

Ecological Genetics Laboratory

Genetic information that exists within all species provides a rich resource for scientists to obtain a fundamental, comprehensive, and systematic understanding of life. The Ecological Genetics laboratory applies DNA technology to a range of environmental research areas, focusing primarily on conservation and pest management.

The laboratory has three main research functions:

1. Biodiversity—determining the genetic diversity in New Zealand native species.
2. Molecular Systematics—understanding the evolutionary history of flora and fauna.
3. Biosecurity—monitoring pest populations.

Genetic diversity in New Zealand native species

Genetic diversity varies significantly between populations and regions. Determining the extent and distribution of genetic variation provides precise information that can be used to direct conservation actions — for example, the most genetically diverse and unique populations can be identified, which enables conservation priorities to be determined and proper management set in place. The preservation of genetic diversity in endangered species is important because long-term survival depends on species maintaining sufficient genetic variability to facilitate adaptation to new environmental pressures including habitat modification. Decreasing genetic diversity can result in inbreeding depression, the breakdown of reproductive processes and diminished evolutionary potential—factors ultimately leading to extinction.

Evolutionary history of New Zealand's native species

DNA sequence information provides some interesting insights into the evolutionary history (phylogeny) of our native species. New Zealand was once part of the supercontinent Gondwana but has been isolated by oceanic barriers for at least 80 million years. Because of our isolation, diverse landscapes and latitudinal range from sub-tropics to subantarctic, New Zealand has a largely endemic, unique flora and fauna. Phylogenetic studies provide a framework for understanding the origins and patterns of genetic diversity among groups of species and reveal a remarkable history of arrivals, dispersals, adaptations and extinctions.

Pest population monitoring

Effective management of pest populations requires accurate information about the numbers and rates of dispersal of animals in a particular area. Traditional methods that rely on trap-catch estimates can be biased as some animals become trap-shy or simply do not encounter a trap when they are at low densities. The Ecological Genetics Laboratory has developed DNA methods to genetically 'fingerprint' pest species such as possums and stoats using 'non-invasive' sampling methods. Special sticky 'hair traps' are used for stoats to pull out strands of hair with DNA-rich follicles attached, while DNA derived from faecal samples is used from possums. In addition to estimating population size, these genetic methods also provide opportunities to obtain further information about pest populations such as dispersal rates and mating systems (relationships between individuals). These data help in designing better control strategies as well as monitoring effectiveness of current pest control programmes.

