

Where Do Purple Martins at a Typical Colony Site Come From?

A Color-banding Study of Natal Dispersal

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Fig. 1. Using tripod-mounted spotting scopes, *PMCA* staffers search for uniquely numbered, colored bands on the legs of Purple Martins at the colony site of Ron and Iris Worden of Springboro, PA. Despite never having banded nestlings or adults there, we found 84 banded birds over an 8-year period. In 2002, the Wordens offered 72 cavities and hosted about 65 breeding pairs of martins.

Have you ever wondered where the martins breeding at your colony site are from? For generations of martin landlords, this has been the unanswered question, the unsolved mystery. But now, thanks to the science of bird banding, we're beginning to piece together some parts to this puzzle.

For the past 9 years, my assistants and I have been color-banding nestling Purple Martins at about 50 colony sites within a 150 mile radius of the *Purple Martin Conservation Association's* headquarters in Edinboro, Pennsylvania (see Hill, 2002, in the citations). A photo of the type of bands we used can be seen on pages 12-13 of the current *Update*. During this time, we banded over 10,000 nestling Purple Martins between the ages

of 10-days-old and 23-days-old, while they were helpless in the nest. Additional banders in other nearby states have also uniquely color banded about 15,000 martins in the last few years. With so many banded Purple Martins now in the population, every martin landlord has a good chance of having a color-banded martin breeding at their site.

After all that color banding, we then spent hundreds of hours looking for banded martins within our study area. Our method was to set up high-powered spotting scopes on tripods at the edges of active colony sites and scan the legs of martins as they returned to feed their young at the nests (see Fig. 1). We quickly discovered that it took too long to check every bird. If we saw a banded bird, it often shot into its

cavity so fast that reading the three or four digit numbers was nearly impossible. It was obvious that we needed to come up with a more efficient technique. The technique we now use is to lower all the housing at a site, plug all the entrance holes with Styrofoam cups, then crank the housing partially back up. Plugging the entrance holes causes all the martins at a site to come in and sit on their porches or top perches with food in their beaks, exposing their legs and bands to us. Using this technique, we are able to scope the legs of nearly every bird at each colony site and read any bands that might be present in just a matter of minutes using our 15x - 60x spotting scopes. We always work quickly and never use this technique during bad weather. We make every effort to minimize stress on the birds.

Where Did the Martins at the Colony Site of Ron & Iris Worden Come From?

One of the colony sites we have visited annually since 1995 is the 65-pair site of Ron and Iris Worden of Springboro, PA (see Fig. 1). This is one of the few colony sites where the landlords would not grant us permission to band their babies. They did, however, allow us to look for leg bands using our spotting scope and cup technique. Amazingly, even though we had never banded at this colony site, we found 84 adult and subadult martins there with bands over an eight year period, despite the fact that we only visited their site for about one hour, once each year!

The 84 banded martins, fledged from 15 different colony sites scattered across three states (see Table 1., and Fig. 2). The color band from the farthest site came from Evanston, IL, a whopping 377 miles away! This was a subadult male seen in 2002 who had fledged in 2001. The color band from the nearest colony site fledged from Andrew Troyer's, just 4.4 miles away. All 84 of these banded Purple Martins had made at least one or more round trips to their Brazilian wintering grounds before settling at the Worden's colony site. None were birds-of-the-year (i.e., fledglings).

Natal Colony Site	Landlord	# of Banded Birds Seen	Dispersal Distance	Dispersal Direction
Conneautville, PA	Andy Troyer	54	4.4 miles	NW
Cranesville, PA	Crowley	5	9.7 miles	S
Linesville, PA	PA Game Comm.	1	12.2 miles	NNE
Edinboro, PA	Glies	2	12.6 miles	SW
Edinboro, PA	PMCA	5	12.6 miles	SW
Conneaut, OH	Lengyel	1	15.1 miles	SE
Girard, PA	Sonney	4	15.3 miles	S
McKean, PA	Peres	4	17.8 miles	SSW
McKean, PA	Leonardi	1	18.5 miles	SW
Kinsman, OH	Enos Troyer	1	27.6 miles	NE
Spartansburg, PA	Bell	1	34.5 miles	W
North East, PA	Bartlett	2	37.2 miles	SW
Holmesville, OH	Shetler	1	115.1 miles	NE
Newcomerstown, OH	Miller	1	124.4 miles	NNE
Evanston, IL	Wefler/McMahon	1	377.3 miles	E

Table 1. A chart showing the natal dispersal distances and directions of 84 color-banded adult and subadult Purple Martins observed over an 8-year period at the Springboro, Pennsylvania colony site of Ron and Iris Worden. Note that the natal (hatching) colony sites of these 84 birds are spread over a three-state area. The chart also shows the number of color-banded martins that dispersed to Worden's from each of the 15 natal colony sites.

cludes one trip to the South American wintering grounds in between fledging and their first breeding season.

We do *not* know if every bird we observed at the Worden site was breeding there, but the majority clearly were as they had insects in their beaks, waiting to feed their young inside the cupped cavities. It is likely that some were unmated subadult male wanderers.

What is the Typical Dispersal Distance of Purple Martins?

Eighty-one (96%) of the 84 banded martins observed in this study were breeding (or hanging out) at a colony site within

37 miles of where they hatched, and 85% were within just 15 miles. Interestingly, the majority of the breed-

ing age birds sighted at the Worden colony site fledged in previous years from Andy Troyer's "super colony site" (i.e., greater than 100 breeding pairs) just 4.4 miles away. In fact, 64% (54 of 84 banded birds seen at Worden's) fledged from the Troyer site in previous years. The average dispersal distance of all 84 color-banded Purple Martins sighted at the Worden's colony site was just 15.5 miles. If you eliminate the three long-distance dispersers from the calculation (those that dispersed 115, 124, and 377 miles), the average dispersal distance was only 8.5 miles. Does this mean that this is the average dispersal

The 84 unique bands seen at Worden's do not include the three hatching year (HY), post-fledging wanderers (i.e., birds-of-the-year), who had wandered 12.5 miles, 44 miles, and 60 miles from their respective natal (hatch) sites and were seen by us at Worden's once when we stopped by late in the breeding season to look for bands. Those three wanderers do not qualify to be included in the natal dispersal study. Theirs is an entirely different phenomenon (i.e., post-fledging wandering) and was discussed in an earlier article by Miller, Miller, and Hill (2001). This current paper deals with "natal dispersal," which is a study of the distance and direction a bird settles to breed compared to the location from which it fledged. In Purple Martins, that in-

“Amazingly, even though we had never banded at this colony site, we found 84 adult and subadult martins there with bands !”

distance of ALL Purple Martins? Probably not. There easily could have been sampling bias in this study, meaning that perhaps birds that dispersed farther simply didn't settle to breed at Worden's and thus weren't sampled in this study. And don't forget, about 10% of banded fledglings return to their natal sites as subadults and thus have a natal dispersal distance of zero. If you add those in, it will bring the average dispersal distance down even further. Minimally, this study shows that some martins do not disperse very far from where they hatched. It also shows that some do.

Do Purple Martins Have a Preferred Dispersal Direction?

Note that in Table 1., and in Fig. 2 the compass direction of dispersal in this study was pretty random. Martins dispersed to the Worden site from all directions. This seems to suggest that Purple Martins do disperse in all directions, at least in this part of the country.

Is There a Sexual Difference in Dispersal Distance in Purple Martins?

Some people have speculated that female Purple Martins disperse farther than males. Do the data from this study shed any light on this debate? Let's see. Of the 54 martins that dispersed from Andrew Troyer's to Worden's, 34 (63%) were male, 20 (37%) were female. Of the 81 martins in this study that dispersed 37 miles or less, 49 (60%) were male and 32 (40%) were female. But what about the fact that the three birds that dispersed the farthest were male? Do these results tell us anything? Does the fact that we sampled more males than females mean females disperse greater distances than males and are thus more diluted in the nearby study population? It might, but first we have to assume that equal numbers of males and females fledge, then survive their first 11 months of life, so that equal numbers of males and females arrive back on the breeding grounds as subadults. These assumptions are probably safe. But after that, martins are believed to have differential survivorship based on sex. Females likely have a shorter life expectancy causing a surplus of males among the older age classes. Why? Because of the stresses of egg-laying and incubation, plus the risks of injury or death that sometimes occur during multiple-participant, forced extra-pair copulations against them. Older females also have lower survivorship because they do more of the nest building and land on the ground more, making them more vulnerable to predation. Because of this slightly skewed sex ratio, and because female martins try to pair with the oldest, most proven males they can, some subadult males can't get mates and end up spending the summer cruising among neighboring colony sites trying to find a widowed female to pair with. If that fails, some subadult bachelors resort to infanticidal behavior, where they kill unguarded young in an

effort to cause nest desertion, and pair-bond dissolution, in hopes of freeing up a "divorcee" female for them to breed with.

So, does a slightly skewed sex ratio in breeding age Purple Martins explain all of the sexual differences in dispersal we saw in this study? It's hard to say. Statistics can sometimes be deceiving. We can get just the opposite result if we average the natal dispersal *distances* we observed in this study. The average dispersal distance of the 52 males that showed up at Worden's

was 19.2 miles, while that of the 32 females was half that, at 8.9 miles. However, if you eliminate the three long-distant dispersers, the average dispersal distances for males and females were 8.1 miles and 8.9, respectively. What can we conclude? I think until we have more data by looking at dispersal to all 50 of the colony sites we have studied (not just dispersal to Worden's), it is inconclusive whether there is a sexual difference in natal dispersal in the Purple Martin.

Can a Simple Mark/Recapture Statistic Tell Us From How Many Different Natal Sites the Martins at Worden's Likely Came?

In 2002, we saw 23 uniquely banded martins at Worden's out of 65 breeding pairs, or approximately 130 birds. We know that those 23 banded individuals dispersed from 7 different natal sites. Therefore, if 23 birds came from 7 known sites, then the entire 130 birds were likely to have dispersed from about 40 different natal sites. This comes from the algebraic formula: $7/23 = X/130$, where X then equals 39.6. Certainly, based on what we know of natal site

fidelity, an unknown number of the unbanded martins at Worden's probably fledged from Worden's site itself. Regardless, this mark/recapture statistic certainly shows that typical colony sites are the recipients of birds dispersing from numerous colony sites.

Do The Results of This Study Support or Refute the Martin Hog Theory?

This study clearly showed that the majority of Purple Martins breeding at the Worden site dispersed from the site of Andy Troyer, the nearest, active site. In the year 2002, Andy offered his martins 184 nesting cavities and produced 558 fledglings.

A few martin enthusiasts have labeled Andy Troyer a "martin hog," a term coined by Morton and Stutchbury (1997) describing martin colony sites thought to suck in more yearling females to breed than they export, or in other words, a giant black hole for martins. As the theory goes, hog sites are a net drain on the surrounding countryside, making colonization of neighboring *new* sites difficult or impossible because the hog sites attract all the yearling females looking to breed for the first time. Given a choice, yearling females would rather join

Mystery of Migration (Out of Nowhere)

Out of nowhere, they seemed to come —

These birds of joy and melody;

With life to cheer, they spread the news

And yet remained a mystery.

From whence came they? How did they know

That faith placed them a dwelling there

And called from out "Dame Nature's" store

The bread of life for nestling's care?

The days wheeled by and Time sped on,

The sun sank in his southern way,

Unspoken words on winds foretold

The end of life to Summer's day.

Out to nowhere, they winged their way —

These birds of joy and melody;

And loneliness crept in anew,

To live and breathe the mystery!

Poem written by J. Warren Jacobs in the early 20th century

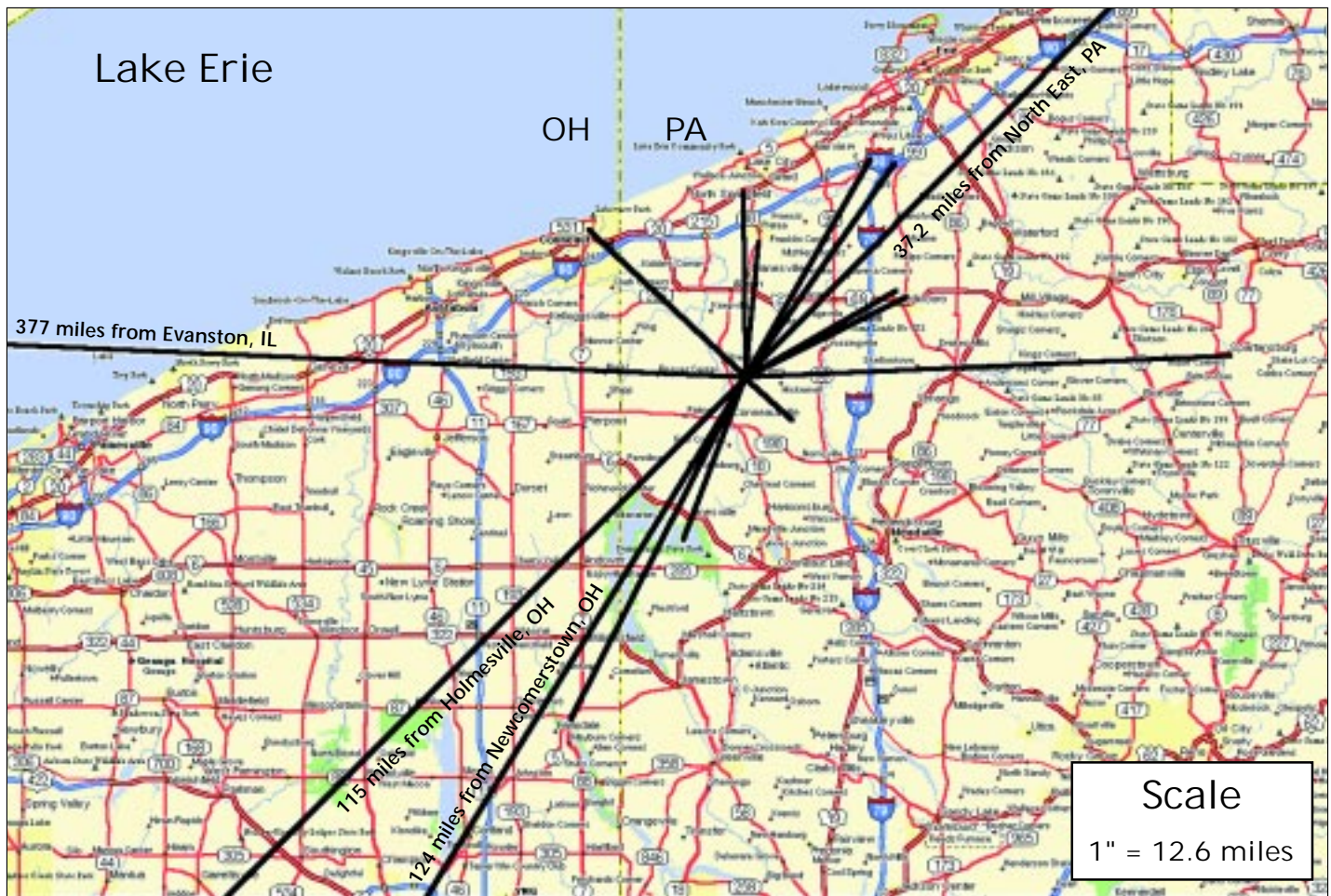


Fig. 2. A map with the Worden's colony site at the center hub showing the direction and distance to the 15 different colony sites from which 84 color-banded Purple Martins fledged, migrated to Brazil, then settled at Worden's to breed in future years.

an existing colony site than take a big risk and start their own colony site somewhere new (Morton and Stutchbury, 1997; Stutchbury and Morton, 1998). Yearling females choose established sites so they can improve the genes of their offspring by sneaking extra-pair copulations with older, more proven males found breeding there.

On the surface, the data reported here do not appear to support the Morton and Stutchbury martin hog theory (i.e., 54 of the 84 banded birds breeding at Worden's fledged 4.4 miles away at Troyer's). It appears that the Troyer colony site is actually producing lots of breeders for nearby sites. As Andy put it long before he knew the results of this banding study, "Yes, I may be a hog farmer, but I'm producing lots of little piglets to send down the road to my neighbors." It appears Andy is correct about that, but Morton and Stutchbury are correct as well. You see, as the hog theory goes, a hog site must keep adding additional housing each year in order to have room to suck in more yearling females than it produces, thus hurting the chances of neighboring sites from ever getting established. However, in the last several years, the Troyers have stopped increasing the number of cavities offered at their site, so are no longer, technically, a hog site. Furthermore, the nearby Worden site was not an uncolonized site that continually failed to attract martins. The Wordens started their colony a few years after Andy started his, but were successful in their first year of trying. So, the hog theory is neither confirmed, nor refuted by this study.

Conclusion

This paper is a preliminary summary of a long-term color banding project carried out by the *Purple Martin Conservation Association* and shows that natal dispersal in Purple Martins is still somewhat of a mystery. In this study, many martins dispersed a relatively short distance to breed after their first (and subsequent) trips to their wintering grounds in South America. Other individuals dispersed hundreds of miles. More studies are warranted.

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