Macroscale population estimates of a migratory songbird using remote sensing

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The Purple martin (*Progne subis*)

Populations of this large swallow form communal roost sites widely across eastern U.S. and their morning exodus are regularly recorded by local weather radar. Using the public archive of radar data, it is possible to quantitatively observe populations at unprecedented continental and decadal scales.

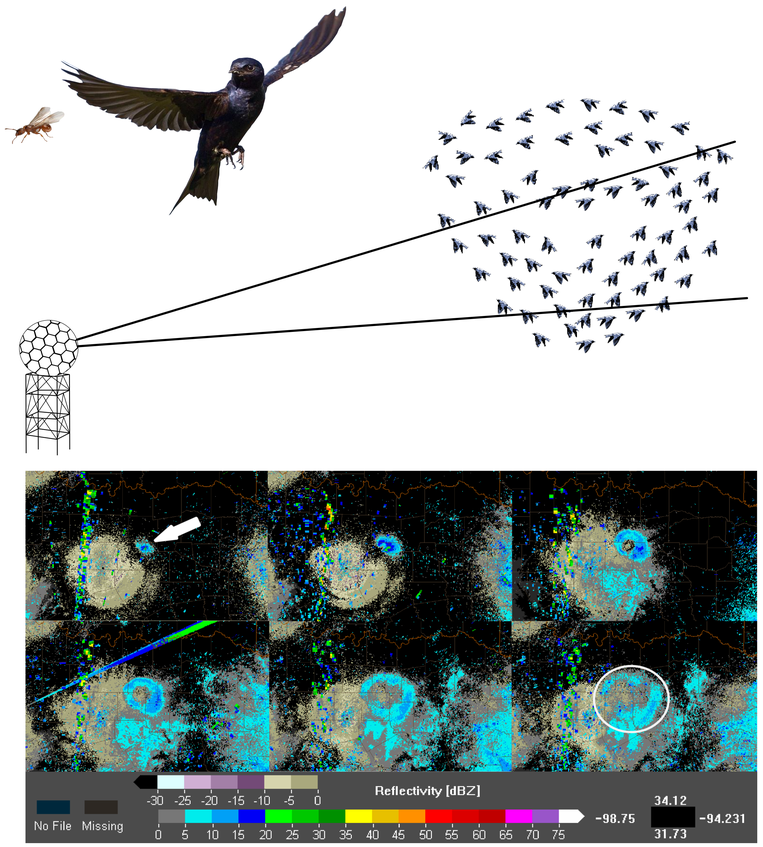

Figure 1. Time series showing the exodus of Purple martins from a roost location in Garland, Texas on the morning of July 13, 2014.

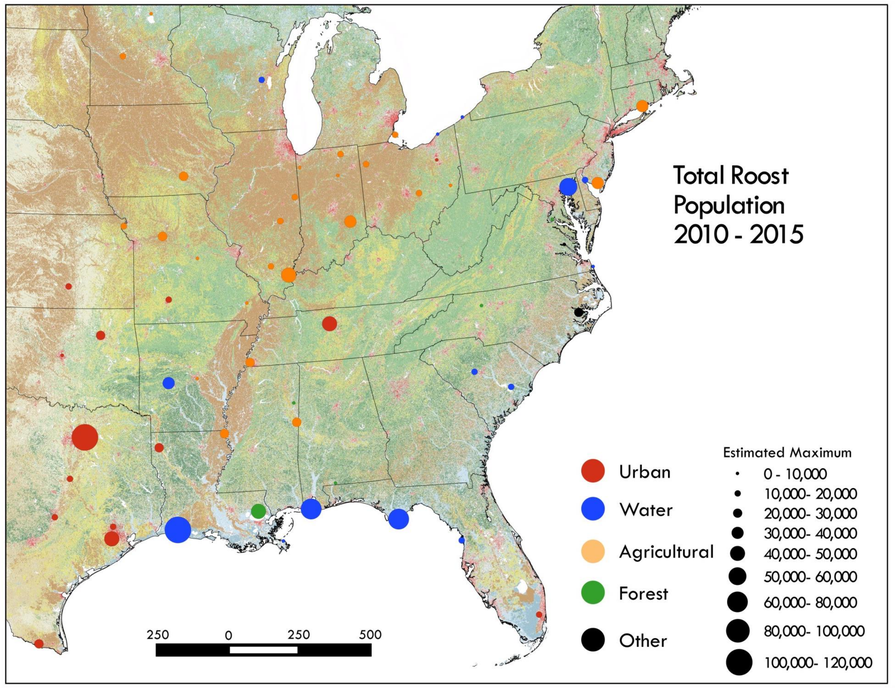

Figure 4. Maximum Total Roost Population estimate derived from radar according to land cover context. Colors indicate the dominant land cover type out to 10 km (NLCD2011, Bridge et al. 2016). Estimates are taken from the maximum of a GAM fitted to all years at each site collectively.

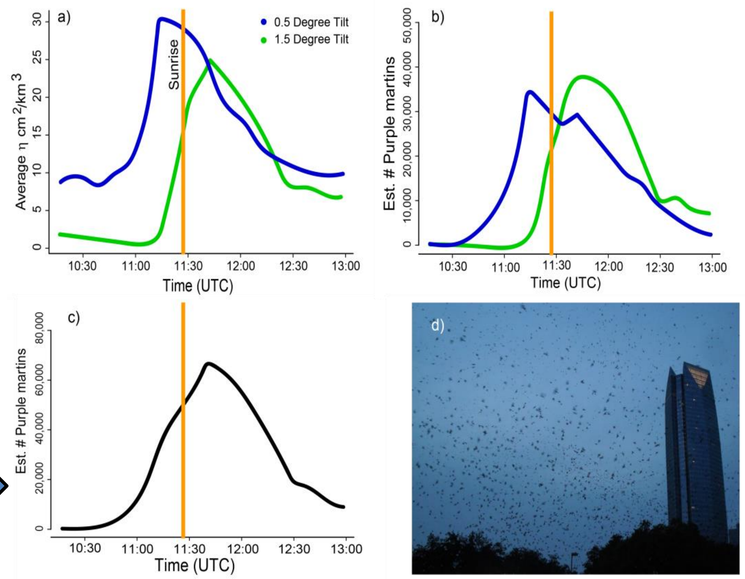

Figure 2. Population estimate of Purple martins aloft from NEXRAD radar products detected by KFWS near Garland, Texas on July 13, 2014. **a)** Averaged values of η per sample volume . **b)** Incorporation of Radar Cross-Section of a single martin[1]. **c)** Cumulative estimate of martins in daily emergence. **d)** Purple martins return to a roost in Oklahoma City, OK (photo: Jeff Kelly).

Landscape of the breeding range

By estimating roosting populations across the martin range we can begin looking for large-scale, species-level trends in populations. Here estimates of roosting populations, taken across five years, is shown according to the land cover type surrounding the roost.

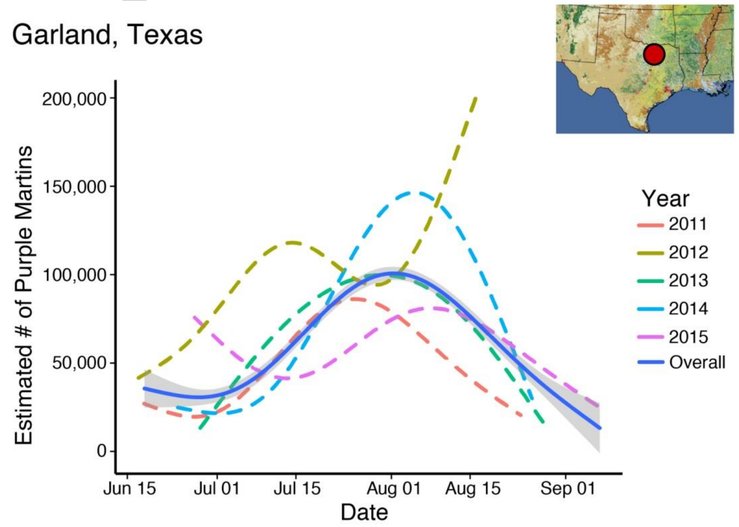

Figure 3. Total Roost Population (TRP) at the Garland site is estimated at approximately 100,000 martins across years, with much variation among years.

Martins in decline

Martins are an ecologically important aerial insectivore that occur across a wide spectrum of landscape contexts. Like many other aerial insectivores, martins are experiencing declines in populations across North America[3]. Using this method, we can generate estimates of martin populations at long-term temporal scales using the radar archive.

References

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6. Photos: Martin - Greg Schneider, RIFA – Brian Valentine

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