Migratory tracking of North American Common and Black terns

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Harbor Herons 2018, Staten Island, NY

Objectives (both studies):

To track full-cycle movements of species in decline:

- Fill gaps in basic ecology of these species
- Identify important migratory stop-over and over-wintering locations (and timing of use)
- Estimate migratory connectivity
- Identify and assess potential causes of long-term population decline
- Inform conservation and stewardship efforts for these species

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RESEARCH ARTICLE

Migratory routes and wintering locations of declining inland North American Common Terns

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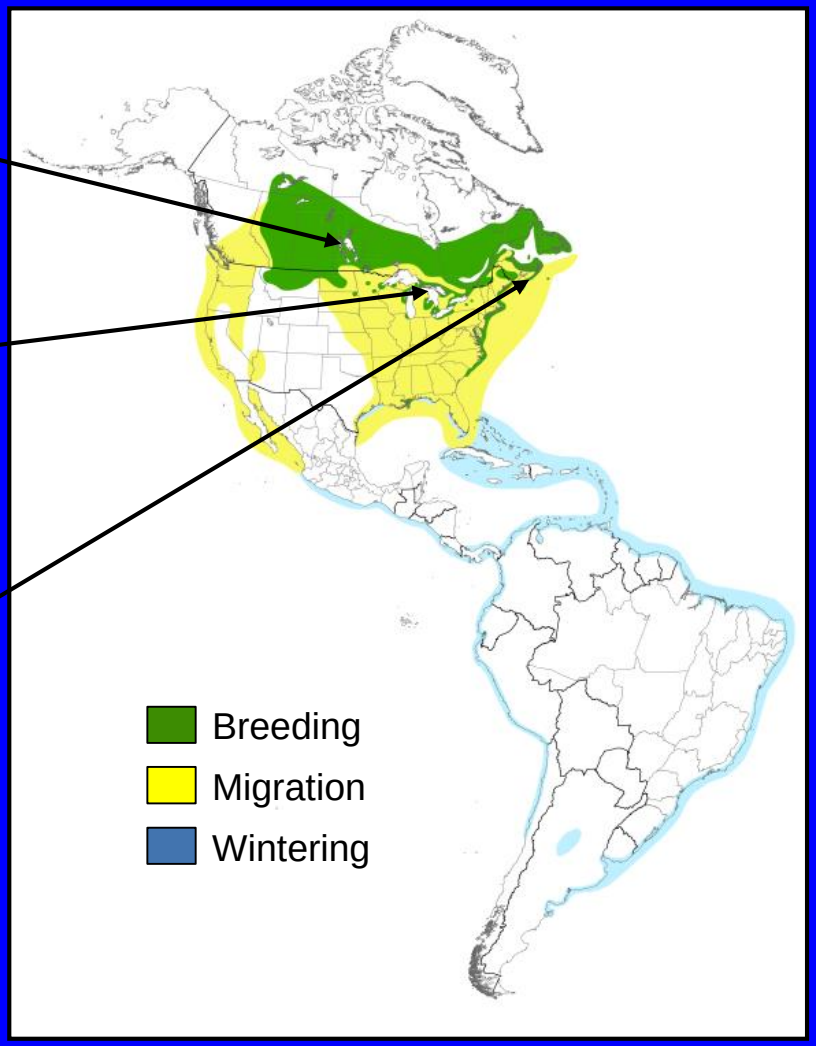
Bracey *et al*. 2018, *Auk* 135:385-399

Common Tern

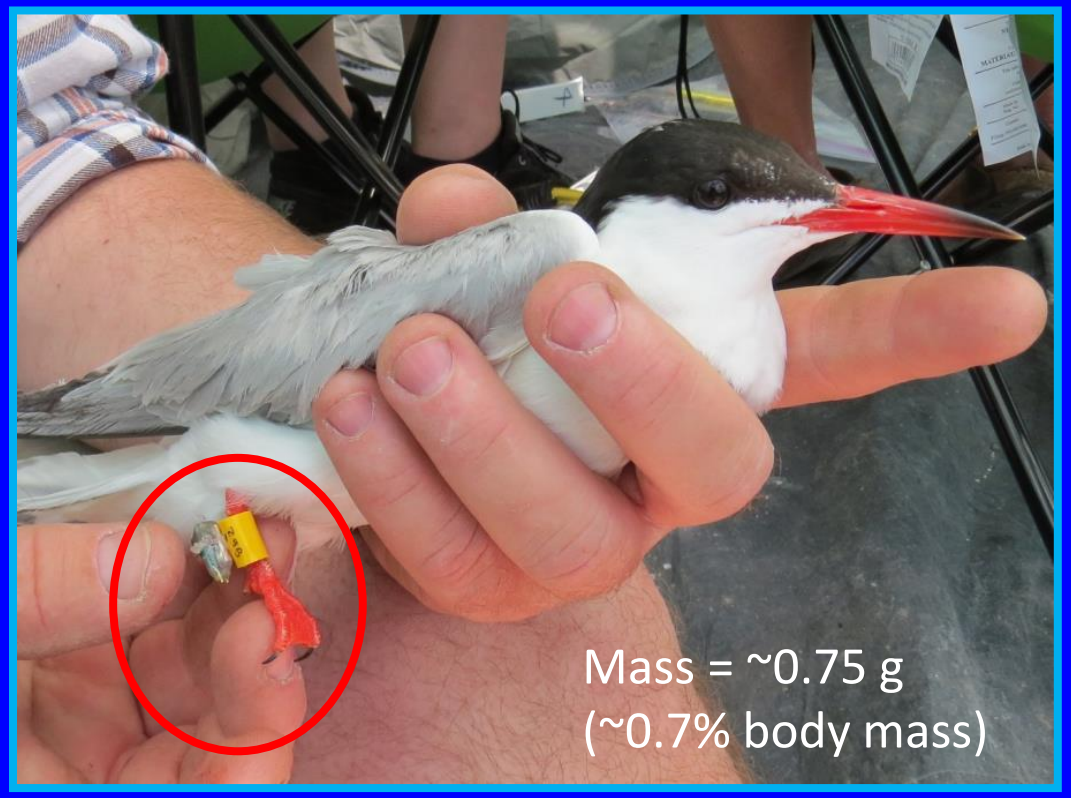
- Populations decimated due to millinery trade – symbol of conservation movement of 1900s
- Facing new and diverse threats
- Listed as Threatened or Endangered in six states bordering Great Lakes region
- Assessed as “not at risk” in Canada, largely due to conflicting population trends across range

Variation in population trends

- Substantial decline (-57 to -67%) since 1990s on large lakes of central Manitoba (Wilson *et al*. 2014 *Waterbirds*)
- Substantial decline (-40%) since 1970s on Great Lakes (Morris *et al*. 2010 *J Great Lakes Res*)
- Apparently stable or increasing in Atlantic region (Morris *et al*. 2012 *Waterbirds*)



Geolocators

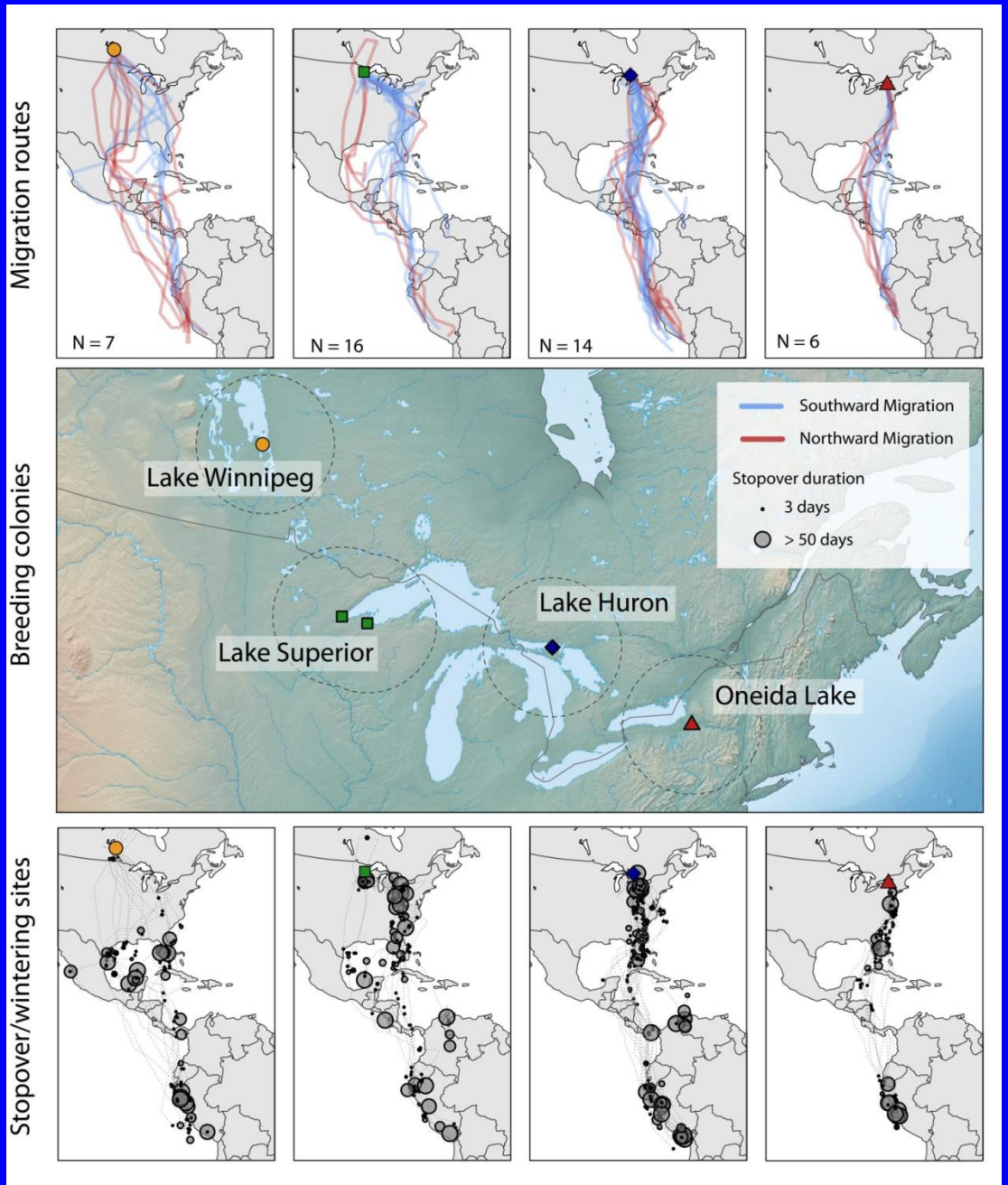


- 106 birds tagged at 5 sites
- Total recaptures = 58 (55%)
- 10 birds missing tags / units failed
- **Total sample = 48 units**

migrate technology

LOTEK WIRELESS FISH & WILDLIFE MONITORING

Tracks & stationary periods



- Considerable individual variation in the timing and duration of migration stages
- Estimated total distance traveled during migration averaged **15,141 ± 695 km** (range: 9,511 – 19,639 km).
- 70% of individuals wintering in Peru (high pop^{n} risk?).

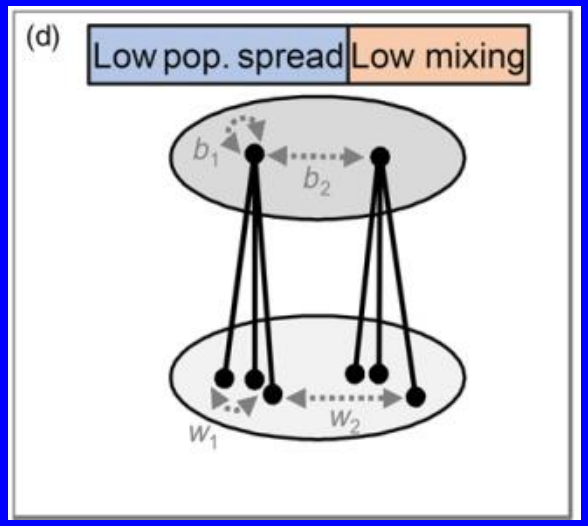
Migratory connectivity & population threats

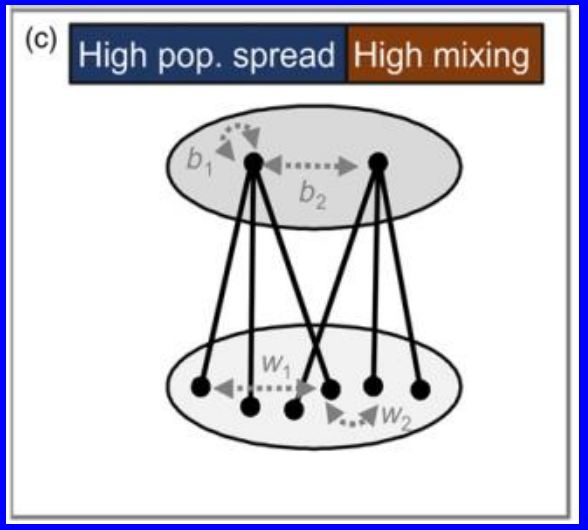
- Strong connectivity: use of discrete non-breeding areas by different breeding populations

- Weak connectivity: individuals from different breeding populations mix during non-breeding season

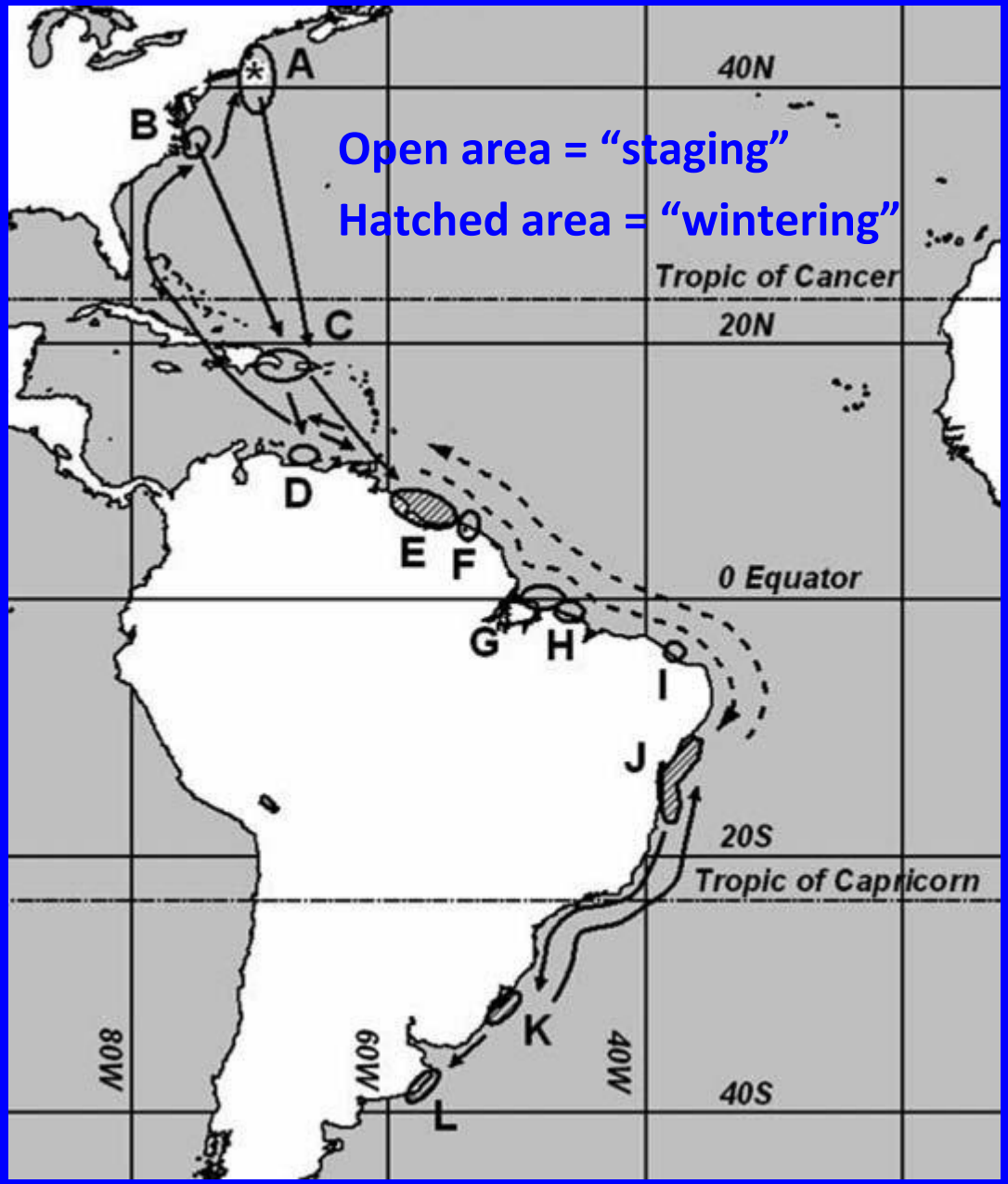
Estimates suggest weak migratory connectivity for inland-breeding COTEs

Finch et al. 2017 *JAE*





But, high connectivity at continental scale



Atlantic COTEs

(Nisbet *et a*l. 2011, *Waterbirds)*

- Southward & northward migration through the Caribbean
- Wintering on the north and east coasts of S. America
- Non-overlapping migration and winter distributions vs. inland colonies
- Only potential for mixing occurs during a few weeks in spring, off Chesapeake Bay (location B)

Understanding the migration patterns and wintering distribution of Black Terns.

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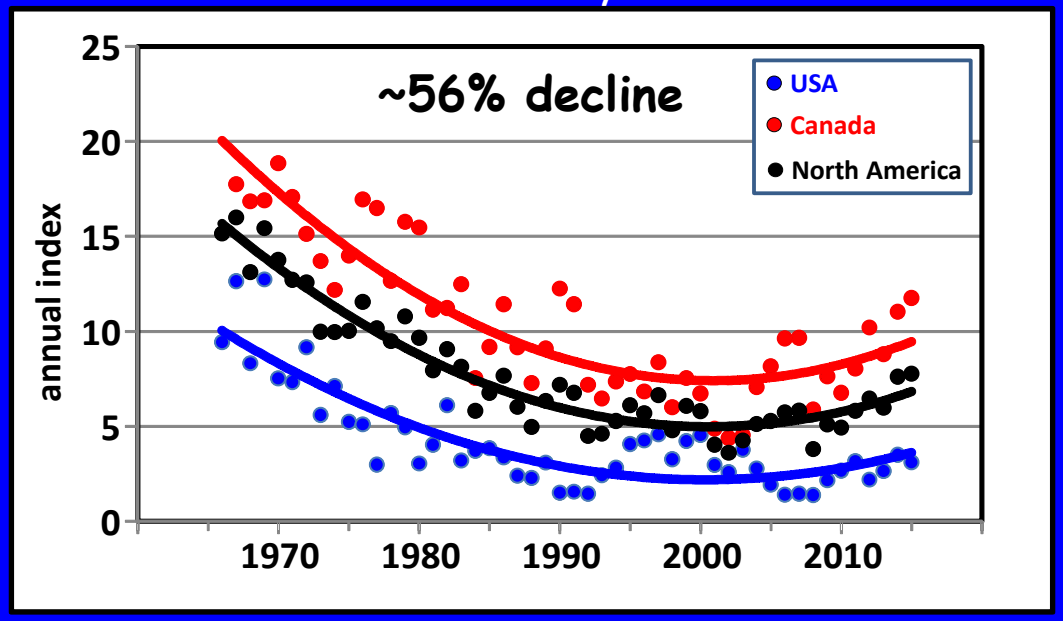
Population trends

NABBS trend analysis 1966-2015



Trends:

- Long-term, range-wide declines
- declines greater on periphery of range
  - e.g. in ON, decline of ~85% in sites, ~70% in nests since 1980s

Population drivers

1) Habitat

- **habitat loss & degradation have occurred, <u>but</u> available breeding habitat does <u>not</u> appear to be a primary limiting factor:**

> ***"…even highly-suitable sites had <20% predicted occupancy probability."*** **(Wyman & Cuthbert 2016)**

Population drivers

2) Demography

- Low annual adult survival probability (~67%; Shealer 2007, unpubl.; Servello 2000)
- Low survival and recruitment of nestlings (<2%, Shealer unpubl.)
- Modeled population growth rate highly sensitive to adult survival, more so than breeding success (Servello, 2000)
  - estimated vital rates far below those required to maintain a stable population
  - Are factors during the non-breeding phase contributing to declines?

Study areas


Untitled Map
Write a description for your map.
Legend
Canada
Quebec
Manitoba
Saskatchewan
Foam Lake, SK (n=23)
Tiny Marsh, ON (n=31)
Vermont
New Hampshire
New York
Massachuset
Connecticut
Montana
North Dakota
Minnesota
Michigan
Wisconsin
Pennsylvania
New Jersey
South Dakota
Wyoming
Maryland
St. Clair Flats, MI (n=9)
Nebraska
Illinois
Indiana
West Virginia
Virginia
Google Earth
900 km
N

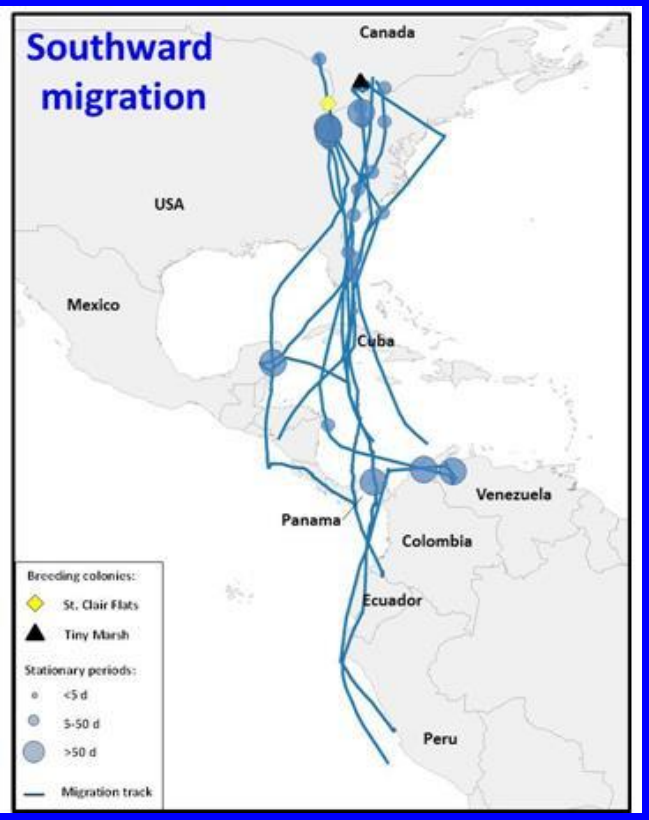
Geolocators - 2016-18

- mass = 0.75 g (~1.3% of average body mass)
- battery life ~2 years
- error: ±47 km
  - good for general movement patterns / ID of stationary sites

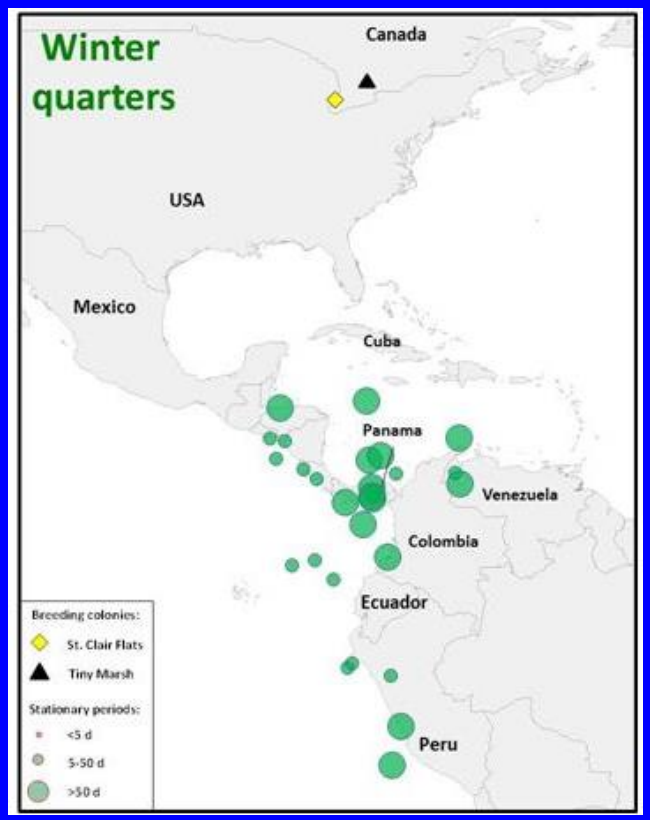
Intigeo-W65A9RJ, Migrate Technology

Tracks and stationary periods (n=8 of 13, composite)

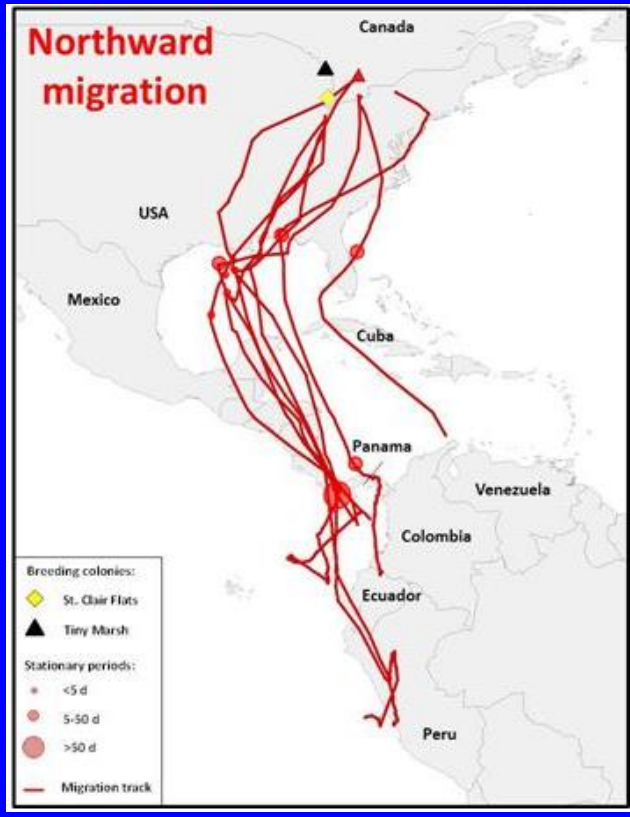
Fall (sorthward) migration



Winter



Spring (northward) migration



Summary of geolocator results

- High degree of individual variation in:
  - the timing and routes of migration
  - non-breeding distribution
- Fall (southward) migration; 7 of 8 staging in the Carolinas, one bird flew to Gulf of Mexico; staging/overwintering in Panama
- Overwintering in Central America (Panama important!) and northern South America from Venezuala /Colombia border to southern Peru
  - 50% of birds spent significant amounts of time offshore
- Spring (northward) migration – staging in the Gulf of Mexico (LO/TX); birds mainly used the Mississippi flyway (n=7; one bird returned up the Atlantic coast); tracks more dispersed than in fall
- Total distance travelled:
  - mean = 15,700 km
  - range = 13,400 – 18,200 km

Nanotag deployment – 2017-18

Motus network

https://motus.org/

tower locations

tower: Tiny Marsh

Nanotag deployment – 2017-18

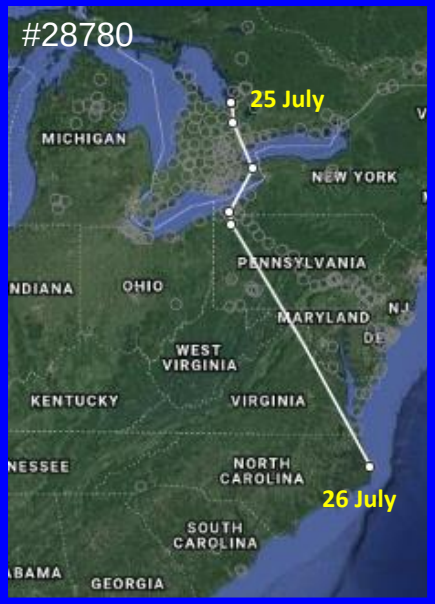
- **Mass = 1.01g** (~1.7% of mean body mass)
- **battery life ~4 months**
  - Collect finer-scale information on migration routes, staging and stop-over locations (and timing)
  - especially during equinox periods ('blackout" periods for geolocators)

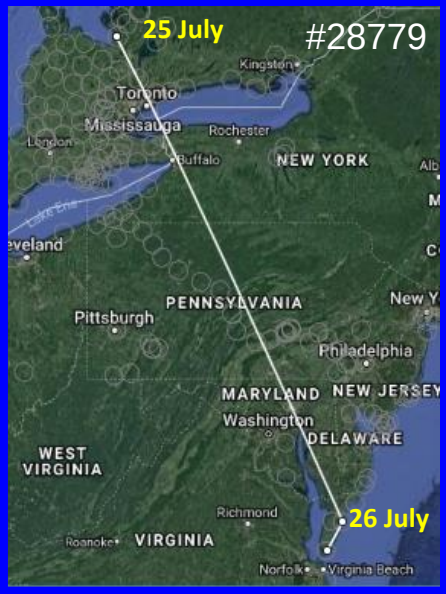
	Tags deployed		
Location	2017	2018	total
TM	7	19	26
SCF	-	10	10
			36

Lotek, NTQBW-3-2

Individual single-day migration movements

… to staging areas on Lake Erie





…to staging areas on Atlantic coast

n.b. Still waiting for data to be submitted from various towers on the network

NY/NJ connection?

- BLTEs use Atlantic flyway in the fall
  - One BLTE travelled though NY/NJ Harbor area during both fall & spring
- Chesapeake Bay an important staging area for COTEs in the spring (only area of potential overlap /mixing with Atlantic coast breeders)
- No genetic differentiation between Great Lakes & Atlantic colonies for either species (Szczys *et al*. 2016, Szczys unpubl.)

Next Steps:

- Recover geo-tags from 2017/18 deployment sites
- Expand collaboration to deploy tags in other areas of N. America (west and east coasts, other?)
    - Estimate migratory connectivity, identify areas of mixing (w.r.t. pop^{n} genetics)
- Identify important migratory stop-over and over-wintering locations
    - potential conservation issues/priorities at these sites; conservation partnerships
    - Multi-species approach to maximize benefits

Thank you!

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