Conservation of Leach's storm-petrels

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Introduction

Populations of Leach's storm-petrels (*Oceanodroma leucorhoa*; hereafter storm-petrels) are experiencing significant population declines (Stenhouse et al. 2000, Bicknell et al. 2012, G Robertson, Env Can, pers comm). Causes are unclear, but among the suspects are high levels of mercury (N Burgess, Env Can, pers comm), and within-breeding-season and carryover effects from perturbations of marine ecosystems and food sources (Hannah 2011), all of which may impair immune function, reduce reproductive success, and lower survival (Scheuhammer et al. 2007, A Hedd, Memorial Univ, unpublished).

Since 2005, my lab has been monitoring reproduction and adult return rates in a colony of storm-petrels, and one objective of our research is to identify causes of population declines. We have been watching for signs of predation, quantifying diets, and monitoring movements of birds within and outside breeding seasons to learn about potential threats to, for example, their food supply, and how these threats relate to reproduction. Moreover, we now have an established population of marked adults for which we can estimate survival rates.

Methods

An estimated 50,000 pairs of Leach's storm-petrels breed on Bon Portage (BP) Island, Nova Scotia and another 8,700 pairs breed on Country Island. Leach's storm-petrels are one of the most abundant seabirds breeding in the northwest Atlantic. Adults of this species breed almost exclusively on marine islands, incubating a single egg for 37-50 d that produces a nestling that spends 56-79 d in burrows (Huntington et al. 1996). Breeding adults forage at sea for several days per trip to provision themselves and their nestlings; foraging locations are presumed to be ~200 km from breeding colonies. In short, energetic commitment to reproduction is extreme in this species, so that even small changes to their environment may have significant consequences for their breeding success.

Since 2005 on BP, we have monitored reproduction (nest initiation date, egg size, egg mass, chick growth rate, nest fate, feeding rates) at permanently marked, GPS-referenced storm-petrel burrows (~250 in 2012). We inspect all burrows that fall within twelve 12- x 12-m quadrats. Quadrats are situated roughly 10 m apart on a 0.5-km-long transect. To track survival, adults are captured in burrows, measured (head length, culmen, tarsus bone, wing length, tail length), and are given uniquely numbered bands if not already banded. When adults are feeding nestlings, they may also be trapped in their burrows (Mauck and Grubb 1995) without provoking abandonment.

Blood samples (quantified, to a maximum volume of 200 µl; Voss et al. 2010) are obtained from nestlings (that reach 40 g) and adults for molecular sexing (Griffiths et al. 1998, Han et al. 2009), stable isotope analysis, quantifying heavy metal contamination, and for measuring other blood parameters.

Geolocators were deployed on adults on both BP and Country Island. In summer 2012 and 2013, we glued geolocators to adults to identify foraging areas (Pollet et al. 2014a). In September 2012 and 2013, we sutured geolocators to birds on Bon Portage to monitor bird movements over the winter, something that has never been achieved for this species (Pollet et al. 2014b). Storm-petrels were returned to their burrows immediately after geolocators were affixed.

Data were analyzed in R (R Core Development Team 2009).

Results

What follows is a brief summary of results we have recently obtained. Nest success (likelihood of producing a nestling that likely fledged), return rates of adults, and mass of returning adults were not statistically different for adults not outfitted or outfitted with geolocators.

From summer deployments of geolocators, we determined that birds from the two colonies have quite distinct foraging areas (Pollet et al. 2014a). Moreover, travel distances far exceeded estimates predicted for birds with this mass. Birds on Country Island travelled approximately 1,000 km from their colonies to forage, with total trip lengths of approximately 2,300 km; equivalent values for Bon Portage were closer to 600 and 1,100. Energetic consequences of such dramatic differences are likely huge; possibly diet quality is part of the explanation because birds on Country Island appeared to have a greater proportion of fish in their diets whereas birds on Bon Portage had a greater proportion of crustaceans. If fish are more digestible, this could make longer trips more feasible.

Another exciting find was of a bird captured in May that still had its geolocator on from the previous September. With collaborators in Newfoundland, we have obtained the first tracks of storm-petrels' over-winter travels (Pollet et al. 2014b)!

Using the recapture data that we have accumulated, Danielle Fife (unpubl.) has produced some preliminary survival estimates for Bon Portage: just over 60% when 90% is considered sustainable. These results are alarming; we will add another year of survival estimates with our research this summer, and hopefully have better news.

In summary, our results are well on the way to meeting important objectives of identifying causes of storm-petrel declines.

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