



Using Rainforest Research

Birds sing the history of the Rainforest

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Birds usually learn their song when young, from other individuals in their local population, just as humans learn a particular dialect from theirs. Birds use songs to:

- assist in identifying individuals of the same species,
- attract and assess likely mates, and
- identify and deal with possible competitors for food and mates.

Such important functions tend to mean songs sung within a bird population are very similar - anyone who sings a different song may not be understood. When populations are isolated from each other, there is the opportunity for song differences to evolve, even within the same species. Factors which might promote this variation include different local habitat structure, changes in population genetic make-up, mistakes during song learning within one or both populations, or different song preferences in the two populations.

Birdsong reveals rainforest history

Rainforest CRC researcher Dr David Westcott realised that if patterns of birdsong were affected by changes in the distribution of habitat, variations in birdsong could be used to predict the effect of the geographical history of the rainforest on birds. The ideas Dr Westcott set out to test were:

- That the geographic isolation of bird populations promoted song variation.
- That the geographic distribution of song variation would match vegetation distribution.

- That upland species isolated on mountain tops would show greater and more frequent song variation than species with an uninterrupted distribution.



Among the birds who sang for the study:
Top: the spotted catbird (*Ailuroides crassirostris*) photo: WTMA
Centre: Victoria's riflebird (*Ptiloris victoriae*) photo: WTMA
Bottom: Lewin's Honeyeater (*Meliphaga lewinii*) photo: Terry Reis

The tropical rainforest birds

Today there are more than 200 species of birds living in the tropical rainforests of north Queensland. Thirteen of these are found only in these rainforests, and of these, eight are restricted to the cooler moist upland rainforests above 600 metres. They all sing!

The Upland bird species studied were:

- Grey-headed robin (*Poecilodryas albispecularis*)
- Golden bowerbird (*Prionodura newtonia*)
- Mountain thornbill (*Acanthiza katherina*)
- Bridled honeyeater (*Lichenostomus frenatus*)
- Fernwren (*Oreoscopus gutteralis*)
- Chowchilla (*Orthonyx spaldingii*)

Bird species with more widespread distributions studied were:

- Grey fantail (*Rhipidura albiscapa*)
- Brown gerygone (*Gerygone mouki*)
- Eastern whipbird (*Psophodes olivaceus*)
- Spotted catbird (*Ailuroides crassirostris*)
- Victoria's riflebird (*Ptiloris victoriae*)
- White-throated treecreeper (*Cormobates leucophaeus*)
- Lewin's honeyeater (*Meliphaga lewinii*)

Measuring and Analysing Birdsong

Dr Westcott recorded birdsong from sites across the Wet Tropics and then analysed the "advertisement" songs of each bird species to look for differences in the song patterns. Advertisement songs are used to attract females and deter intruders.

Providing science for the conservation and management of Australia's World Heritage tropical rainforests.



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The Rainforest CRC is a research partnership involving the Commonwealth and Queensland State governments, the Wet Tropics Management Authority, the tourism industry, Aboriginal groups, CSIRO, James Cook University, Griffith University and The University of Queensland

Variables used to characterise each song included:

- the song length,
- the maximum and minimum frequency,
- the number of calls per song,
- time between various calls, and
- the number of types of call.

Results showed that:

- Geographic variation is a common feature of the songs of north Queensland rainforest bird species and occurs at both the local and regional scale.
- This variation is most marked and most common in the upland species with their more restricted habitat and irregular distribution.
- Song variation occurs between blocks of continuous upland forest rather than within the same blocks.

The existence of variation at both the local and regional scale implies the usefulness of birdsong in documenting the effects of relatively recent vegetation changes on bird populations. The fact that variation is more marked in the upland species further suggests that the isolation of populations on mountaintops has contributed to the evolution of a cultural trait in birds - in this case, of their song.

An Example: the golden bowerbird

The golden bowerbird is an upland species that lives above 700 metres with populations which are isolated from each other on different mountain tops.



The golden bowerbird (*Prionodura newtoniana*)
photo: WTMA

Recordings of the advertisement song, consisting of four to six calls, were made of 30 males at 5 different sites.

Analyses of the recordings showed large differences between the songs of golden bowerbirds from different mountaintops. These differences, easily detected both in sound analysis and by the human ear, are very important to the birds. Dr Westcott and his colleague Dr Frederieke Kroon, played the different recorded songs back to male bowerbirds to see if they could discriminate between the different dialects from different locations.

Males responded aggressively to local dialects, but either ignored or responded less strongly to those from different locations.

Implications

If birds do not adequately recognise and respond to songs of their species that differ from their own population, then birds singing different songs may be at a reproductive disadvantage. In this way, song variance may contribute to increasing reproductive isolation and genetic variation between populations. Studies elsewhere in the world indicate that such cultural differences may play an important role in the evolution of populations and races into species.

The research to date highlights the fact that isolated populations of the same species of birds can be different from one another. If birds are considered at risk or endangered, it may not be appropriate to manage them as one species. Birdsong can indicate whether or not a bird population is isolated and distinct from other populations of the same species. If appropriate, management strategies can then be properly planned for each population rather than the species as a collective.

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