

Habitat loss, nutritional stress, and the decline of the Australasian bittern in Aotearoa New Zealand

The Australasian bittern/Matuku-hūrepo (*Botaurus poiciloptilus*) is a native species that has undergone dramatic population declines over the last few decades, resulting in their listing as ‘threatened-nationally critical’ by the Department of Conservation. It is thought that bitterns are affected by a lack of prey due to the loss and degradation of their wetland environments, but there is currently a lack of knowledge regarding the role of diet in the decline of this species. Identifying the diet of bitterns and how it has changed is important for developing and implementing targeted conservation strategies. The aim of my research is to identify whether population declines in bittern are due to dietary changes over time by comparing feather growth patterns and stable isotope values in both historical and contemporary populations. I am also evaluating whether changes in habitat quality may have contributed to bittern distribution changes. My study has three objectives: (1) determine whether changes in bittern distribution over the past 50 years is correlated with changes in the extent and vegetation structure of wetlands, (2) determine whether there is a correlation between water quality and the presence of bittern in contemporary wetland environments, and (3) examine whether levels of nutritional stress in bitterns differs between wetlands that vary in quality and over time.

To compare changes in wetland habitats, I am using the Birds New Zealand bird atlases to analyze changes in bittern distributions over time. This allows me to identify wetlands in which bitterns remain and those from which they have disappeared. I am then using satellite imagery to identify changes in vegetation coverage over time, and collecting water samples to analyze a number of water quality measures (e.g., turbidity, pH, nitrate and phosphorus levels) to see if they differ between sites with and without bitterns. To compare the diets of bittern I have collected feathers from historical (sampled from museum study skins/mounts) and contemporary feathers (sampled from live or deceased birds) ranging in dates from 1886 to 2023. For each feather, I first conduct ptilochronology, which is the measurement of growth bars along a feather, and that are known to be related to nutritional condition of a bird. This will be used to determine whether bitterns have undergone changes in feather growth patterns over time due to changes in their diet. Finally, I am performing stable isotope analysis of carbon and nitrogen and compound-specific stable isotope analysis of nitrogen in amino acids on feathers to determine whether bitterns have undergone trophic positional changes over the past century. This will tell me whether dietary changes may have contributed to the population declines of bitterns and what we would need to do to restore wetlands to a level that would support this species again.

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