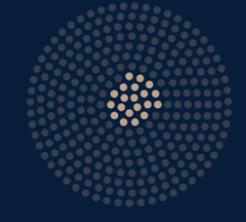


# Population problems

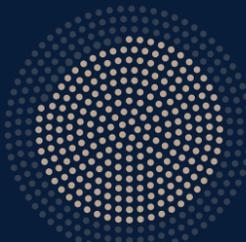
## STOLEN ARCTIC EGGS

Less than 7% of the shorebird eggs at East Bay on Southampton Island hatched successfully, whereas the rate at Coats Island topped 55%. The difference? Coats Island has no snow geese but East Bay is overrun. When shorebirds leave their nests to defend against encroaching geese, that provides an opportunity for predators to steal eggs.

**EAST BAY**  
20/296 eggs hatched

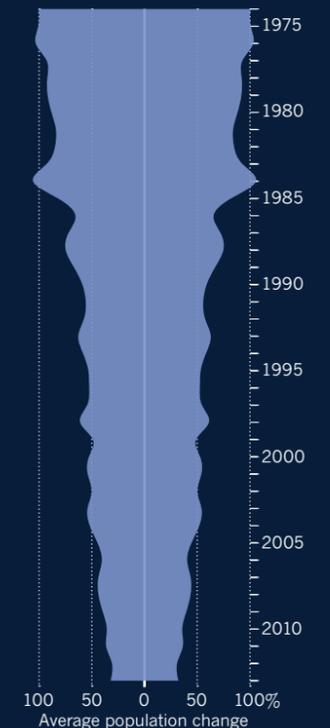


**COATS ISLAND**  
247/448 eggs hatched



## NEGATIVE NUMBERS

Since the 1970s, migratory shorebird species have experienced a 70% drop in population size, on average.



# Tracking trouble in the Arctic

Migrating shorebirds face a long list of hazards on their epic flights.

BY MARGARET MUNRO AND RICHARD MONASTERSKY  
DESIGN BY JASIEK KRZYSZTOFIAK

Many shorebird populations are declining steeply around the globe, and those that nest in the Arctic are among the hardest hit. On their long-distance migrations, they encounter a number of threats, including hurricanes and hunters, pesticides in croplands and human sprawl that is destroying wetlands used by the birds as refuelling stations. By tracking the journeys of each species, researchers can better understand the problems confronting these birds.

Shorebirds are vulnerable because their migrations are tightly tuned to the cycles of other species. The robin-sized red knot (*Calidris canutus*, pictured) that breeds in the Canadian Arctic times its northward migration so that it can stop and bulk up on the eggs of horseshoe crabs (*Limulus polyphemus*) in Delaware Bay. Western sandpipers (*Calidris mauri*) touch down every spring on Canada's west coast to feast on biofilm produced by algae along the expansive mudflats of the Fraser River delta. And all the Arctic breeders aim to have their chicks hatch at a time when there is a banquet of mosquitoes and other insects on the tundra. But there is growing concern — and evidence — that the connections have begun to fray because of climate change and other human impacts on the environment and ecosystems.



Red knot

ID tag



All tags shown actual size



## Spy tech

### MOTUS NANOTAG

Pearl-sized nanotags (shown here and on back of bird), that weigh as little as 0.25 grams are so light that they can be glued onto small birds, bats and insects. Batteries can last a couple of weeks to a year, powering coded transmissions that get picked up by a network of towers. Nanotags fall off when birds moult.

### SATELLITE TAG

Tags attached to backs of birds send or receive signals from satellite networks to track the location of the birds as they migrate. These tags are bigger than Motus nanotags and geolocators and are worn until they can be removed from the bird, or fall off.

### GEOLOCATOR

Long-lasting tags, typically attached to the leg, record sunrise and sunset, which can be used to establish rough estimates of a bird's latitude and longitude. Tags must be recovered to retrieve data.

## Animal network

A powerful new tool in animal research is the Motus Wildlife Tracking System, which uses a network of towers that capture signals from nanotags. The system has some 300 towers located mostly in North America, and is expanding to other continents.



## Trials and trails

The red knot has a wingspan of about 50 centimetres, but it makes one of the longest animal migrations known, from the tip of South America to the Arctic. The rufa subspecies, which breeds in northern Canada, has been hard hit in recent decades and is listed as threatened by the United States and endangered by Canada.

### MAP KEY

#### Motus towers

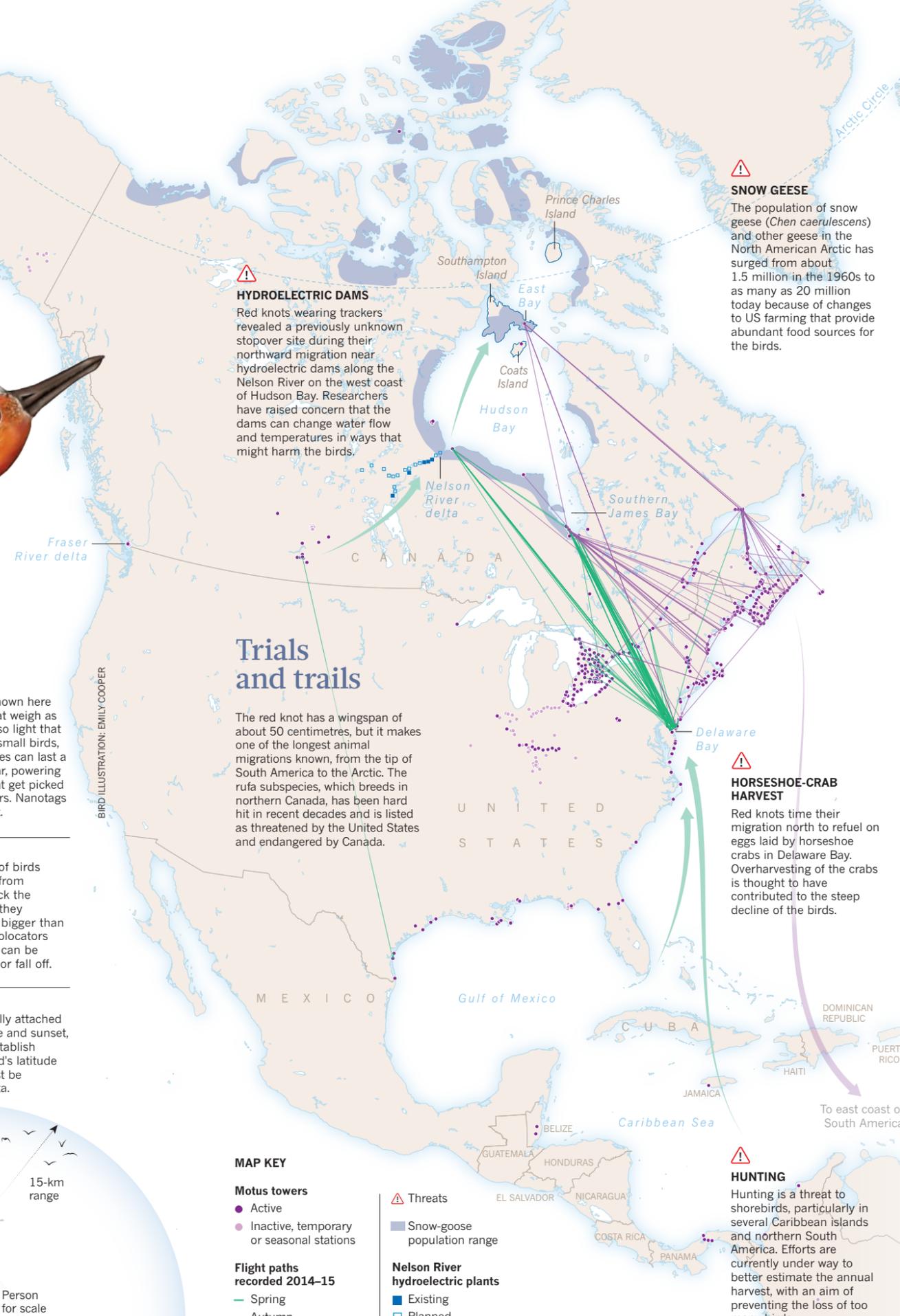
- Active
- Inactive, temporary or seasonal stations

#### Flight paths recorded 2014–15

- Spring
- Autumn

#### Threats

- Snow-geese population range
- Existing Nelson River hydroelectric plants
- Planned



### HYDROELECTRIC DAMS

Red knots wearing trackers revealed a previously unknown stopover site during their northward migration near hydroelectric dams along the Nelson River on the west coast of Hudson Bay. Researchers have raised concern that the dams can change water flow and temperatures in ways that might harm the birds.

### SNOW GEESE

The population of snow geese (*Chen caerulescens*) and other geese in the North American Arctic has surged from about 1.5 million in the 1960s to as many as 20 million today because of changes to US farming that provide abundant food sources for the birds.

### HORSESHOE-CRAB HARVEST

Red knots time their migration north to refuel on eggs laid by horseshoe crabs in Delaware Bay. Overharvesting of the crabs is thought to have contributed to the steep decline of the birds.

### HUNTING

Hunting is a threat to shorebirds, particularly in several Caribbean islands and northern South America. Efforts are currently under way to better estimate the annual harvest, with an aim of preventing the loss of too many birds.