

INTERIM RECOVERY PLAN NO. 97

PRICKLY HONEYSUCKLE
(LAMBERTIA ECHINATA SUBSP. ECHINATA)
INTERIM RECOVERY PLAN
2001-2004

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Photograph: A. P. Brown
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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This Interim Recovery Plan will operate from May 2001 to April 2004 but will remain in force until withdrawn or replaced.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 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 May 2001.

SUMMARY

Scientific Name:	<i>Lambertia echinata</i> subsp. <i>echinata</i>	Common Name:	Prickly Honeysuckle
Family:	Proteaceae	Flowering Period:	September to January
CALM Region:	South Coast	CALM District:	Esperance
Shire:	Esperance	Recovery Team:	To be established

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; Hnatiuk, R. J. (1995). *Flora of Australia*. 16:425-7; Keighery, G. J. (1997). A new subspecies of *Lambertia echinata* (Proteaceae). *Nuytsia*. 11(2):283-4.

Current status *Lambertia echinata* subsp. *echinata* was declared as Rare Flora in November 1980 and was ranked as Critically Endangered (CR) in September 1995. It is currently (May 2001) listed under World Conservation Union (IUCN 1994) Red List criteria as Category 'CR' under criteria A1e, B1+2c, C1 and D. However, it no longer meets D as, following recent surveys, a total of 65 mature plants are now known. It should therefore be listed as CR under criteria A1e, B1a,b(iii,v)+2a,b(iii,v) and C1 (IUCN 2000) as populations are fragmented, there is decline in both area and quality of habitat from the effects of pathogens (*Phytophthora cinnamomi*), and there is a continuing decline in the number of mature individuals in both populations. The main threats are inappropriate fire, disease, poor recruitment and limited genetic diversity.

Habitat requirements: *Lambertia echinata* subsp. *echinata* occupies sandy-loams over granite on windswept rocky near coastal slopes, growing in association with *Eucalyptus lehmanii*, *Hakea ruscifolia*, *Melaleuca striata*, *Allocasuarina trichodon*, *Leucopogon apiculatus*, *Acacia nigricans*, *Agonis obtusissima* and *Dryandra armata*.

Critical habitat: The critical habitat for *Lambertia echinata* subsp. *echinata* comprises the area of occupancy of known populations, areas within 200 metres of known populations, corridors of vegetation that link populations and additional occurrences of suitable habitat that do not currently contain the subspecies.

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

1. Staff from CALM's Threatened Flora Seed Centre (TFSC) have collected c. 800 seeds of *Lambertia echinata* subsp. *echinata* that are now in storage at -18°C.
2. An experimental translocation proposal was written and implemented in 1998. Subsequent plantings were made in June 1999.
3. *Phytophthora cinnamomi* (dieback) was found in translocated seedlings that have subsequently been sprayed with Phosphite. Subpopulation 1a was aerial sprayed in autumn 1998 with 15l/ha of phosphite at 400 g/l concentration.
4. A pit at Subpopulation 1a, which is no longer used for gravel extraction, has been deep ripped and allowed to regenerate. The old access road has been barricaded to prevent entry.
5. CALM staff have extensively surveyed in the vicinity of the Population 1 and have recently discovered a second population several kilometres away.
6. An information sheet for *Lambertia echinata* subsp. *echinata* has been produced and distributed.
7. Staff from the Esperance District Office are overseeing the implementation of this IRP and are regularly monitoring both populations of *Lambertia echinata* subsp. *echinata*.

IRP Objective: The objective of this Interim Recovery Plan (IRP) is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the subspecies 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. Establish a Threatened Flora Recovery Team.
2. Phosphite application.
3. Install dieback signs.
4. Develop and implement a fire management strategy
5. Collect seed and cutting material.
6. Propagate plants for translocation.
7. Conduct further translocations.
8. Rehabilitate the gravel pit.
9. Monitor populations.
10. Conduct further surveys.
11. Obtain biological and ecological information.
12. Address appropriate recommendations in the Management Plan for the Park.
13. Write a full Recovery Plan.

1. BACKGROUND

History

Lambertia echinata subsp. *echinata* was collected by Robert Brown in 1801 during the time that the *Investigator* was in the Esperance area, and was described by him in 1810. There are three subspecies of *L. echinata* (*L. echinata* subsp. *echinata*, *L. echinata* subsp. *citrina* and *L. echinata* subsp. *occidentalis*). Two of these – *L. echinata* subsp. *echinata* and *L. echinata* subsp. *occidentalis* are threatened flora ranked Critically Endangered (CR). *Lambertia echinata* subsp. *echinata* is found only in the Esperance area.

Subpopulation 1a of *Lambertia echinata* subsp. *echinata*, which consists of three adult plants, occurs on two small islands of vegetation in an otherwise cleared gravel pit. Extraction of gravel has ceased and rehabilitation of the gravel pit began in 1994. Seed was collected from the three plants and in 1995 four seedlings were raised and planted back into the pit. Inspection of these seedlings in 1996 showed that only two had survived and a further inspection in 1997 could only find one. During the most recent surveys in October 2000, a further three seedlings of natural origin were found.

An experimental translocation proposal was developed by CALMScience staff (Coates *et al.* 1998) and, with the help of CALM Esperance District staff and volunteers, was implemented in 1998. Seed collected in 1994 and 1997 was germinated at CALM's Threatened Flora Seed Centre (TFSC), grown on at the Botanic Garden and Parks Authority (BGPA) nursery and translocated into the site of Subpopulation 1a. To date, the survival rate has been low (39%) possibly due to the presence of *Phytophthora cinnamomi*, however, even at this low rate the total numbers of plants at the site has increased by over 1200%. Monitoring occurs four times a year. A further planting of 99 seedlings, from seed collected in 1998, took place in June 1999.

Phytophthora cinnamomi (dieback) was isolated from seedlings that died following the 1998 translocation. Subsequently, all seedlings were sprayed every 8 to 12 weeks with a 0.2% solution of Phosphite to reduce the likelihood of further deaths from dieback. Subpopulation 1a was also sprayed from the air in May and June 1998 with 15 l/ha of phosphite at 400 g/l concentration.

Between 1980 and 2000, CALM staff and volunteers extensively surveyed for new populations of *Lambertia echinata* subsp. *echinata*, concentrating on areas of similar habitat within Cape Le Grand National Park. Further plants were found in the area of Population 1 with the total number of extant plants now known to consist of 38 mature plants and 4 seedlings. In October 2000, CALM, with the assistance of Andrew Waters (Greencorp Coordinator) and a Greencorp team, discovered a new population (Population 2) southeast of Population 1. This new population consists of 33 mature plants. With a total of 65 mature plants *Lambertia echinata* subsp. *echinata* no longer meets criterion D, however, it is still ranked Critically Endangered under criteria A1e, B1a,b(iii,v)+2a,b(iii,v) and C1 (IUCN 2000).

Description

Lambertia echinata subsp. *echinata* is a many-branched shrub to 1 m tall with hairy stems and leaves that are usually divided into five sharply pointed lobes. The leaves, which taper toward the stem and are up to 4 cm long, have prominent veins on their underside and are commonly arranged in whorls of three. The flowers are trumpet-shaped, dark pinkish-red and up to 5 cm long. Arranged in sevens, they are produced from September to January. The shiny grey coloured fruits are beaked and up to 2 cm long (Brown 1810, Erickson *et al.* 1979).

Lambertia echinata subsp. *echinata* has pinkish-red coloured flowers, while *L. echinata* subsp. *occidentalis* and *L. echinata* subsp. *citrina* have yellow flowers. A full taxonomic description by Brown (1810), modified by Hnatiuk (1995) and Keighery (1997), is provided in section 7.

Distribution and habitat

Lambertia echinata subsp. *echinata* occupies sandy-loams over granite on windswept rocky slopes in the Cape Le Grand National Park area, growing in association with *Eucalyptus lehmanii*, *Hakea ruscifolia*, *Melaleuca striata*, *Allocasuarina trichodon*, *Leucopogon apiculatus*, *Acacia nigricans*, *Agonis obtusissima* and *Dryandra armata*

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 *Lambertia echinata* subsp. *echinata* comprises:

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

Biology and ecology

Dieback (*Phytophthora cinnamomi*) is known to be present and has caused the death of several translocated plants at Subpopulation 1a. The extremely restricted distribution of the subspecies means that any local event (disease, clearing, fire) may result in its extinction in the wild.

Lambertia species are killed by fire and regenerate from soil stored seed (Obbens & Coates 1997).

Seed collected from *Lambertia echinata* subsp. *echinata* appears to be highly viable (initially 93 to 98%, and after 1 year 87.5 to 93.5%) (personal communication A. Cochrane¹). It is probable, therefore, that viable soil-stored seed is present in both populations.

The response of *Lambertia echinata* subsp. *echinata* to physical soil disturbance is unknown but is thought to be unfavourable (Obbens & Coates 1997).

Little is known about pollinators, response to Phosphite application or insect predation of flowers and fruit. This information is essential for the long-term recovery of *Lambertia echinata* subsp. *echinata* and research will be conducted within the three year term of this IRP.

Threats

Lambertia echinata subsp. *echinata* was declared as Rare Flora in November 1980 and was ranked as Critically Endangered (CR) in September 1995. It is currently (April 2001) listed under World Conservation Union (IUCN 1994) Red List criteria as Category 'CR' under criteria A1e, B1+2c, C1 and D. However, it no longer meets D as, following recent surveys, a total of 65 mature plants are now known. It should therefore be listed as CR under the criteria A1e, B1a,b (iii,v)+2a,b (iii,v) and C1 (IUCN 2000) as populations are fragmented, there is decline in both area and quality of habitat from the effects of pathogens (*Phytophthora cinnamomi*), and there is a continuing decline in the number of mature individuals in both populations. The main threats are inappropriate fire, disease, poor recruitment and limited genetic diversity.

- **Disease** is a serious threat to both populations. *Phytophthora* has been identified in many areas of Cape Le Grand National Park (Obbens & Coates 1997), and visual observations indicate that *Phytophthora* is affecting vegetation surrounding Subpopulation 1a. *Phytophthora cinnamomi* has also been isolated from dead translocated seedlings in Subpopulation 1a. Several plants in Population 2, including juvenile plants had necrotic limbs and foliage, possibly due to drought or aerial canker.
- **Inappropriate fire regimes.** As most *Lambertia* species are killed by fire and regenerate only from seed, the soil seed bank would rapidly be depleted if fires recurred before seedlings reached maturity. Frequent fire would therefore be detrimental to the long-term viability of populations. Occasional fire, however, is beneficial, as it would promote regeneration in aging populations that are reaching senescence.
- **Limited genetic diversity** is a threat to the long-term conservation of *Lambertia echinata* subsp. *echinata*. There are only 65 naturally occurring adult plants in the two known populations, which represents an extremely limited gene pool. Genetic diversity is needed to provide populations the ability to adapt to changes in the environment. It is possible that the subspecies is unable to do this with the limited genetic material available in the two known populations.

Summary of population information and threats

¹ Anne Cochrane, Manager, CALM Threatened Flora Seed Centre.

Pop. No. & Location	Land Status	No. plants/Year	Condition	Threats
1a. Esperance	National Park	1999 3 (2) 2000 3 (4)	Disturbed	Disease (dieback, canker), fire and limited genetic diversity.
1b. Esperance	National Park	1999 17 (2) 2000 32 (4) [19]	Habitat mainly healthy	Disease (dieback, canker), fire and limited genetic diversity.
2. Cape le Grand	National Park	2000 30 (3) [6]	Habitat mainly healthy	Disease (dieback, canker), fire and limited genetic diversity.

Note: Figures in () represent juvenile plants or seedlings, figures in [] represents dead plants.

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 *Lambertia echinata* subsp. *echinata* 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 subspecies 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

Staff from CALM's TFSC collected a total of 812 seeds over five sampling periods between 1993 and 1999. Initial germination rates were between 87.5 and 97%. The seed collected is now in storage at -18°C.

CALMScience staff wrote a translocation proposal (experimental) in 1998 and, in conjunction with Esperance District and WATSCU staff, implementation started in 1998. Plants grown from seed collected in 1994 and 1997 were germinated at the TFSC, grown on at BGPA, and translocated into the disturbed gravel pit site of Subpopulation 1a. The translocation was conducted on an experimental basis and is providing information about the most effective techniques for future translocations. The treatments used include shading, watering and control. Watering occurred regularly from early November to late April in 1999. To date, the success rate has been low (39%). Monitoring of the translocation site occurs four times a year. A further planting of 99 seedlings took place in June 1999.

Phytophthora (dieback disease) was isolated from translocated plants that had died following the 1998 translocation. All translocated seedlings are, therefore, being sprayed every eight to 12 weeks with a 0.2% solution of Phosphite to reduce the likelihood of death resulting from dieback infection. Subpopulation 1a was also sprayed from the air in autumn 1998 with 15 l/ha of phosphite at 400 g/l concentration.

The gravel pit at Subpopulation 1a is no longer used and has been deep ripped and left to regenerate naturally. The regeneration has been recorded as "good" (personal communication, K. Tiedemann²). The access road to the quarry has been ripped and barricaded.

Further surveys for *Lambertia echinata* subsp. *echinata* were undertaken in a number of locations east of Esperance and these have resulted in several new populations being found.

An information sheet for *Lambertia echinata* subsp. *echinata* has been produced and distributed. It includes a description of the plant, its habitat type, threats, management actions, and photographs of the plant and its habitat. The sheet is being distributed to the public through CALM's Esperance District office. The information sheet has also been placed on CALM's NatureBase at http://www.calm.wa.gov.au/plants_animals/critical_flora.html

² Klaus Tiedemann, District Manager, CALM Esperance.

Staff from the Esperance District Office are overseeing the implementation of this IRP and are regularly monitoring both populations of *Lambertia echinata* subsp. *echinata*.

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. Establish a Threatened Flora Recovery Team

A Threatened Flora Recovery Team (TFRT) will be established in the Esperance District. This team will oversee the implementation of the recovery actions for *Lambertia echinata* subsp. *echinata* and other Critically Endangered flora in the district.

Action: Establish a Threatened Flora Recovery Team
Responsibility: CALM (Esperance District) through the EDTFRT
Cost: \$2,100 per year

2. Phosphite application

As dieback is known to be present in both populations of *Lambertia echinata* subsp. *echinata*, and research conducted between 1992 and 1997 indicates that phosphite is very effective in controlling its impact (Murray 1997), aerial and backpack spraying of phosphite has been implemented for Subpopulation 1a. Esperance District staff will implement further control measures as required.

Action: Phosphite application
Responsibility: CALM (Esperance District, Dieback Disease Coordinator) through the EDTFRT
Cost: \$3,900 for the first and third years

3. Install dieback signs

Many species in the plant community in which *Lambertia echinata* subsp. *echinata* occurs are presumed susceptible to dieback. It is therefore necessary to maintain disease hygiene measures. Access to the area has been restricted and signs advising of the dieback risk will be placed at the beginning of tracks leading into populations of the species.

Action: Install dieback signs
Responsibility: CALM (Esperance District, WATSCU) through the EDTFRT
Cost: \$1,100 in the first year

4. Develop and implement a fire management strategy

Adult plants of *Lambertia echinata* subsp. *echinata* are killed by fire and regenerate only from soil held seed. Frequent fire would prevent the accumulation of sufficient stored seed to allow continued regeneration of the population. Every effort should be made, therefore, to prevent fire from occurring in this area, at least in the short term. 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 (Esperance District) through the EDTFRT
Cost: \$1,400 in the first year

5. Collect seed and cutting material

A quantity of seed has been collected from the subspecies and placed in storage. Additional seed and cutting material will be collected as required.

Action: Collect seed and cutting material
Responsibility: CALM (TFSC, Esperance District) and BGPA, through the EDTFRT
Cost: \$5,100 per year

6. Propagate plants for translocation

The propagation of plants for translocation is essential as both known populations are under threat from dieback.

Action: Propagate plants for translocation
Responsibility: CALM (TFSC, Esperance District) and BGPA through the EDTFRT
Cost: \$2,000 per year

7. Conduct further translocations

As the total number of extant plants is low, and disease and inappropriate fire threaten both populations, further translocation is essential for the long-term conservation of the subspecies. Although translocations are generally undertaken under full Recovery Plans, a translocation proposal has been written and approved (Coates *et al.* 1998), and implementation has begun. CALM will conduct further translocations within the time frame of this IRP. Further translocation will be coordinated by the EDTFRT once it has been established. 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 CALM's Director of Nature Conservation.

Action: Conduct further translocations
Responsibility: CALM (CALMScience, Esperance District) through the EDTFRT
Cost: \$7,100 per year

8. Rehabilitate the gravel pit

Rehabilitation of the gravel pit site around the islands of vegetation in which *Lambertia echinata* subsp. *echinata* occurs may encourage recruitment of the subspecies outside its current population area.

Action: Rehabilitate the gravel pit
Responsibility: CALM (Esperance District) through the EDTFRT
Cost: \$3,100 in the second year and \$3,800 in the third year

9. Monitor population

Monitoring of factors such as weed invasion, habitat degradation, pollination and seed dispersal vectors, population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity is essential. The impact of phosphite treatment on *Lambertia echinata* subsp. *echinata* and its effectiveness in controlling *Phytophthora* species will also be monitored.

Action: Monitor population
Responsibility: CALM (Esperance District) through the EDTFRT
Cost: \$500 per year

10. Conduct further surveys

Further surveys supervised by CALM staff and with assistance from local naturalists and wildflower society members will be conducted during the flowering period of the subspecies (September to January).

Action: Conduct further surveys
Responsibility: CALM (Esperance District) through the EDTFRT
Cost: \$1,800 per year

11. Obtain biological and ecological information

Increased knowledge of the biology and ecology of the subspecies will provide a scientific basis for management of *Lambertia echinata* subsp. *echinata* 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 *Lambertia echinata* subsp. *echinata* and its habitat.

Action: Obtain biological and ecological information
Responsibility: CALM (CALMScience, Esperance District) through the EDTFRT

Cost: \$17,500 per year

12. Address appropriate recommendations in the Management Plan for the Park

The Management Plan for the National Park in which *Lambertia echinata* subsp. *echinata* occurs will need to address recommendations made in the Interim Recovery Plan for the subspecies.

Action: Address appropriate recommendations in the Management Plan for the Park
Responsibility: CALM (Esperance District) through the EDTFRT
Cost: \$700 in the second 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 *Lambertia echinata* subsp. *echinata* 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, Esperance District) through the EDTFRT
Cost: \$17,900 once in the final 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:

Sarah Barrett	Flora Conservation Officer, CALM Albany District
Kate Brown	Former Botanist, Threatened Flora Seed Centre, CALMScience Division
Anne Cochrane	Manager, Threatened Flora Seed Centre, CALMScience Division
Dave Coates	Principal Research Scientist, CALMScience Division
Alan Danks	Regional Leader Nature Conservation, CALM Albany Region
Bernie Haberley	District Wildlife Officer, CALM Esperance District
Emma Holland	Former Consultant, WATSCU, CALM Nature Conservation Division
Kim Kershaw	Former Consultant, WATSCU, CALM Nature Conservation Division
Leonie Monks	Research Scientist, CALMScience Division
Robyn Phillimore	Project Officer, WATSCU, CALM Nature Conservation Division
Klaus Tiedemann	District Manager, CALM Esperance District

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

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7. TAXONOMIC DESCRIPTION

***Lambertia echinata* - Brown, R. (1810)**

Shrub to 2.5 m; lignotubers not known. Branches erect or spreading; young branches densely villous. Leaves with petiole to 2 mm long or absent; lamina narrowly cuneate 10 - 40 mm long, with dilated apex, 3-5 marginal spines, mucronate, glabrous, rarely almost unlobed; distal lobes undulate. Conflorescence 7-flowered; bracts numerous, firm; inner bracts c. two-thirds length of perianth. Flowers zygomorphic, crowded, loosely enclosed by bracts. Perianth 25-40 mm long, yellow or reddish pink, dilated, ± glabrous; adaxial suture deepest. Hypogynous glands 2-4, free or variously fused. Style slender; lower half sparsely pilose-villous. Fruit ovoid, 5-8 mm diameter, with spines on entire surface. Seeds 2, circular, with narrow, annular wing.

Endemic to Western Australia between Albany and Esperance; grows in gravelly or sandy-clay soils in kwongan vegetation. Flowers mainly September-January.

***Lambertia echinata* subsp. *echinata* - Hnatiuk (1995)**

Shrub to 1 m tall; branches spreading. Leaves 30-40 mm long; veins on undersurface prominently raised. Perianth orange – red to pink.

Known only from the type locality in south west of W. A.; grow in exposed coastal area.

1A. Perianth yellow

2A. Vegetative and floral leaves have 3-5 rigid points, floral bracts 12-16 mmsubsp. *citrina*

2B. Entire vegetative leaves, floral leaves 3-pointed or entire,
floral bracts 15-19 mmsubsp. *occidentalis*

Keighery (1997)

1B. Perianth orange-red to pink subsp. *echinata*