

INTERIM RECOVERY PLAN NO. 54

# IRONSTONE GREVILLEA

*(GREVILLEA ELONGATA)*

## INTERIM RECOVERY PLAN

**1999-2002**

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Photograph: L. Monks

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Western Australian Threatened Species and Communities Unit (WATSCU)  
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Natural Heritage Trust  
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Department of Conservation and Land  
Management

## **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This Interim Recovery Plan will operate from January 2000 to December 2002 but will remain in force until withdrawn or replaced.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 13 February 2000. 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 January 2000.

## SUMMARY

<b>Scientific Name:</b>	<i>Grevillea elongata</i>
<b>Common Name:</b>	Ironstone Grevillea
<b>Family:</b>	Proteaceae
<b>Flowering Period:</b>	September - November
<b>CALM Region:</b>	Central Forest
<b>CALM District:</b>	South West Capes
<b>Shire:</b>	Busselton
<b>Recovery Team:</b>	Central Forest Region Threatened Flora Recovery Team (CFRTFRT)

**Illustrations and/or further information:** Olde, P. M. and Marriott, N. R. (1995). *The Grevillea Book 2*: 142-143. Kangaroo Press, Kenthurst N.S.W.; Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998). *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia.

**Current status:** *Grevillea elongata* was declared as Rare Flora in 1996 and ranked as Critically Endangered (CR) in 1997. It currently meets World Conservation Union (IUCN) Red List Category CR under criterion B1+2c (IUCN 1994) due to the high fragmentation of populations, and a continuing decline in the quality of the habitat. The main threats are inappropriate fire regimes; disease; chemical drift; road, rail and pine plantation maintenance activities; weed invasion; and farming activities.

**Habitat requirements:** *Grevillea elongata* is endemic to Western Australia and is apparently confined to the Whicher Range area. It is found on soils ranging from red-brown gravelly clay over ironstone through light brown sandy clay over ironstone to grey sandy soils. It generally occurs in low, often very diverse heathland with *Corymbia calophylla*, *Dryandra squarrosa* subsp. *argillacea*, *Calothamnus* aff. *quadrifidus* and *Xanthorrhoea* sp.

**Existing Recovery Actions:** The following recovery actions have been or are currently being implemented:

1. All appropriate land managers have been informed of the species' locations and the associated legal obligations.
2. Declared Rare Flora (DRF) markers have been installed at all road and rail reserve populations.
3. Dashboard stickers and posters describing the significance of DRF markers have been produced and distributed.
4. Private property, containing Population 7 was fenced in 1996 and purchased in 1998.
5. Private property, containing Subpopulation 1e, was fenced and purchased in 1999.
6. Seed was collected in 1995 and 1998, and stored in CALM's Threatened Flora Seed Centre (TFSC). Germinants have also been produced and sent to the Botanic Gardens and Parks Authority (BGPA) for propagation.
7. Cuttings were collected by CALM staff in 1995 and sent to BGPA for growing.
8. Weed control research is being conducted at Population 2 by CALMScience staff.
9. Control of Bridal Creeper near Population 3 occurred in 1998.
10. Staff from CALM's South West Capes District regularly monitor all populations.
11. The Central Forest Region Threatened Flora Recovery Team (CFRTFRT) is overseeing the implementation of this IRP and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

**IRP Objective:** The objective of this Interim Recovery Plan (IRP) is to abate identified threats and maintain viable *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. Monitor dieback and assess the need for disease treatment, implement disease hygiene.
3. Develop and implement a fire management strategy.
4. Undertake weed control.
5. Remove pines.
6. Liaise with relevant land managers.
7. Conduct further surveys.
8. Monitor populations.
9. Collect seed and cutting material.
10. Obtain biological and ecological information.
11. Promote awareness.
12. Write full Recovery Plan.

## 1. BACKGROUND

### History

*Grevillea* is a genus of some 250 species, most of which occur in Australia. *Grevillea* species grow in a wide range of habitats from the foredunes of the coast (eg, *G. lanigera*), through tropical rainforest (eg, *G. baileyana*), to above the snowline in the mountains (eg, *G. victoriae*) (Elliot and Jones 1990). While *Grevillea* species occur in all Australian states, there is a centre of diversity in the South Western Botanical Province of Western Australia as defined by Beard (1990), where 150 species occur. Here, they are concentrated on the sandheaths and lateritic rises of the kwongan and in association with granite outcrops (Olde and Marriott 1994).

The first collection of *Grevillea elongata*, housed at the Western Australian Herbarium, was made in 1950 by R. Royce. Further collections have since been made and there is now a total of over 1,000 plants known from seven populations.

### Description

*Grevillea elongata* is a tall upright shrub to 2 m tall by 2.5 m wide with terete erect branchlets. The leaves are 2.5-5 cm long, glabrous and finely divaricate. The inflorescences are terminal or axillary, sessile or shortly pedunculate and white and cream in colour. The fruit is obliquely shaped, 8 mm long, 3.5 mm wide and 4 mm deep. The species was once thought to be a form of kerosene bush (*G. paniculata*) which has leaves channelled on the upper surface, smaller floral bracts (1 mm long), a globose conflorescence with shorter floral rachis (5 mm long), longer pedicels and deeply wrinkled fruits (Olde and Marriott, 1994).

### Distribution and habitat

*Grevillea elongata* is endemic to Western Australia and is apparently confined to the Whicher Range area. The species is found on poorly drained soils ranging from red-brown gravelly clay over ironstone through light brown sandy clay over ironstone to grey sandy soils. It is largely confined to the Critically Endangered 'shrubland association on southern Swan Coastal Plain ironstone' ('Southern Ironstone') ecological community (Gibson *et al.* 1994; English and Blyth 1997). *G. elongata* occurs in association with *Corymbia calophylla*, *Dryandra squarrosa* subsp. *argillacea*, *Calothamnus* aff. *quadrifidus* and *Xanthorrhoea* sp.

### Biology and ecology

Very little is known about the species. Many small beetles have been seen on the flowers and the species is believed to be insect-pollinated. Seed is probably dehiscent soon after maturity, and this is typical for grevilleas. Longevity of the seed is unknown, as is the plant's life span. *Grevillea elongata* regenerates from seed after fire (Olde and Marriott, 1995).

*Grevillea elongata* seedlings have germinated within a second rotation on a pine plantation (Population 6), but it does not occur on the fire breaks. Subpopulations 6b and 6c occur adjacent to native bushland, however, only three plants have germinated within the bush area, and these occur along the track edge of the pine plantation. It appears therefore, that the species responds well to significant soil disturbance.

Susceptibility of *Grevillea elongata* to a plant pathogen that causes dieback, *Phytophthora cinnamoni*, is unclear, but in general members of the family Proteaceae are highly susceptible. The occurrence of waterlogged soils in the habitat, and earth moving activity associated with maintenance of roads, firebreaks and pine plantations may predispose the species to the infection. Testing by CALMSscience indicated that *Grevillea elongata* germinants were not susceptible to *P. cinnamoni* under laboratory conditions (<sup>1</sup>C. Crane, personal communication). Testing of *G. elongata* for *P. cinnamoni* in the field however, has proved positive on two occasions (Subpopulations 6a and 6b). It may be, therefore, that the species is able to resist the disease when healthy but succumbs when under stress in the field. Further testing of *Phytophthora cinnamoni* susceptibility is required.

<sup>1</sup> Colin Crane – CALMSscience, CALM, Como

## Threats

*Grevillea elongata* was declared as Rare Flora in 1996 and ranked as Critically Endangered in 1997 under IUCN Red List criterion B1+2c (IUCN 1994). The rarity of *G. elongata* is probably due to the amount of clearing for agricultural purposes, particularly on heavier soils, that has occurred in the Busselton area. Over 90% of the highly restricted 'Southern Ironstone' community with which the species is generally associated, has been cleared (Tille and Lantzke (1990a, 1990b). Another possible cause of the species' rarity may be the loss of suitable habitat due to the introduction of *Phytophthora cinnamoni*.

The main threats to *Grevillea elongata* are fire, disease, chemical drift, road and rail maintenance activities, weeds, and plantation and farming activities.

- **Inappropriate fire regimes** would adversely affect the viability of populations, as seeds of *Grevillea elongata* probably germinate following fire. If this were the case, the soil seed bank would rapidly be depleted if fires recurred before regenerating or juvenile plants reached maturity and replenished the soil seed bank. However, it is likely that occasional fires are needed for reproduction of this species.
- **Dieback disease** is a serious threat to all populations. *Phytophthora cinnamoni* causes the roots to rot and results in the plants dying of drought stress. *Grevillea elongata* may be susceptible to *P. cinnamoni* when under stress. Populations occur in harsh environments within a pine plantation and on seasonally waterlogged ironstone soils and most of the habitat in which it grows is severely affected by dieback disease.
- **Road, rail and firebreak maintenance activities** threaten plants and habitat at road verge and rail reserve populations of *Grevillea elongata*. These include actions such as grading the road verge, constructing drainage channels and mowing the roadside vegetation to improve visibility. These disturbance events also often encourage weed invasion into adjacent habitat. Relevant authorities need to be informed of the location of road reserve populations so that the populations can be protected. The owners of adjacent land should also be informed of this species' presence to prevent possible grazing damage.
- **Weed invasion** is a serious threat to Populations 2, 3 and 4. Populations 3 and 4 are very narrow linear populations immediately adjacent to cleared paddocks, and are already badly weed infested. They are threatened by both grasses and broadleaved weeds. Population 2 is a wider linear population, invaded mostly by *Watsonia* with fewer grasses. 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 the large amounts of fuel that are produced annually by many grass weed species. Narrow linear populations such as these are severely affected by influences from adjacent cleared land such as weed invasion.
- **Plantation activities** impact on Subpopulations 6a, 6b and 6c. Activities that may threaten these subpopulations include fertiliser application, firebreak maintenance, tree harvesting and site preparation. In addition, competition for light, soil moisture and growing space will increase as the pine plantation matures.

### Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1A. SE Busselton	Shire Reserve	1997 50+	Healthy	Road maintenance, fire
1B. SE Busselton	Rail Reserve	1997 100+	Healthy	Rail maintenance, fire
1C. SE Busselton	Private Property	1995 160	Healthy	Fire, mining
1D. SE Busselton	Private Property	1995 160	Healthy	Fire, mining
1E. SE Busselton	Proposed Nature Reserve	1995 100 1998 100+	Healthy	Weeds, disease, grazing
2A. SE Busselton	Shire Reserve	1997 100+	Healthy	Road maintenance, fire
2B. SE Busselton	Rail Reserve	1997 100+	Healthy	Rail maintenance, fire
2C. SE Busselton	Road Reserve	1997 100+	Moderate	Road maintenance
2D. SE Busselton	Rail Reserve	1997 100+	Moderate	Rail maintenance
3A. SE Busselton	Shire Reserve	1997 60+	Poor	Weeds, road maintenance
3B. SE Busselton	Drain Reserve	1995 40	Moderate	Weeds
4. SE Busselton	Shire Reserve	1996 44 1997 44	Moderate	Weeds, road maintenance, grazing
5. SE Busselton	Private Property	1997 3	Poor	Grazing, weeds
6A. SE Busselton	State Forest	1997 12	Mod/Poor	Plantation operations, fire, <i>Phytophthora cinnamoni</i>
6B. SE Busselton	State Forest	1997 160 1999 62	Poor	Plantation operations, fire, <i>Phytophthora cinnamoni</i>
6C. SE Busselton	State Forest	1997 40 1999 25	Moderate	Plantation operations, fire
7. SE Busselton	Proposed Nature Reserve	1999 2	Healthy	Fire

## 2. RECOVERY OBJECTIVE AND CRITERIA

### Objective

The objective of this Interim Recovery Plan is to abate identified threats and maintain viable *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

All appropriate people have been made aware of the existence of this species and its locations. Busselton Shire and Westrail have been notified about populations of *Grevillea elongata* that occur on lands that they manage, and adjacent landowners have also been informed of the locations of the populations. These notifications detailed the Declared Rare status of the species and the associated legal obligations.

DRF markers have been installed at all road and rail reserve populations. These alert people working in the area to the presence of significant flora, and help to prevent accidental damage during maintenance operations. Awareness of the significance of these markers is being promoted to relevant bodies such as Shires, MRWA and Westrail. To this end, dashboard stickers and posters have been produced and distributed. These illustrate DRF markers, inform of their purpose and provide a contact telephone number to use if such a marker is encountered.

Population 7 was fenced in 1996 and the site purchased in 1999. This property also contains another Critically Endangered plant, *Grevillea maccutcheonii*. An additional area of approximately 25 hectares was purchased by CALM with assistance from Environment Australia in 1999. This fenced area contains Subpopulation 1e of *Grevillea elongata* as well as an occurrence of the 'Southern Ironstone' community.

A total of approximately 1800 seeds were collected in 1995 and 1998, and stored in CALM's TFSC at -18°C. The TFSC tests the viability of the seed initially, after one year in storage and again after five years. The initial germination rate ranged from 50% to 85% and after one year in storage was 36%. Germinants have been produced from seed collected and these were sent to the BGPA in 1997 for growing.

Cuttings were collected by staff of the Western Australian Herbarium in 1995 and propagated by BGPA. The success rate was 57%.

Weed control research has been conducted at Population 2 by CALMScience. Two experimental treatments were examined - weed control in isolation, and weed control combined with disturbance.

Control of Bridal Creeper, a noxious weed, was undertaken near Population 3 in 1998.

Staff from CALM's South West Capes District regularly monitor all populations.

The CFRTFRT is overseeing the implementation of this IRP and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

### Future recovery actions

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

#### 1. Coordinate recovery actions

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

**Action:** Coordinate recovery actions  
**Responsibility:** CALM (South West Capes District) through the CFRTFRT  
**Cost:** \$4,500 per year

#### 2. Monitor dieback and assess the need for disease treatment, implement disease hygiene

It is known that *Phytophthora cinnamomi* occurs within populations of *Grevillea elongata* and it is possible that plants may be susceptible to dieback disease when stressed. Seed from *G. elongata* populations will be collected and further germinants tested for dieback disease by CALMScience. The populations will also be routinely monitored for death of other dieback susceptible species, eg. *Xanthorrhoea preissii*, *Eucalyptus marginata* and *Banksia littoralis*. Selective (hand spraying) or broad-scale treatment with phosphite will be required if dieback is present and if studies indicate *G. elongata* is dieback susceptible. Research conducted from 1992 to 1997 indicates that phosphite application is a very effective tool in controlling the impact of dieback disease (Murray 1997). Dieback hygiene measures as outlined in the CALM Dieback Hygiene Manual 1992 will be adhered to near populations of *G. elongata*. Hygiene measures will primarily involve restricting access to the area, especially when the soil is wet.

**Action:** Monitor dieback and assess the need for disease treatment, implement disease hygiene  
**Responsibility:** CALM (South West Capes District, Dieback Disease Coordinator) through the CFRTFRT  
**Cost:** \$800 in first and third years, \$400 in second year

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

Fire appears to kill adult plants of the species, and regeneration is likely to be largely from seed. Frequent fire may prevent the accumulation of sufficient soil stored seed to allow regeneration of the populations. A fire management strategy will be developed to determine fire control measures and fire frequency.

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

#### 4. Undertake weed control

Weeds are a threat to Population 3, which is located on a road and drain reserve, Population 5 located on private land, and Subpopulation 1e which is on land recently purchased by CALM with assistance from Environment Australia. The following actions will be implemented:

1. Selection of appropriate herbicides after determining which weeds are present.
2. Controlling invasive weeds by hand removal or spot spraying around *Grevillea elongata* plants when weeds first emerge.
3. Scheduling weed control to include spraying at other threatened flora populations within the district as appropriate.

The tolerance of associated native plant species to herbicides within the habitat of *Grevillea elongata* is not known and weed control programs will be undertaken in conjunction with research (see Recovery Action 10).

**Action:** Undertake weed control  
**Responsibility:** CALM (South West Capes District, CALMScience) through the CFRTFRT  
**Cost:** \$500 per year

#### 5. Remove pines

Subpopulations 6a, 6b and 6c occur within a *Pinus radiata* plantation that was established 6 years ago. Many of the plants are experiencing stress and death possibly as a result of competition with the pines. *Phytophthora cinnamomi* has also been positively identified at Subpopulations 6a and 6b. These plants are at risk from further plantation activities including fertiliser application, thinning and harvesting. Pines up to a distance of 20 m surrounding each subpopulation will be culled to reduce competition with *Grevillea elongata* plants. The subpopulations will then be treated with phosphite to control *Phytophthora cinnamomi* and regeneration will be monitored.

**Action:** Remove pines  
**Responsibility:** CALM (South West Capes District, CALMScience) through the CFRTFRT  
**Cost:** \$3,400 in first year

#### 6. Liaise with relevant land managers

Staff from CALM's South West Capes District will continue to liaise with owners of land on which populations of *Grevillea elongata* occur, and with owners of adjacent lands. This will help prevent accidental damage or destruction of the plants.

**Action:** Liaise with relevant land managers  
**Responsibility:** CALM (South West Capes District) through the CFRTFRT  
**Cost:** \$500 per year

#### 7. Conduct further surveys

Volunteers from the local community, Wildflower Societies, Naturalist Clubs and other community-based groups will be encouraged to be involved in further surveys for *Grevillea elongata*. Surveys will be conducted during the species' flowering period (September to November) and will be supervised by CALM staff.

**Action:** Conduct further surveys  
**Responsibility:** CALM (South West Capes District) through the CFRTFRT  
**Cost:** \$1,700 per year

#### 8. Monitor populations

Monitoring of factors such as weed invasion, habitat degradation, salinity levels, population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity are essential. The populations will be inspected annually.

**Action:** Monitor populations  
**Responsibility:** CALM (South West Capes District) through the CFRTFRT  
**Cost:** \$800 per year



## 9. Collect seed and cutting material

A small quantity of seed has been collected from Population 1. Seed will be collected from Subpopulations 6a, 6b and 6c by South West Capes District and forwarded to the Threatened Flora Seed Centre. Additional seed will be collected as required. Cuttings will also be collected to establish a living collection of genetic material at BGPA.

**Action:** Collect seed and cutting material  
**Responsibility:** CALM (South West Capes District, TFSC) and BGPA, through the CFRTFRT  
**Cost:** \$3,100 per year

## 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 elongata* in the wild. Studies will ideally include:

1. Investigation of the impacts of dieback disease and control techniques on *Grevillea elongata* and its habitat.
2. Study of the soil seed bank dynamics and the role of various factors including disturbance, competition, rainfall and grazing in recruitment and seedling survival.
3. Determination of reproductive strategies, phenology and seasonal growth.
4. Investigation of the mating system and pollination biology.
5. Investigation of population genetic structure, levels of genetic diversity and minimum viable population size.
6. The impact of changes in the level of salinity in the habitat.

**Action:** Obtain biological and ecological information  
**Responsibility:** CALM (CALMScience, South West Capes District) through the CFRTFRT  
**Cost:** \$15,600 per year

## 11. Promote awareness

The importance of biodiversity conservation and the protection of the Critically Endangered *Grevillea elongata* will be promoted to the public. An information sheet that includes a description of the plant, its habitat type, threats and management actions, and photos will be produced. Formal links with local naturalist groups and interested individuals will also be encouraged.

**Action:** Promote awareness  
**Responsibility:** CALM (WATSCU, South West Capes District, Corporate Relations) through the CFRTFRT  
**Cost:** \$600 per year

## 12. Write full Recovery Plan

At the end of the three year term of this Interim Recovery Plan, the need for further recovery will be assessed. If the species is still ranked Critically Endangered, a full Recovery Plan will be developed to describe action required for long-term maintenance. A Recovery Plan will be prepared with the benefit of knowledge gained over the time frame of this Interim Recovery Plan.

**Action:** Write full Recovery Plan  
**Responsibility:** CALM (WATSCU, South West Capes District) through the CFRTFRT  
**Cost:** \$18,100 in third year

## 4. TERM OF PLAN

This Interim Recovery Plan will operate from January 2000 to December 2002 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:

Kate Brown	Botanist, previously CALM Threatened Flora Seed Centre
Anne Cochran	Manager, CALM Threatened Flora Seed Centre
Kingsley Dixon	Assistant Director, Botanic Gardens and Parks Authority
Rebecca Evans	Project Officer, previously CALM W.A. Threatened Species and Communities Unit
Sophie Juskiewicz	Propagator, Botanic Gardens and Parks Authority
Leonie Monks	Research Scientist, CALMScience
Frank Obbens	Consultant, CALMScience
Diana Papenfus	Botanist, previously CALMScience
Sue Patrick	Senior Research Scientist, CALMScience
Amanda Shade	Horticulturalist, Botanic Gardens and Parks Authority
Meredith Soutar	CALM Officer, CALM South West Capes District
Darren Touchell	Research Scientist, previously Botanic Gardens and Parks Authority
Andrew Webb	CALM Officer, previously CALM South West Capes District
Kim Williams	Program Leader Nature Conservation, CALM Central Forest Region

Thanks also to the staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and CALM's Wildlife Branch for extensive assistance.

## 6. REFERENCES

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## 7. TAXONOMIC DESCRIPTION

Olde, P. M. and Marriott, N. R. (1995). *The Grevillea Book 2*: 142-143. Kangaroo Press, Kenthurst N.S.W.

**Shrub** 1.5-2 m high, 2-2.5 m wide. **Branchlets** red, erect, glabrous or sparsely silky, terete with longitudinal ribbing. **Leaves** 2.5-5 cm long, glabrous, divaricately tripartite to pinnatifid, sometimes with some or all lobes again bi- or tripartite, sessile or shortly petiolate, the first lobe 12-30 mm from leaf base; leaf lobes often of uneven length, 5-30 mm long, c. 0.8 mm wide, subulate, trigonous, pungent; upper surface smooth, venation obscure; lower surface, bisulcate with midvein prominent; texture firmly papery to leathery. **Coniflorescence** terminal or axillary, sessile or shortly pedunculate,

simple or few-branched; unit confluence 2-5.5 cm long, open, cylindrical; development acropetal; peduncle tomentose; rachis c. 1 mm wide, sometimes sparsely pubescent at the base, otherwise glabrous; bracts 2.8-3.4 mm long, 3-4 mm wide, imbricate, ovate, glabrous except ciliate margin, persistent almost to anthesis; pedicels 2.2-3.2 mm long, glabrous; torus 0.3 mm wide, oblique at c. 10-15°. **Flower colour:** perianth and style white throughout, the bracts cream. **Flowers** glabrous; **perianth** 3.5 mm long, 0.5 mm wide, actinomorphic, oblong-obovate constricted below limb, erect; all tepals separating and rolling back at anthesis; limb 1 mm long, 1.2 mm wide; **pistil** 4.5 mm long; stipe 1.2 mm long, flexuose, filamentous; ovary 1 mm long, globose; style constricted just above ovary, dilating abruptly to 0.5 mm thick, gradually tapering to 0.3 mm wide at base of pollen presenter; pollen presenter 0.7 mm high 0.4 mm wide at base, erect with base slightly oblique, faintly rimmed, truncate-conical to subcylindrical. **Fruit** 8 mm long, 3.5 mm wide, 4 mm deep, oblique, rugulose; pericarp 0.2 mm thick at centre face of the suture. **Seed** not seen.