

# Endangered populations: the concept in practice

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## ABSTRACT

The NSW *Threatened Species Conservation Act 1995* (TSC Act) is unique and effective in Australian jurisdictions in recognising threatened populations. Section 11 of the TSC Act provides for the listing of endangered populations. There were 28 endangered populations listed under the TSC Act (January 2003) for which there were two approved recovery plans, one publicly exhibited draft plan and four plans in preparation. Monitoring was being undertaken for only six populations. The TSC Act would be strengthened by: (i) adding an objective which states that recognising threatened entities is fundamental to the legislation; (ii) changing the definition of population to make it consistent with IUCN terminology; (iii) simplifying Section 11; (iv) better resourcing for faster preparation of plans and their implementation; and (v) including population monitoring in all recovery plans. The process of saving threatened species is occurring at the level of population; for example, through priority sites for threat abatement, translocation, replicates for research treatments and habitat protection. The objective of recognising and the process of listing threatened populations are fundamental to sound threatened species legislation.

**Key words:** threatened populations, TSC Act of New South Wales, definition of populations.

## Introduction

Throughout the world, countries legislate in an effort to prevent the extinction of species and to conserve natural biodiversity. The topic of the forum asks the questions: Are the relevant transactions of deliberative assemblies (statutes, legislation etc), the acts, effective in preventing extinctions? Or are they a pretence, an act? Globally, the transactions are a pretence! My pessimistic belief, together with learned commentators (e.g. Suzuki 1990; Gould 1991; Flannery 1994; Wilson 2001), is that the ongoing catastrophe of worldwide anthropogenic threats to biodiversity and extinctions of species are symptomatic of the global industrialised society which is causing unsustainable resource extraction and despoliation of natural ecosystems.

In NSW, the *Threatened Species Conservation Act 1995* (TSC Act) deals with threatened plants and animals and Part 7A of the *Fisheries Management Act 1994* (FM Act) deals with threatened fish and marine vegetation as defined in these acts respectively. This paper focuses on the TSC Act. Is it effective or is it a pretence?

An effective threatened species act would have, as its first objective, the recognition of threatened entities (taxa, populations and ecological communities) within its jurisdiction. This important objective is missing from the TSC Act even though it is meant to be effected through the listing process which is an integral part of the Act. Regardless of the uncertainty about status of threatened species (Burgman 2004) and the limitations and potential misuses of threatened species lists (Possingham *et al.* 2002; Lamoreux *et al.* 2003), threatened species legislation cannot be effective unless it begins by recognising which entities are threatened. The TSC Act would be strengthened by being explicit that the recognition of threatened entities is the foundation of the Act and that (a) recognising and (b) saving threatened species are different objectives to

be achieved through different processes. Failure to make this distinction in NSW has resulted in confusion about these separate roles and a demonstrable head-in-the-sand approach to amending and interpreting the legislation.

The TSC Act does have an objective to prevent extinction and promote recovery of threatened entities which is intended to be achieved through the process of preparing and implementing recovery plans and threat abatement plans. The TSC Act also achieves its objectives through protection and regulation but this is not assessed here. As at January 2003, there were 877 listings for which there were plans covering 335 listings (67 covered in approved plans, 15 in publicly exhibited drafts and 253 in plans in preparation) (NPWS 2003a). There were no plans for more than 60% of the listed threatened taxa, populations and ecological communities; most of the plans were only in preparation; many of the actions in the existing plans were unfunded, not being implemented and, for those being implemented, there is no reporting mechanism to assess the success or otherwise of those actions in promoting recovery; and of 16 key threatening processes listed, there was only one threat abatement plan approved and there was no plan for two of the most serious threats, land clearing and altered flow regimes. Judged by this alone, the TSC Act might be considered more pretence than it is effective in saving threatened species.

## Endangered populations - the concept

Threatened species may be categorised as vulnerable, endangered or critically endangered depending on the increasing likelihood of them going extinct (IUCN 2001). A standard meaning of population is a group of individuals of a single species (Recher *et al.* 1986; Krebs 1994). Under the TSC Act and the FM Act, population means a group of organisms, all of the same species, occupying a particular

**area.** The focus of this paper is with this definition and Section 11 of the TSC Act, which explicitly provides for the listing of endangered populations. But first, three contextual notes.

Firstly, the concept of populations going extinct is simple and real; it is not a pretence. The Eastern Bristlebird *Dasyornis brachypterus* is a case in point. Within approximately a century of being named by Latham in 1801, the species was locally extinct in the Sydney area (Baker 1997). Over the last three decades, from Lake Tyers in eastern Victoria to Nadgee Nature Reserve in south-eastern NSW, 11 of 12 populations have become extinct (Baker 1997; Bramwell 1997; Clarke and Bramwell 1998) and, from the Conondale Ranges in south-eastern Queensland to Lismore in north-eastern NSW, 19 of 23 populations have also become extinct (Holmes 1989, 1997; D Stewart pers. comm. 2003).

Secondly, the legislation in NSW is unique among Australian jurisdictions in being the most explicit about, as well as being active in, listing threatened populations (Table 1). Under the TSC Act, 28 endangered populations had been listed as at January 2003 (Table 2) and a further two had been listed under the FM Act as at July 2003. Through adopting the IUCN (2001) categorisation (Queensland, South Australia, Western Australia and Northern Territory) or otherwise, the legislation in all other jurisdictions implies that threatened populations can be listed. For example, in Queensland, where threatened species are listed under the *Nature Conservation Act 1992*, a “species” means a species, subspecies, hybrid, variant, race, mutation or geographically separate population; in Victoria, where threatened species are listed under the *Flora and Fauna Guarantee Act 1988*, taxa which are below the level of sub-species and communities of flora or fauna narrowly defined because of their taxonomic composition, environmental conditions or geography are eligible for listing if there is a special need to conserve them. However, as at October 2003, none of the other states or territories had listed a threatened population. Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), threatened populations of species (and ecological communities) may be listed as sub-groups of species (and ecological communities) and two populations had been listed as at October 2003.

Thirdly, the *Threatened Species Conservation Amendment Act 2002* amended Section 11 of the TSC Act, most notably by adding the criterion that the population must be of conservation value at the State or regional level (regions as defined in Thackway and Cresswell 1995) and a footnote explaining that isolated populations of limited conservation value are intended to be excluded from listing. The meanings and means of assessment of “value” and “limited value” are not clear in the legislation. It seems to me, however, that this condones triage and it is possible that some isolated populations could go extinct because they are not protected by the legislation.

To understand the practice of listing endangered populations under the TSC Act in NSW, it is necessary to understand how populations may be eligible for listing. Since a population is a group of one species **in a particular area**, by legislation, the area must be delimited. In practice, the area has been delimited variously as a patch of habitat (e.g. habitat for Little Penguin *Eudyptula minor* in the Manly Point Area, along the shoreline where it is suitable for nesting and extending 100 m offshore), a geographic feature (e.g. the Squirrel Glider *Petaurus norfolcensis* on the Barrenjoey Peninsula), a polygon bounded by roads (e.g. *Dillwynia tenuifolia* at Kemps Creek), a local government area (e.g. *Persoonia hirsuta* and *Hibbertia incana* in the Baulkham Hills Shire), a bioregion (e.g. the Tusked Frog *Adelotus brevis* in the Nandewar and New England Tablelands Bioregions). These particular areas do not need to be biologically meaningful, for instance it is feasible to list a population delimited by a square.

The combination of the definition of population under the TSC Act and the criteria in Section 11 have been the cause of some angst. For instance, the Scientific Committee rejected the nomination to list the Scotts Head population of the Glossy Black-cockatoo *Calyptorhynchus lathamii*. The final determination stated that the mobility of the species made definition of a population difficult and that the Scotts Head birds were part of a wider population which was not in immediate danger of extinction. In another case, the Scientific Committee listed the Gang-gang Cockatoo *Callocephalon fimbriatum* population in the Hornsby and Ku-ring-gai Local Government Areas because it was of significant conservation value as it is the last known breeding population of the species in the Sydney Metropolitan area, despite acknowledging that individual birds are likely to move across the population boundary.

**Table 1.** Threatened population listings for all Australian jurisdictions

Jurisdiction	Act	Population listings
Commonwealth	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	2 (as at October 2003)
NSW	<i>Threatened Species Conservation Act 1995</i>	28 (as at January 2003)
	<i>Fisheries Management Act 1994</i>	2 (as at July 2003)
Victoria	<i>Flora and Fauna Guarantee Act 1988</i>	None (as at October 2003)
ACT	<i>Nature Conservation Act 1980</i>	None (as at October 2003)
Queensland	<i>Nature Conservation Act 1992</i>	None (as at October 2003)
Northern Territory	<i>Territory Parks and Wildlife Conservation Act 2000</i>	None (as at October 2003)
Western Australia	<i>Wildlife Conservation Act 1950</i>	None (as at October 2003)
South Australia	<i>National Parks and Wildlife Act 1972</i>	None (as at October 2003)
Tasmania	<i>Threatened Species Protection Act 1995</i>	None (as at October 2003)

**Table 2.** Summary of attributes of populations listed under the TSC Act (from NPWS 2003a)

Taxa	Number of populations	Number of plans	Number of populations for which there are recovery actions	Number of populations for which there is monitoring
Reptile	-	-	-	-
Frog	1	0	1	0
Bird	5	1 approved	4	2
Mammal	7	3 in prep. 1 publicly exhibited draft 1 approved	7	3
Invertebrate	1	0	1	1
Plant	14	1 in prep.	5	0
Totals	28	7	18	6

The TSC Act could be strengthened, in my opinion, by changing the definition of population and by simplifying Section 11 (see Box 1). Section 11(2) logically prevents populations of a listed endangered species from being listed as endangered. Section 11(1) gives the criteria for listing a population as endangered, depending on the opinion of the Scientific Committee as described in the final determination. This is consistent with the laudable practice of having an independent group of experts undertake the listing process on behalf of the government. The criteria for listing are that a population must: (i) be facing a high risk of becoming extinct in nature in NSW and (ii) be of conservation value at the State or regional level for at least one of the following reasons:

- It is *disjunct*.
- It is *or is likely to be genetically, morphologically or ecologically distinct*.

These first two reasons can be summarised as geographically or otherwise distinct. Fragmentation of a species into isolated groups can lead to local extinctions as demonstrated by the example of the Eastern Bristlebird. Conversely, subgroups of a species which show distinct genetic, morphological or ecological characteristics are manifestly carrying the diversity which may lead to evolutionary development which the TSC Act seeks to conserve. Hence, these first two are sound criteria for recognising threatened populations and they are reasons about which the Scientific Committee has expertise in giving opinions.

- It is *near the limit of its geographic range*.

This is a sound reason only if the population is also distinct. Otherwise, metapopulations of species (Levins 1970) are known and expected to wax and wane at the limit of their range without necessarily increasing the risk that the species will become extinct (Hastings and Harrison 1994).

- It is *otherwise of significant conservation value*.

This is bothersome because “significant” and “value” are undefined and the Scientific Committee may be called upon to give opinions on non-scientific values. For instance, this criterion certainly should not be used to list populations on the basis of their cultural

value because (i) this is not the intent of the TSC Act and (ii) it is neither within the charter nor the expertise of the Scientific Committee to give opinions on cultural values.

#### **Box 1. TSC Act, Section 11**

##### **Populations eligible for listing as endangered populations**

- (1) A population is eligible to be listed as an endangered population if, in the opinion of the Scientific Committee, it is facing a high risk of becoming extinct in nature in New South Wales and it is of conservation value at the State or regional level for one or more of the following reasons:
- (a) it is disjunct or near the limit of its geographic range,
  - (b) it is or is likely to be genetically, morphologically or ecologically distinct,
  - (c) it is otherwise of significant conservation value.

**Note.** The intention of the criteria is to exclude from listing isolated populations of limited conservation value.

- (2) A population is not eligible to be listed as an endangered population if it is a population of a species already listed in Schedule 1.

In the Red List Criteria (IUCN 2001 Version 3.1), the term population is used in a specific sense that is different to its common biological usage. Population is defined as the total number of individuals of the taxon. **Subpopulations** are defined as geographically or otherwise **distinct groups** in the population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less). Much of the angst about listing threatened populations under the TSC Act would be removed if the IUCN definition (of subpopulation) was used and the only criterion under Section 11(1) was high risk of extinction. Furthermore, the footnote, which proposes to exclude isolated populations of limited conservation value from being listed, could be removed. Listing threatened populations under the FM Act (see Box 2) could also be improved with similar changes.



**Box 2. FM Act, Section 220F(2)****Endangered populations**

A population is eligible to be listed as an endangered population if it is a reproducing population but its numbers have been reduced to such a critical level, or its habitat has been so drastically reduced, that it is in immediate danger of extinction, and:

- (a) it is a population of a vulnerable species listed in Schedule 5, or
- (b) it is disjunct and at or near the limit of its geographic range and it is or is likely to be genetically distinct.

**Endangered populations - in practice**

Under the TSC Act, 28 populations were listed as endangered as at January 2003 (NPWS 2003a; Table 2). The list is dynamic. (i) New listing can be made. During January to October 2003 inclusive, two endangered populations were added. (ii) The definition of the particular area can change. This occurred for the Manly population of the Little Penguin (in October 1999) and the Tadgell's Bluebell *Wahlenbergia multicaulis* population in a group of Local Government Areas (LGAs) in Sydney (in November 2003). (iii) When a species is listed as endangered, populations of that species are not eligible to remain listed populations. This occurred with the Warrumbungles population of the Brush-tailed Rock-Wallaby *Petrogale penicillata* (in July 2003) and the Baulkham Hills Shire population of *Persoonia hirsuta* (in June 1998). (iv) The taxonomy of the species can be revised. For example, the population of *Hibbertia incana* in the Baulkham Hills LGA was removed from the list in October 2001 when the newly described *H. superans*, which included the population of *H. incana* (Toelken 2000), was listed as an endangered species.

In summary, the listings of endangered populations as at January 2003 (NPWS 2003a) were a Tusked Frog population, five separate bird species, seven mammal species, the beetle *Menippus fugitivus* population in the Sutherland Shire and 14 separate plant species (Table 2). The listings of endangered populations included eight populations of species listed as vulnerable: the Glossy Black-cockatoo, Koala (2 populations), Squirrel Glider (2), Broad-toothed Rat *Mastacomys fuscus*, Brush-tailed Rock-wallaby and the shrub *Dillwynia tenuifolia*.

Recovery planning for the populations listed as endangered has proceeded slowly. As at January 2003, plans existed for seven populations (NPWS 2003a; Table 2). There were approved plans for the Little Penguin in the Manly Point Area and the Brush-tailed Rock-wallaby in the Warrumbungles; the draft plan for the Koala population at Hawks Nest and Tea Gardens had been exhibited; and plans were in preparation for the Squirrel Glider in the Wagga Wagga LGA, the Long-nosed Bandicoot *Perameles nasuta* at North Head, the Broad-toothed Rat at Barrington Tops in the Gloucester, Scone and Dungog LGAs and the Tadgell's Bluebell in the Auburn, Bankstown, Canterbury and Strathfield LGAs. For 18 of the populations, one or more of the following recovery actions had been undertaken: surveys and mapping; research into causes of decline, ameliorative

methods, biology and ecology; habitat management for pest animals, weeds, fire, site protection and site rehabilitation; and ex-situ husbandry and propagation. However, monitoring, which is fundamental to understanding the effect of management actions and the ongoing status of threatened entities, was occurring for only 6 of the 28 listed endangered populations. Judged by the above information, the TSC Act could be much more effective in the process of saving the endangered populations which it lists if more resources were provided for the preparation and implementation of recovery plans.

The spread of the listed endangered populations throughout NSW, based on the NPWS Directorate boundaries, was Central - the Sydney Basin (17), Northern - north-eastern NSW (7), Western (3) and Southern - south-eastern NSW (1) (NPWS 2003a). This is probably an indication that threats to biodiversity are more likely to be recognised in the more densely peopled areas.

If the changes to the definition and criteria for listing populations under the TSC Act, as proposed earlier in this paper were enacted, then only 1 of the 28 populations listed as at January 2003 (the Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai LGAs) would have been ineligible for listing.

Widespread, vulnerable species are likely to have, and in the case of icons such as the Koala and the Glossy Black-cockatoo have had, multiple nominations for endangered populations. Presumably, every subset of a species in NSW is more likely to become extinct than the species. And, while it might be argued that populations of a vulnerable species are *ipso facto* of state or regional significance (Scientific Committee in lit.) and might thereby be eligible to be listed as endangered, the current *ad hoc* and often reactive practice of nominating and listing such populations can be inefficient and ineffective. For such species, it would be much more effective to be proactive through the recovery planning process by having as a first action: mapping the distinct populations, assessing their status and thereby ranking priorities for further recovery actions.

In practice, many of the actions in recovery plans and threat abatement plans work at the level of populations. The recovery plan for *Zieria prostrata* (NPWS 1998) has an action to identify, reserve and protect all populations of this endangered species. In the recovery plan for the vulnerable *Beryta* sp. Cobar-Coolabah, there is an action to develop management strategies for the Coolabah and Gibraltar Range populations which might include fencing and burning where these senescent populations occur (NPWS 2002). The recovery plan for the endangered Eastern Bristlebird (NPWS 2003b) recognised that there were few individuals (<2000) in a few disjunct populations, only two of which had more than 500 birds, and that the species is a poor disperser. Therefore, the plan included an action to translocate birds from one of the large populations in an attempt to re-establish another viable population. The threat abatement plan for the Red Fox *Vulpes vulpes* (NPWS 2001) identified 32 high-priority threatened species which are prey to the Fox and prioritised sites, some of which have distinct populations of a prey species, to concentrate the effort of reducing the impact of predation by the Fox.

For some species (e. g. Brush-tailed Rock-wallaby), distinct populations are used as replicates in experiments designed to test the efficacy of Fox removal in the recovery of that prey species. This model of focusing at the level of site/population will be used in all of the threat abatement plans which address pest species (Leys 2004).

## Conclusions

The TSC Act would be more effective if it was strengthened in the following ways: (i) A new first objective should be added which states that recognising threatened entities is fundamental to the legislation (see Box 3). (ii) The definition of population could be made consistent with IUCN terminology (see Box 3). (iii) Section 11 could be greatly simplified (see Box 3). (iv) Recovery planning for endangered populations, as well as threatened species and ecological communities, could be better resourced for faster preparation and more thorough implementation. (v) All recovery plans for populations should include population monitoring. (vi) Recovery and threat abatement planning for species should continue to focus at the level of populations.

Recognising, listing and saving threatened populations is fundamental to sound threatened species legislation; without these, the TSC Act would just be an act.

### Box 3. Suggested changes to TSC Act

#### Section 3 Objects of Act

- (a) to recognise threatened species, populations, ecological communities and key threatening processes, and
- (b) the other objects of the Act to be renumbered and to follow.

#### Section 4 Definitions

**Populations** mean geographically or otherwise distinct groups of a species between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less).

#### Section 11 Populations eligible for listing as endangered populations

- (1) A population is eligible to be listed as an endangered population if, in the opinion of the Scientific Committee, it is facing a high risk of becoming extinct in nature in New South Wales.
- (2) A population is not eligible to be listed as an endangered population if it is a population of a species already listed in Schedule 1.

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