Quantifying the relative contribution of breeding vs. non-breeding environmental conditions to survival variations in a trans-Saharan migratory bird of prey

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Abstract

Migratory species are subject to environmental variability occurring on both breeding and non-breeding grounds. As a result, conditions experienced sequentially can affect the

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ability of individuals to survive over the whole year. Estimating the relative contribution of environmental factors experienced at different periods of the life cycle, and their potential interaction, to the variation in survival is of paramount importance to predict population dynamics.
Here we investigated how much environmental variability affects age-specific survival rates of the Montagu's harrier *Circus pygargus*, a trans-Saharan migratory raptor. We studied two distinct areas in western France, based on the monitoring of marked chicks and adults from 1988 to 2005 in RO and adults only in ML between 1999 and 2017. We tested for correlations between age-specific survival and different proxies for food availability available in breeding and non-breeding grounds.
Adult survival in RO was lower and more variable compared to ML, a result consistent with the fact that environmental conditions were harsher and more variable during the former period. Indeed adult survival in RO was positively related to the amount of rainfall, but not NDVI, during the wet season in Sahel and, to a lesser extent, to annual mean breeding success. By contrast, survival in ML was not affected by any proxy. First-year survival in RO was similarly affected by rainfall in Sahel. However age-specific survival rates varied asynchronously as fist-year survival was lower in years with higher annual mean breeding success, suggesting competition occurred between chicks during their first months of life. Overall, our results indicate that Montagu's harriers are primarily sensitive to environmental conditions experienced on wintering grounds, and particularly when such conditions are below a given threshold, with no evidence for an interaction between summer and winter conditions.