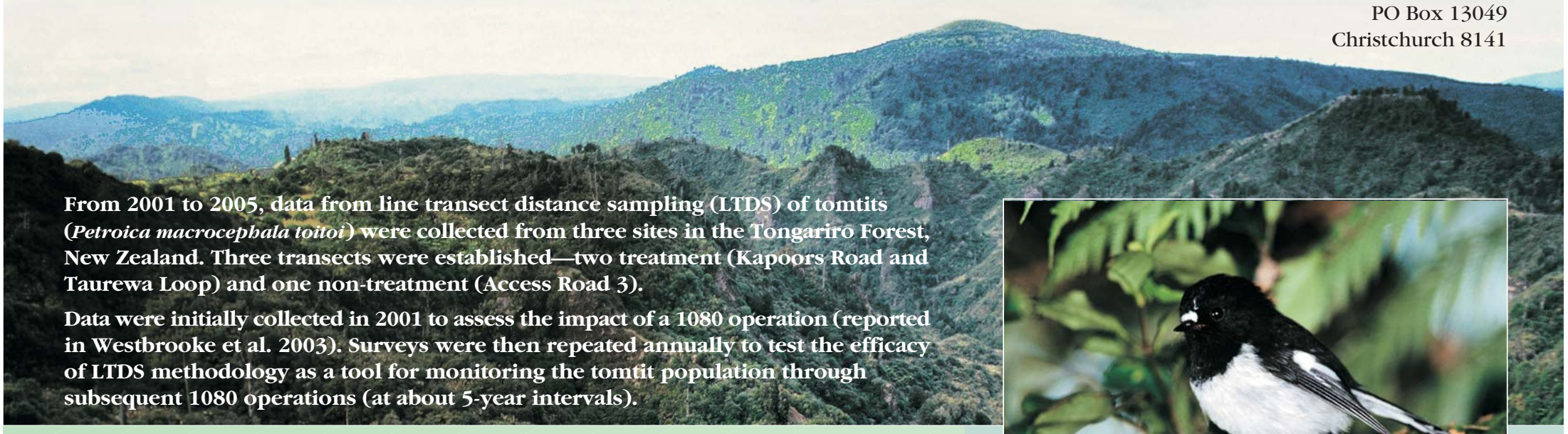
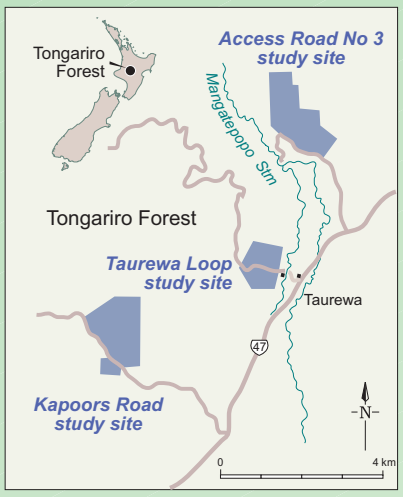
# Using line transect distance sampling to estimate relative abundances of tomtits

**Carla Meurk & Ian Westbrooke**
Dept of Conservation
PO Box 13049
Christchurch 8141



**From 2001 to 2005, data from line transect distance sampling (LTDS) of tomtits (*Petroica macrocephala toitoi*) were collected from three sites in the Tongariro Forest, New Zealand. Three transects were established—two treatment (Kapoors Road and Taurewa Loop) and one non-treatment (Access Road 3).**

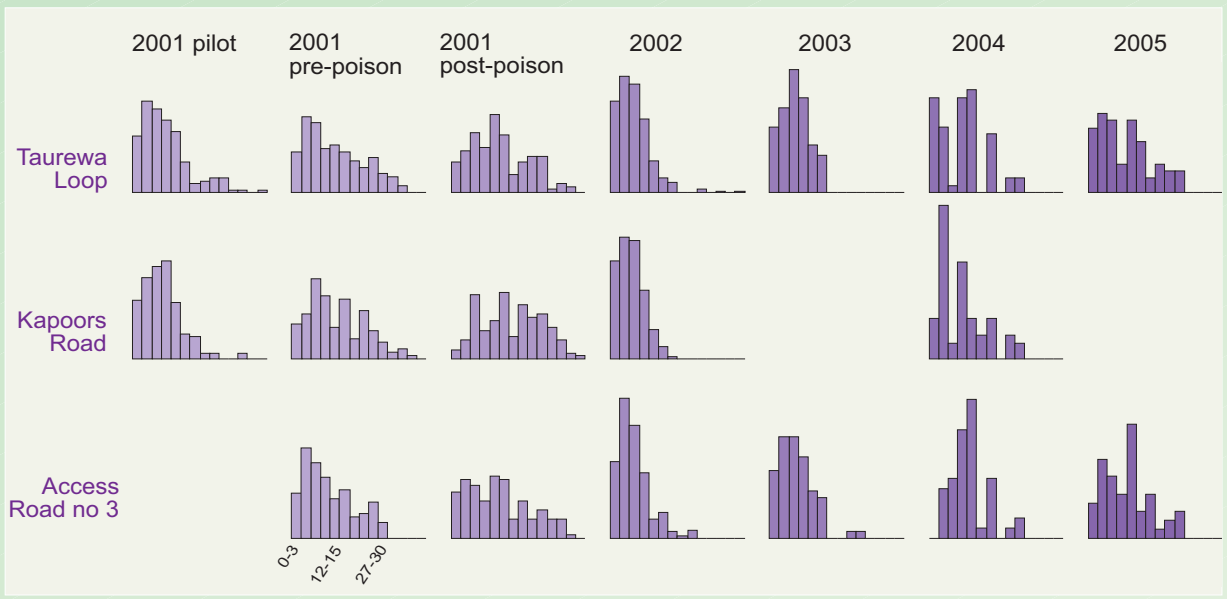
**Data were initially collected in 2001 to assess the impact of a 1080 operation (reported in Westbrooke et al. 2003). Surveys were then repeated annually to test the efficacy of LTDS methodology as a tool for monitoring the tomtit population through subsequent 1080 operations (at about 5-year intervals).**




## Data analysis

Data visualisation (i.e. producing plots as below, and examining them) was used to identify sensible groupings of patterns of detection by distance. Fitting detection functions to these patterns is central to distance sampling methodology.

The figure clearly shows that the most obvious grouping is by year. More formal analysis showed that grouping by year (and by phase—pilot, pre-poison and post-poison within the first year) provided the best-fitting model for detection functions (using AIC criteria) compared with groupings by year only, groupings by site, and treating each survey separately.




*Histograms of the distribution of distances observed, grouped in 3-m intervals, by site and year (plus phase in 2001).*

## Conclusions

- Strong similarities in the pattern of detection of tomtits at particular distances from each transect were evident, both within years and phases.
- Differences between years and phases are most likely the result of processes such as change in observers from year to year and seasonal effects.
- Expending resources to ensure consistency of variables within each year (or season) may improve the quality of data collected more than attempting to ensure consistency between years.



## Validity of abundance estimates

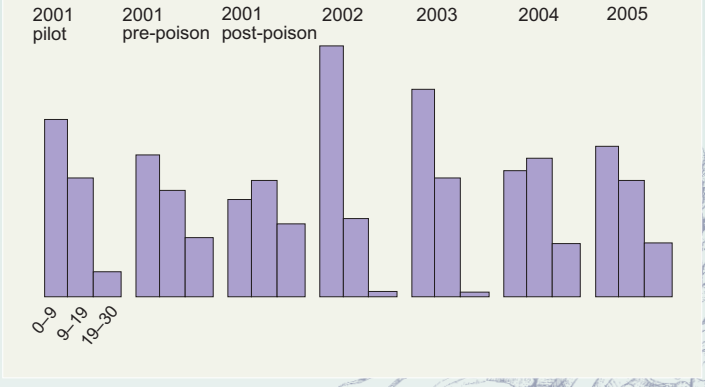
During this study, birds appeared to move away from the transects in response to the presence of the observer. This was noticeable as a 'bow-wave' effect in the data at 6–8 m from the transect (reported in Westbrooke et al. 2003).

This violates the LTDS assumption that distances recorded are not affected by movement in response to the observer.

The problem was addressed by grouping data into three groups of distances (0–9 m, 9–19 m and 19–30 m, as shown below). This ensured that birds moving away from the transect were all included in the first group, thus avoiding potential problems with fitting detection functions.

## Conclusion

Although you may be aware of issues such as the 'bow-wave' effect while doing surveys, avoid grouping distances in the field! Make sure you estimate them exactly, without a truncation distance. This provides maximum flexibility to deal with data issues later during analysis.

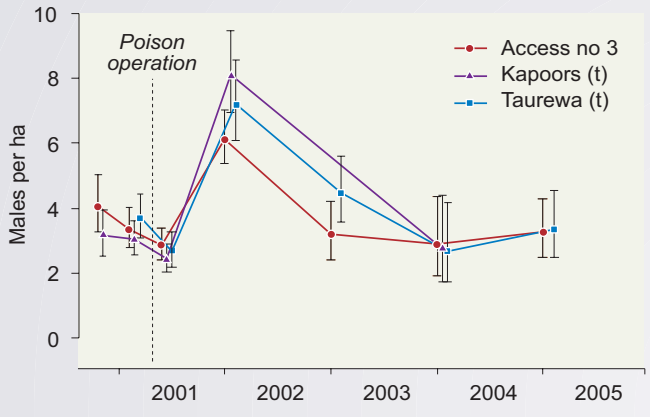



*Histograms of the distribution of distances observed across sites.*

## Density estimates

Once data were grouped (as explained), we were able to derive density estimates. This figure shows that following the 1080 operation in 2001 there was no significant drop in abundance of tomtits in treatment relative to non-treatment sites (reported in Westbrooke et al. 2003).

However, there was a subsequent spike in densities in 2002 at all three sites. Sampling will continue through the next 1080 operation planned for 2006 to see if the post-operation spike is replicated.




*Tomtit densities by site; t = treatment.*


**Reference**
Westbrooke, I.M.; Etheridge, N.D.; Powlesland, R.G. 2003: Comparing methods of assessing mortality impacts of an aerial 1080 pest control operation on tomtits (*Petroica macrocephala toitoi*) in Tongariro Forest. *New Zealand Journal of Ecology 27*: 115–123.

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