

Insurance Population Strategy

1. INTRODUCTION

This Strategy has been prepared by the Tasmanian Department of Primary Industries and Water (DPIW) and the Australasian Regional Association of Zoological Parks and Aquaria (ARAZPA) and endorsed by the *Save the Tasmanian Devil* Steering Committee.

The purpose of the Strategy is to provide a framework for the establishment and maintenance of a single Insurance Population of Tasmanian devils. An Insurance Population is required to insure against the possibility of extinction of devils in the wild, and to provide for the release of healthy devils to the wild at an appropriate time.

The Strategy should be reviewed on a regular basis and as any new information arises that may affect the Strategy, including but not limited to:

- the appropriate time period of the Strategy;
- the appropriate size of the Insurance Population; and
- any issues associated with implementation of the Strategy

2. STRATEGY GOAL

The *Tasmanian Devil Insurance Population Strategy* provides an overarching framework to establish and maintain a healthy, viable Insurance Population of Tasmanian Devils for 25 years, that:

- **is disease free (DFTD-free);**
- **is genetically representative of the species;**
- **is able to sustain a harvest of animals for release to the wild; and**
- **provides for the maintenance of the suite of associated flora and fauna (commensal, symbiotic and parasitic) and wild behaviours wherever possible, to facilitate reintroduction to the wild.**

Based on the best available science and expert knowledge of the species, it is anticipated that an **effective population size of 500 animals** will be required as a medium to long term insurance population, to address the risk of extinction of devils in the wild.

This effective population size could be achieved through either 1500 intensively managed animals or 5000 extensively managed animals, or some intermediate combination.

It is desirable for some proportion of the Insurance Population to be comprised of extensively managed populations that have been directly harvested from the wild (rather than from intensively managed captive populations). This would help to maximise the likelihood of maintaining a representative suite of associated flora and fauna and wild behaviours in those animals, to assist with the likelihood of successful reintroduction to the wild.

3. STRATEGY

The Strategy for the Insurance Population is to:

1. Acquire 150 wild-caught founders, as a matter of urgency, to use as a basis for an intensively managed population, and maintain representation of these founders over time;
2. In addition to the 150 wild-caught founders, establish one or more extensively managed populations from wild-harvest, for the purposes of maintaining a representative suite of associated organisms (commensal, symbiotic and parasitic flora and fauna) and wild behaviours of the devils;
3. Build the managed population up to an effective population size of 500 animals, and maintain the effective population size over time;
4. Coordinate breeding and animal transfers among approved components of the Insurance Population to control population size, retain genetic diversity and manage disease risk; and
5. Maintain the capacity to “release” animals into the wild from the managed population, until such time as it is no longer required for future release to the wild

Under this Strategy, priority should be given to:

1. Establishing an intensively managed¹ captive population up to an actual population size of at least 500 animals (starting with facilities that are immediately available and meet the required standards); and
2. Beyond this size, or where the carrying capacity of intensively managed facilities is met (either in the short or long-term), priority will be given to placing animals in:
 - Managed enclosures² for which appropriate conditions and approval requirements are met; and
 - Islands (‘virtual’ and ‘actual’)³ for which appropriate conditions and approval requirements are met.

Note¹ – Intensively managed populations are those captive populations in facilities where population size, structure and pairings for breeding are controlled, primarily to maximise genetic diversity

Note² – Managed enclosures are large, fenced facilities able to house large numbers of animals, that can be removed as necessary, and have a limited ability to track population parameters (eg. numbers, sex ratio, breeding success). They have an intermediate level of management between an intensively managed population and an island population. There is also potentially more control over security breaches of the boundary.

Note³ – Islands are large and/or relatively inaccessible natural areas, where the boundaries may be man-made or natural (eg. water). Populations are likely to be permanent once established and there is either a limited ability or no ability to track population parameters.

4. GOVERNANCE STRUCTURE

This Strategy is endorsed and governed by the *Save the Tasmanian Devil Program Steering Committee*.

Detailed management of the Insurance Population, in accordance with this Strategy, will be documented and managed under a *Tasmanian Devil Captive Management Plan*.

The Captive Management Plan is to be governed by DPIW, and decisions are to be made under that Plan by an expert Captive Management Group. This Group will consist of experts in captive management and Tasmanian devil biology, and will report to the *Save the Tasmanian Devil Program Steering Committee*. The Group will include representatives from the Tasmanian Department of Primary Industries and Water (DPIW), the Australasian Regional Association of Zoological Parks and Aquaria (ARAZPA), and the Senior Scientist.

The captive population will be managed in partnership between ARAZPA and DPIW. ARAZPA will be responsible for managing all populations in institutions that are members of ARAZPA and that meet ARAZPA standards. DPIW will be responsible for managing the remaining populations. Individual proposals for the establishment and management of populations that aim to contribute to the Insurance Population may be submitted for consideration to the Captive Management Group.

2.1 Data Management

Data sharing arrangements are to be put in place for all organisations that are responsible for managing a population that forms part of the broader Insurance Population. There are three categories of managed populations that may contribute to the Insurance Population. These are 'intensively managed'; 'managed enclosure'; and 'island' populations.

In order for a population to be considered to form part of the intensively managed population, the data provided by a facility under this Strategy must meet ARAZPA data standards. Any intensively managed populations that do not meet the ARAZPA standards and are not able to meet these standards over time would be considered to form part of the 'managed enclosures' category. Appropriate data standards should be set under the Captive Management Plan for the 'managed enclosures' and 'islands' categories. Formal Data Sharing Agreements should be developed to facilitate this wherever possible.

2.2 Other Documentation

Various standards, including pre-conditions for participation in the intensively managed component of the Insurance Populations, will be documented to support the Captive Management Plan and to guide implementation of this Strategy.

ATTACHMENT 1 - INTERPRETATION

The following provides a brief overview of terms in the goal for the Insurance Population.

(A) 'Disease free' status:

A single working definition of "Disease-free status" is required for use across all documentation and planning in relation to the Tasmanian Devil Program. This Strategy will adopt that definition.

(B) Genetically representative of the species

For the purposes of this Strategy, the working definition of being "genetically representative" is that the Insurance Population contains at least 95% of the genetic diversity of the species. The number of animals required for the Insurance Population is based on research and modelling by ARAZPA under the *Tasmanian Devil Captive Management Plan 2006*.

There are two components to retaining genetic diversity:

1. the need to capture a sufficient amount of the existing genetic diversity of the wild population in founders; and
2. the need to maintain that genetic diversity over time, through managed breeding and appropriate population size.

Founders

The recommended sampling strategy is based on the following considerations:

- the Insurance Population aims to insure against the potential extinction of the species in the wild;
- devils are known to be genetically impoverished;
- the observed success of spread of the disease is likely to relate in part to the genetic similarity amongst devils; and
- allelic diversity is known to be important for the long-term future of species through its ability to confer adaptive potential.

Therefore the sampling strategy recommended is more ambitious than that usually applied, and follows *Marshall and Brown 1975*. The Strategy recommends sampling 150 founders from across as much of the geographic range of the devil as is feasible, to achieve a 95% probability of capturing those alleles that occur in the population at a frequency of ≥ 0.01 .

Maintenance of Genetic Diversity

There are two key principles in maintaining genetic diversity of a population:

1. Maximising population size - the smaller the population, the faster the genetic diversity is lost through genetic drift and other factors; and
2. Optimising genetic diversity through intensive management of breeding.

The **effective population size** is an indicator of the efficiency with which the population is conserving genetic diversity from one generation to the next. The larger the effective size, the greater the amount of genetic diversity conserved. At an effective size of around 500 animals the population would be expected to lose genetic diversity very slowly and at approximately the same rate as new diversity accumulates through gene mutation. This is an optimum figure that takes into account the possibility that devils may need to be retained, for many generations, without reintroduction to the wild.

The effective population size is closest to (and can even exceed) actual population size when: sex ratios are equal; all animals breed and breed equally (matings are not monopolised by particular individuals); and overall population size is constant.

Typical effective population sizes for captive populations range between 20% and 40% of actual population size (Mace, 1986). Values of 10% are typical for wild populations (Frankham, 1995c). Based on previous experience with the species, 30-40% of actual population size is predicted for the Tasmanian Devil program.

The initial founder population of 150 founders would be built up through intensive captive breeding to around 1500 animals, or alternatively to around 5000 animals in extensively managed populations (or some intermediate combination) in order to maintain that genetic diversity over time. Optimum conditions for the maintenance or retention of the genetic diversity involves rapid but equal growth of founder lines (ie. managed rapid expansion of each founder) up to maximum capacity. Once capacity is reached, the population should be maintained at that size. To alleviate genetic inbreeding, it may be necessary or desirable to move a subset of devils between different locations (populations) at intervals.

At predicted growth rates based on observed growth rates in captivity (λ 1.3-1.7) from a starting population of 150 animals, the Insurance Population would be expected to number 450 animals in 4-6 years.

This modelling includes post-reproductive animals. Additional modelling may be appropriate to explore the actual and effective population numbers required for an intensively managed population where only reproductively capable animals are included.

Able to sustain a harvest of animals for release to the wild

This Strategy aims to maintain an Insurance Population that can be harvested in the future, if appropriate, for release to the wild in their natural range in Tasmania.

Once the capacity of the Insurance Population is reached (at an effective population of 500 animals), the population should be maintained at that level. This could be achieved either by retiring breeding or harvesting a population for release or other purposes. Should releases occur, an Insurance Population should be maintained for a substantial period, to act as insurance against further risks to the devil upon reintroduction and establishment in the wild.

This Strategy does not consider the requirements for release to the wild. A Release Strategy should be developed prior to any such release occurring. In relation to the Insurance Population, release considerations will need to include the following:

- wild conditions that would trigger reintroduction
- pre-release conditioning
- post-release provisioning
- post-release monitoring
- disease screening
- age, reproductive capacity, sex ratio and number of animals required;

It is not anticipated that any harvesting of the Insurance Population would occur until the population is sufficiently robust to sustain the required harvest.

ATTACHMENT 2 – CRITERIA AND STANDARDS

Individual proposals for establishing and managing populations that form part of the broader Insurance Population will be assessed in accordance with this Strategy and under the Captive Management Plan. Criteria and standards will need to be developed under the Captive Management Plan to guide the assessment of these proposals. The detail of these will require regular review.

Standards that need to be developed include, but may not be limited to:

- disease risk management (DFTD) including quarantine procedures;
- protocols, particularly for security breach;
- monitoring and reporting requirements; and
- standards for extensively managed populations

Common issues to be considered for each of the proposals and around which criteria could potentially be developed, include but are not be limited to:

- resourcing required;
- relative efficiency of resourcing (and by whom);
- efficiency of genetic retention (including numbers needed);
- potential impacts on ecosystems of using extensively managed populations; and
- potential for reintroduction (eg. potential changes to animal behaviour as a result of management in captivity, and ‘whole organism management’ in captivity)

REFERENCES

- Frankham, R. 1995c. Effective population size/adult population size ratios in wildlife: a review. *Genet. Res.* 66, 95-107
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- Marshall, D.R. & Brown, A.H.D. (1975). Optimum sampling strategies in genetic conservation. Pp. 53-80 In O.H. Frankel & J.G. Hawkes, eds, *Crop Genetic Resources for Today and Tomorrow*. Cambridge University Press, Cambridge UK.