Tracking Great Shearwaters Leads Down Many Paths

David Wiley is the research coordinator for NOAA's Stellwagen Bank National Marine Sanctuary where his work focuses on whales, seabirds, and forage fish. Linda Welch is the seabird biologist at the Maine Coastal Islands National Wildlife Refuge Complex and specializes in the foraging behavior and movements of coastal seabirds.

The great shearwater (GS) is a numerous, long-lived species of seabird that breeds in the South Atlantic's remote Tristan da Cunha Island group and spends the austral winter foraging throughout the western North Atlantic, including the Gulf of Maine (see figure). While the general annual migration pattern of the birds is well known, little fine-scale information exists relative to habitat use and interaction with human activities. This is a management concern for the U.S. Fish & Wildlife Service and U.S. National Marine Fisheries Service, since GS are subject to high levels of bycatch in commercial fisheries, at least in the northern parts of its range.

The U.S. National Oceanic and Atmospheric Administration’s Stellwagen Bank National Marine Sanctuary is a 2181 km² marine protected area located in the southern Gulf of Maine (see figure; top insert), the U.S. National Marine Sanctuaries Network, and beyond (see figure; middle and bottom inserts). Because our goal is identifying fine-scale habitat use rather than migratory paths, we chose not to duty cycle our tags, but allow them to constantly transmit locations. As a result, we have been receiving ~18 locations per day and applying those data to understand GS habitat use (Powers et al., Marine Ecology Progress Series, In Press). However, as location data began flowing, so did ideas as to their interpretation and how we could combine the locations with other data to truly understand GS. What are they doing in the Stellwagen Sanctuary? Combining GS location data with our ongoing research into the abundance and distribution of sand lance (a key forage fish) suggests that GS only use the sanctuary when and where sand lance are abundant, such as the southern part of the sanctuary in 2016 (see figure; top insert). To further investigate food habits, we are collaborating with Les Kaufman (Boston University) and Kent Hatch (Long Island University Post) for stable isotope analysis of exhaled gas, blood, and feather samples from captured birds. Understanding the importance of sand lance to GS and other seabirds is highly dependent on winds for travel, our birds can be used as a large-scale indicator of environmental change and how species react.

Additionally, since GS travel between hemispheres and are highly dependent on winds for travel, our birds can be used as a large-scale indicator of environmental change and how species react.

Incredibly, some of our birds are wearing continuously transmitting tags that have traveled the entire migration route, the longest remaining active for over 300 days (see figure).

Long-term data sets such as ours (five years and hopefully continuing) will become increasingly important as we attempt to understand the impacts of climate change at local and global scales. Our focal study area in the Gulf of Maine is experiencing one of the marine world’s most rapid increases in temperature. Our data set that includes movement, food habits, and bird condition (e.g., body weight and measurements) will allow us to use GS as a barometer for the entire system. Additionally, since GS travel between hemispheres and are highly dependent on winds for travel, our birds can be used as a large-scale indicator of environmental change and how species react.

Anyone interested in following our birds can find them at http://stellwagen.nmo.gov/seabirds.html. Starting in 2017, our birds will have their own Twitter account: @TrackSeabirds