

INTERIM RECOVERY PLAN NO. 91

# MAXWELL'S GREVILLEA

*(GREVILLEA MAXWELLII)*

## INTERIM RECOVERY PLAN

**2001-2004**

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Photograph: E. Hickman  
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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This Interim Recovery Plan will operate from March 2001 to February 2004 but will remain in force until withdrawn or replaced.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 26 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 March 2001.

**SUMMARY**

<b>Scientific Name:</b>	<i>Grevillea maxwellii</i>	<b>Common Name:</b>	Maxwell's Grevillea
<b>Family:</b>	Proteaceae	<b>Flowering Period:</b>	August to September
<b>CALM Region:</b>	South Coast	<b>CALM District:</b>	Albany
<b>Shire:</b>	Albany	<b>Recovery Team:</b>	Albany District Threatened Flora Recovery Team (ADTFRT)

**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; Olde, P.M. and Marriott, N.R. (1995) *The Grevillea Book 2*: 108-109. Kangaroo Press, Kenthurst NSW.

**Current status:** *Grevillea maxwellii* was declared as Rare Flora in September 1994 and ranked as Critically Endangered (CR) in September 1995. It currently meets World Conservation Union (IUCN, 1994) Red List Category 'CR' under criteria B1+2ce due to populations being severely fragmented, and a continuing decline in both the area and quality of habitat and the number of mature individuals. The main threats are drought, grazing, weeds, little remaining habitat and inappropriate fire regimes.

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

**Habitat requirements:** *Grevillea maxwellii* grows in areas of low open heath in shallow brown loamy soil over granite on rocky hilltops and slopes to the Pallinup River east of the Stirling Ranges. Plants become rarer as the soil depth increases (Robinson & Coates, 1995).

**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. An A4 sized poster that provides a description of *Grevillea maxwellii* and information about threats and recovery actions has been produced.
3. Approximately 200 seeds were collected from Population 2 in October 1995, 192 seeds from Populations 1 and 2 in December 1996, and 1042 seeds from Subpopulation 4a and Populations 1 and 2 in October 1997. These are stored in CALM's Threatened Flora Seed Centre (TFSC) at -18°C.
4. Populations 1 to 5 have been fenced to exclude stock.
5. An article about the *Grevillea maxwellii* was placed in the Albany Advertiser in May 2000.
6. The Botanic Garden and Parks Authority (BGPA) currently have 38 plants of *Grevillea maxwellii*, a result of five germinants from seed obtained from the TFSC.
7. A reply paid postal drop illustrating *Grevillea maxwellii* and describing its distinctive features and habitat was distributed by CALM's Albany District office in August 1999 and 2000 to farmers and residents in the Borden area.
8. Testing of eight *Grevillea maxwellii* plants for *Phytophthora cinnamomi* susceptibility by CALMScience found that 75% of plants died following inoculation.
9. The Albany District Threatened Flora Recovery Team (ADTFRT) is overseeing the implementation of this IRP and will include it in its annual report to CALM's Corporate Executive and funding bodies.
10. Staff from CALM's Albany District Office regularly monitor all populations.

**IRP Objective:** The objective of this Interim Recovery Plan is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the species 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. Undertake weed control.
3. Develop and implement a fire management strategy.
4. Monitor populations.
5. Conduct further surveys.
6. Collect seed and cutting material.
7. Liaise with land managers.
8. Rehabilitate habitat.
9. Protect populations on private land.
10. Obtain biological and ecological information.
11. Promote awareness.
12. Start translocation process.
13. Write a full Recovery Plan.

## 1. BACKGROUND

### History

*Grevillea maxwellii* was first collected by from the Pallinup area by James Drummond in 1840. The next collection was made east of Ellens Peak by K. Newbey in 1966, but was mis-identified as *G. asparagoides*. *Grevillea maxwellii* was not seen again until 1986 when G. Keighery conducted an extensive survey of the Stirling Range area and located a new population of over 40 plants on the south side of the Pallinup River.

Surveys by CALM staff in 1994 resulted in the discovery of further populations. Currently, *Grevillea maxwellii* is known from nine populations and a total of around 700 plants.

### Description

*Grevillea maxwellii* is a small, spreading shrub to just over 1 m tall and 1.5 m across. Its pinnate leaves are up to 7.5 cm long, have three to six lobes, each of which are divided into three smaller lobes. Large red flowers are produced in August and September, and are borne at the end of branchlets that usually curve downwards. The flowers are often found sheltered beneath the foliage giving the plant an attractive layered appearance (Brown *et al.* 1998).

*Grevillea maxwellii* is related to *G. asparagoides*, *G. batrachioides* and *G. secunda*. *G. asparagoides* and *G. batrachioides* differ in their longer pistil and saccate perianth. *G. secunda* has no glandular hairs on the upper perianth surface and no edge veins visible on the upper surface of the leaf lobes (Olde and Marriott 1995).

### Distribution and habitat

*Grevillea maxwellii* grows in low open heath in shallow brown loamy soil over granite on rocky hilltops and slopes to the Pallinup River east of the Stirling Range. Plants become rarer as the soil depth increases (Robinson & Coates 1995).

Associated species include *Calothamnus quadrifidus*, *Hakea lissocarpha*, *Allocasuarina huegeliana*, *Agonis spathulata*, *Calectasia grandiflora*, *Hakea marginata*, *Hypocalymma angustifolium*, *Allocasuarina campestris*, *Xanthorrhoea platyphylla*, *Stypandra glauca*, *Melaleuca uncinata*, *Eucalyptus tetragona*, *Borya sphaerocephala*, *Dryandra nivea*, *Daviesia flexuosa*, *Kunzea recurva*, *Gastrolobium spinosum* and *Phyllanthus calycinus*.

### Critical habitat

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

The critical habitat for *Grevillea maxwellii* comprises:

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

Explanatory Note: Adjacent uncleared vegetation linked to the known habitat of the species and additional occurrences of the habitat are potential areas for the species and provide opportunities for reintroduction, re-invasion and translocation. They may also provide habitat for the grevillea's pollinator.

### Biology and ecology

While the biology of many grevillea species is well researched, the biology of *Grevillea maxwellii* is poorly known.

*Grevillea maxwellii* may vary in form from erect to prostrate. Foliage colour may also vary with some plants being an ashy grey-green and others dark green. Flowers may be prominent on some plants and hidden in others. The species is likely to

be pollinated by nectarivorous birds (Olde & Marriott 1995). High levels of predation of fruits by insects and birds have been recorded (personal observation A. Cochrane<sup>1</sup>).

*Grevillea maxwellii* was introduced to the nursery industry in 1986 as it grows vigorously and flowers profusely. According to Olde and Marriott (1995) cuttings strike readily at most times of the year. However, this is not always the case as staff of the Botanic Gardens and Parks Authority (BGPA) had a poor success rate in propagating the species from cuttings.

Testing of the susceptibility to *Phytophthora cinnamomi* of eight *Grevillea maxwellii* plants by CALMScience found that 75% of plants died following inoculation, placing the species in the dieback susceptible group. However, the number of plants tested was small and so questions the validity of the test (personal communication C. Crane<sup>2</sup>). Further testing is therefore required and will be addressed under recovery action 10.

## Threats

*Grevillea maxwellii* was declared as Rare Flora in September 1994 and was ranked Critically Endangered (CR) in September 1995. It currently meets World Conservation Union (IUCN, 1994) Red List Category 'CR' under criteria B1+2ce due to the species being known from one location, and a continuing decline in both the area of habitat and the number of plants. The main threats are drought, weeds and inappropriate fire regimes.

- **Drought** is a threat to all populations due to the very shallow soils that the species grows in. Drought may directly impact on the species by reducing flowering, seed set and population recruitment, and will increase the mortality of plants.
- **Weed invasion** is a major threat to Subpopulations 4b and Population 5, and a minor threat to most other populations. 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).
- **Inappropriate fire** may affect the long-term viability of populations. Seed of *Grevillea maxwellii* 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 reached maturity. Occasional fires are, however, needed for the recruitment and regeneration of this species and so a no fire regime is also detrimental in the long-term. Further investigation is required and will be addressed in recovery action 10.

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<sup>1</sup> Anne Cochrane, Manager Threatened Flora Seed Centre, CALMScience Division

<sup>2</sup> Colin Crane, Senior Technical Officer, CALMScience Division

**Summary of population information and threats**

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1. S Pallinup River	Private property	1993 48 1999 55 + 5 dead]	Moderate	Drought, fire, weeds
2. S Pallinup River	Unallocated Crown Land	1993 33 + 3 dead 1999 40 (30) + 1 dead	Healthy	Drought, fire, weeds
**3. N & S Pallinup River	Unallocated Crown Land (Water)	1999 0	Unknown	Unknown
4A. S Pallinup River	Private property	1994 *200 + 10+ dead 2000 150 + 5 dead	Moderate	Drought, fire, weeds
4B. S Pallinup River	Private property	1994 *200 + 10 dead 2000 8	Moderate	Drought, fire, weeds
5. S Pallinup River	Shire road reserve	1994 2 1999 1	Healthy	Drought, fire, weeds
6. S Pallinup River	Private property & UCL	1999 33 (9) + 3 dead	Healthy	Drought, fire, weeds
7. N Pallinup River	Private property	1999 27+ 2 dead	Healthy	Drought, fire, weeds
8. N Pallinup River	Private property	1999 300+ 15 dead	Healthy	Drought, fire, weeds
9. N Pallinup River	Private property	2000 100 + 2 dead	Healthy to moderate	Drought, fire, weeds

\*Total for both subpopulations combined. \*\* A collection made by G. Keighery in 1986 which may have incorrect location details as the habitat is not suitable and the soil is too deep. Numbers in ( ) refers to number of seedlings.

**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 *Grevillea maxwellii* 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 or have the potential to spread or amplify dieback disease caused by the plant pathogen *Phytophthora cinnamomi*.

**2. RECOVERY OBJECTIVE AND CRITERIA****Objectives**

The objective of this Interim Recovery Plan is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the species 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 *Grevillea maxwellii*. Private property owners, Shires and the Department of Land Administration (DOLA) have been formally notified of populations on their land. The notification details the Declared Rare status of the taxon and relevant legal responsibilities.

An A4 sized poster that contains a description of the species and information about threats and recovery actions has been produced for *Grevillea maxwellii*. It is hoped that the poster will result in the discovery of new populations.

Approximately 200 seeds were collected from Population 2 in October 1995 and stored in CALM's Threatened Flora Seed Centre (TFSC) at -18°C. TFSC staff test the viability of the seed after one year in storage and again after five years. The initial germination rate of *Grevillea maxwellii* seed was found to be 61%. Further collections of 89 seeds from Population 2 and 103 seeds from Population 1 were made in December 1996. The initial germination rate ranged from 30% to 73%. After one year in storage the germination rate of the seed ranged from 67% to 90%. In October 1997 seed collections consisted of 55 seeds from Subpopulation 4a, 150 seeds from Population 2, and 837 seeds from Population 1. The initial germination rate of the latter was 84% (unpublished data A. Cochrane).

Populations 1 to 5 of *Grevillea maxwellii* have been fenced to exclude stock. The Albany Shire contributed financially towards the fencing of Population 5 and an article appeared in the local newspaper promoting the cooperation between the Shire, property owner and CALM.

An article about the *Grevillea maxwellii* was placed in the *Albany Advertiser* in May 2000.

BGPA currently has 38 nursery grown plants of *Grevillea maxwellii*. Most of these are from seed. BGPA have had poor success in propagating the species from cuttings. Of seven attempts a zero strike rate was recorded three times, 57% once, and 14 to 16% the other three times (personal communication A. Shade<sup>3</sup>).

A reply paid postal drop illustrating *Grevillea maxwellii*, describing its distinctive features and providing habitat information was distributed by CALM's Albany District office in August 1999 and 2000 to local farmers and residents in the Borden area. Postal drops contain information about the threatened species and provide a contact name and number if plants are discovered. It is hoped that by targeting residents of specific areas new populations will be located.

Testing, done by CALMScience, of the susceptibility to *Phytophthora cinnamomi* of eight *Grevillea maxwellii* plants found that 75% of plants died following inoculation. This places the species in the dieback susceptible group (personal communication C. Crane).

The Albany District Threatened Flora Recovery Team (ADTFRT) 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 Albany District Office regularly monitor all populations.

### **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 ADTFRT will oversee the implementation of recovery actions for *Grevillea maxwellii* and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

**Action:** Coordinate recovery actions  
**Responsibility:** CALM (Albany District) through the ADTFRT  
**Cost:** \$400 per year

#### **2. Undertake weed control**

Weeds are a major threat to Subpopulations 4b and Population 5, and a minor threat to most other populations. 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 around *Grevillea maxwellii* plants when weeds first emerge.
3. Weed control will be scheduled to coincide with spraying of other threatened flora populations within the district.

The tolerance of associated native plant species to herbicides at the site of *Grevillea maxwellii* is not known and weed control programs will be undertaken in conjunction with research.

**Action:** Undertake weed control  
**Responsibility:** CALM (Albany District, CALMScience) through the ADTFRT  
**Cost:** \$700 per year

#### **3. Develop and implement a fire management strategy**

Fire may kill adult plants of the species with most regeneration likely to be from soil-stored seed. Frequent fire, prior to plants reaching maturity, is likely to result in there being insufficient soil stored seed for successful regeneration. Fire should therefore be prevented from occurring if possible, at least in the short term. A fire management strategy will be developed to determine fire control measures and fire frequency.

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<sup>3</sup> Amanda Shade, Horticulturalist, Botanic Garden and Parks Authority

**Action:** Develop and implement a fire management strategy  
**Responsibility:** CALM (Albany District) through the ADTFRT  
**Cost:** \$2,300 in first year and \$1,000 in subsequent years

#### 4. Monitor populations

Annual monitoring of habitat degradation (including the impact of dieback), population stability (expansion or decline), weed invasion, pollination activity, seed production, recruitment, longevity and predation is essential.

**Action:** Monitor populations  
**Responsibility:** CALM (Albany District) through the ADTFRT  
**Cost:** \$1,800 per year

#### 5. Conduct further surveys

Further surveys, supervised by CALM staff and with assistance from local naturalists and wildflower society members, will be conducted during the species' flowering period (August to September).

**Action:** Conduct further surveys  
**Responsibility:** CALM (Albany District) through the ADTFRT  
**Cost:** \$3,200 per year

#### 6. Collect seed and cutting material

Preservation of germplasm is essential to guard against the possible future extinction of wild populations. Seed collections are also needed to propagate plants for translocations. A small quantity of seed has been collected from Populations 1, 2 and 4 but additional seed is required from all populations. Cuttings will also be collected to further establish a living collection of genetic material at the BGPA.

**Action:** Collect seed and cutting material  
**Responsibility:** CALM (Albany District, TFSC) and the BGPA, through the ADTFRT  
**Cost:** \$3,400 per year

#### 7. Liaise with land managers

Staff from CALM's Albany District will continue to liaise with land managers and adjacent landowners to ensure that populations are not damaged or destroyed accidentally. Due to the potential susceptibility of the habitat of this species to dieback, the need for dieback hygiene procedures will be included in information provided to land managers.

**Action:** Liaise with land managers  
**Responsibility:** CALM (Albany District) through the ADTFRT  
**Cost:** \$1,200 per year

#### 8. Rehabilitate habitat

As *Grevillea maxwellii* is often a dominant component of the community where it occurs, restoration of habitat in areas where the species is likely to have occurred prior to clearing is recommended in conjunction with other strategic 'macro corridor' revegetation projects. Where possible, site rehabilitation should extend beyond the current boundary of *G. maxwellii* populations to disfavour weed invasion and buffer plants from chemical drift. It should include the introduction of both *G. maxwellii* and other local plant species.

**Action:** Rehabilitate habitat  
**Responsibility:** CALM (Albany District) through the ADTFRT  
**Cost:** \$10,200 in second year

#### 9. Protect populations on private land

Ways of achieving protection of the land on which *Grevillea maxwellii* occurs will be investigated. Possible methods of achieving future conservation include covenanting and land purchase.

**Action:** Protect populations on private land  
**Responsibility:** CALM (Albany District) through the ADTFRT



**Cost:** To be determined

#### 10. Obtain biological and ecological information

Increased knowledge of the biology and ecology of the species will provide a scientific basis for management of *Grevillea maxwellii* in the wild. Investigations will include:

1. Studying the soil seed bank dynamics and the effect of disturbance (such as fire), competition, grazing and rainfall on recruitment and seedling survival.
2. Determining reproductive strategies, phenology and seasonal growth.
3. Investigating the species' reproductive system and pollination biology.
4. Investigating population genetic structure, levels of genetic diversity and minimum viable population size.
5. Investigating the impacts of dieback disease and control techniques (Phosphite) on *Grevillea maxwellii* and its habitat.

**Action:** Obtain biological and ecological information  
**Responsibility:** CALM (CALMScience, Albany District) through the ADTFRT  
**Cost:** \$18,400 per year

#### 11. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of *Grevillea maxwellii* 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 will be produced. Formal links with local naturalist groups and interested individuals will also be encouraged.

Due to the potential susceptibility of the habitat of this species to dieback the need for dieback hygiene procedures will be included in information provided to landowners and visitors to the sites.

**Action:** Promote awareness  
**Responsibility:** CALM (Albany District, Strategic Development and Corporate Affairs Division) through the ADTFRT  
**Cost:** \$700 per year

#### 12. Start translocation 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 ADTFRT. 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:** Start translocation process  
**Responsibility:** CALM (CALMScience, Albany District) through the ADTFRT  
**Cost:** \$5,200 in third year

#### 13. Write a full Recovery Plan

At the end of the third-year of this IRP, the need for further recovery will be assessed. If *Grevillea maxwellii* 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 a full Recovery Plan  
**Responsibility:** CALM (WATSCU, Albany District) through the ADTFRT  
**Cost:** \$18,100 in third year

#### 4. TERM OF PLAN

This Interim Recovery Plan will operate from March 2001 to February 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:

Sarah Barrett	Flora Officer, CALM Albany District
Colin Crane	Senior Technical Officer, CALM Science Division
Anne Cochran	Manager, CALM Threatened Flora Seed Centre, CALM Science Division
Amanda Shade	Horticulturalist, Botanic Garden and Parks Authority

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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- World Conservation Union (1994) *IUCN red list categories prepared by the IUCN Species Survival Commission*, as approved by the 40th meeting of the IUCN Council. Gland, Switzerland.

## 7. TAXONOMIC DESCRIPTION

McGillivray D.J. (1993) *Grevillea, Proteaceae. A taxonomic revision*. Melbourne University Press, Carlton.

*Grevillea maxwellii* is a prostrate to spreading shrub up to c. 1.2 m high and 1.5 m across, branches sometimes subsecund; branchlets rounded or slightly ridged, tomentose. **Leaves** ascending to spreading, sessile to shortly petiolate, 2-7.5 cm long, partly bipinnatifid, or pinnatifid (almost pinnatisect) with primary lobes often tripartite; lobes ascending to spreading (less divaricate than in *G. asparagoides*), primary lobes often tripartite; lobes ascending to spreading (less divaricate than in *G. asparagoides*), primary lobes (2-)3-9 per leaf; distance from base of leaf to base of first lobe 18-28 mm; ultimate lobes linear, 6-28 mm long; 0.8 - 1.4 mm wide; base straight, petioles up to c. 30 mm long; apex and apices of lobes acuminate, pungent; margin more or less angularly revolute, enclosing the lower surface except for the midvein; upper surface often glabrous, sometimes with an open indumentum of curled hairs, the hairs sometimes resembling granules; lower surface, enclosed by the margin, packed with slender flexuose hairs, venation conspicuous to obscure, consisting of a midvein and a longitudinal vein along each edge of each lobe; texture firmly chartaceous. **Inflorescences** terminal or axillary, erect to deflexed, pedunculate, simple to 3-branched, c. 2.5-4.5 cm long; simple inflorescences and branches secund and centripetal, c. 2.5 cm across from rhachis to style-ends; new branches arising from the bases of older inflorescences; peduncles c. 0.5-1 cm long, peduncles and rhachises tomentose; bracts broadly ovate, concave, 0.6-1.0 mm long, 0.9-1.3 mm wide, tomentose outside, glabrous inside; sometimes persistent beyond anthesis; floral orientation parallel, with the sutures adaxial; **pedicels** usually retrorse, sometimes spreading, 3-5.5 mm long, tomentose or loosely so with 2-armed and multicellular glandular hairs; torus oblique at 30°-45°, 1.1-1.5 mm across; perianth obliquely oblong-ovoid below the curve and somewhat saccate near the base, c. 2-3 mm across, loosely tomentose outside with 2-armed and multicellular glandular hairs, glabrous inside; limb subglobose, 1.8-2.5 mm long, 2.5-2.7 mm across; dorsal tepals 13-13.5 mm long, 1.5-1.9 mm wide; nectary prominent, slightly enclosed with the torus, often spreading, usually broadly linguiform, occasionally broadly arcuate, 0.7-0.9 mm long, extending 0.3-0.4 mm beyond the rim, 0.2-0.9 mm thick at the level of the rim, margin strongly lipped, often also broadly tridentate, occasionally crenate or uneven; pistil 20-24 mm long; stipe absent to obscure, up to 0.2 mm long; ovary sessile or almost so, narrowly and obliquely ovoid, 1.2-1.4 mm long,

subvillous to tomentose, the hairs ascending, ovules attached at or slightly below the medial position; styles with numerous or sometimes few spreading multicellular glandular hairs, the hairs becoming less frequent towards the base of the style; pollen-presenter oblique at c. 40-45°, elliptical or occasionally almost round, 1.1-1.5 mm long, 1.0-1.3 mm wide, 0.2-0.3 mm high; stigma distally off-centre or central.