Eco Gene
DNA-based diagnostics

Case Study #1

DNA for population estimation: stoats in a New Zealand beech forest

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Aim: To obtain a DNA-based estimate of stoat population density

Background: Estimating the abundance and/or population density of stoats is essential for two main applications; i) understanding the relationship between stoat population density and impact on particular native species and ii) monitoring the relative abundance before and after control operations to determine the effectiveness of a particular management strategy. However, obtaining density estimates from stoats using standard methods can result in biased and/or imprecise estimates, as stoats tend to be elusive and trap-shy. Furthermore, estimates derived from live-trapping are very labour intensive and require large areas to be sampled in order to provide sufficient data to satisfy statistical requirements.

Non-invasive method used to obtain DNA: Hair samples from tubes in a grid design. Hair-tubes consisted of a 20-cm length of PVC pipe, 45 mm in diameter, with a rubber band covered in adhesive gel stretched across the aperture of each end of the pipe.

Study design: Tubes baited with rabbit meat were placed 250m apart, on lines 500 m apart, to create a 3-km by 3-km grid (9 km^2) in a beech forest in the South Island, resulting in a total of 98 tube stations. A field trial was run over a 7-night period and hair-tubes were checked daily. There was a very high 'hit rate', with approximately 60 hair samples obtained during 7 nights of sampling; 98% originated from stoats. DNA profiles allowed mark-recapture estimates of approximately 30 stoats in the 9 km^2 area.

Conclusions: Genotypes from stoat hair samples enabled us to conclude that:

(i) there was an estimated density of 2.9 stoats/km^2 over a 7-night period.
(ii) the results compared favourably with live-trapping estimates of stoat abundance obtained elsewhere in New Zealand.
(iii) overall, labour costs were considerably cheaper than traditional methods.
(iv) conservation managers know exactly how many animals they are dealing with and can target control efforts accordingly.

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