

Metapopulations with people

John L. Craig

School of Geography & Environmental Science
University of Auckland, Private Bag 92019, Auckland, New Zealand
j.craig@auckland.ac.nz

ABSTRACT

All urban areas contain a matrix of parks and urban gardens. Many also have larger parks on the outskirts. Native biodiversity is present in all yet authorities rarely consider the advantages of integrating planning in ways that enhance biodiversity and the opportunities for citizens to appreciate their heritage in their own backyard. Instead the protectionist mindset that biodiversity is best conserved in parks distant from people prevails.

This paper investigates how concepts of metapopulation management can enhance biodiversity opportunities in urban areas. Managing source populations that allow immigration to counter localised extinctions is important. Using examples from greater Auckland, this paper highlights current shortcomings as well as the wealth of opportunities that are available with integrated planning. The presence of people is key to future success.

INTRODUCTION

New Zealand has a poor record for the sustainable management of its biodiversity (Craig et al. 2000). Not only have we lost many species, many others are rare or in decline. Indeed, our national biodiversity strategy shows ongoing biodiversity declines (DOC & MfE 2000). Some of the greatest losses have been from areas of high human population. In response, the country has reserved a large proportion (by international standards) of land area for conservation but seeks to manage these areas independently and through government welfare funding.

The greatest threat to biodiversity is the presence of introduced animals and plants (Craig et al. 2000; DOC & MfE 2000). Welfare approaches to funding are grossly inadequate for containing this problem and national strategies limit effective control to a minute percentage of conservation lands. The result is a disenfranchise vortex where people are less able to experience their heritage, less pressure is applied for adequate funding which results in further retrenchment in management especially near urban areas and so the cycle continues to spiral downwards (Fig. 1). Engaging the

support of people becomes an important tool for reversing this.

Most biological communities are made up of populations of different species that may or may not be continuous with adjacent populations. Discontinuous populations have become the norm in the fragmented landscapes created by people. Metapopulations (Levins 1970) are just populations of populations where there is a finite probability of extinction of any population which can be restarted by immigration from neighbouring populations. The existence of corridors or the maintenance of suitable habitat patches within known dispersal ranges becomes an important part of sustaining metapopulations.

The concept of metapopulations offers opportunities for returning rare biodiversity to urban New Zealanders. Cities contain numerous parks which alone or in association with the neighbouring urban gardens can provide, with appropriate pest control, the chance of sustaining rarer species. Given New Zealand's problems with introduced predators, managing parks to retain a full suite of species will always be difficult and there will be the

threat of local extinctions. As long as some are sustained with near pest free status, there remains the opportunity that they will act as a source for subsequent reinvasion of surrounding sink habitat.

WHAT DO NEW ZEALANDERS WANT?

A number of studies have surveyed people’s opinions on their requirements in relation to conservation of native biodiversity. Common results are that people have a strong interest in conservation, want greater opportunities for involvement, want more done and, in the case of urban people, greater access to native species in their own backyards (e.g., DOC 1992, 2001; Craig et al. 1995; Abbott 1998). Moreover, these attitudes hold regardless of current access to natural or degraded sites (Stewart & Craig 2002). These attitudes contrast somewhat with the current approaches where conservation spending near urban areas is low in contrast with that in distant areas such as most National Parks and mainland islands (Saunders 2000; DOC 2003).

Indeed Abbott (1998) found for people living near parks in eastern Auckland, 95% of people wanted more planting of native plants, 85% would be prepared to plant species that provide bird food in their own garden, and 89% ranking seeing native birds as important. When given a list of birds seen in their suburb, they wanted to see more of the natives, excepting silvereyes (*Zosterops lateralis lateralis*), and considerably less of the introduced species (Fig. 2).

HOW DO METAPOPOPULATIONS ASSIST MEETING THESE NEEDS?

Urban areas are a matrix of parks surrounded by urban, commercial and industrial areas which all have gardens of varying size. Some are large enough to provide adequate habitat to sustain small populations of native species. Some urban gardens add further habitat. The key to ensuring the possibility of sustainable populations of native animals is appropriate management including selective plantings and pest control.

Urban areas also contain people who declare interests in conservation and a desire to see native species. Hence there is an interested clientele who are available for management. Generating and sustaining their interest becomes the challenge. Successful management of urban parks can demonstrate three important messages for conservation in New Zealand:

1. Outcomes of active management (in parks initially)
2. Outcomes of no management (in most gardens and some parks)
3. Value of personal action and contact with native biodiversity.

A matrix of parks for biodiversity will require integrated management among all authorities managing parks. In Auckland this involves the Department of Conservation (DOC), Auckland Regional Council and the many local councils. Planning will need to include planting (to ensure adequate habitat area, year round food and safe roosting and breeding) and integrated action.

Adequate habitat

Having one large park assists although many small, well-managed parks in close proximity are adequate. Having both is best. Well-managed urban gardens can extend effective park size and provide corridors. Relying on concepts of habitat selection to determine suitability is not always helpful as many animals and plants are highly adaptive (see Gray & Craig 1991). Indeed in an urban setting, a mix of native and exotic plants can often provide highly suitable habitat.

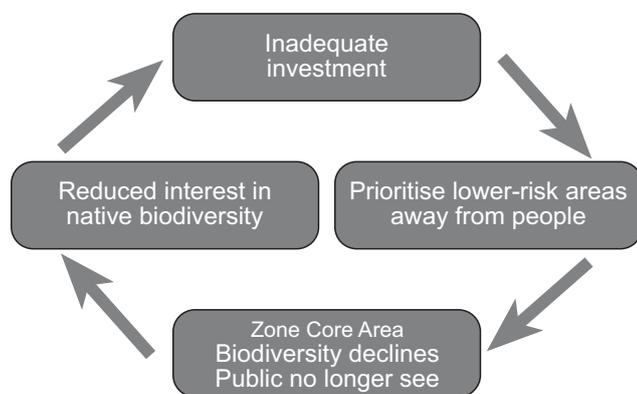


Fig. 1 Disenfranchise matrix for native biodiversity.

Year-round food

Plantings in city parks are often a compromise between aesthetics and ecology. A number of urban reserve plantings have been undertaken to enhance particular bird species but inadequate consideration has been given to food requirements. Waiatarua Reserve in Remuera, Auckland was planted in the past by the local community partly to enhance tūī (*Prosthemadera novaeseelandiae novaeseelandiae*) numbers. While many food trees were planted, there is little food available in summer and winter and so these birds had to disperse to other parks to survive (unpublished data). Similarly, Shakespear Regional Park has received considerable additional plantings that have done nothing to provide for birds that use the park and are essential for the restoration of forest processes (May 1999).

Many of the autumn and winter food trees are large (e.g., podocarps, pūriri, rata) and can only be planted in parks whereas other species including exotics as well as bird feeders in urban gardens can provide important food sources. Integrating these becomes the issue.

Safe breeding and roosting

Forest birds and waterfowl are the most common native birds in urban areas. Rats and cats are

probably the greatest threat. Many households have a cat and do not believe that it is their responsibility to constrain its movements. Rats are rarely controlled except by cats. Dogs appear to help control stoats and even possum but some breeds can be a threat to waterfowl unless wetland areas are planted in ways to deter access by dogs. Gardens, without cats and with rat control, can offer safe breeding that can be enhanced by artificial feeding.

BUILDING PUBLIC INTEREST

Native birds appear to attract public interest more than other animals or trees. Enhancing bird populations requires adequate habitat and hence allows opportunities to bring other native plants and animals into urban areas. Providing access to native birds in people’s backyards is an important way of engendering interest in conservation (Abbott 1998). Finding ways of enhancing such rewards through the return of rarer species is an opportunity currently being missed.

Island sanctuaries are clear sources of emigrating birds yet most end up in mainland sink habitat that is unable to support populations. For example, kākā (*Nestor meridionalis*) find their way into a number of Auckland suburbs, probably originating from Little Barrier Island (Hauturu). Similarly, bellbird (or korimako; *Anthornis melanura*), kākārīki (*Cyanoramphus novaeseelandiae*), tomtits (*Petroica macrocephala*) and bats (*Chalinolobus* sp.) disperse from Little Barrier Island to the adjacent mainland at Leigh. Bellbird (locally extinct since the 1860s) and kākārīki have dispersed from Tiritiri Matangi Island to the end of Whangaparaoa Peninsula and hence from these movements, it is possible to suggest likely dispersal ranges if further island sanctuaries are created.

Restoration programs have begun on Motutapu, Rangitoto and Motuihe Islands and these have the ability to disperse native animals into much of urban Auckland (Fig. 3, 4). The key to retaining these birds in the city and allowing them to be seen in urban backyards is integrated management of islands, urban parks and gardens.

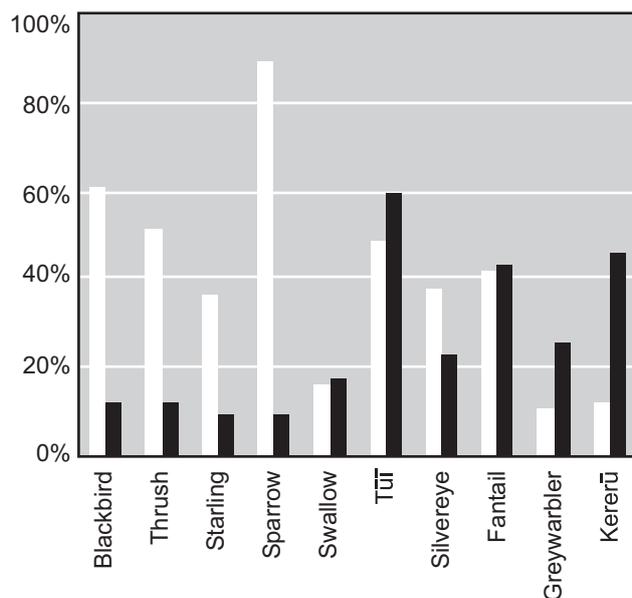


Fig. 2 Difference between current sightings of birds in urban gardens (white) and desired sightings (black). From Abbott (1998).

BEING AWARE OF PEST METAPOPOPULATIONS

Whereas emigration of animals from island sanctuaries and managed parks can deliver native animals to people's backyards, the reverse movement by pests, especially weeds, can create costly problems. Movement of seeds by starlings (S. Heiss-Dunlop pers. comm. 2003) which roost in parks and on the islands at night as well as wind movement of seeds from aggressive weeds such as moth plant (*Araujia sericifera*) create major problems for park managers. Tiritiri Matangi, Motutapu and Motuihe Islands have annual expenditure of tens of thousands of dollars for ongoing weed control as a result of dispersal from urban gardens and parks.

SOLUTIONS

Integrated management to maximise the opportunities of returning native species, especially birds, to urban gardens and minimise the threats of the reverse issue of weeds in island sanctuaries and managed parks is currently lacking. Parks, including islands, are typically seen as separate entities that require their own independent management plan. Moving to a situation where central, regional and local government agencies work together to maximise conservation gains will achieve much more than the current separatist approaches.

New Zealanders want greater access to their natural heritage and many are unable to afford to visit distant reserves. It is not only possible to deliver desired rewards where people live and work, many people express a desire to be involved and so reduce the costs of management. There is no need for additional land purchases for parks, just a clear vision and integrated action. Understanding concepts of metapopulations, as well as sources and sinks, allow immediate action toward a preferred future — metapopulations of native biodiversity among urban people.

REFERENCES

Abbott, B. A. 1998: The management of forest ecosystems in urban parks and reserves. Unpublished MSc thesis, University of Auckland, Auckland, New Zealand. 201 p.

Craig, J.; Anderson, S.; Clout, M.; Creese, R.; Mitchell, N.; Ogden, J.; Roberts, M.; Ussher, G. 2000: Conservation issues in New Zealand. *Annual Reviews of Ecology and Systematics* 33: 61–78.

Craig, J. L.; Craig, C. J.; Murphy, B. D.; Murphy, A. J. 1995: Community involvement for effective conservation: what do the community want? *In*: Saunders, D. A.; Craig, J. L.; Mittisky, E. M. *Nature Conservation 4: the role of networks*. Chipping Norton, Surrey Beatty & Sons. Pp. 130–139.

Department of Conservation (DOC) 1992: *Atawhai Ruamano Conservation 2000*. Wellington, Department of Conservation. 16 p.

Department of Conservation (DOC) 2001: *Conservation awareness: working with the community*. Wellington, Department of Conservation. 23 p.

Department of Conservation (DOC) 2003: *Conservation Action: Te Ngangahau ki te Kura Taiao*. Wellington, Department of Conservation. 60 p.

Department of Conservation (DOC) and the Ministry for the Environment (MfE) 2000: *The New Zealand biodiversity strategy: our chance to turn the tide*. Wellington, Department of Conservation and Ministry for the Environment. 144 p. Available at <http://www.biodiversity.govt.nz/picture/doing/nzbs/contents.html>.

Gray, R. D.; Craig, J. L. 1991: Theory really matters: hidden assumptions and the theory of habitat requirements. *Acta XX Congressus Internationalis Ornithologici* 4: 2553–2560.

Levins, R. A. 1970: Extinction. *Lecture Notes in Mathematics and Life Sciences* 2: 75–107.

May, S. 1999: *Towards re-integration: developing management strategies for Shakespear Regional Park*. Unpublished MSc thesis, University of Auckland, Auckland, New Zealand. 153 p.

Saunders, A. J. 2000: *A review of Department of Conservation mainland restoration projects and recommendations for further action*. Wellington, Department of Conservation. 219 p.

Stewart, A. M.; Craig, J. L. 2002: Predicting pro-environmental behaviours: a model and a test. *Journal of Environmental Systems* 28: 293–318.

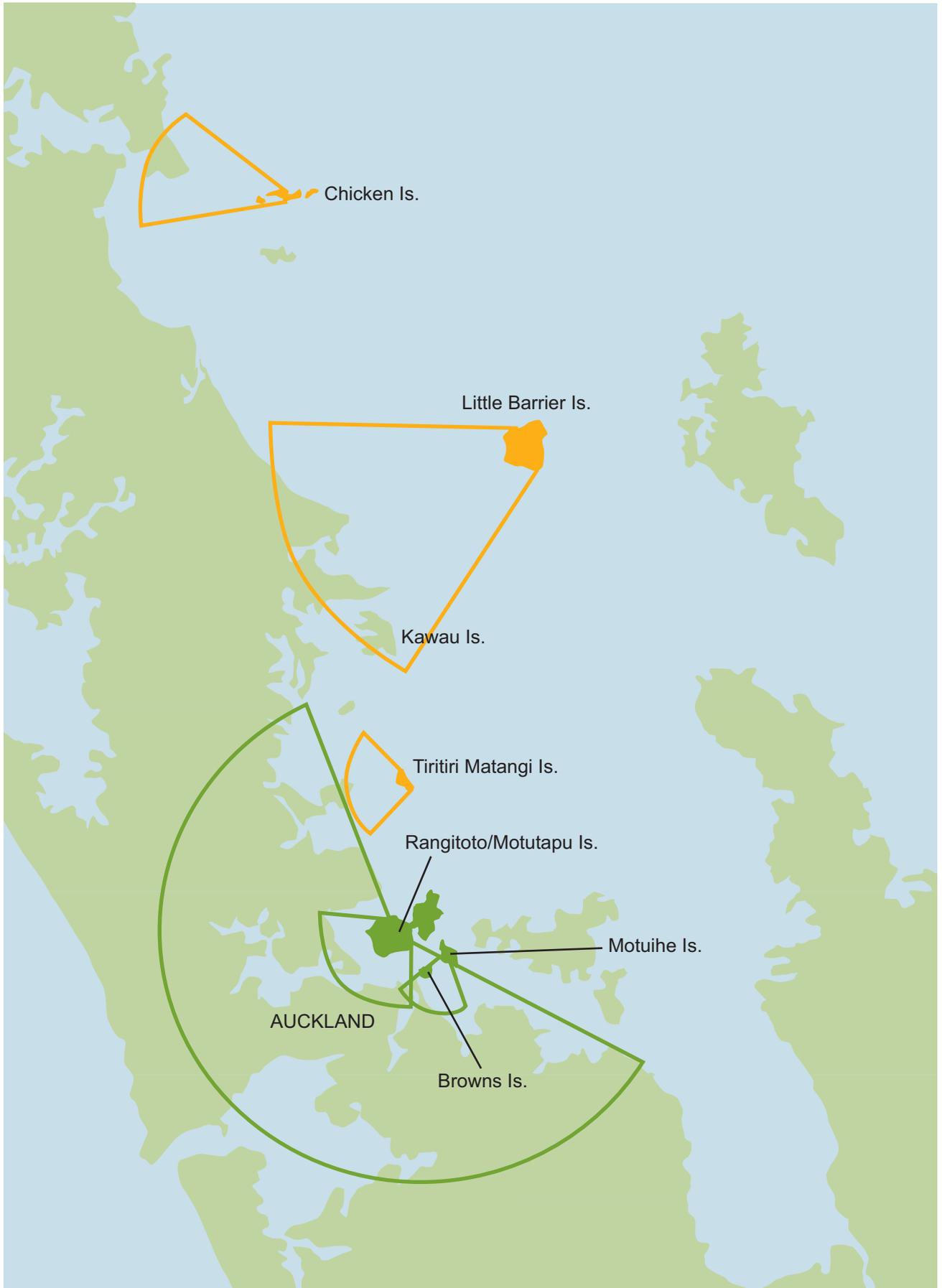


Fig. 3 Known dispersal distances of bellbird and kākāriki from island sanctuaries. Same distances superimposed onto Auckland from islands currently undergoing restoration.



Fig. 4 Enlarged version of Fig. 3 showing known dispersal distances for bellbird and kākāriki superimposed onto urban Auckland (shaded).