INTERIM RECOVERY PLAN NO. 89

GRANITE TETRATHECA

(*TETRATHECA DELTOIDEA*)

INTERIM RECOVERY PLAN

2001-2004

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Photograph: S. Hopper

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Western Australian Threatened Species and Communities Unit (WATSCU)
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FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos. 44 and 50.

IRPs outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities, and begin the recovery process.

CALM is committed to ensuring that Critically Endangered taxa are conserved through the preparation and implementation of Recovery Plans or Interim Recovery Plans and by ensuring that conservation action commences as soon as possible and always within one year of endorsement of that rank by the Minister.

This Interim Recovery Plan will operate from May 2001 to April 2004 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be replaced by a full Recovery Plan after three years.

This IRP was approved by the Director of Nature Conservation on 27 June 2001. The provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting CALM, as well as the need to address other priorities.

Information in this IRP was accurate at May 2001.

SUMMARY

Scientific Name: ***Tetratheca deltoidea*** **Common Name:** Granite tetratheca
Family: Tremandraceae **Flowering Period:** May, August to October
CALM Region: Wheatbelt **CALM District:** Merredin
Shire: Kellerberrin **Recovery Team:** Merredin District Threatened Flora Recovery Team (MDTFRT)

Illustrations and/or further information: Brown, A., Thomson-Dans, C. and Marchant, N. (Eds) (1998). *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia; Western Australian Herbarium (1998). FloraBase – Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. http://www.calm.wa.gov.au/science/

Current status: *Tetratheca deltoidea* was declared as Rare Flora in December 1992 and ranked as Critically Endangered (CR) in September 1995. It currently meets World Conservation Union (IUCN, 1994) Red List Category CR under criteria A1e, B1+2e, C2a (IUCN 1994) due to the single known population, a continuing decline in the number individuals and habitat degradation. The main threats are grazing, weeds, inappropriate fire and drought.

Habitat requirements *Tetratheca deltoidea* is known from a single population, comprising several subpopulations, on pockets of rich, grey, loamy soil at the top of a large granite outcrop. The habitat consists of *Eucalyptus caesia* subsp. *caesia* over open dwarf scrub of *Grevillea petrophiloides* subsp. *magnifica, Gastrolobium spinosum* and *Lasiopetalum floribundum* over low sedges of *Lepidosperma resinosum*.

Tetratheca deltoidea occurs with four flora priority species *Acacia cowaniana*, *Eucalyptus caesia* subsp. *caesia*, *Millotia pilosa*, and *Gastrolobium callistachys* and one vulnerable fauna species *Petrogale lateralis*.

Critical habitat: The critical habitat of *Tetratheca deltoidea* comprises the area of the known population, adjacent areas of similar habitat within 200 metres of the population, corridors of remnant vegetation that link subpopulations, and other nearby occurrences of suitable habitat that are not currently known to contain populations of the species but which may be suitable for translocations.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented:
1. Land managers and adjacent landowners have been made aware of the threatened nature of the species and its location.
2. Extensive surveys were undertaken in 1988. No new populations were located.
3. An A4 sized poster that provides a description of *Tetratheca deltoidea* and information about threats and recovery actions has been produced.
4. In order to reduce weeds, Subpopulation 1a was sprayed with Fusilade in 1997.
5. To control grazing in Subpopulation 1a, rabbit netting was placed over four plants in 1997.
6. Staff from CALM's Threatened Flora Seed Centre (TFSC) collected approximately 12 seeds in 1997.
7. Botanic Gardens and Parks Authority have two *Tetratheca deltoidea* plants in their nursery, one from cutting material and one from seed collected in 1997 by staff of the Threatened Flora Seed Centre.
8. The Merredin District Threatened Flora Recovery Team is overseeing the implementation of this IRP.
9. Staff from CALM's Merredin District Office regularly monitor the population.

IRP Objective: The objective of this Interim Recovery Plan is to abate identified threats and maintain and/or enhance *in situ* populations to ensure the long-term preservation of the taxon in the wild.

Recovery criteria
Criterion for success: The number of individuals within populations and/or the number of populations have increased.
Criterion for failure: The number of individuals within populations and/or the number of populations have decreased.

Recovery actions
1. Coordinate recovery actions.
2. Install fencing.
3. Obtain cutting material.
4. Undertake weed control.
5. Conduct further surveys.
6. Monitor population.
7. Develop and implement a fire management strategy.
8. Promote awareness.
9. Obtain biological and ecological information.
10. Develop a translocation proposal.
11. Write a full Recovery Plan.

1. BACKGROUND

History

Tetratheca deltoidea was first collected by G. Sewell from south of Kellerberrin and east of York in 1889 and 1891 respectively. Location details given for these specimens do not exclude the possibility that both are from the same site (Thompson 1976). *T. deltoidea* was not seen again until July 1988 when S. Hopper[1] rediscovered it whilst conducting research on the bird pollination of *Eucalyptus caesia* subsp. *caesia*. In August 1988, the population was mapped and found to consist of two small subpopulations. Further surveys have been undertaken that include similar habitat on other granite outcrops but no new populations have been found.

Description

Tetratheca deltoidea is a leafy, delicate, trailing shrub to 1 m high with broadly cordate-ovate to deltoid leaves 1.3 cm long, with a paler under surface. Reddish-brown bristles 1 to 2 mm long, arise from tubercles and cover the stem. The strongly scented, dark pink flowers are 1 cm long by 0.7 cm wide and occur singly from leaf axils on slender pedicles to 2 cm long. The flowers are usually produced between August and October but have also been seen in May (personal communication P. Roberts[2]). Seed is set between November and December (Thompson 1976). The species name is derived from the Greek *delta*, referring to the often triangular shape of the leaves (Brown *et al*. 1984).

Distribution and habitat

Tetratheca deltoidea is known from a single population, growing in pockets of rich, grey, loamy soil at the top of a large granite outcrop. Associated vegetation consists of *Eucalyptus caesia* subsp. *caesia* over *Grevillea petrophiloides* subsp. *magnifica, Gastrolobium spinosum, Lasiopetalum floribundum* and *Lepidosperma resinosum*. *T. deltoidea* occurs with four priority flora species - *Acacia cowaniana* (P2), *Eucalyptus caesia* subsp. *caesia* (P4), *Millotia pilosa* (P2), and *Gastrolobium callistachys* (P4).

The Black-flanked Rock-wallaby (*Petrogale lateralis lateralis*), which is listed as Vulnerable, occurs in the same habitat as *Tetratheca deltoidea*.

Critical habitat

Critical habitat is habitat identified as being critical to the survival of a listed threatened species or listed threatened ecological community. Habitat is defined as the biophysical medium or media occupied (continuously, periodically or occasionally) by an organism or group of organisms or once occupied (continuously, periodically or occasionally) by an organism, or group of organisms, and into which organisms of that kind that the potential to be reintroduced. (*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)).

The critical habitat for *Tetratheca deltoidea* comprises:

- The habitat of the known population.
- Similar habitat within 200 metres of the known population (these provide potential habitat for natural recruitment).
- Corridors of remnant vegetation that link the population with other nearby areas of apparently suitable habitat that do not currently contain the species.
- Areas of similar habitat elsewhere that may be used for future translocation.

[1] Dr Stephen Hopper, Director, Botanic Gardens and Parks Authority
[2] Paul Roberts, District Manager, CALM Merredin district

Biology and ecology

The genus *Tetratheca* is endemic to Australia where it comprises 41 species, 23 of which are endemic to Western Australia. All are small perennial shrubs and most are restricted to loose sandy or gravelly soils of sandstone or granitic origin, often among rocks. A few are found in winter-wet swamps. Species of *Tetratheca* are usually most noticeable following disturbance which stimulates new growth and flowering. Hybridisation within the genus is extremely rare (Thompson, 1976).

The species appears to be naturally highly restricted, requiring specific components within the ecosystem, ie shallow soils over granite.

Tetratheca deltoidea is stoloniferous. Stolons are produced a few centimetres underneath the loose leaf litter and nodes are formed every 50 cm or so. The species tends to grow through *Lepidosperma resinosa* at the base of *Eucalyptus caesia* subsp. *caesia*, with the *Lepidosperma* in some instances providing protection for the delicate trailing stems (Alford 1991).

No specific pollination events have been observed for *Tetratheca deltoidea*, however, native bees, flies and mosquitos have been seen in the area.

Threats

Tetratheca deltoidea was declared as Rare Flora in December 1992 and ranked as Critically Endangered (CR) in September 1995. It currently meets World Conservation Union (IUCN, 1994) Red List Category CR under criteria A1e, B1+2e, C2a (IUCN 1994) due to the single known population, a continuing decline in the number individuals and habitat degradation. The main threats include grazing, weed invasion, inappropriate fire and drought.

- **Grazing** of new growth is occurring and may threaten the long-term survival of *Tetratheca deltoidea*. Although it has not been directly observed, it is likely that Rock-wallabies (*Petrogale lateralis lateralis*) and rabbits (*Oryctolagus cuniculus*) are the culprits, as scats from these animals have often been observed near the plants.

- **Weed invasion** is a threat to the population. Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads, which are produced annually by many grass weed species (Lynch 1987; Saunders *et al*. 1987; Taylor 1987). *Briza maxima* and *Avena barbata* have been recorded within the population.

- **Inappropriate fire** may affect the long-term viability of populations Seed of *Tetratheca deltoidea* appears to germinate following fire and if this is the case, the soil seed bank would rapidly be depleted if fires recurred before regenerating or juvenile plants reach maturity. Occasional fires are, however, needed for recruitment and regeneration and so a no fire regime is also detrimental in the long-term. Further investigation is required and will be addressed in recovery action 9.

- **Drought** may directly impact on the species by reducing the number of flowering plants, resulting in poor seed set, and increasing the mortality of seedlings and possibly also adult plants. During drier periods, when there is little green feed available, the grazing pressure on *Tetratheca deltoidea* is likely to increase.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1a. S of Kellerberrin	Nature reserve	1989 100+ 2000 17clumps	Moderate	Grazing, weed invasion, inappropriate fire, drought
1b. S of Kellerberrin	Nature reserve	1989 51+ 2000 5 clumps	Moderate	Grazing, weed invasion, inappropriate fire, drought

Note: * total for both subpopulations combined.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Development in the immediate vicinity of populations or within the defined critical habitat of *Tetratheca deltoidea* will require assessment. Developments should not be approved unless the proponents can demonstrate that they will not have a negative impact on the species, and its habitat or potential habitat

2. RECOVERY OBJECTIVES AND CRITERIA

Objectives

The objective of this Interim Recovery Plan is to abate identified threats and maintain and/or enhance *in situ* populations to ensure the long-term preservation of the taxon in the wild.

Criterion for success: The number of individuals within populations and/or the number of populations have increased.
Criterion for failure: The number of individuals within populations and/or the number of populations have decreased.

3. RECOVERY ACTIONS

Existing recovery actions

Land managers and adjacent landowners have been made aware of the location and threatened nature of *Tetratheca deltoidea*. The notification details the Declared Rare status of the taxon and relevant legal responsibilities.

In September 1988, J. Alford undertook extensive surveys for *Tetratheca deltoidea* at Mount Caroline, Mount Stirling (south of Mt Caroline) and Gathercole Nature Reserve (east of Wongan Hills). Although all areas contained granite outcrops and had the same associated plant species, including *Eucalyptus caesia* subsp. *caesia*, no new populations were located.

Fox control and research are components of CALM's "Western Shield" project. Mount Caroline Nature Reserve is one of the reserves included in the Wheatbelt's "Nature Restored" project (Bailey 1996). The area is baited 13 times a year.

An A4 sized poster, which provides a description of the species, and information about threats and recovery actions, has been developed for *Tetratheca deltoidea*. It is hoped that the poster will result in the discovery of new populations.

Subpopulation 1a was sprayed with Fusilade in 1997 to reduce the impact of weeds.

In 1997, rabbit netting was placed over four plants in Subpopulation 1a to reduce rock wallaby and rabbit grazing.

Approximately 12 seeds were collected by staff from CALM's Threatened Flora Seed Centre (TFSC) in 1997.

Botanic Gardens and Parks Authority (BGPA) have two *Tetratheca deltoidea* plants in their nursery, one from cutting material and one from seed collected in 1997 by staff from the TFSC. Although the cuttings did well initially with a 50 to 60% strike rate, most died when potted out.

The Merredin District Threatened Flora Recovery Team (MDTFRT) is overseeing the implementation of this IRP and will include it in its annual report to CALM's Corporate Executive and funding bodies.

Staff from CALM's Merredin District office regularly monitor the population.

Future recovery actions

Where populations occur on lands other than those managed by CALM, permission has been or will be sought from the appropriate land managers prior to recovery actions being undertaken.

1. Coordinate recovery actions

The MDTFRT will continue to oversee the implementation of recovery actions for *Tetratheca deltoidea* and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $1000 per year

2. Install fencing

New growth on *Tetratheca deltoidea* is being grazed and, although it has not been directly observed, it is likely that Rock-wallabies and rabbits are the culprits. A fence will be erected around the population and will include a buffer of surrounding habitat.

Action: Install fencing
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $3,100 in the first year

3. Obtain cutting material

Because of the grazing impact, seed has not been produced for a long time. Collection of cutting material is therefore vital to ensure a living collection of genetic material.

Action: Obtain cutting material
Responsibility: CALM (Merredin District, Threatened Flora Seed Centre) and BGPA, through the MDTFRT
Cost: $3,000 per year

4. Undertake weed control

Weed control using herbicides and hand pulling is required. The following actions will be implemented:

1. Appropriate herbicides will be selected after determining which weeds are present.
2. Invasive weeds will be controlled by hand removal or spot spraying.
3. Dodder infestations will be controlled by hand removal as necessary.
4. Weed control will be scheduled to include spraying at other threatened flora populations within the Merredin district.

The tolerance of associated native plant species to herbicides at the site of *Tetratheca deltoidea* is not known and weed control programs will be undertaken in conjunction with research (see Recovery Action 9).

Action: Undertake weed control
Responsibility: CALM (Merredin District, CALMScience) through the MDTFRT
Cost: $700 per year

5. Conduct further surveys

Further surveys will be conducted during the species' flowering period (September to November) and volunteers, including members of naturalists clubs and wildflower societies, will be encouraged to become involved.

Action: Conduct further surveys
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $2,200 per year

6. Monitor population

Monitoring of factors such as grazing, weed invasion, habitat degradation, and population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity is essential. Both subpopulations will be inspected annually.

Action: Monitor population
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $1,200 per year

7. Develop and implement a fire management strategy

A fire management strategy based on the one developed by Central Forest Region, which defines fire control measures, and fire frequency and timing will be developed in consultation with relevant authorities and land managers.

Action: Develop and implement a fire management strategy
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $2,200 in first year and $1,000 in subsequent years

8. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of *Tetratheca deltoidea* in the wild will be promoted to the public through the local print and electronic media and through poster displays. An information sheet that includes a description of the plant, its habitat type, threats and management actions has been produced and circulated. Formal links with local naturalist groups and interested individuals will be encouraged.

Action: Promote awareness
Responsibility: CALM (Merredin District, Corporate Relations) through the MDTFRT
Cost: $600 per year

9. Obtain biological and ecological information

A better knowledge of the biology and ecology of *Tetratheca deltoidea* will result in improved management of the species in the wild. Investigations will include:

1. A study of the soil seed bank dynamics and the role of various factors including disturbance, competition, rainfall, and grazing in recruitment and seedling survival.
2. Determination of reproductive strategies, phenology and seasonal growth.
3. Investigating its pollination biology.
4. Investigation of population genetic structure, levels of genetic diversity and minimum viable population size.

Action: Obtain biological and ecological information
Responsibility: CALM (CALMScience, Merredin District) through the MDTFRT
Cost: $15,900 per year

10. Develop a translocation proposal

Future translocation is essential for the long-term conservation of this species as the total numbers of extant plants are low and these occur in a very confined area which could be damaged or destroyed by a single threatening process. Although translocations are generally undertaken under full Recovery Plans, it is possible to develop a translocation proposal and start propagating plants within the time frame of an Interim Recovery Plan. This will be coordinated by the MDTFRT. Information on the translocation of threatened animals and plants in the wild is provided in CALM Policy Statement No. 29 *Translocation of Threatened Flora and Fauna.* All translocation proposals require endorsement by the Director of Nature Conservation.

Action: Develop a translocation proposal
Responsibility: CALM (CALMScience, Merredin District) through the MDTFRT
Cost: $2,800 in third year

11. Write full Recovery Plan

At the end of the third-year of this IRP, the need for further recovery will be assessed. If *Tetratheca deltoidea* is still ranked Critically Endangered at that time a full Recovery Plan will be developed that prescribes actions required for the long-term recovery of the species.

Action: Write full Recovery Plan
Responsibility: CALM (WATSCU, Merredin District) through the MDTFRT
Cost: $19,000 in third year

4. TERM OF PLAN

This Interim Recovery Plan will operate from May 2001 to April 2004 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be replaced by a full Recovery Plan after three years.

5. ACKNOWLEDGMENTS

The following people have provided assistance and advice in the preparation of this Interim Recovery Plan:

Heather Adamson	Officer, Land for Wildlife, Merredin
Alex Agafonoff	Former Conservation Officer, CALM Merredin District
Jeni Alford	Former Nature Conservation Planning Officer, CALM Perth District
Brett Beecham	Regional Ecologist, CALM Wheatbelt Region
Karen Bettink	Conservation Officer, CALM Merredin District
Anne Cochrane	Manager, CALM Threatened Flora Seed Centre, CALMScience Division
Jack Kinnear	Former Principal Research Scientist, CALMScience Division
Mike O'Donoghue	Flora Administrative Officer, CALM Wildlife Branch, Nature Conservation Division
Paul Roberts	District Manager, CALM Merredin District
Amanda Shade	Horticulturist, Botanic Gardens and Parks Authority
Claire Welbon	Former Conservation Officer, CALM Merredin District

We would like to thank the staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and CALM's Wildlife Branch for their extensive assistance.

6. REFERENCES

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7. TAXONOMIC DESCRIPTION

Thompson, J. (1976) A revision of the genus *Tetratheca* (Tremandraceae). *Telopea* 1(3): 139-215.

Tetratheca deltoidea has terete stems, slightly vertically ridged on younger stems, with reddish brown, tubercle-based, strongly retrorse, appressed setae 1 to 2 mm long, the stems 0.5 to 1.0 mm broad in the flowering region, the branching alternate. Leaves ovate to deltoid or narrowly deltoid, glabrous, the under surface paler, the midrib conspicuous at the base, the margins flat with minute denticulations, or tending to recurve, usually with sparse inconspicuous point- or even seta-bearing teeth at least at the base, the apex with a small sharp point, pale, usually 0.5 mm in length; often with strongly reversed setae below the base, the petiole distinct. Flowers occurring singly in the leaf-axils, the bracts 1.5 mm long, green and leaf-like and glabrous. Peduncles 13 to 20 mm long, slender, glabrous, dark-coloured, curved at the top and widening to form a receptacle 1 to 2 mm in diameter. Calyx-segments 5, deciduous, dark-coloured, glabrous except for hairs on the inner margin, c. 2 mm long, ovate to almost deltoid, acuminate, rather thin in texture and undulate at the edges, each segment attached well inside the edge of the receptacle with a thick turgid ridge along the lower back. Petals 5, dark pink, broadly linguiform, ca. 1 cm long and 7 mm wide with the greatest width in the top third deciduous. Stamens 10, 2.5 mm long, filament completely absent; body of the anther 2 mm long, narrowed at the base with the narrowed basal part at a slight angle, the rest straight, very slightly narrowed to a broad straight anther-tube; anther-tube c. 0.5 mm long with a broad, straight, scarcely lipped orifice. Ovary glabrous, on a broad base and tapering at the apex into a rather stout glabrous style 1.5 mm long. Ovules 2, 1 in each loculus, attached near the upper part of the central axis. Fruit not seen.