



Palaeoecology and Ancient DNA of the Kakapo

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The remarkable, flightless, nocturnal kakapo is currently one of New Zealand's most critically endangered birds. However, it is now well understood that these unusual parrots were once among the country's most abundant large animals, found throughout NZ's forests from North Cape to Stewart Island, and from sea level into the high mountains. Tragically, kakapo populations plummeted following the arrival of humans and predatory mammals. Today, the semi-wild population is restricted to just over 150 birds, with only three breeding populations on intensively managed offshore islands. Although the kakapo population is steadily increasing thanks to an intensive and dedicated conservation effort, the bird remains extinct in its natural range and interacts with a fraction of habitats and other species they once did. Therefore, an understanding of kakapo ecology is limited using contemporary observations alone.

The success of kakapo conservation is dependent on increasing kakapo numbers and identifying appropriate islands for reintroductions, which is constrained by kakapo ecological requirements. For example, female kakapo only become receptive during rare, mass-fruiting (mast) events of mature rimu (*Dacrydium cupressium*) providing sufficient nutrients for reproduction. However, the fossil record of kakapo demonstrates that kakapo could persist in any habitat with tree cover, including forests devoid of rimu. For example, this record demonstrates kakapo were common in high altitude beech forests in Nelson or Fiordland or were common in kahikatea-dominant forests on the Canterbury plains. Fossils of nesting material in semi-arid Central Otago, even demonstrates the birds were breeding in low woodlands lacking tall trees. This historical evidence suggests kakapo have a much more complex and adaptable ecology than may be inferred today.

Uniquely for any still living native bird, faecal materials centuries or thousands of years old from long-extinct kakapo populations have been preserved in caves throughout the South Island, representing a wide variety of habitats different from those occupied today. This project based at the Long-Term Ecology Lab, Lincoln, ([LTEL](#)) will use a range of methods to explore the content of kakapo coprolites (preserved faeces), including ancient DNA, next-generation sequencing, and fossil analyses. Together these data will provide a closer understanding of kakapo diet, disease, behaviour and ecological roles.

However, although our laboratory group currently possesses a large number of kakapo coprolites which are currently being analysed, these originate from just two localities and provide minimal ecological variation. However, large, confirmed but unsampled deposits of kakapo coprolites still occur in many remote caves, such as the high-altitude, and ecologically unique site of Euphrates cave in the Garibaldi plateau, North-West Nelson (pictured). The generous grant provided by Birds NZ, will fund field work to sample several such sites, representing a wide range of ecologies. Researching these poorly known deposits, will in turn, allow us to greatly boost our understanding of kakapo ecology and conservation. For additional information, or if you would be interested in becoming involved, please contact Alex Boast (apboast@gmail.com).

Pictured: (Left), young captive kakapo hatched in recent 2016 breeding season (credit Alex Boast); (Middle), Euphrates Cave, Garibaldi plateau, North-West Nelson (credit Aaron Camens); (Right), recently discovered deposit of kakapo coprolites, cave near Mt. Owen, North-West Nelson (credit Corey Mosen).