

# How Do They Find Their Way?

Rob Bierregaard has been studying Ospreys since 1971. He began satellite-tagging Ospreys in 2000. Since then, he has followed the migration of 49 adults and 56 juveniles.



How young animals find their way to and from their wintering areas on their first migration cycle has long been a mystery. Some birds—cranes, waterfowl, and some gulls and terns for example—migrate in family groups or flocks, so the young learn the route by following migration veterans. In the Northern Hemisphere, young birds of prey migrate on their own—usually after both parents have headed south to their wintering ranges—so they cannot learn the route.

From 2004 through 2016, my collaborators and I have outfitted 56 young Ospreys with Microwave Telemetry's 22g and 30g Solar Argos/GPS PTTs from South Carolina to the eastern edge of the North American continent in Newfoundland. Of these birds, 20 were tagged on Martha's Vineyard, an island in the Atlantic, just south of Cape Cod.

Studies of adult Ospreys have shown the route adults on the east coast follow to their winter ranges. Nearly all move south in a broad front to Florida. Ironically, Ospreys, whose diet consists entirely of fish, avoid water crossings if they can. (If they fly into foul weather, they can't stop and rest in the water as could a duck or gull). So by staying over land as long as possible, they're funneled to the southern tip of Florida, where they then push off and head to Cuba. They follow Cuba to its eastern tip, then cross over to Haiti and the Dominican



Figure 1. Southward migration routes of adult Ospreys.

Republic. With no land on the southern horizon, they then begin a 400-mile crossing of the Caribbean. Once in South America, they spread out over most of the continent as far south as Argentina (Figure 1).

Knowing this, we were surprised when one after another of the young tagged on Martha's Vineyard started their first migrations

heading due south over the Atlantic, crossing as much as 1200 miles of open ocean before making landfall in the Bahamas (Figure 2). Some of the flights took more than 50 hours, and not all the young made the ocean crossing. Those that had wandered west prior to migrating followed the "adult route" down the coast to Florida.



Figure 2. Juvenile first migration routes from Martha's Vineyard.

Our first thoughts were that natural selection was eliminating young that made the risky flight across open water. What else would explain the lack of any adults migrating over the Atlantic? But then, as more and more young successfully completed this leg of their migration, we had to look for another explanation.

When the Atlantic-crossing young that survived their first stay in South America made their maiden trips

north, we realized what was going on.

Their drive to head north combined with the reluctance to head over open water directed them to the two peninsulas on either side of the Gulf of Venezuela, the northernmost points of South America. Arriving there, they were faced with the same dilemma that confronted them in their first fall trip when they got to the south shore of Martha's Vineyard and saw nothing but water. But the drive to go north trumps the drive to stay over land, so they pushed off across the Caribbean.

Once across the Caribbean, they could head northeast over the Atlantic, retracing their southern migration. But none did this. Instead, they see the Bahaman Islands stretched out like stepping stones, so they island-hop their way northwest to the Florida coast. From there, it's over land back to New England. They have discovered, rather than inherited, a safer route to and from their wintering grounds. It's longer than the trip across the Atlantic, but when the weather turns bad, the safety of solid ground beneath them makes it worth the extra miles flown.

On their next trip south, these now savvy Ospreys know they can get to South America without crossing the Atlantic. Staying over land as they work their way south gets them to the Florida Keys and into Cuba.

Belle is an Osprey that we tagged in 2010 not long after she had fledged from her nest on Martha's Vineyard. Six years later, she is the longest surviving Osprey tagged as a juvenile in the world, having just completed her fifth migration north from her winter range in Brazil's Amazonian rainforest.

Belle was not the first of our Ospreys to cross the Atlantic, but she went the furthest east of any of our adventurous youngsters. Her first four migration cycles beautifully demonstrate how this discovery process takes place (Figure 3).

On her first trip north, she used the Bahamas to get to Florida. On the second trip south, she started south down the coast but went over water from North Carolina to the Bahamas. On her second trip north, she found Cuba but turned north too soon. By her fourth migration cycle, she had the adult route fully wired into her internal navigation computer.

Our young Ospreys have shown us an elegantly simple explanation of how these birds know how to get to and from their winter ranges. It's not some complicated, genetic map wired into their DNA, but rather a very simple two-step algorithm that neatly explains the data we have collected. In the fall, head south and stay over land if possible. When there's no land to the south, just head over the water. In the spring, use the same program with north in the equation. After a few migration cycles, as Belle has shown us, a naïve Osprey will almost inevitably find the path that tens of thousands of adult Ospreys follow each fall and spring.

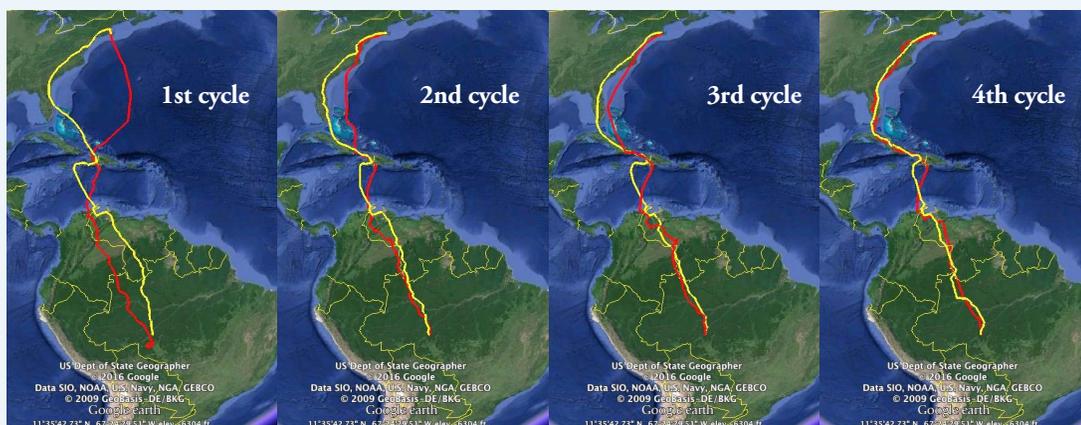


Figure 3. The first 4 migration cycles of the Osprey Belle. By her 4th migration cycle, she adopted the typical path taken by adult Ospreys. (Southern routes taken in the fall depicted in red, and northern routes taken in the spring depicted in yellow.)