at 15 days old

## Data Summary and Discussion

Results from three seasons of monitoring are shown in Table 1. In comparison to a fourteen-year study (1984–1997), which followed more than 2000 nests at sites in Pennsylvania, Ohio, and New York, our data are scanty. In the larger study, eggs had a hatch rate of seventy-five percent, and fifty-three percent of the eggs resulted in fledged young. At the Plum Island colony, the hatch rate was sixty-seven percent, with twenty-six percent of eggs resulting in fledged young. The Plum Island results should be interpreted with caution; they cover only three seasons, each of which was marked by weather extremes.

It is clear that weather continues to be a major challenge for the Purple Martins of Plum Island. Adverse conditions during nestling development resulted in the low overall success rates for 2004 and 2005. Although inclement weather challenged the adult and subadult birds early in the 2006 season, it was followed by favorable conditions during nestling development. This contributed to the overall success rate of seventy-four percent for 2006. If this productivity is looked at as the ratio of hatched eggs to fledged young, it was 1:1. In other words, if it hatched in 2006, it fledged!

## Conclusion

During our work with the martins, we have seen the challenges they face. We have seen them build nests, counted their eggs, and seen them hatch. We have seen their young grow from helpless chicks into sometimes-feisty nestlings, held them to band, and watched them after they fledged. We have seen them return to their natal site. At the end of each season we always wish that we had spent more time just watching and enjoying them.

Our intention in writing this paper is to share with you what we have learned about a species that is often overlooked. When you visit Plum Island during future nesting seasons, we ask that you pause after passing through the gate to the Refuge. Take a closer look at these birds. Can you find a martin with a silver band? Does it also sport a color band? These birds have traveled far. They belong to all of us, and they belong to none of us. Let's hope that they will continue to return to Plum Island for many seasons. 



Banded as a chick in 2004, this was the first banded martin seen in 2005.

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### **FROM MASSWILDLIFE: BEARS AND BIRDFEEDERS**

To avoid possible seasonal conflicts between people and bears in central and western Massachusetts, MassWildlife recommends that bird feeders be taken down by mid-March and that other preventive actions be taken. "There is little in the way of natural foods and bears learn to seek out high-energy human foods such as bird seed," says Jim Cardoza, MassWildlife Bear Project Leader. "This may lead to conflicts that pose hazards to both bears and people." Though Massachusetts is the third most densely populated state in the country, it is also home to approximately 2000 resident bears, with the majority living west of the Connecticut River. Bears also reside as far east as Worcester County and northern Middlesex County.

Bears have excellent long-term memories and remember which foods are available at different seasons and where these foods can be found. Even if a feeder is inaccessible to bears, they will be attracted by the scent of seed and suet, and they will scavenge seed spilled on the ground. Once they learn the location of these foods, they will return. Bears are typically shy and fearful of people, but deliberate feeding or indirect availability of human food, coupled with a lack of harassment, can cause bears to become accustomed to people. If bears lose their fear of people and develop a taste for human foodstuffs, bears can become bolder and may cause damage that ultimately leads to harm to people or to the demise of the animal.

If a bear is passing through a neighborhood without stopping, enjoy the sight. However, if the bear stops to feed on trash, bird seed, or other human generated foods, remove those foods after the bear has left and advise all neighbors to do the same. Due to their fear of people, bears tend to leave a yard when people step outside. Garbage and pet food must be secured from bears. Keep garbage in airtight containers, securely stored in a cellar, garage, or shed. Put trash out for roadside pickup the day of trash pickup, not the night before. Keep trash cans clean and wash them regularly to remove food scraps and fluids. Bears can break into small sheds with loose doors, especially when attracted by sweet or meaty smells. Ammonia or bleach may help deodorize trash containers. Refrain from feeding pets outdoors. Do not deposit sweet or meaty items in your compost pile since bears will soon find it. In residential areas where bears are known to be present, the entire neighborhood must take recommended actions or bears will move from yard to yard seeking food. Cardoza noted these actions also reduce problems with other common wildlife species such as coyotes, raccoons, skunks, and foxes. For more detailed black bear information, click the Wildlife button on the MassWildlife website ([www.mass.gov/masswildlife](http://www.mass.gov/masswildlife)).