

first autumn migration after following the ultra-light plane. This pattern was consistent with observational data from wild NBI populations. In spring 2006, birds were equipped with GPS data loggers. This technique allows precise tracking of movements with a resolution of only seconds. We present preliminary data in a three-dimensional terrain model.

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**Phylogeography of the great southern skuas (*Catharacta spec.*)**

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The great southern skua (*Catharacta*) complex comprises five described taxa in a phylogenetically young genus. Cytochrome b variation was found to be low in a former study, and failed to resolve the phylogeny of the complex. Accordingly, we set out to investigate its phylogeography by sequencing a hypervariable region, HVR I, of the mitochondrial DNA D Loop. The marker contained enough informative variation to resolve population differences. DNA samples of 10-25 individuals per breeding location were used and covered the breeding range of all taxa. The analysis to be presented reveals the phylogeny and age of the five taxa, as well as population history and potential range changes. The prediction that climatic oscillations reduce phylogeographic structure in high-latitude taxa will be tested by comparing populations of South Polar (*Catharacta maccormicki*) and sub-antarctic great skuas. The project also enables comparisons of speciation in arctic gulls and antarctic skuas, and reveals the importance of glaciation in shaping genetic structure in these seabird populations and past speciation events.

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**Waterbirds as indicators of agricultural intensification: Local response to effluents in the Mar Menor Lagoon, southeast Spain**

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Under an EU-funded project for managing the Mar Menor lagoon and its watershed in southeast Spain, analysis of a census of wintering waterbirds revealed a general positive response to nutrient input. The Mar Menor is a 135 km<sup>2</sup> coastal wetland complex surrounded by an irrigated agricultural plain of 330 km<sup>2</sup> and a dense urban belt. During the winter of 2004-2005, we studied the distributional response of waterbirds around the main effluent, Rambla del Albuñón, formerly a derelict ephemeral channel. The effluent collects drainage water from agricultural fields and refuse water from sewage and desalination plants. We counted birds and recorded their activity inside the lagoon, along a stretch of undeveloped shoreline on both sides of the channel outlet. The entire shoreline is affected by diffuse drainage discharge, which ultimately reaches the lagoon through a saline steppe. After dividing the adjacent waters into sectors located at different distances from shore and outlet, we compared waterbird

numbers among them and in sections of the lagoon not affected by agricultural drainage. There was a marked aggregation of the three most abundant species, Great Crested and Black-necked Grebes (*Podiceps cristatus*, *P. nigricollis*) and Eurasian Coots (*Fulica atra*) around the point of discharge. The distribution of these species is discussed in relation to their trophic, ecological and physiological requirements. The case of the Coot is especially remarkable, as it had increased from virtual absence in the late 1980s to over 700 wintering birds in 2004-2005, concentrated in sectors closer to the outlet probably because of its preference for low salinity waters. Since salinity reduction and nutrient loading are the main factors controlling environmental change within the system, waterbird numbers appear to be useful indicators of potential problem areas in and around agricultural effluents.

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**Effects of weather on a nearctic-neotropical migrant songbird: Implications for climate change**

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Reproduction and survival of nearctic-neotropical migratory birds is affected by global climate patterns, but how local weather influences these parameters is not well understood. We use a 23-year study of the demography of Black-throated Blue Warblers (*Dendroica caerulescens*), including 10 years of study across an 800-m elevational gradient, to reveal how the breeding biology of this species is being affected by changing climate at the Hubbard Brook Experimental Forest, New Hampshire, USA. Weather was highly variable among years, with mean May temperatures differing by up to 6.8°C during this period, while mean June temperatures increased by 1.7°C. Mean temperatures across the elevational gradient differed by about 2°C, approximately the shift expected to occur in New England due to global warming over the next 50 years. Cool springs resulted in later nesting and little recruitment at high elevation, dramatically shifting the age structure and density of the population across elevations. Within years, mean date of completion of first clutches did not differ significantly among plots at different elevations. Biomass of Lepidoptera larvae, a primary food of migratory songbirds, varied widely among years and was significantly higher at higher elevations; but it fluctuated largely independently of local weather. These findings indicate that the usual conditions at mid- and high- elevation represent optimal habitat for the warblers, in part, because food abundance has been greatest at these locations. The projected warming trend will expand the area subject to low-elevation climate - and least food - while reducing mid- and high-elevation habitat. Such changes should have a negative impact on the distribution and abundance of Black-throated Blue Warblers by reducing annual fecundity. It can thus be expected that projected climate change will affect this and other migratory bird species through changes in habitat quality, especially food availability.