



Palaeoecology and Ancient DNA of the Kakapo

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It may be surprising to think that kakapo were once one of the most common and widespread birds in New Zealand. It was just over a Century ago, that the explorer Charlie Douglas wrote that kakapo were so common in some remote forests that they could be shaken out of tutu bushes “like apples”. NZ’s rich fossil record shows that kakapo probably occurred in all the forested habitats on the NZ mainland, whether it be subtropical kauri forest, rainy mountain beech forest, or dry Central Otago woodlands. Furthermore, in some fossil-rich cave regions, such as Waitomo, kakapo remains dominate above other bird species. These plump, flightless, nocturnal parrots must have once had an important impact on NZ’s ecosystems, and males must have filled the forests with their lusty booming calls during the Summer. They evidently also had the potential to live in a much broader variety of habitats than the tiny surviving populations occupy today. Any information how kakapo may have once lived in different habitats in ancient NZ would therefore be of great interest.

NZ has a wealth of different kinds of subfossils, which can tell a lot about what NZ was once like before the arrival of humans – such as bones, feathers, eggshells and even the mummified bodies of birds such as moa. One of the more unusual subfossils identified are coprolites – a general word for preserved, prehistoric dung. Coprolites suspected to have originated from birds such as moa have been found in dry rockshelters and caves in the South Island in the past. In recent years, researchers at the Long-Term Ecology Lab (LTEL), at Landcare Research, Lincoln, has used a combination of ancient DNA and fossil data to examine these coprolites as well as look more closely for them in the field. This work has recovered hundreds of preserved coprolites from several sites in the South Island, many of which have been processed for fossil and DNA data. Ancient DNA has also confirmed that apart from moa, the most common ancient coprolite type in NZ (as long suspected, from a characteristic “spaghetti” shape) originate from the humble kakapo.

Research on moa coprolites has revealed a wealth of information about these extinct giant birds’ diet, ecology and diseases – and has also shown how coprolites can reveal a huge amount of information about how a species once lived in the past. Although hundreds, even thousands, of coprolites suspected or confirmed to belong to kakapo are known to occur – the great majority of NZ coprolite research has been on moa. A new project ongoing at the LTEL is now extensively surveying kakapo coprolites and hopes to help us better understand how ancient NZ functioned and how we might better conserve kakapo today. However, when this project started, most of the kakapo coprolites that were available for research came from a small handful of sites.

The greatest concentrations of probable-kakapo coprolites, are in caves from around North-West Nelson and North Westland. Many of these sites are very remote and difficult to reach. A Birds NZ Fund provided the financial support to venture into the wilderness and collect coprolites from three different caves – each widely spaced from near sea level to high in the mountains. It was extremely sobering to walk into a cave surrounded by lush silver beech forest. Within were hundreds of kakapo coprolites spread throughout the cave floor, which appeared so well-preserved that they could have been dropped yesterday. One high mountain cave was so remote that it could only be reached by helicopter. None of this would have been possible without the help from the OSNZ.

Research on these coprolites is now ongoing, and over a hundred have been processed for DNA and fossil content. It is confirmed that nearly all samples do indeed originate from kakapo. Some are confirmed by radiocarbon dating to be over 800 years old. Although there is still much to be analysed, it is clear that kakapo not just lived, but thrived, in many kinds of habitats in ancient NZ. No doubt these weird, wonderful, great green parrots hold many surprises in store for us.

Pictures: (Left), young captive kakapo (Alex Boast); (Middle), Euphrates Cave, North-West Nelson (credit Aaron Camens); (Right), recently discovered deposit of kakapo coprolites near Mt. Owen, North-West Nelson (credit Corey Mosen).