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LASIANTHOS

The Labiates of Australia

July 2002
Number 3
ISSN 1320-8608

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ASGAP PROSTANTHERA & WESTRINGIA STUDY GROUP
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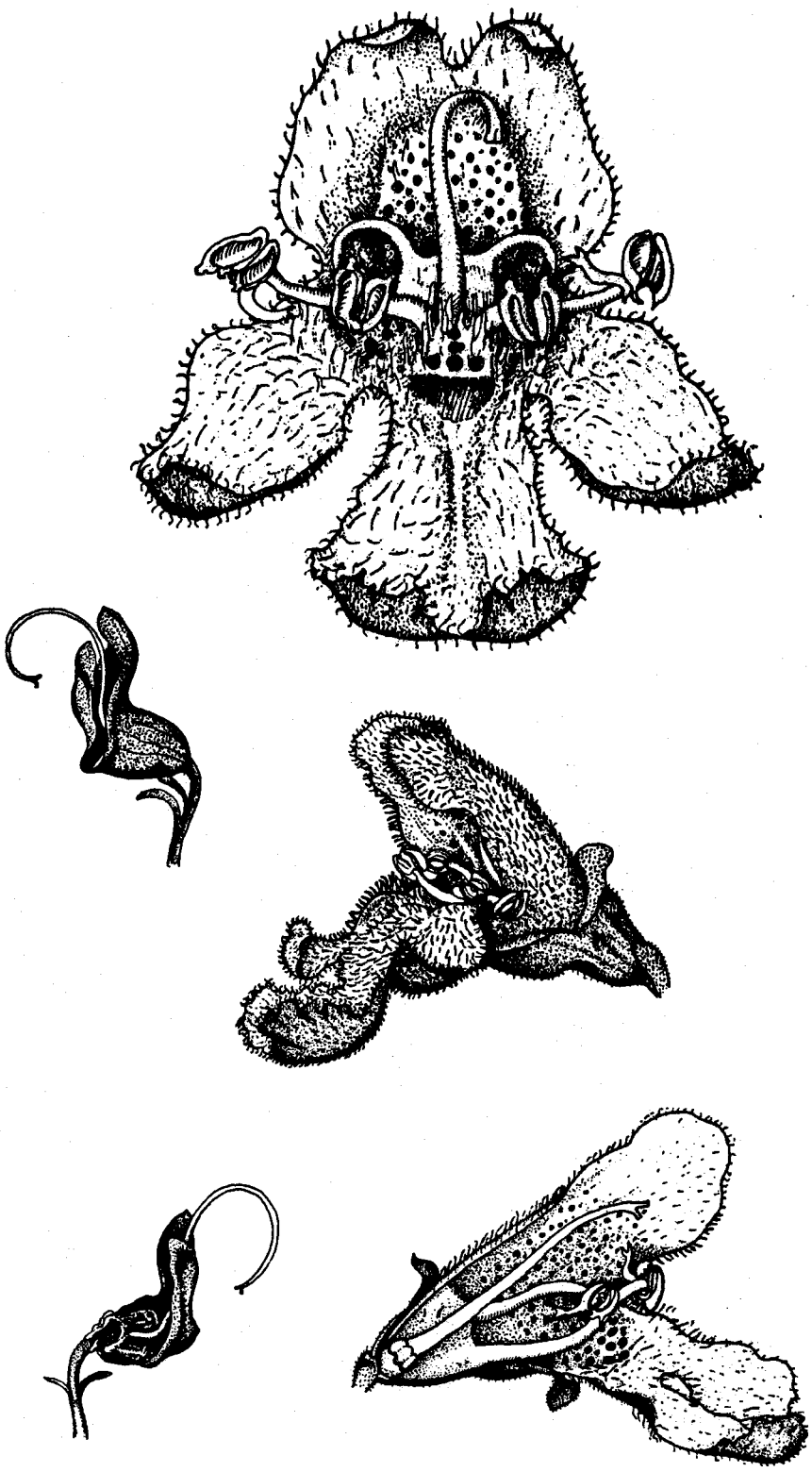
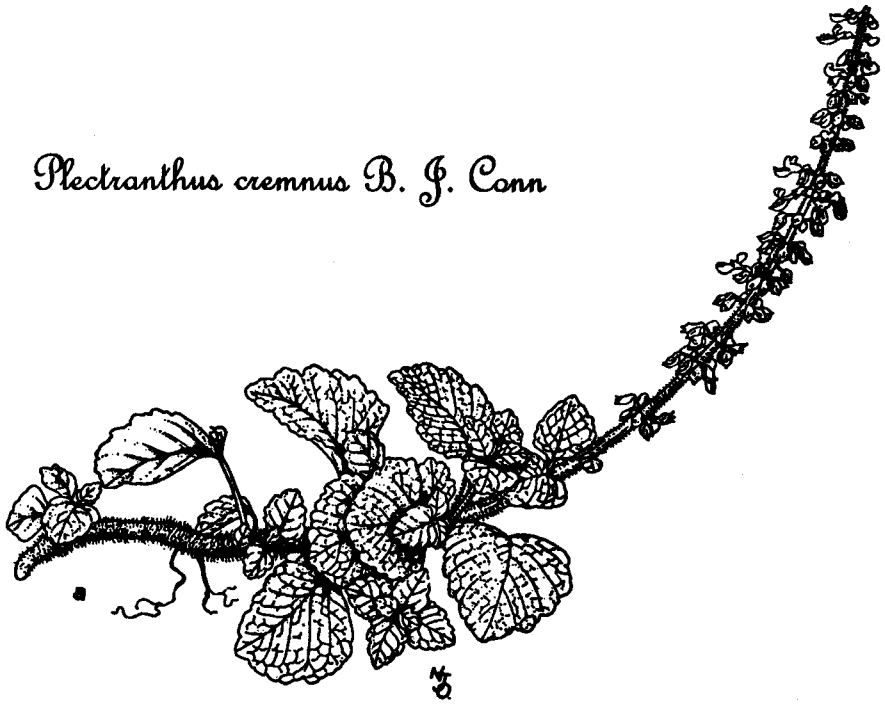


Plectranthus cremnus - Widespread But Threatened

By

Steve Clemesha



The following short document describes new, previously undocumented locations of *Plectranthus cremnus*. All locations described are from personal field observations made by Steve Clemesha.

Plectranthus cremnus is a widespread species and still fairly plentiful, though under threat in many of its habitats from Bitou Bush, Kikuyu and other weeds.

The furthest south I have found it is at Bluey's Point, the southern headland at Bluey's Beach. I could not find it at Seal Rocks. At Seal Rocks, I found *Plectranthus parviflorus* in situations where you may expect to find *P. cremnus*. However, the habitat was a bit sheltered from the full exposure of the ocean, though it still would cop a severe dose in rough weather.

I have also observed *P. cremnus* on Bennetts Head, which is about 20 km north and in the middle of Foster.

The species also grows at Diamond Head in Crowdy Bay National Park.

Further north, I have seen it at Big Hill, south of Crescent Head, and other headlands near there. It occurs on all the headlands, except a few smaller ones north from there.

In the Coffs Harbour area, it is found on all the headlands and three of the rocky islands of the Solitary group. It is particularly abundant on Flat Top Point. This is an island you can wade out to at low tide.

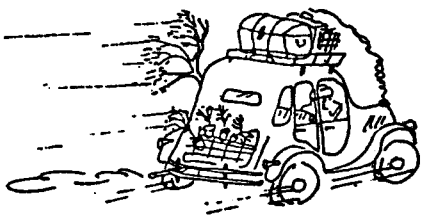
North from there it is on most headlands. I have seen it on all the headlands between Ballina and Lennox Head. It is also found on Cape Byron and at Nobby's Head at Bogangar.

It grows literally on the border of Queensland and New South Wales at Point Dangar; both at the top & bottom of the man made cliff (through quarrying).

In Queensland it grows on a rocky little hill at the north end of Currumbin Beach. The northern most place where I have seen it is Burleigh Point which is about 1 km north of Burleigh Head. It is not on Burleigh Head, another species is at the edge of the rainforest. I don't know what it is.

North of Burleigh Point there are no headlands for many kilometres. If it grows north of there I presume the Qld. botanists would have found it. However, before *P. cremnus* was named it was considered to be a coastal form of *P. parviflorus*. It may still be thought of as that by some people.

Some of its habitats are on cliffs where weeds can't get at it but weeds are a major threat to most of the many populations of this species.

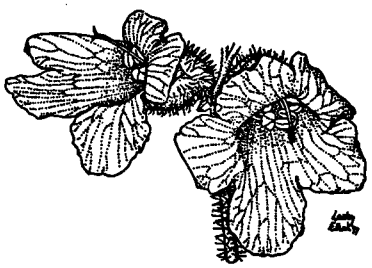


NEW SOUTH WALES THREATENED SPECIES CONSERVATION ACT 1995 (TSC ACT)

The following article aims to give an outline of the objectives of the TSC Act and a brief overview of the processes that are undertaken to reach those objectives. The legal requirements of determining or consent authorities as outlined under the EPA and TSC Acts are not discussed here.

The information contain within the article is compiled from the following sources:

- The NSW National Parks & Wildlife Services *Threatened Species Management Information Circulars* (January 1996 onwards);
- NSW National Parks & Wildlife Service (2000) *Threatened Species Information and Environmental Assessment Guidelines* – Central Directorate NSW NPWS, Hurstville;
- *On the Brink Your Bush, Their Habitat, Our Act Is the Threatened Species Conservation Act working?* Proceedings of the Conference held at the University of Sydney, May 1997. In particular papers presented by Graham Wilson, NSW National Parks & Wildlife Service, Dr. Chris Dickman, Chairman of the NSW Scientific Committee and Kim Brebach, NSW Co-ordinator, Threatened Species Network;
- *Environmental Law Tool Kit – A guide for assisting public participation in environmental decision making in NSW* Environmental Defenders Office (1996).



The Threatened Species Conservation Act was introduced to ensure that "effective threatened species conservation occurs in <u>all</u> areas of NSW" (Wilson 1997).

The Act allows and relies on input from individuals, community groups, government and non-government organisations to reach its objectives.

Objectives

The following six objectives, as listed by Wilson 1997, are outlined within the Act so as to maximise the likelihood that the intent of the Act becomes a reality:

1: to conserve biological diversity and promote ecologically sustainable development

2: to prevent the extinction and promote the recovery of threatened species, populations and ecological communities

3: to protect the critical habitat of those threatened species, populations and ecological communities that are endangered

4: to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities

5: to ensure that the impact of any action affecting threatened species populations and ecological communities is properly assessed

6: to encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving cooperative management.

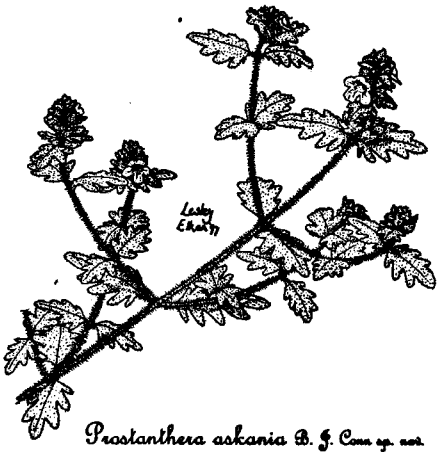
Mechanisms of the TSC Act

<u>Listing of threatened species on the schedules</u>

"The TSC Act allows for the listing of threatened species, endangered populations, endangered ecological communities and key threatening processes in NSW" (Dickman 1997). This is an important and fundamental aspect of the TSC Act. Nominations for listing can be made by any person; the NSW Scientific Committee then assesses such nominations. "Many nominations have been made from concerned individuals and community groups as well as biological consultants, government and non-government organisations and the Scientific Committee itself" (Dickman 1997).

The Scientific Committee meets once a month to consider nominations. Nominations are evaluated against criteria as

outlined within the TSC Act. "A decision is usually made within 3-6 months on average" (Brebach 1997). "The Act requires the committee to make a final determination within six months. However, if more information is needed and requested from a nominator, this has the effect of "stopping the clock" until additional information is received (Dickman 1997).



If, on consideration, the Scientific Committee supports the nomination a "Preliminary Determination" is published stating the reasons for the determination. To ensure wide-ranging notification and to maximise responses relevant organisations are notified directly. Typically this may include Department of Urban Affairs & Planning, Department of Land & Water Conservation, State Forest of NSW, NSW Agriculture, NSW Fisheries, Local Government and the Nature Conservation Council of NSW Additionally, notices of determinations are published in the Government Gazette, the *Sydney Morning Herald* and in local newspapers in the areas that may be affected by the determination.

The aim of the notifications is to gain submissions on the preliminary listings from interested parties. Usually a 30-day period is allowed for comment from the date of publication, submissions are an important part of the determination process. Such submissions (for or against the nomination) allow additional information to be forwarded to the Scientific Committee. It is the intent of this procedure that "maximum potential input" be gained "contributing significantly to the ability of the Scientific Committee to arrive at informed and effective decisions (Dickman 1997).

Following consideration of submissions the Scientific Committee makes a final determination to accept or reject the nomination. The nominator, the Minister for the Environment and the Director-General of NSW NPWS are notified and the determination is published as per the preliminary determination. If accepted the relevant schedules of the TSC Act are then amended.

The Act also allows for provisional listing on an emergency basis for an endangered species. Such listings are mostly reserved for species not previously known to occur in NSW and are considered likely to be endangered. These may include a newly discovered extensions of range, especially a disjunct population, a taxon new to science or a species formerly considered to have been extinct but not already listed on Part 1, Schedule 1 of the Act.

A provisional listing has the effect of amending Schedule 1 immediately, but public notification and comment is also sought. "The scientific Committee must review the status of provisionally listed species within 12 months, otherwise the listing ceases to have effect" (Dickman 1997).

Critical habitat

"Critical habitat means habitat declared to be critical under Part 3 of the TSC Act". In summary, "critical habitat is the whole or any part or parts of an area or areas of land comprising the habitat of an endangered species, an endangered population or an endangered ecological community that is critical to the survival of the species population or ecological community" (NPWS 1996).

Recovery Plans

The NSW NPWS has the responsibility to prepare and implement recovery plans for all species (other than those presumed extinct), populations and ecological communities listed in the TSC Act 1995. The object of a recovery plan is "*to promote the recovery of the species, population or ecological community to which it relates to a position of viability in nature*" (NPWS 2000). "The contents of a recovery plan are outlined in section 59 of the TSC Act" (NPWS 1996).

As listed by Brebach, a recovery plan must:

a) identify the threatened species, population or ecological community to which it applies, and

b) identify any critical habitat declared in relation to the threatened species, population or ecological community, and

c) identify any threatening process or processes threatening the threatened species, population or ecological community, and

d) identify methods by which adverse social and economic consequences of the making of the plan can be minimised, and

e) state what must be done to ensure the recovery of the threatened species, population or ecological community, and

f) state what must be done to protect the critical habitat (if any) identified in the plan, and

g) state, with reference to the objects of this Act:

   (i) the way in which those objects are to be implemented or promoted for the benefit of the threatened species, population or ecological community, and

   (ii) the method by which progress towards achieving those objects is to be assessed, and

h) identify the persons or public authorities who are responsible for the implementation of the measures included in the plan, and

i) state the date by which the recovery plan should be subject to review by the Director-General.

"The legislation places a high priority on the development of Recovery Plans that are socially and economically feasible and utilise resources effectively. This is considered desirable as without these issues being built into the process from the outset the likelihood of success, where problems are encountered in these areas, is low" (Wilson 1997).

All major stakeholders are consulted in the preparation of the recovery plans and representatives may choose to be part of the recovery team. The function of the recovery team is to gather relevant information pertaining to the subject species population or ecological community and formulate strategies (**within social and economic constraints**) which will lead to its recovery. These are published in the form of a draft recovery plan for the subject entity. The Draft Recovery Plans are then exhibited for a statuary period so as to gain broader community comment. "*The TSC Act requires the Director General to consider all written submissions received prior to forwarding a plan to the Minister for approval. If the Director-General considers that any major changes should be made to a recovery plan or threat abatement plan as a result of the review process or submissions from public authorities or the general public, the Director-General is to prepare a new plan in accordance with Part 4 or 5 of the TSC Act* (NPWS 1996).

Threat Abatement Plans (TBA's)

The purpose of Threat Abatement Plans is to manage key threatening processes with a view to their abatement, amelioration or elimination" (NPWS 1996).

Threat Abatement Plans are one of the most important and pro-active areas of this legislation. These provisions are closely modeled on Commonwealth provisions.

The NPWS has been involved in assisting the Commonwealth to develop Threat Abatement Plans for a range of introduced species, and is using these as a model for the development of future plans of its own. The drafting of threat abatement plans follows a similar procedure to that of recovery plans.

A recovery plan or threat abatement plan processed under the TSC Act must be prepared within the time frames as shown below; in Table 1.

Table 1	Listed Prior 1/1/96	Listed After 1/1/96
Endangered	5 yrs	3 yrs
Vulnerable	10 yrs	5 yrs
TBA's	6 yrs	3 yrs

Conclusion

The objectives of the Threatened Species Conservation Act are sound, however these objectives are frequently in stark contrast with social, economic and political imperatives.

Consideration of social and economic impost may be viewed as politically astute and warranted through the eyes of many, but from a purely biological viewpoint, this places considerable constraints on the recovery of many threatened species, populations and ecological communities. It also provides a very convenient "out" which is often abused by development proponents. Social and economic imperatives, at the end of the day, invariably outweigh biological consideration.

The greatest benefit derived from the implementation of the TSC Act is the ability of community to nominate entities for listing. Once listed under the Act, the subject species has legal status, and at least is considered.

Finally, as with all laws, the TSC Act is only as good as its implementation and enforcement.

Unfortunately, the list of threatened species is increasing whilst the funding to formulate and implement the required ameloriative measures stagnates or decreases.

As such vigilance and co-operation from all parties is required if the rate of decline and extinction of our state's biodiversity is to be to redressed.

THREATENED SPECIES INFORMATION & ENQUIRIES – TO WHOM & WHERE

NSW NPWS CONTACTS

- **General enquiries regarding NSW TSC Act**

Biodiversity Management Unit
Biodiversity Research and Management Division, Policy and Science Directorate
PO Baox 1967
Hurstville NSW 2220
Ph 02 9585 6540 or 1300 36 1967
Fax 02 9585 6544

Approved Recovery Plans and a wide array of other information can be accessed and viewed on the NPWS web page at:

www.npws.gov.au

Final determinations can be viewed at:
http://www.npws.nsw.gov.au/news/tscdets/index.html

Species profile sheets can be viewed at:
www.npws.nsw.gov.au/wildlife/threatened.htm#profiles

- **Inquiries for site specific matters regarding TSC Act** contact the relevant NPWS Directorate eg. for the Central Directorate:

Threatened Species Unit
Conservation Programs and Planning Division,
Central
PO Box 1967
Hurstville NSW 2220

Ph 02 9585 6333
1300 36 1967
Fax 02 9585 6527

Scientific Committee

Executive Officer, Scientific Committee
C/o PO Box 1967
Hurstville NSW 2220
Ph 02 9585 6940

THREATENED SPECIES DATA SOURCES

NSW NPWS Wildlife Atlas Data Exchange Officer
GIS Division, NSW NPWS
PO Box 1967
Hurstville NSW 2220
Ph. (02) 9585 6684 or
95856688 or
95856694
Fax: (02) 9585 6466
E-mail: gis@npws.nsw.gov.au
Website:
www.wildlifeatlas.npws.nsw.gov.au

Australian Museum
Collections Manager, Mammals
6 College Street
Sydney NSW 2000
Ph. (02) 9320 6118
Fax (02) 9320 6050

www.austmus.gov.au

National Herbarium of NSW
Curator Manager Herbarium
Royal Botanic Gardens
Mrs Macquarie's Road
Sydney NSW 2000

Ph (02) 9231 8144
Fax (02) 9251 7231

www.rbgsyd.gov.au

Environment Australia – Biodiversity Group
Executive Officer, ABBBS
The Australian Bird and Bat Banding Scheme
GPO Box 8
Canberra ACT 2601

Ph. (02) 6274 2402
Fax (02) 62742455

www.biodiversity.environment.gov.au/

Birds Australia
Birds Australia Sydney Office
PO Box 1322
Crows Nest NSW 2065

Ph. (02) 9436 0388
Fax (02) 94360466

CSRIO
Collection Manager
CSRIO Wildlife & Ecology Dsivision
GPO Box 284
Canberra ACT 2601

Ph. (02) 6242 1624
Fax (02) 6242 1555

Threatened Species Network

Total Environment Centre

Environmental Defenders Office

Nature Conservation Council of NSW

NSW SCIENTIFIC COMMITTEE

Notice of Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list the shrub, *Prostanthera askania* B.J. Conn. (Lamiaceae) as an ENDANGERED SPECIES on Part 1 of Schedule 1 of the Act and, as a consequence, to omit reference to the shrub, *Prostanthera* sp. Strickland State Forest as a vulnerable species on Schedule 2 of the Act.

Prostanthera askania B.J. Conn is the published taxon referred to previously as *Prostanthera* sp. Strickland State Forest.

The Committee is of the opinion that the species is likely to become extinct in nature in NSW unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Copies of this Determination may be inspected at the National Parks & Wildlife Service Information Centre (Level 1), 43 Bridge Street, Hurstville and at all District Offices during business hours.

Dr Chris Dickman, Chairperson

ESTABLISHED UNDER THE THREATENED SPECIES CONSERVATION ACT 1995

Contact Address: C/o PO Box 1967 Hurstville NSW 2220 Telephone: (02) 9585 6940 Facsimile: (02) 9585 6606

NSW SCIENTIFIC COMMITTEE

Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act. has made a Final Determination to list the shrub, *Prostanthera askania* B.J. Conn. (Lamiaceae) as an ENDANGERED SPECIES on Part 1 of Schedule 1 of the Threatened Species Conservation Act and, as a consequence, to omit reference to the shrub, *Prostanthera* sp. Strickland State Forest as a vulnerable species on Schedule 2 of the Act.

Prostanthera askania B.J. Conn is the published taxon referred to previously as *Prostanthera* sp. Strickland State Forest.

The Scientific Committee has found that:

1. *Prostanthera askania* was recently described by B.J. Conn, and has previously been referred to as *Prostanthera* sp. Strickland State Forest, *Prostanthera* sp. 6, and *Prostanthera* sp. G. It was first collected by Maiden in 1915.
2. *Prostanthera askania* is an erect, openly branched shrub to one metre high with deeply toothed hairy leaves 12-25mm long and 8-18mm wide. The mauve flowers are arranged in a terminal botryoid with the corolla about 8mm long. It grows in sclerophyll forest on ridges adjacent to rainforest and flowers in spring (Harden (1992) Flora of NSW Volume 3. NSW University Press).
3. The species is restricted to the Ourimbah - Narara area near Gosford on the Central Coast of NSW where it is currently known to exist in five populations. None of these populations are in reserves.
4. The total number of plants in three of the five populations is estimated to be less than 650 plants, with one population consisting of only 50 plants within a small area. Plant numbers in the remaining two populations are unknown but are thought to be low.
5. The main threats are continued land clearing and low plant numbers.
6. In view of 3, 4 & 5 above the Scientific Committee is of the opinion that the species is likely to become extinct in nature in NSW unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Dr Chris Dickman
Chairperson
Scientific Committee

Proposed Gazettal Date: 12/6/98

Exhibition period: 12/6/98 to 17/7/98

ESTABLISHED UNDER THE THREATENED SPECIES CONSERVATION ACT 1995

Contact Address: C/o PO Box 1967 Hurstville NSW 2220 Telephone: (02) 9585 6940 Facsimile: (02) 9585 6606

NEW SOUTH WALES NATIONAL PARKS & WILDLIFE SERVICE - Obtaining Background Information for Recovery Plans, Threatened Species Profiles and Environmental Assessment Guidelines

The NSW National Parks & Wildlife Service is required to produce recovery plans for all threatened species gazetted under the NSW TSC ACT 1995. The ecological requirements and population status of many listed species are poorly known. Only a few herbarium records exist for some species. Many of these records are also greater than 50yrs old and/or are from areas that have been highly modified since European settlement.

Before recovery plans can be formulated it is essential that additional information is obtained on the current status of the subject species, Information, including field survey work, is gathered either by NPWS staff or by commissioned flora & fauna specialists.

The scope of the work performed also usually includes:

- a literature review on the biology of the subject species;
- a compilation of existing records of the subject species from the National Parks & Wildlife Service, Royal Botanic Gardens and other relevant databases;
- populations located from database records are plotted on topographic maps to assist in locating the subject species whilst undertaking field survey work;
- re-locating the subject species in the wild;
- recording information on the status and extent of re-located populations, habitat requirements and any current threats noted;
- plotting the location and extent of the located species onto topographic maps;
- Global Positioning System readings are also taken for transferal to GIS mapping systems and to include accurate location data on herbarium vouchers and data base records;
- if a new population of the species is located, a voucher specimen is taken for lodgment at the National Herbarium of NSW for confirmation;
- a photographic record (colour slide) of the species and its habitat is also a primary objective;
- potential habitat areas are identified and mapped, for future investigation;
- where resources permit, targeted surveys are undertaken to locate new populations.

Details of any incidental threatened species sightings are also recorded for inclusion within the NPWS ATLAS of Wildlife. In the case of flora survey work a voucher specimen is lodged with the National Herbarium of NSW.

Field surveys are often limited by available resources, time constraints, inaccuracies of data records and lack of precise locality details. The distance between localities, gaining permission to access private lands and the rugged nature of many habitat areas may substantially add to the cost of obtaining the necessary information.

In many instances location of species is exploratory, and by foot access into rugged terrain. Some survey work is performed with the use of helicopters.

Additionally gathered information is used to produce manuals containing threatened species profiles and environmental impact assessment guidelines. These manuals are prepared " to assist in the environmental planning and impact assessment process in relation to threatened species, populations and communities" (NPWS 2000) across NSW. "The need for information about threatened species has arisen in response to repeated inquiries and requests for assistance in relation to: the interpretation of threatened species legislation; information on threatened species listings, their identification, habitat requirements, impact assessment and recovery planning" (NPWS 2000).

The NSW NPWS Central Directorate manages the Sydney Basin, an area bounded by the towns of Cardiff, Merriwa, Mudgee, Lithgow and

Shellharbour. The Threatened Species Information & Environmental Assessment Guideline for the Central Directorate is an excellent example of such a manual. It "provides the following information:

- threatened species inventories for Local Government Areas and NPWS Regions within the Directorate;
- threatened species profiles outlining the species conservation status, description, occurrence in conservation reserves, habitat, ecology, threats and management, for species recorded in Central Directorate; and
- environmental impact assessment guidelines designed to assist authors of species impact statements, development and activity proponents, and determining and consent authorities, who are required to prepare or review assessments of likely effects on threatened species pursuant to the provisions of the Environmental Planning and Assessment Act 1979 (NSW)." (NPWS 2000).

This manual can be purchase from the NSW NPWS by contacting:

Katrina Dunn

Conservation, Programs and Planning Division

Central Directorate

PO Box 1967
Hurstville NSW 2220
Ph 95856623

The following brief article outlines an example of one such survey effort:

NEW SOUTH WALES NATIONAL PARKS & WILDLIFE SERVICE 1999 RARE PLANT SURVEY – BLUE MOUNTAINS AND CENTRAL WESTERN SLOPES OF NSW

In 1999 the NSW National Parks & Wildlife Service commissioned Cumberland Flora & Fauna Interpretive Services to compile background information on the distribution, current status and habitat requirements of four poorly known and vulnerable flora species occurring in the Blue Mountains and/or Central Western Slope areas of the NPWS Central Region. The subject species were:

Kennedia retrorsa, *Prostanthera cryptandroides*, *Prostanthera discolor* and *Prostanthera stricta* sens lat..

The object of this work was to prepare draft species profiles and environmental impact assessment guidelines. Additionally gathered data would later form the background information sections for recovery plans for the subject species. Incidental sightings of rare, threatened or unusual occurrences of taxon were also noted.

The survey involved three separate field trips –

1. Sydney – Colo Heights – Howes Valley – Denman – Mt. Dangar – Widden Valley – Baerami Valley – Coxs Gap – Bylong – Glen Davis – Sydney.
2. Sydney – Mount Vincent – Glen Davis – Genowlan Mountain – Sydney.
3. Sydney – Colo Heights – Denman – Myambat – Sydney.

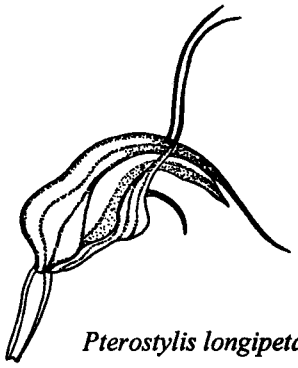
RESULTS

Location of Species

Populations of all four species were re-located. Two species, namely *Prostanthera discolor* and *Kennedia retrorsa*, appear to be extremely vulnerable due to extremely low population numbers at all known sites. Larger populations of both *Prostanthera stricta* s. str. and *Prostanthera cryptandroides* spp. *cryptandroides* were located and although vulnerable to a range of potential and current threatening processes were observed to be somewhat more secure. A number of small populations of a taxon closely related to *P. stricta* (*P.* aff. *stricta)* were located in the northern edge of the Wollemi National Park.

Data entry errors

The study revealed a number of records to be either inaccurate or highly generalised in the precision of Lat / Long or AMG co-ordinates. Many of these records are duplications arising out of cross-referencing other data sources. This appears to have



Pterostylis longipetala

given rise to a cluster of records around a given locality eg. *Prostanthera discolor* - where the original collection may have stated – first westward branch of Honeysuckle Creek, at the base of Coxs Gap, Murrumbo - data processors appear to have recorded varying co-ordinates for Murrumbo, a cluster around Coxs Gap and a spread of co-ordinates for Honeysuckle Creek.

A number of data entry errors were found to exist and appear to occur mostly where a record is old and a generalised locality is given. A highly dubious database record for *Prostanthera stricta* at Mount Vincent, Cessnock SF near Heaton is an obvious example. Collection details for this record are precisely the same as the R.T Baker, 1892 Mount Vincent – Central Tablelands collection. This data entry error has presumably arisen from looking up co-ordinates for Mount Vincent in an atlas or similar reference.

Extensions of range

Additionally, the field survey team, comprised of Robert Miller, Colin Gibson and Chris Lacey, recorded 20 extensions of range. Some of these were species not previously recorded for either the Central Tablelands or the Central Western Slopes and include a number of taxon of rare occurrence in NSW. The extentions of range included species such as:

Acacia matthewii: lower slopes of Mt Gundangaroo c. 1 km W of Sir Johns Point, Capertee Valley (Robert Miller & Colin Gibson 24-4-1999).

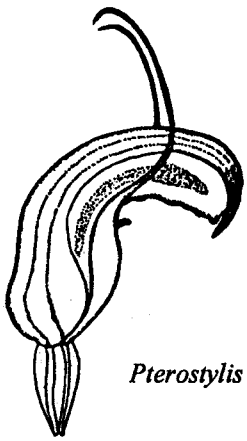
Acacia prominens: upper Baerami Creek, Wollemi National Park (Colin Gibson & Robert Miller 29-4-1999).

Astrotricha longifolia (inland form): Dingo Creek, Wollemi National Park (Colin Gibson & Robert Miller 25-4-1999); Gundy Wattle Creek, Widen Valley, Wollemi National Park (Colin Gibson & Robert Miller 27-4-1999).

Dodonaea multijuga: "Crypt Hill", Crescent Hill Ridge, Baerami Valley, Wollemi National Park (Robert Miller & Colin Gibson 29-4-1999).

Brachycome leptocarpa vel. aff. : Old Convict Road, Yengo National Park (Colin Gibson & Robert Miller 24-4-1999).

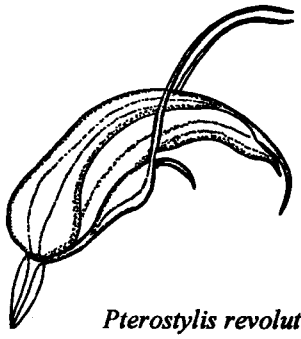
Exocarpos aphyllus: Stockyard Point, Mount Vincent (Robert Miller & Chris Lacey 3-5-1999) First record for Central Tablelands – 3 only record for NSW.



Pterostylis truncata

Melaleuca lanceolata: Below the northwestern side of Mt Gundangaroo, Capertee Valley (Robert Miller & Colin Gibson 30-4-1999). First record for CC or CT and eastern extension of range.

Monotaxis macrophylla: "Crypt Hill", Crescent Hill Ridge, Baerami Valley, Wollemi National Park (Robert Miller & Colin Gibson 29-4-1999). First record for the Central Western Slopes and southern extension of range.



Pterostylis revoluta

Pterostylis longipetala Myambat Logistics Company, near Denman, NSW (Robert Miller, Colin Gibson & Louise Canns 20-5-1999).

Pterostylis obtusa: Cousins Creek, Bylong Labyrinth, Wollemi National Park (Colin Gibson , Robert Miller & Chris Pavich 28-4-1999) and Gundy Wattle Creek, Widen Valley, Wollemi National Park (Robert Miller & Colin Gibson 27-4-99).

Pterostylis revoluta lower west gully of Honeysuckle Creek, near Cox's Gap (Colin Gibson & Robert Miller 27-4-1999):

Pterostylis truncata: Cousins Creek, Bylong Labyrinth, Wollemi National Park (Colin Gibson , Robert Miller & Chris Pavich 28-4-1999).

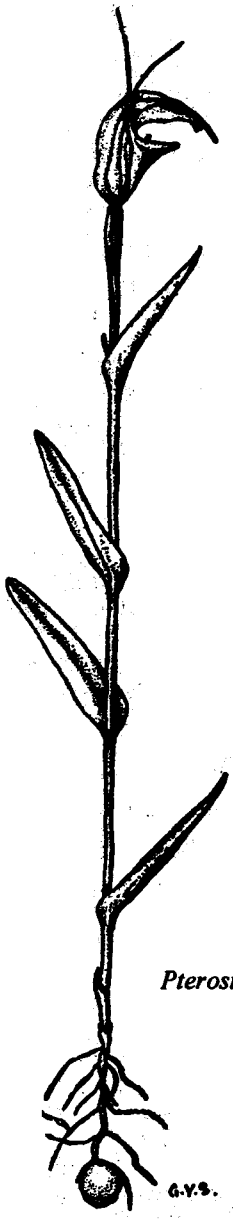
Rulingia procumbens: South spur of Mount Dangar, Goulburn River National Park (Robert Miller & Colin Gibson 21-5-1999).

Sarcostemma brunonianum: Myambat Logistics Company, near Denman, NSW (Robert Miller, Colin Gibson & Louise Canns 20-5-1999). First record for Central Western Slopes and western extension of range.

New populations of a number of uncommon, rare or vulnerable taxa were also recorded. Examples of such species include:

- *Grevillea johnsonii;*
- *Eucalyptus laophila,* and
- *Hemigenia cuneifolia.*

The information compiled from field surveys and literature reviews were utilised to produce draft Species Profile Sheets and Environmental Impact Assessment Guidelines for each of the subject species.



Pterostylis obtusa

COMMENT

The presence of errors in our biological databases should be a major concern to all land managers. Such errors raise serious questions about the accuracy of records for all threatened flora and fauna.

This may have serious implications about the presumed security of many species.

Should "best practice" require management decision to be based on vouchered herbarium material only?

STOP PRESS:

It appears that the *Rulingea procumbens* collected at Mt Dangar is atypical of the species. Researchers are currently investigating this as a possible "new" species which to date is only known from four localities.

Examples of the Species Profile Sheets and Environmental Impact Assessment Guidelines which were published by the New South Wales National Parks and Wildlife Service Threatened Species Unit as an outcome of this study are included in the back of this newsletter.

Additional Species Profile Sheets and Environmental Impact Assessment guidelines and all approved recovery and draft recovery plans can be veiwed on the NPWS WebPage at www.npws.nsw.gov.au/wildlife/threatened.htm#profiles or through the home page directory at www.npws.nsw.gov.au

Approved and draft recovery plans can also be purchased for $8.25 (including GST) from the NPWS Head Office Information Centre.

ALONG THE PROSTANTHERA TRAIL

By
Colin Gibson

On an assignment for the NSW National Parks & Wildlife Service (NPWS), Rob Miller & I were on the Prostanthera trail, of three of the rarest mint bushes in New South Wales: *P. cryptandroides*, *P. discolor* & *P. stricta*. Our job was to find their listed wild localities per NPWS and Royal Botanic Gardens databases. Just to spoil the theme however, NPWS had thrown in the rare *Kennedia retrorsa*, as all these species occur in and around the margins of the Wollemi National Park. The Kennedia is also known from the Blacktown Tableland, several hundred kilometers to the north in central Queensland. Our trip took place in April 1999.

The Kennedia, for the purpose of this journal, I give the title of "Honorary Prostanthera". J. L. Boorman first collected it in 1904 from the lower slopes of Mount Dangar, near Gungal in the Goulburn Valley west of Newcastle. For a while it was thought to be extinct until relocated in the same area by Tony Rodd in 1966.

The database also gave us citations for Devil's Hole, Putty Road; from a tributary of Hungerfords Creek, Wollemi N.P. and five kilometers north of Bilpin. The last two records were extremely generalised in their respective location details. As finding these reported occurrences we quickly assessed as being worse than the proverbial "needle in a haystack" they were placed at the bottom of the list. Unfortunately, resources allocated for our survey ultimately did not allow for an attempt at relocating these sites. The problem of the Putty Road localities took up all the time we could avail.

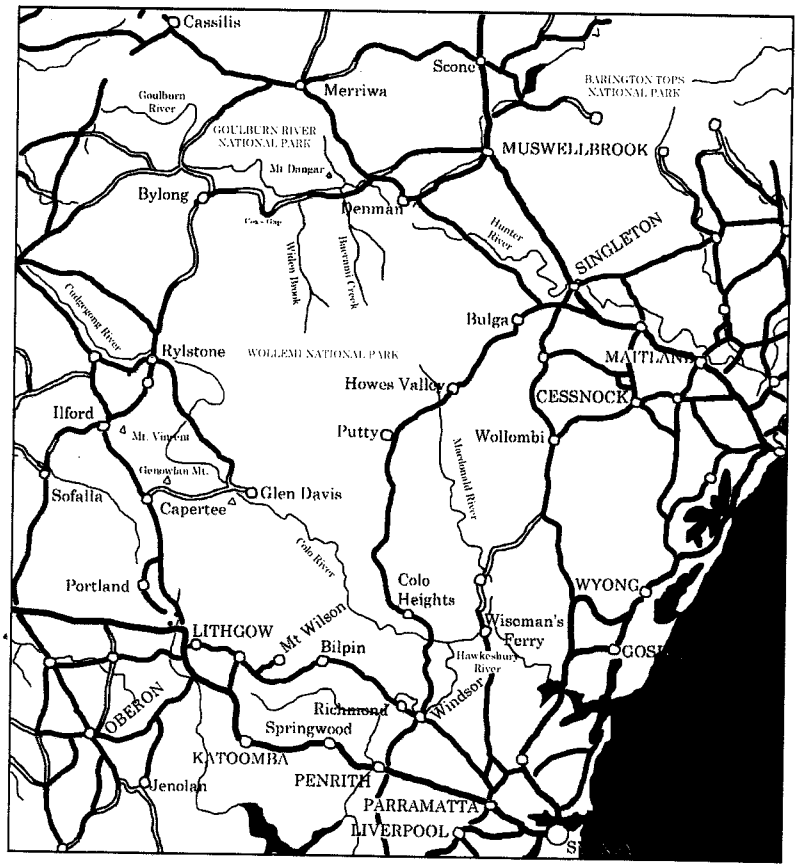
To begin with, there are two Devils Holes along the Putty Road, and there were two separate collections under this location (J. Pickard March and August 1969). There was no doubt that one was the Devils Hole closest to Colo Heights, as labeled, but the March collection was listed only as Devil's Hole, Putty Road.

So first we sought the Colo Heights Devil's Hole, guided by local resident Biker Bill Thatcher, the Richmond tattooist. The gully seemed to go down and down, plenty of Kennedia (common rubicunda) but no sign of retrorsa. Bill and Rob went a lot further than I did, it smelled a cold trail to me. This fruitless search cost us most of an afternoon, although we did collect what is probably an undescribed species of Dianella in this vicinity. At the end of it we thanked Bill and drove up the Putty Road to camp at Kings Waterhole.

We felt now obligated to investigate Devil's Hole Creek, the Howes Valley Devil's Hole. Next morning we made for Howes Valley , found the access track, drove along it to a certain point, then set off on foot into the gully. We ended up walking almost the entire gully from top to bottom, finding only the same Kennedia as we did the previous day. This posed a quandary: had there been a misidentification? Were there data entry errors? Both seemed likely.

Part of our problem was that the NSW Herbarium's Kennedia boxes were on loan to a botanist at Canberra - Terina Lally. At the conclusion of our survey Robert was able to contact Terina to ask her to check the Devils Hole specimens. Sure enough, the material we had collected at the Colo Heights location matched that of the Pickard collection (which was infertile) and on closer examination it was

THE PROSTANTHERA TRAIL
- as shown in yellow



evident that this was not a good match for *Kennedia retrorsa*. It was also acknowledge that there was more variation within *Kennedia rubicunda* than has commonly been recognised.

Our suspicions of data entry error were also strengthened. It is likely that, having collected the March specimen (which is infertile), the collector returned to the site in very late winter to obtain fertile material. Being unsuccessful, the specimen was only annotated with Devil's Hole, Putty Road. The collector is likely to have assumed, as many of us do, that it was obvious that this specimen was from the same site as previously collected in March. To the data processors defense, this is a pretty diabolical area, not far away you'll find a Devil's Elbow, and also Caley's Devil's Wilderness south of Bell's Range.

The Kennedia retrorsa-less exploration of the two Devil's Holes took up the first two days of our trip. We camped the second night at Apex Road Lookout, outside Denman. Unfortunately, this lovely lookout is used as a rubbish dump by thoughtless people who drive to the top and throw their refuse over the cliff. The view is beautiful, but the smell has the unmistakable odour of dead-dog-stuffed-in-plastic-bag. To those responsible: may a ten tonne garbage truck tip its contents over your heads.

In the morning we made our way to Dingo Creek, just past Baerami, a known location for the true *Kennedia retrorsa*. We first encountered it in the creek, a couple of hundred metres up from the Denman – Mudgee Road crossing, and a beautiful thing it is. The following passage from Boorman's field notes of Mount Dangar, 3-9-1904, might do it justice: " Then again lower down the mountain sides are to be found beautiful specimens of *Canavalia obtusifolia*? (sic) climbing and scrambling over the ledges of the rocks and festooning the trees all around. It is a very strong climber with very bright green foliage, with bright red flowers (rich red) in profusion. It requires a fair amount of moisture and warm situations . It seemingly is not so robust as near the sea coast but is much more prolific in flower, at this particular month looking very showy and is another evidence of a very useful climber for covering over unsightly embankments and is one that should be brought more

under cultivation for choice flowering climber" (RBG, per A. N. Rodd 24-8-1966).

In August 1984 Terry Tame found a Prostanthera growing on the creek-flat of Dingo Creek. To date, this plant is assigned the epithet of *P. stricta* by the Royal Botanic Gardens, Sydney. It is however morphologically distinct from the populations occurring on the summits of Mt. Vincent and Genowlan Mountain and should be referred to as *P.* aff. *stricta*.

The type form of *P. stricta s. str.* was collected by R. T. Baker at Mount Vincent, on the Dividing Range near Capertee, in 1892. A second locality was not found until Ernie Constable collected it on Genowlan Mountain in 1964.

The Dingo Creek aff. *stricta* has since been found in a couple of other localities: Kevin Stokes found it in the Widden Valley, Robert, with Brian Timmis, also found it there at Gundy Wattle Creek in 1987, and the following year Robert and I found it in 'Thorny Hand Creek' under the northern side of Mt. Monundilla.

I must also mention the mystery Malvaceae (?) we found in Dingo Creek, which would be worth a trip back to try and find in flower. I say Malvaceae, but none of us are sure. With only leaves to go on, Barry Conn tentatively identified this specimen as *Rulingia salviifolia*, which is not known further south than around Mount Warning. Further examination of Rulingia material later ruled this out. Then *Hibiscus sturtii* was suggested, but we did find *H. sturtii* in Dingo Creek and it is not a clear match for our mystery plant. One for the future to sort out, I think.

PROSTANTHERA STRICTA, *R.T.B.*

After our Dingo Creek foray we drove around via Gungal into the Worondi Valley, to find a campsite under the eastern slopes of Mount Dangar. We had been here in 1988 and we knew we would find specimens of *Kennedia retrorsa*, and we surely did. But we were also on the watch for *Prostanthera cryptandroides*, what we hoped would be the re-collection of this species from its type locality.

The *Prostanthera cryptandroides* trail goes all the way back to Alan Cunningham's collection of 20th April 1825; the notes to the specimen state "On the NW branches of Hunters River, NSW. On dry shelving sandstone hills." Cunningham's party was heading west at the time, up the Goulburn River valley, close to the southern foothills of Mount Dangar, and it was around these foothills we reckoned his collection had been made.

In the Prostanthera & Westringia Study Group Newsletter of September 1988 I wrote up a little account of how we confirmed the presence of *Prostanthera cryptandroides* in the Hunter River catchment, in the sandstone hills of the Baerami Labyrinth, part of Wollemi N.P.. At that time we thought we were the first to find it in the Hunter catchment since Cunningham. However , we were not aware of collections by Heron (1909) and Laseron (1924) that are labeled "Denman". These would be a lot closer to Cunningham's route than our Baerami collection.

Principally, we were here to look for *Kennedia retrorsa*, but, just the same, we intended to continue our search of the Mount Dangar ridges for *Prostanthera cryptandroides*, carrying on from our investigations here in 1988. We climbed rocky knolls and stony spurs; full of caves, covered in dense scrub and Dwyer's Mallee; real wallaroo country. *Kennedia retrorsa* turned up in a couple of gullies and under north facing rock outcrops; we found the rare *Grevillea johnsonii* and a possible eastern extension of range for *Rulingea procumbens*, but no *P. cryptandroides.*

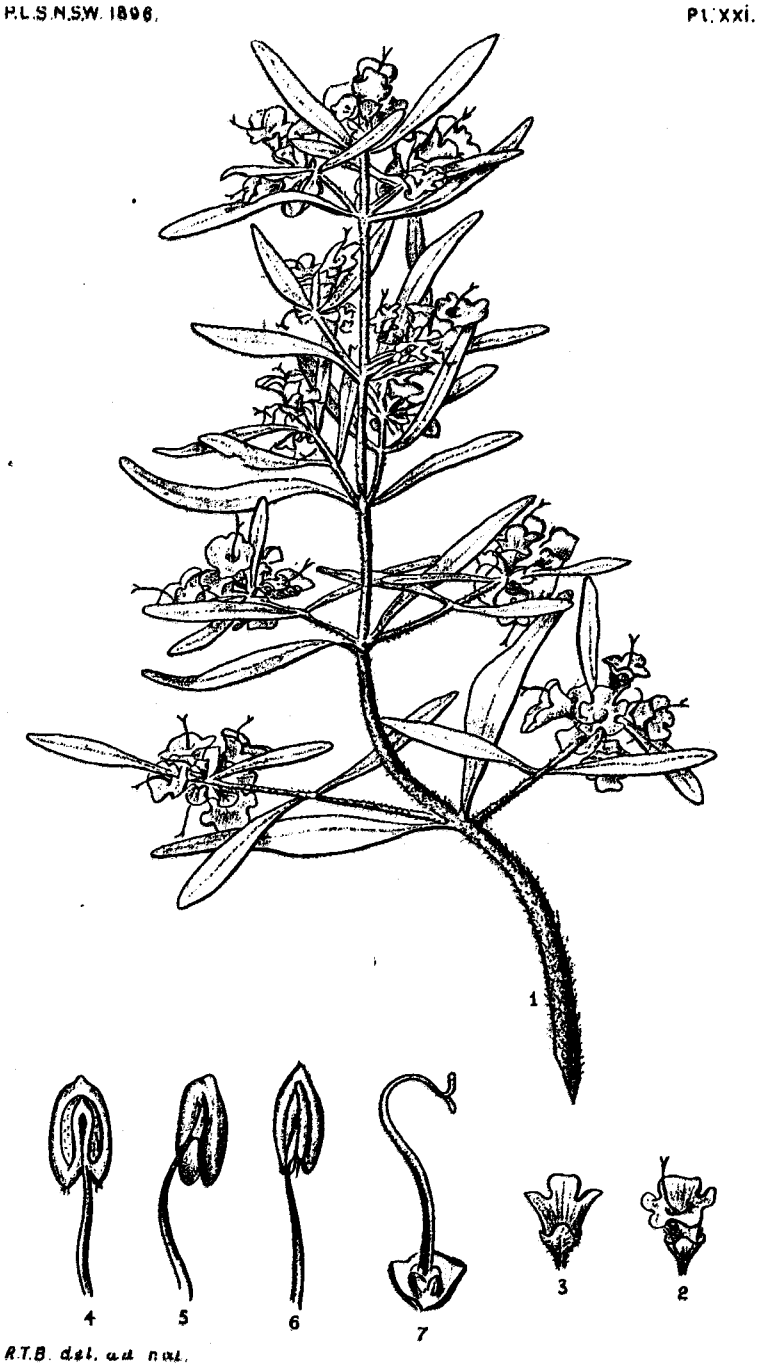
At the 'Holbrook' property we introduced ourselves and went from there up to Gundy Wattle Flat. This is where Robert and Brian observed *P.* aff. *stricta* in 1997. As stated *P. stricta s. str.* was only known from the summits of Mount Vincent and Genowlan Mountain, to the southwest. Robert has identified physiological distinctions between the Mount Vincent population and the northern Wollemi populations at Gundy Wattle and Dingo Creeks. Whether they are eventually recognised officially as separate species or subspecies is yet to be determined. I've been kicking myself over this, because I was here in 1981, when I walked all the way up to the head of Gundy Wattle Creek at the start of a long overland traverse to Mount Wilson. Of course, I didn't know what it was at the time, and, though there was a great mass of it along the creek, I was too loaded up with a heavy pack and didn't, think to collect it. At that time, to me, it would have been simply 'a Mintbush' – and nothing more.

Our next mission was to locate *Prostanthera discolor* at Honeysuckle Creek, below Coxs Gap. Perhaps the rarest of the lot, P. discolor was first collected by R.T. Baker in 1895 "at the foot of Cox's Gap Road, Murrumbo, Goulburn River, N.S.W. (R.T.B.)". Constable found it at Coxs Gap (undoubtedly at Honeysuckle Creek) in 1948. George Althofer in the "Cradle of Incense" lists it from Cox's Gap, Bylong Valley and Murrumbo and predicted that it would doubtless be found "at many other places along the rocky escarpments of the Goulburn River from Kerrabee to its head near Ulan."

Sure enough, in 1988 Robert and I found a small population of it in the heads of Baerami Creek, south east of Kerrabee. As for Althofer's Bylong observation, there is no Althofer collection on the database to confirm this. George might not have actually collected it, or, if he

did, it could be stashed away in one of his old collection boxes, possibly at Burrendong.

There was though a database record from the Bylong Labyrinth, from October 1998, above Cousins Creek, east of the Growee Hut Trail. So after relocating and logging the occurrence at Honeysuckle Creek, next morning we rendezvoused with NPWS Ranger Chris Pavich at Bylong. From there we transferred to his FWD vehicle for the trip up the Growee Hut Trail. Chris knew the whereabouts in Cousins Creek of the alleged collection and, after leaving the vehicle on top of a basalt ridge, he took us down into the gully where, after a mile or so, we eventually found the lower slopes of a whole spur covered in what was supposed to be *Prostanthera discolor*. But it wasn't as Robert quickly observed, it was in fact a form of *P. ovalifolia* sens. lat.. Interesting in itself but as with the Devil's Hole Kennedia it was a lot of work to come up only with an imposter. Such is the way with things elusive and rare.



PROSTANTHERA DISCOLOR, *R.T.B.*

After following a rocky spur back to the car we took our leave of Chris and drove back along the Denman road into the Baerami Valley. At the furthest farmhouse we met a cat at the back door munching a freshly killed ground parrot (not enough mice around, probably). With permission from the owners, and a warning about the wild dogs, we continued on up the back of the valley in the dark to find a campsite under some big old River Oaks. Wild dogs set up a worrying racket that night in the surrounding foothills.

Next day we set off walking up Baerami Creek; our main objective was Crypt Hill, one of the two sites we found for *P. cryptandroides* in '88. On that same trip, in one of the main branches of Baerami Creek, we had also found a colony of *Prostanthera*

discolor but on this occasion we did not manage to find it again in this complex area. We were unsure of its exact whereabouts, and the likely area had been burnt some 12-24 months previous.

Crypt Hill is way up the back of the Crescent Hill Ridge, and to get there we had to climb out of the main creek bed and up to a section of sandstone outcrops we called The Gibber Peaks. Here we got separated: Rob sidling along the talus on the north side, whilst I scrambled along the outcrops to a ledge that gave access to a small gap by way of a shoulder-wide passage in the sandstone about 10 metres high and 20 metres long. We attained Crypt Hill on the other side of the gap. From a ledge on the side of the hill we looked into the upper reaches of the Baerami Labyrinth: trackless and wild, and probably one of the least known corners of the Wollemi wilderness.

The whole hilltop had been scorched about a year or so ago, and it was flush with new growth. Here we found in the rejuvenating scrub a little yellow-flowered fire response annual, *Monotaxis macrophylla*, a long way from home, not having been previously recorded in the Central Western Slopes botanical subdivision. And of course we reacquainted ourselves with the population of *Prostanthera cryptandroides*.

To the north we looked down into Baerami Long Arm (as marked on the 1:25,000). That's the other place we found a few plants of *Prostanthera discolor* in 1988. But we were running out of daylight so we decided against going down there. Instead we sidled back around the Gibber Peaks and angled our way down off the Crescent Hill Ridge into the back-paddocks of upper Baerami. We processed our specimens, packed up our tents and drove into Rylstone for a counter tea. Then it was on to Glen Davis to pitch our tents for the night.

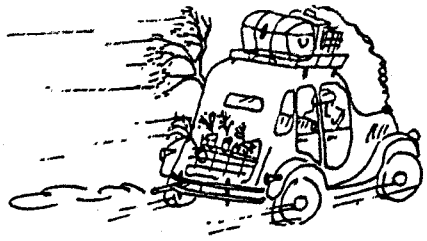
The Glen Davis Mist Monster filled the valley, and birdsong from every direction. First it was a butcherbird above my sleeping spot, they are so musical. Then a flock of King parrots, then cockatoos, then magpies, and then combinations of them all. I waited till the sun came bursting through the fog and by the time I got up Rob was arriving back with sprigs of *Prostanthera cryptandroides* from half way up to Gindantherie (Glen trig). There's plenty of it here. Our first inspection site was up the back of the Glen Davis tip. (I can inform the reader there is no recycling services at this tip).

Later, behind the property called "Rivendell" we found masses of *P. cryptandroides* on the lower slopes under Mount Gundangaroo. Probably our most interesting find in this area though was a colony of Moonah (*Melaleuca lanceolata*) – quite a long extension of range to the east for this species.

We backtracked from near "Rivendell" closer to Sir Johns Point and started up a steep spur. I piked but Rob went all the way to the base of the cliffs under Gundangaroo. There he found a new population of *Grevillea johnsonii.*

Back down to Glen Davis we followed the Pipeline Track for a distance, where *Prostanthera cryptandroides* is well known, having originally been recorded in this vicinity by Ern Constable in 1964. Later in the afternoon , when packing up at Glen Davis I lifted my groundsheet to find a funnel-web spider scurrying over the grass.

The trip back to Sydney was all that remained, and we were pretty happy, loaded up with the rewards of a weeks worth of adventure. It was great to get out into the field to solve a few old mysteries – and possibly even to discover a few new ones.



UNDER THE LENS

The *Prostanthera cryptandroides–P. euphrasioides–P. odoratissima* complex (Labiatae)

Dr. Barry J. Conn

Abstract

Conn, B.J. (National Herbarium of New South Wales, Royal Botanic Gardens, Mrs Macquaries Road, Sydney NSW 2000, Australia) 199x. *The* Prostanthera cryptandroides–P. euphrasioides–P. odoratissima *complex (Labiatae).* Telopea 8(2): June 1999. A morphological re-evaluation of this species complex supports the conclusion that it comprises a single species *P. cryptandroides* consisting of two subspecies, subsp. *cryptandroides* and subsp. *euphrasioides* (Benth.) B.J.Conn. A full description, key to subspecies, habitat and typification notes, distribution map and botanical illustration are provided.

Introduction

During the preparation of the Lamiaceae for the recent 'Flora of New South Wales' project (Conn 1992), a narrow view of *Prostanthera cryptandroides* and *P. euphrasioides* (Section *Prostanthereae*) was presented. However, the degree of morphological separation of these closely allied taxa was not discussed. This paper presents a morphological re-evaluation of these taxa, together with *P. odoratissima*, as part of the revision of *Prostanthera* section *Prostanthera* (Labiatae) for eastern Australia (earlier papers are Conn 1997, 1998).

Materials and methods

The taxonomic conclusions presented in this paper are based on field studies and herbarium material held at A, AD, BRI, C, CANB, E, K, L, MEL, MO, NSW, NY, P, PERTH, PRS, RSA, S, UC and W (herbarium abbreviations follow Holmgren *et al.* 1990). Morphological terminology follows Conn (1984), but that describing the inflorescence is as modified by Conn (1995).

Taxonomy

Prostanthera cryptandroides A.Cunn. ex Benth., *Lab. gen. et sp.* 453 (1834); Dietrich. *Syn. pl.* 3: 427 (1843); Walpers, *Rep.* 3: 767 (1844–5); Benth. in DC., *Prodr.* 12: 561 (1848); Benth., *Fl. austral.* 5: 105 (1870); F.Muell., *Syst. census Austral. pl.* 101 (1882); C.Moore, *Cens. pl. New S. Wales* 53 (1884); Woolls, *Pl. New S. Wales* 83 (1885); F.Muell., *Sec. syst. census Austral. pl.* 170 (1889); C.Moore, *Handb. fl. N.S.W.* 352 (1893); Briq. in Engl. & Prantl, *Nat. Pflanzenfam.*

4(3a): 220 (1895); Dixon, *Pl. New S. Wales* 232 (1906); Sulman, *Wild Fl. New S. Wales* 2: 154 (1914); Althofer, *Cradle of Incense* 102, 105, 107, 110, 111, 165 (1978).

Lectotype (here chosen): New South Wales, W branches, Hunter's River, *Cunningham 20*, April 1825 (K); *isolectotype* (fragmentary): On dry shelving sandstone hills on the N.W. branches of Hunter's River, *Cunningham 20*, April 1825 (NSW 422711).

P. odoratissima Benth. in T.Mitch., *J. trop. Austral.* 291 (1848); Benth. in DC. *Prodr.* 12: 700 (1848); Benth., *Fl. austral.* 5: 104 (1870); F.Muell., *Syst. census Austral. pl.* 101 (1882); Bailey, *Synop. Queensl. pl.* 389 (1883); F.Muell. *Sec. syst. census Austral. pl.* 169 (1889); Bailey, *Cat. indig. pl. Queensl.* 36 (1890); Bailey, *Queensl. fl.* 4: 1203 (1901); Bailey, *Compr. cat. Queensl. pl.* 392 (1913); Althofer, *Cradle of Incense* 33, 34, 92, 94, 100 (1978).

Type: 'On the top of the plateau' (Mitchell 1848, p. 290), south of Balmy Creek, [presumably on] 'sandstone' (*ibid.*, p. 291), west of Mantuan Downs (refer *ibid.*, map opposite p. 189), *T.L. Mitchell* [*?and W. Stephenson*] *s.n.*, '31st August' 1846 (Mitchell 1848, p. 290); possible type material: 'T.L.Mitchell 271 31 Aug 1846 Subtrop. N.H.' (K - not seen); 'Sir T.L.Mitchell, presented 1847. Mantian Down, Qld' (BM - not seen); 'Sir T.L. Mitchell, Australia' (TCD - one specimen on right of sheet).(refer Typification notes, below)

P. euphrasioides Benth. in T.Mitch., *J. trop. Austral.* 360 (1848); Benth. in DC., *Prodr.* 12: 700 (1848); F.Muell., *Fragm.* 6: 108 (1868); Benth., *Fl. austral.* 5: 104 (1870); F.Muell., *Syst. census Austral. pl.* 101 (1882); C.Moore, *Census New S. Wales* 53 (1884); Bailey, *Synop. Queensl. pl.* 389 (1883); Woolls, *Pl. New S. Wales* 83 (1885); F.Muell., *Sec. syst. census Austral. pl.* 169 (1889); Bailey, *Cat. indig. pl. Queensl.* 36 (1890); C.Moore, *Handb. fl. N.S.W.* 352 (1893); Briq. in Engl. & Prantl, *Nat. Pflanzenfam.* 4(3a): 220 (1895); Bailey, *Queensl. fl.* 4: 1203 (1901); Dixon, *Pl. New S. Wales* 232 (1906); Bailey, *Compr. cat. Queensl. pl.* 392 (1913); Althofer, *Cradle of Incense* 32–35 (1978).

Lectotype (here chosen): [*J.W. Drysdale for*] *T.L. Mitchell 513*, August 1846, 'Sub-trop. N.H. [Nova Hollandia], Camp 29 [near junction of Maranoa River and possibly Eastern Creek (26°14'54", 147°54'36"), Queensland]' (K); possible isolectotypes: 'Subtrop. N. Holl.' (K), 'Sir T.L. Mitchell, presented 1847, Queensland' (BM), 'Sir T.L. Mitchell, Australia' (TCD - two specimens on sheet). (refer Typification notes, below)

Spreading to divaricate shrub 0.5–1.2(-2) m high. *Branches* ± terete, rarely subquadrangular, usually densely glandular-pubescent throughout with 80–100 hairs/mm^2 with podiate glandular hairs (refer Notes, below), subsessile glands and non-glandular hairs present; non-glandular hairs ± straight, patent to spreading, or antrorse, 0.2–0.6 mm long, white; glands multicelled, 0.2–0.5 mm long. *Leaves* light green, viscid, strongly aromatic (when crushed); *petiole* absent or to 1 mm long; *lamina* ovate to elliptic, usually narrowly so, 5–9 mm long, 1–3 mm wide, with length 3.4–6(-8) times width, distance from base of maximum width 0.3–0.6 times total lamina length, usually densely covered with podiate glands, but, since glands are not always persistent, leaves sometimes appearing glabrescent or sparsely glandular; base cuneate to obtuse; margin with 2–4 obtuse lobes/teeth on each side, each lobe 0.2–0.6(-1) mm long, or margin occasionally subentire, rarely entire; apex obtuse; venation not visible, midrib slightly raised basally. *Inflorescence* a frondose racemiform conflorescence, 2–10-flowered; uniflorescence monadic.

Pherophylls absent. *Podium* 1.5–4 mm long, densely covered with podiate glands, subsessile glands also present. *Prophylls* not persistent, inserted at base of calyx (propodium to anthopodium ratio at least 20), opposite, narrow, oblong or ovate or obovate, 4–5 mm long, 0.7–2 mm wide, with length 2.5–4 times width, and distance from base of maximum width 0.3–0.4 (when ovate) or 0.7–0.8 (when obovate) times total lamina length, densely covered with podiate glands; base cuneate; margin entire or 1–3 lobed on each side; apex ± obtuse; venation not visible. *Calyx* green; inner and outer surfaces sparsely to densely glandular-pubescent with 25–80 podiate glands/mm^2; podiate glands (0.1-)0.2–0.6 mm long, multicelled, white, glandular apex of trichome not always persistent; tube 2.2–3.5 mm long; *abaxial lobe* very broadly to broadly ovate, 1.8–3 mm long, 2.5–3 mm wide at base, with length 0.6–1 times width, apex rounded; *adaxial lobe* very broadly to broadly ovate, 2–3 mm long, 3.5–4.2 mm wide at base, with length 0.6–1 times width, apex rounded to slightly emarginate, sinus c. 0.2 mm long, 1.5–2 mm wide, with adaxial lobe length 1–1.1 times abaxial lobe length. *Corolla* 9–15 mm long, mauve, with yellow to cream-coloured markings abaxially in throat and maroon markings abaxially and laterally in throat, inner abaxial-median surface of tube with irregular row of yellow spots flanked by brownish spots or maroon-orange spots, and laterally with dark violet/purple dots; outer surface glabrous or sparsely to moderately hairy distally (particularly in bud) with up to c. 40 hairs/mm^2, hairs 0.1–0.4(-0.7) mm long, ± spreading; inner surface glabrous, except mouth and base of lobes sparsely hairy with 16–32 hairs/mm^2, hairs 0.6–1.1 mm long; *tube* 8–10 mm long; *abaxial median lobes* spathulate, 8–10 mm long, 5–6 mm wide, with length 1.6–1.7 times width, apex irregular and rounded, bilobed (sinus 0.8–1 mm long, 2–3 mm wide distally); *lateral lobes* broadly ovate to ovate, 4–4.3 mm long, 3.4–3.5 mm wide, with length 1–1.2 times width, apex rounded and slightly irregular; *adaxial median lobe-pair* ± depressed ovate, 4–6 mm long, 8–12 mm wide, with length 0.5–0.6 times width, apex rounded to subtruncate, slightly irregular, bilobed (sinus 1–1.5 mm long, 1.5–3 mm wide distally). *Stamens* inserted 2–3 mm above base of corolla; filaments 5.5–7 mm long; anthers 1–1.3 mm long, lobes ± cristate on basal dorsal surface (narrowly triangular trichomes to c. 0.1 mm long) and with small acumen basally, connective extended to form a basal appendage 1.4–2 mm long, terminating in 1–5 narrowly triangular trichomes 0.2–0.4 mm long. Disc c. 0.7 mm long. *Pistil* 9–10 mm long; *ovary* cylindrical obovoid, 0.4–0.6 mm long, diameter at base 0.7–1 mm, lobes 0.1–0.2 mm long; *style* 8–8.5 mm long; *stigma lobes* 0.4–0.5 mm long. *Fruiting calyx* not or only slightly enlarged; abaxial lobe 3–4.5 mm long, 3–3.5 mm wide and length 1–1.2 times width; adaxial lobe 3–5.5 mm long, 3–5 mm wide and length 1–1.2 times width; adaxial lobe length 1–1.4 times abaxial lobe length. *Mericarps* 2–2.5 mm long, distally 1–1.2 mm extended beyond base of style, distal diameter 2.3–2.8 mm; seeds ellipsoid-cylindrical, 2–2.4 mm long, c. 1 mm diameter.

Habitat: Both subspecies occur on dry rocky, sandstone ridges and hillsides in open woodlands and low forests, commonly associated with *Callitris*, *Eucalyptus* (incl. *E. crebra*, *E. exserta*, *E. sideroxylon*, *E. trachyphloia*), *Acacia* (incl. *A. conferta*, *A. doratoxylon*, *A. longispicata*, *A. shirleyi*, *A. uncinata*) and the following understorey species: *Daviesia recurvata*, *Dodonaea filifolia*, *Hemigenia cuneifolia*, *Hovea*, *Jacksonia scoparia* and *Pultenaea*.

Conservation status: Although this widespread species is not considered to be endangered, neither subspecies is common and subsp. *cryptandroides* has a very restricted distribution.

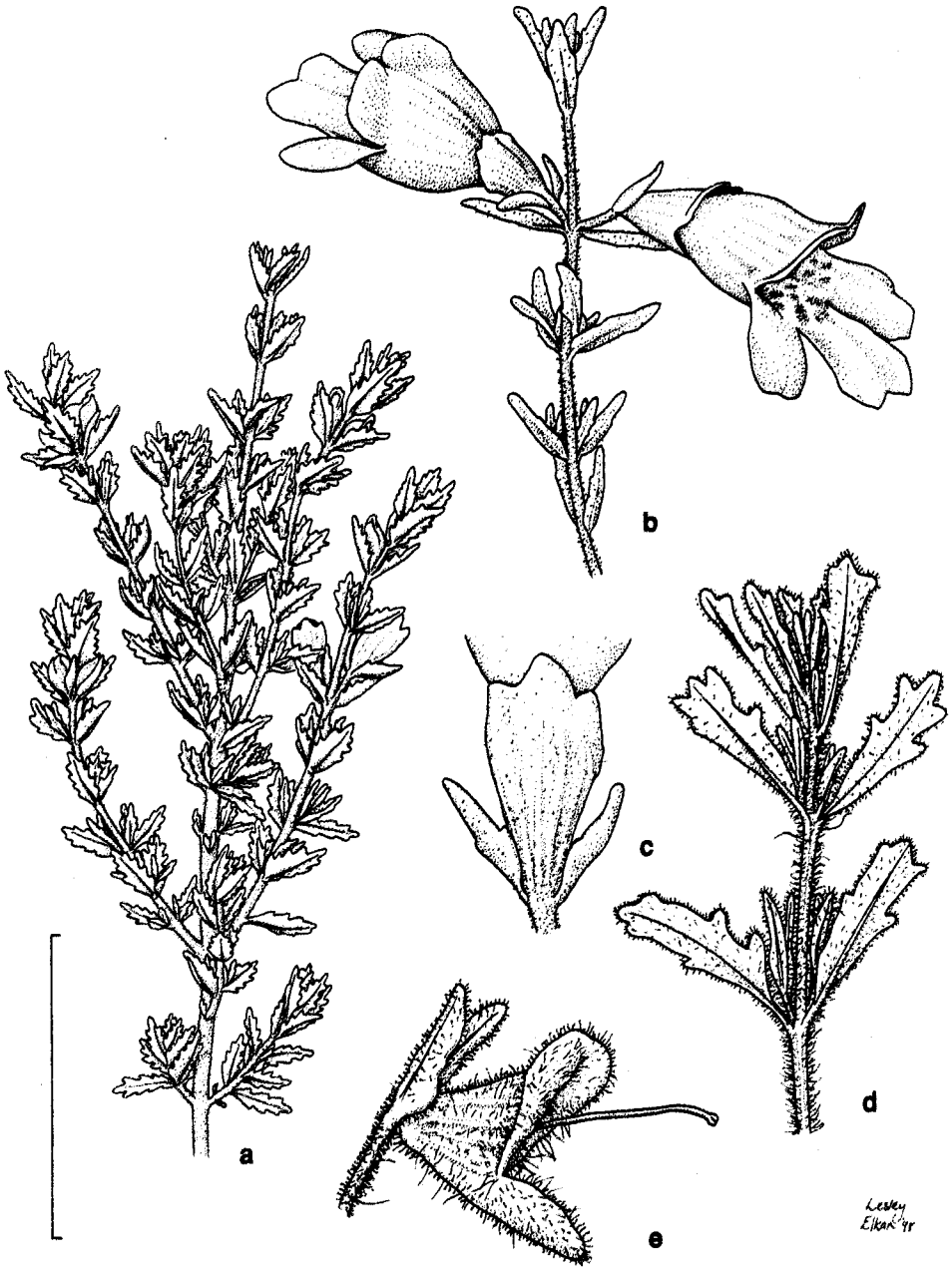


Figure 1. *Prostanthera cryptandroides* A.Cunn. ex Benth. subspecies *cryptandroides* a, Branchlet with flower buds; b, detail of flowers and branchlet of entire/subentire leaf variant, showing short hairs; c, detail of base of flower, showing prophylls, adaxial calyx lobe with apex 3-lobed, and base of corolla. *P. cryptandroides* A.Cunn. ex Benth. subspecies *euphrasioides* (Benth.) B.J.Conn d, Branchlet, showing distinct glandular-pubescent indumentum; e, detail of calyx, style and prophylls, showing glandular-pubescent inner calyx surface and adaxial calyx lobe with rounded apex. (a & c. *Constable 7224*; b. *Gibson & Miller s.n.*, 17 July 1988; d & e. *Moore 8787*). Scale bar: a = 30 mm; b & d = 15 mm; c & e = 10 mm.

Typification

1. Prostanthera cryptandroides. Cunningham refers to two plants of *Prostanthera* from the Mt Dangar area of the Upper Hunter Valley (Cunningham 1825). On 17 April 1825, Cunningham records that 'an intelligible [sic] servant' (Cunningham 1825) collected 'a Prostanthera without flowers, ...' for Cunningham from about '10 miles' ESE of Mount Dangar (near present-day Denman). On 22 April 1825, Cunningham collected *Prostanthera* on the southern approaches to the summit of Mount Dangar. He states: 'on a Pine or Callitris range, I gathered the following species - a delicate Prostanthera, ...'. Since the type collection is a flowering specimen, the former collection can not be considered as type material. In his 1825 specimen list, he describes a specimen of *Prostanthera* (*Cunningham 20*) as having 'floribus axillaribus solitariis'. In this list, he records the habitat of this plant as occurring 'on shelving Sandstone rocks ...', which matches the label of the type material at NSW that states 'On dry shelving sandstone hills on the NW branch of Hunter's River'.

2. Prostanthera euphrasioides. Although *Mitchell 513* (K) is here chosen as the lectotype of the name of this taxon, there is a possibility that some of the collections regarded as possible type material may be referrable to *P. odoratissima*. Unfortunately, information about the type material of this name and that of *P. odoratissima* (see below) is not sufficiently specific to make an unambiguous choice. As for *P. odoratissima* (see below), Bentham's (1848, p. 700) non-specific citation of the type of this taxon as 'In Australiâ orientali subtropicâ (Mitchell!)' makes it difficult to assign all the type material to this name.

John Waugh Drysdale, who was described as 'the store-keeper' (Mitchell 1848, pp. 6 and 359), collected this species for Mitchell 'In August' (*l.c.*).

3. Prostanthera odoratissima. The type of this name is unknown. Bentham (1848, p. 700) cited the type of this name as 'In Australiâ orientali subtropicâ (Mitchell)' (cf. *P. euphrasioides*, above). Unfortunately, none of Mitchell's collections can be definitely identified from this generalised locality. One collection at TCD, with 'Australia Sir T.L. Mitchell' hand-written (middle right) and 'Prostanthera odoratissima' hand-written (lower right) is referable to the type. J. Carrick (*in adnot.*) refers the type of this name to the following collections: 'T.L.Mitchell 271, 31 Aug 1846 Subtrop. N.H.' (K) and 'Sir T.L.Mitchell, presented 1847. Mantuan Downs, Qld' (BM). Unfortunately, I have not examined these collections. However, the former should be considered as potential lectotype material as Carrick's unpublished description of this material matches the protologue. Although the protologue (Bentham, in Mitchell 1848: 291) does not cite a type collection, it does describe the plant as 'viscoso-puberula', a feature more typical of subsp. *euphrasioides* than subsp. *cryptandroides*. Therefore, this name is here regarded as more likely to be synonymous with the former subspecies.

It is here concluded that this species was probably jointly collected by Stephenson and Mitchell because Mitchell records (1848, p. 290) that 'we found a plateau of flowering shrubs chiefly new and strange, so that Mr Stephenson was soon loaded like a market gardener'. W. Stephenson was described as 'Surgeon and Collector of objects of Natural History' (Mitchell 1848, p. 6).

Notes: Although Bentham originally described the leaves of *Prostanthera odoratissima* as 'paucidentatis' (Bentham, in Mitchell 1848: 291), he later described them as 'entire' (Bentham 1870: 104). This latter circumscription was frequently used to distinguish this taxon from *P. cryptandroides* (*s. str.*). However, Carrick's unpublished description of the K material (as referred to above) describes the leaves as 'entire or with one or two short blunt lobes'. I have found that specimens of both subspecies (as recognised here) occasionally have subentire or rarely entire leaves (these are cited below, under each subspecies).

Pedicellate glandular hairs, as used by myself in previous papers on *Prostanthera*, are here referred to as podiate glandular hairs, using the terminology of Conn (1995). This is a nomenclatural change only.

Key to subspecies

1a. Calyx and branches not appearing glandular because podiate glands <0.02 mm long; calyx with inner surface glabrous or with an occasional hair and gland (visible by 10X magnification); adaxial calyx lobe with apex rounded to 3-lobed .....**1.** subsp. ***cryptandroides***

1b. Calyx and branches distinctly glandular, podiate glands (0.1-)0.2–0.6 mm long; calyx with inner surface glandular (visible by 10X magnification); adaxial calyx lobe rounded to slightly emarginate .....**2.** subsp. ***euphrasioides***

1. subsp. **cryptandroides**

Basionym: P. cryptandroides A.Cunn. ex Benth., *Lab. gen. et sp.* 453 (1834).

Branches usually not distinctly hairy and not appearing glandular because podiate glands <0.02 mm long. *Calyx* appearing glandular, not distinctly hairy (with 10X hand lens); outer surfaces sparsely to densely glandular with 25–80 podiate glands/mm^2; podiate glands <0.02 mm long; inner surface glabrous or with an occasional hair and gland; *abaxial calyx lobe* with apex rounded to subtruncate or slightly emarginate (then sinus to 1 mm long and 1–1.2 mm wide); *adaxial lobe* with apex rounded to 3-lobed (then lateral lobes 0.4–1 mm long; median lobe to 1 mm long).

Distribution: This subspecies is confined to New South Wales, occurring in the Central Tablelands and Central Western Slopes.

Selected specimens with 2–4-lobed/toothed leaves (18 examined): New South Wales: Central Tablelands: Ridge near Green Gully, Glen Davis, *Coveny 9280 & Hind*, 24 Apr 1977 (A, AD 97814337, K, L, NSW 233715, MO, PRE, RSA); Sir John's Point, Mount Gundangaroo, *Constable 7224*, 28 Oct 1966 (K, NY); c. 40 km NNE of Lithgow, 1.5 km SSW of Glen Davis, *Telford 5008 & Crisp*, 25 Oct 1976 (AD 97709816). Central Western Slopes: Bumberry, Harvey Ranges, *Boorman s.n.*, Jun 1914 (NSW 128461).

Specimens with entire or subentire leaves:

New South Wales: Central Western Slopes: Upper Baerami Valley, c. 40 km from Sandy Hollow, *Gibson & Miller s.n.*, without date (MEL, NSW 228914, PERTH); Crescent Hill Ridge, c. 40 km from Sandy Hollow, *Gibson & Miller s.n.*, 17 Jul 1988 (NSW 228915, PERTH, MEL, MO, E, BRI); Denman, *Heron s.n.*, Jan 1909 (NSW 233709).

2. subsp. **euphrasioides** (Benth.) B.J.Conn **comb. nov.**

P. euphrasioides Benth. in T.Mitch., *J. trop. Austral.* 360 (1848)(*basionym*); *P. odoratissima* Benth. in T.Mitch., *J. trop. Austral.* 291 (1848) (*pro parte*, probably including type)(refer Typification notes, above).

Branches distinctly hairy. *Calyx* appearing distinctly hairy (with 10X hand lens), with inner and outer surfaces sparsely to densely glandular with 25–80 podiate glands/mm^2; podiate glands (0.1-)0.2–0.6 mm long; *abaxial calyx lobe* with apex rounded; *adaxial lobe* with apex rounded to slightly emarginate (then sinus c. 0.2 mm long, 1.5–2 mm wide).

Distribution: This subspecies extends from the Leichhardt region of Queensland (with one collection from North Kennedy) to northern New South Wales (North Western Slopes and North Western Plains).

Notes: The branches and calyx of this subspecies tend to be much hairier and glandular than those of subsp. *cryptandroides*.

One collection from the border region of New South Wales (Northern Tablelands) and Queensland (viz. *Boorman s.n.*, July 1904, Wallangarra [NSW 128463]) and one from the North Western Slopes (New South Wales) (viz. *Boorman s.n.*, June 1904, Howell [K, UC 437605]) have features that are intermediate between the two subspecies. These specimens have branches which are glandular-pubescent and the inner surface of the calyx is hairy (both features typical of subsp. *euphrasioides*); however, the outer surface is almost devoid of podiate glands (a feature typical of subsp. *cryptandroides*).

Selected specimens with 2–4-lobed/toothed leaves (100 examined): Queensland: North Kennedy: Cape River, *Anon.* [*Bowman*] *s.n.*, without date (MEL 43152). Leichhardt: W of Moura, *Jones 2915,* 25 Nov 1964 (CANB 189273 & 189274); 11 miles SW of Moura Township, *Lazarides 6916*, 6 Jul 1963 (BRI 051480, CANB 123592, MEL 43143, NSW 233195); Carnarvon Range between Roma & Springsure, *White 9484*, 26 Oct 1933 (A, BRI 162696). Port Curtis: Broad Sound, *Anon.* [*Bowman*] *s.n.*, without date, (MEL 43146). Burnett: 'Rocky bar', Hawkwood, *Hamilton s.n.*, Oct 1930 (BRI 162694); Eidsvold, *Bancroft s.n.*, Dec 1911, (BRI 162698). Maronoa: Bollan, *Gauba s.n.*, 5 Jun 1959 (AD 97512121). Darling Downs: near Drillham, *Blake 19168*, 26 Mar 1953, (NSW 232913); Auburn-Chinchilla road, 36.2 km by road N of Chinchilla, *Coveny 6812 & Hind*, 29 Aug 1975, (BRI, MEL, NSW 233776); 1 mile W of Goonalah, 8.5 miles W of Miles, *Melville & Blake s.n.*, 26 Mar 1953 (BRI 236046, MEL 537658, NSW 233774); 44 km N of Warrego Highway on Auburn Road, *Rodd 4163 & Hando*, 27 Nov 1984 (NSW 199230).

New South Wales: North Western Slopes: Warialda, *Davis s.n.*, May 1955, (AD 95809066); 2 miles E of Warialda, *Johnson s.n.*, 6 Nov 1951 (NSW 17510); Warialda, *Boorman s.n.*, Oct 1914, (NSW 128462). North Western Plains: Bruxner Highway, 4.9 km E of Yetman, *Coveny 11641 & Wilson*, 1 Nov 1983 (NSW 233716).

Specimens with entire or subentire leaves:

Queensland: Leichhardt: *Gittins 1187*, Jul 1966, Blackdown above Rockland Spring (BRI 068974, NSW 233708); Planet Creek, c. 30 miles NE of Rolleston Township, *Story & Yapp 293*, 30 Sep 1962 (BRI 051325, CANB 115533, NSW 233705). Darling Downs: Tara, *Althofer s.n.*, *anno* 1947, (NSW 233707); *Althofer 25*, [received at NSW] Dec 1949 (NSW 233706); Weranga, *Gordon 22*, 13 Dec 1947 (BRI 162756).

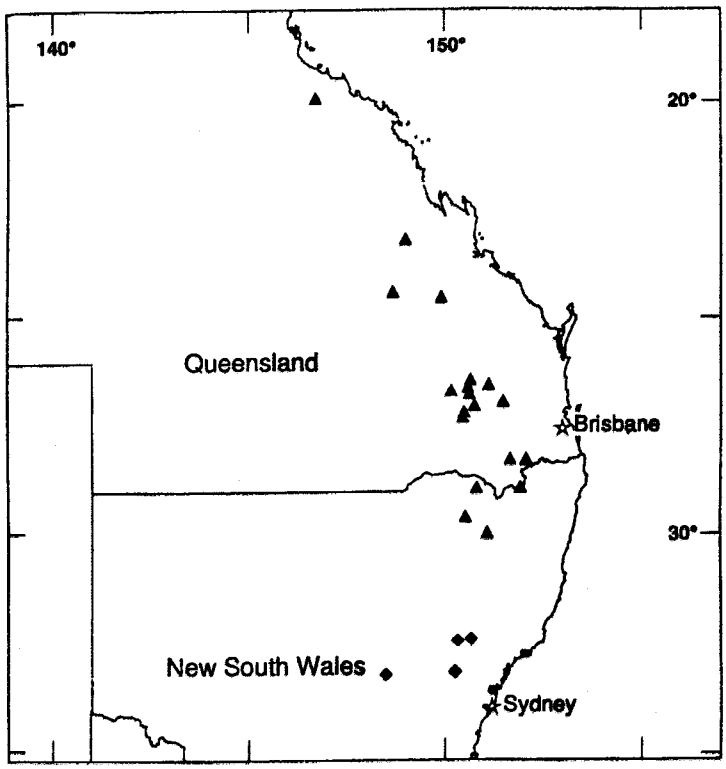


Fig. 2 Distribution of *Prostanthera cryptandroides (in Queensland and New South Wales);* subsp. *cryptandroides* (◆) ; subsp. *euphrasioides* (▲)

Acknowledgments

I gratefully thank Lesley Elkan for preparing the botanical illustration and Kathi Downs (both NSW) for preparing the distribution map.

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Prostanthera cryptandroides

Bentham

Conservation status

Prostanthera cryptandroides is listed as a **vulnerable species** on Schedule 2 of the NSW *Threatened Species Conservation Act* 1995 and as a **vulnerable species** under the Commonwealth *Endangered Species Protection Act* 1992.

Description

P. cryptandroides ssp. cryptandroides is a low-spreading shrub with a distinctive pleasant aroma commonly growing 0.5-1m high and up to 1m wide. The branches are moderately dense, and are often black or obscured due to "sooty mould". Leaves are light green, 5-9mm long, 1-3mm wide and strongly aromatic. Flowers are lilac to mauve and occur from September to May (Miller pers obs).

Distribution

P. cryptandroides is restricted, known from two disjunct occurrences at Glen Davis in the Central Tablelands Botanical Division and from the Denman–Baerami and Widden Valleys on the Central Western Slopes Botanical Division. Potential habitat may occur between these two sites.

Occurrences in conservation reserves

P. cryptandroides occurs in the Wollemi National Park and is likely also to occur within the Goulburn River National Park.

Habitat

At Glen Davis *P. cryptandroides* occurs in Open-forest dominated by *Eucalyptus fibrosa* (mapped as "Talus-slope Woodland" Map Unit 10I by Benson & Keith 1990). *Eucalyptus albens, E. crebra, E. dawsonii, E. punctata* and *Callitris endlicheri* may be present as subdominants. One record occurs in "Pagoda Rock Complex" Map Unit 21d (Benson & Keith 1990).

In the Denman–Gungal and Widden–Baerami Valley areas *P. cryptandroides* occurs on rocky ridgelines on Narrabeen Group Sandstones in association with a range of communities. Open-forest of *Eucalyptus dwyeri, E. fibrosa, E. punctata, Acacia doratoxylon* and *Allocasuarina verticillata;* Open-heath / Open-scrubland of *Calytrix tetragona, Isopogon dawsonii, Leptospermum parvifolium, Acacia crassa, A. doratoxylon* and *Callitris endlicheri;* the ecotone between Low Closed Forest of *Acacia doratoxylon, Eucalyptus dwyeri, Allocasuarina verticillata* and Low Open-scrub/heath of *Acacia triptera, Micromyrtus sessilis, Leptospermum trinervium* and *Isopogon dawsonii* (These communities are described by Bell (in prep.) as Narrabeen Rocky Heath, Narrabeen Acacia Woodland and Narrabeen Exposed Woodland), and Open heath of *Calytrix tetragona, Letospermum parvifolium, Isopogon dawsonii* and Open Scrubland of *Eucalyptus dwyeri, Baeckea densifolia, Dillwynia floribunda, Aotus ericoides* and *Hemigenia cuneifolia.*

Ecology

It is thought that *P. cryptandroides* has a lifespan of more than 15 years. It flowers from September to May but, depending on seasonal conditions, it is likely to

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flower sporadically in any month of the year.

P. cryptandroides flowers possess pollination guides and so is presumably pollinated by insects. Gene flow is thus likely to be facilitated by pollen dispersal rather than by seed dispersal, although some wind dispersal may occur on exposed sites.

P. cryptandroides is fire sensitive (Miller and Gibson 1999), with recruitment occurring from the soil seed bank. Reproductive maturity is likely to occur at 3–5 years. *P. cryptandroides* does not appear to reproduce vegetatively.

Threats

Threats to *P. cryptandroides* populations include habitat loss through land degradation (such as erosion), trampling and grazing by domesticated and feral animals, inappropriate fire regimes, habitat modification from weed invasion, reduced water quality/agricultural or residential runoff, nutrification of the soil due to animal excrement or the application of agricultural chemicals (especially fertiliser upslope of the habitat), and altered hydrological function and erosion. Runoff, erosion and sedimentation are particularly significant issues due to the sensitivity of *Prostanthera* to waterborne and soil pathogens.

Management

Management should be aimed at protection of habitat and the control, minimisation or removal of threats.

Fire regimes should be managed to allow intervals of greater than 8 years. It may be important to maintain unburnt "refuge" areas containing large numbers of *P. cryptandroides* for long periods of time to assist in assuring the survival of the as yet unknown specific pollination vector(s).

Habitat should be managed to maintain continuity between individuals within sub-populations, and to avoid artificially creating new sub-populations. A buffer should be placed around sub-populations to conserve seed stored in the soil.

Recovery Plan

A recovery plan has not been prepared for *P. cryptandroides*..

For further information contact

Threatened Species Unit, Central Directorate, NSW NPWS, PO Box 1967, Hurstville NSW 2220. Phone (02) 9585 6678 or visit our website www.npws.nsw.gov.au.

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May 2000

Prostanthera cryptandroides

Bentham

The following information is provided to assist authors of Species Impact Statements, development and activity proponents, and determining and consent authorities, who are required to prepare or review assessments of likely impacts on threatened species pursuant to the provisions of the *Environmental Planning and Assessment Act* 1979. These guidelines should be read in conjunction with the NPWS *Information Circular .No. 2: Threatened Species Assessment under the EP&A Act: The '8 Part Test' of Significance* (November 1996) and with the accompanying "Threatened Species Information" sheet.

Survey

Prostanthera cryptandroides is most easily located when flowering, although flowers are not required for identification. Non-flowering plants on ridgetops often blend into the surrounding vegetation and are easily overlooked without intensive survey work. Flowers are not required for identification.

Seedlings are cryptic and intensive survey work is required to ascertain their presence/absence in burnt areas.

If a talus slope is being searched, each rise or spur should be traversed up to the base of the cliffline, with emphasis on areas with a sparse medium-large shrub layer and open upper canopy. Surveys on ridgetops should include comprehensive searches in all exposed localities including ledges, but should ensure that "minor" habitat niches within scrubland/woodland/open–forest are also searched.

Life cycle of the species

P. cryptandroides has low germination rates and variable vegetative reproduction response and so is unlikely to recolonise a site through natural recruitment *P. cryptandroides.* is fire sensitive, adult plants being killed by fire. Fire intervals of less than 5–8 years are likely to result in sub-population declines, while fire intervals of less than 3–5 years are likely to result in *P. cryptandroides* extinction.

Prostanthera seeds are thought to be stored in the upper layers of the soil profile. Therefore the seedbank is sensitive to any disturbance to this layer, particularly in the form habitat degradation such as soil ersosion and sedimentation. *Prostanthera* is sensitive to waterborne and soil pathogens.

An activity which results in the modification or removal of associated vegetation is also likely to impact upon the life cycles of pollination vectors and therefore *P. cryptandroides.*

Threatening processes

"High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition" is listed in the NSW *Threatened Species Conservation Act* 1995 as a key threatening process and may affect *P. cryptandroides.*

Viable local population

The minimum size of a viable local population of *P. cryptandroides* is not known. Research by Tierney (1996) on *Prostanthera* indicates that relatively small populations are capable of successful reproduction, at least in the short term.

Significant area of habitat

The following factors should be considered in determining a significant area of *P. cryptandroides* habitat:

- the number, density and population dynamics (age) of the individuals occurring there;
- the proximity of the habitat in question to existing *P. cryptandroides populations*;
- whether the habitat can be managed.

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Isolation/fragmentation

P. cryptandroides. has a relatively continuous distribution however, both natural and modified conditions may break the continuity of distribution into a series of sub-populations.

Fragmentation or isolation of *P. cryptandroides* is likely to result in reduced reproductive success, and inbreeding depression as a consequence of mating among close relatives.

Regional distribution of the habitat

P. cryptandroides occurs in the Central Tablelands and Central Western Slopes botanical sub-divisions of NSW (Benson and McDougall 1997) within a range of plant communities. It also occurs entirely within the Sydney Basin Bioregion.

Limit of known distribution

The northern distributional limit of *P. cryptandroides* is Myambat (west of Denman), and the southern limit is Glen Davis. A historic record exists for the Harvey Ranges between Manildra and Parkes.

Adequacy of representation in conservation reserves

Although a sub-population of *P. cryptandroides* occurs within the Wollemi National Park, the species is not adequately conserved. Most sub-populations are small and are vulnerable to a range of degrading influences, especially repeated fire events.

Critical habitat

Critical habitat cannot be declared for *P. cryptandroides* as it is not listed on Schedule 1 of the NSW *Threatened Species Conservation Act* 1995.

For further information contact

Threatened Species Unit, Central Directorate, NSW NPWS, PO Box 1967, Hurstville NSW 2220. Phone (02) 9585 6678 or visit our website www.npws.nsw.gov.au.

References

Benson, D.H. and McDougall, L. (1997) Ecology of Sydney plant species Part 5 Flacourtiaceae to Myrsinaceae in *Cunninghamia* 5(2).

Tierney, D.A. (1996) *Prostanthera sp. Somersby; is recovery possible*? Unpublished report, Masters of Natural Resource Management, University of New England, Armidale.

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May 2000

Prostanthera discolor

R. T. Baker

The following information is provided to assist authors of Species Impact Statements, development and activity proponents, and determining and consent authorities, who are required to prepare or review assessments of likely impacts on threatened species pursuant to the provisions of the *Environmental Planning and Assessment Act* 1979. These guidelines should be read in conjunction with the NPWS *Information Circular No. 2: Threatened Species Assessment under the EP&A Act: The '8 Part Test' of Significance* (November 1996) and with the accompanying "Threatened Species Information" sheet.

Survey

Prostanthera discolor is most easily located and identified when flowering. When not in flower the species is difficult to locate, its open growth form merging into the surrounding vegetation.

Identification of seedlings and juvenile plants requires microscopic examination or chemical analysis. Surveys undertaken in habitat with a recent fire history will require intensive searches to determine presence /absence.

P. discolor is easily confused with *P. ovalifolia sens. Lat*, which occurs in the same area. The species is discernible from this taxon in the bud or fruiting stage, as well as by the distinctive aroma of its foliage. *P. discolor* flowers in short compact clusters whereas *P. ovalifolia sens. lat.* the clusters are more elongated.

Due to the habitat specialisation of this species, survey should include intensive searches of creeklines, intermittent drainage lines and sideslopes. Likely habitat areas are sites with an open canopy and/or landform features such as rock outcrops, especially boulder chokes, exposed rock platforms, ledges and cliff bases.

Life cycle of the species

Prostanthera seeds are thought to be stored in the upper layers of the soil profile. The dormancy mechanisms of *P. discolor* seed are unknown.

P. discolor is fire sensitive and adult plants are killed by fire.

The lifecycle of *P. discolor* is likely to be disrupted physical destruction of plants, by fires at intervals of less than 8 years, by seedbank disturbance and habitat modification such as weed invasion, reduced water quality/agricultural or residential runoff, nutrification of the soil due to animal excrement or the application of agricultural chemicals (especially fertiliser upslope of the habitat), altered hydrological function and erosion. Runoff, erosion and sedimentation are significant issues due to the sensitivity of *Prostanthera* to waterborne and soil pathogens.

Any activity which results in the modification or removal of associated vegetation is also likely to impact upon the life cycles of pollination vectors and therefore *P. discolor*.

Threatening processes

"High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition" is listed in the NSW *Threatened Species Conservation Act* 1995 as a key threatening process and may affect *P. discolor*.

Viable local population

The minimum size of a viable local population of *P. discolor* is not known. Research by Tierney (1996) on *P. junonsis* indicates that relatively small populations are capable of successful reproduction, at least in the short term.

Significant area of habitat

In assessing whether a significant area of habitat is to modified or removed, the focus on assessment should be with reference to the areas of known habitat within the current distribution (ie is the

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area of habitat significant in relation to the existing distribution).

The following factors should be considered in relation to determining whether a significant area of *P. discolor* habitat exists:

- the number, density and population dynamics (age) of the individuals occurring there;

the proximity of the habitat in question to existing *Prostanthera P. discolor* sub-populations; and

whether the habitat can be managed.

Isolation/fragmentation

Two areas of *P. discolor* habitat have been identified, both within the Goulburn River Catchment. The two populations are separated by approximately 40km of developed agricultural lands and rugged natural terrain. Potential habitat occurs within this expanse so it is likely that sub-populations of the species may be found here.

Gene flow is likely to be facilitated by pollen dispersal rather than by seed dispersal. Seed may also be dispersed by water. Fragmentation or isolation of *P. discolor* is likely to result in reduced reproductive success or inbreeding depression, from mating among close relatives.

Regional distribution of the habitat

P. discolor habitat occurs within the Sydney Basin Bioregion.

Limit of known distribution

The northern distributional limit of *P. discolor* occurs at Coxs Gap and the south-eastern limit is in the Baerami Valley.

Adequacy of representation in conservation reserves

Despite occurring entirely in Wollemi National Park, *P. discolor* is not considered to be adequately conserved due to its small population.

Critical habitat

Critical habitat cannot be declared for *P. discolor* as it is not listed on Schedule 1 of the NSW *Threatened Species Conservation Act* 1995.

For further information contact

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References

Tierney, D.A. (1996) *Prostanthera sp. Somersby; is recovery possible*? Unpublished report, Masters of Natural Resource Management, University of New England, Armidale.

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Prostanthera stricta

R. T. Baker

Conservation status

Prostanthera stricta is listed as a **vulnerable species** on Schedule 2 of the NSW *Threatened Species Conservation Act* 1995 and as a **vulnerable species** under the Commonwealth *Endangered Species Protection Act* 1992.

Description

P. stricta is an erect, bushy, aromatic shrub, commonly growing 1–2m high and 1–2m wide. The branches are covered with moderately dense layer of hairs. Leaves are tapered, 7–14mm long and 4–6mm wide, the upper-surface is mid green, with a moderate cover of hairs, and the lower surface is paler. Flowers are borne in pairs and are pale mauve to deep purple. (Miller pers. obs.).

Left: *Prostanthera stricta* Genowlan Mountain; Right: *Prostanthera aff. stricta* Widden Valley.

Plants assigned to *P. stricta* in Harden 1992 from the northern Wollemi area (referred to as *P.* aff *stricta*) differ to the type form by having leaves which are broad ovate to ovate and leaf bases which are often broadly rounded. Its leaves may appear triangular when the leaf margins are strongly recurved as in periods of drought or on herbarium specimens. The whole plant has a slightly longer and a greater density of indumentum. (Miller pers. obs. 1999).

Distribution

P. stricta s. str. is known from Mount Vincent and Genowlan Mountain, in the Central Tablelands Botanical Division of NSW and *P.* aff. *stricta* is known from Dingo Creek and the Widden and Baerami Valleys in the Central Western Slopes Botanical Division of NSW.

Occurrences in conservation reserves

P. stricta s. str. is not known to occur within any conservation reserve while *P.* aff. *stricta* occurs within Wollemi National Park.

Habitat

P. stricta s. str. occurs in areas receiving a rainfall of 600–700mm annually (Benson and McDougall 1997), primarily at the geological interface of fertile basalt caps and infertile sandstones at 800–1050m. The habitat is often characterised by steep rocky sideslopes, cliff lines, sandstone platforms or gentle slopes with exposed sandstone outcroppings. The species grows both in areas of skeletal soil and on deeper, well-drained soil profiles.

At Mount Vincent the habitat of *P. stricta s. str* is restricted. to the gradation from basalt to sandstone, which is frequently abrupt, occupying a narrow band of 5-50m. *P. stricta s.*

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str is often a locally dominant undershrub in heath/scrub communities along cliff edges, or as an understorey species within a range of open–forest or tall open–forest types, or in adjacent transitional communities.

P. aff. *stricta* occurs on Narrabeen Formation and Quaternary alluvial and colluvial deposits. It can be a locally dominant shrub on and at the base of conglomerate slope/cliffs and on ledges and crevices, sandy colluvium at the base of cliffs, in fluvial depositional zones such as banks and bars, and on sandy alluvial deposits, and rocky side slopes

On the above substrate types *P.* aff. *stricta* respectively occurs in: low scrub community with *Backhousia myrtifolia, Cryptandra buxifolia, Isopogon dawsonii* and *Leucopogon muticus*; open-forest of *Eucalyptus caleyi, E. punctata, E. sideroxylon, Allocasuarina torulosa* and *Macrozamia communis;* open-forest of Eucalyptus *tereticornis, E. sideroxylon, Angophora floribunda, Acacia caesiella* and *Callistemon salignus, and* open-forest of *Angophora floribunda, Eucalyptus fibrosa* and *E. punctata.*

Ecology

It is estimated that *P. stricta s. str* lives 10 – 15 years.

The lifespan of *P.* aff. *stricta* is unknown. The clonal capabilities of this taxon in riparian zones potentially allows an indefinite lifespan.

The mechanism of seed dispersal amongst *Prostanthera* is not known. Conn (1984) observed seed dispersal by birds in *Prostanthera lasianthos* but notes that it seems likely that the mericarps usually fall directly to the ground with very little lateral displacement caused by air currents.

Gene flow is likely therefore to be facilitated by pollen dispersal rather than by seed dispersal. In *P. stricta s. str.* seed dispersal may be assisted by wind in habitat along or close to cliff edges. *P.* aff. *stricta* may be dispersed by water as most known sites are within the riparian zone.

Prostanthera seed is difficult to germinate in horticultural endeavours. This has been attributed to low viability, complex dormancy mechanisms, and short duration of seed viability.

The flowering period for *P. stricta* is usually winter–spring (Harden 1992) and flowers are likely to be pollinated by insects. Keighery (1980) records eleven species of *Prostanthera* to be insect pollinated.

P. stricta is likely to be fire sensitive, with recruitment occurring from the soil seed bank. Reproductive maturity of the species is likely to be between 3-5 years and peak maturity is not likely to be reached until 5-8 years (Miller pers obs.) *P. stricta* s. str does not appear to reproduce vegetatively, but the northern Wollemi taxon is capable of clonal reproduction by layering of branches when growing in the riparian zone.

Threats

Threats to *P. stricta* include clearance of habitat for agriculture, mining, residential development and road construction, and inappropriate fire regimes.

Increase in the density of dwellings may increase the incidence of high source degradation or pathogen infection points, such as septic systems and access roads.

Trampling and grazing by domesticated and feral animals may present a long-term risk.

Management

Exclusion fencing will reduce the impacts of grazing and trampling on by domestic and feral stock. Fencing in some circumstances may reduce the threat of pathogenic organisms by

minimising intrusion by visitors and stock into sensitive areas.

Fire regimes should be managed to allow intervals of greater than 8 years. It may be important to maintain unburnt "refuge" areas containing large numbers of *P. stricta* for long periods of time to assist in assuring the survival of the yet unknown specific pollination vector(s).

Management should maintain a buffer around sub-populations to conserve seed stored in the soil, and habitat should be managed to maintain continuity between individuals within sub-populations and to avoid artificially creating new sub-populations.

Recovery Plan

No recovery plan has been prepared for *P. stricta*

For further information contact

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References

Benson, D.H. and McDougall, L. (1997) Ecology of Sydney plant species Part 5 Flacourtiaceae to Myrsinaceae. *Cunninghamia* 5(2).

Conn, B.J. (1984) A taxonomic revision of *Prostanthera* Labill. Section *Klanderia* (F.v. Muell.) Benth. (Labiatae). *J. Adelaides ? Bot. Gard.* 6: 207–348.

Harden, G. J. (ed.), *Flora of New South Wales* vol. 3 (NSW University Press: Kensington).Harden 1992

Keighery, G.J. (1980) Bird pollination in south Western Australian: A checklist. *Plant System. Evol.* 135: 171-176.

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Prostanthera stricta

Baker

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Survey

Prostanthera stricta is most easily observed during the flowering period due to the profusion of mauve–purple flowers. Experience is required to identify non-flowering plants. Caution should be exercised in rapid population counts when assessing seedlings and juvenile plants. These may be misidentified by casual observation as they may superficially resemble non-fertile plants of Gonocarpus spp. in general form. Both genera may exist within the same habitat.

Due to the often restricted or localised occurrences of this species, surveys should target all possible habitat areas.

Life cycle of the species

P. stricta has low germination rates and variable vegetative reproduction response and so is unlikely to recolonise a site through natural recruitment *P. stricta* . is fire sensitive, adult plants being killed by fire. Fire intervals of less than 5–8 years are likely to result in sub-population declines, while fire intervals of less than 3–5 years are likely to result in *P. stricta* extinction.

Prostanthera seeds are thought to be stored in the upper layers of the soil profile. Therefore the seedbank is sensitive to any disturbance to this layer, particularly in the form habitat degradation such as soil ersosion and sedimentation. *Prostanthera* is sensitive to waterborne and soil pathogens.

An activity which results in the modification or removal of associated vegetation is also likely to impact upon the life cycles of pollination vectors and therefore *P. stricta.*

Threatening processes

"High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition" is listed in the NSW *Threatened Species Conservation Act* 1995 as a key threatening process and may affect *P. stricta.*

Viable local population

The minimum size of a viable local population of *P. stricta* is not known. Research by Tierney (1996) on *Prostanthera* indicates that relatively small populations are capable of successful reproduction, at least in the short term.

Significant area of habitat

The following factors should be considered in relation to determining

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whether a significant area of *P. stricta* habitat exists:

- the number, density and population dynamics (age) of the individuals occurring there;
- the proximity of the habitat in question to existing *P. stricta* sub-populations;
- whether the habitat is capable of being managed.

Isolation/fragmentation

P. stricta s. str. has a relatively continuous distribution. However, both natural and modified conditions may effectively break the continuity of distribution into a series of sub-populations. *P.* aff. *stricta* is known to occur in three sub-catchments and these should be treated as separate management units.

Fragmentation or isolation of *P. stricta* is likely to result in disruption to the plant's lifecycle as a consequence of inbreeding depression in small populations arising from mating among close relatives.

Regional distribution of the habitat

P. stricta s. str habitat occurs in the Central Tablelands Botanical sub-division (Benson and Keith 1990).

P. aff. *stricta.* is known only from Dingo Creek and the Baerami and Widden Valleys where it grows on Narrabeen Group alluvial and colluvial sediments and steep rock slopes.

All records for *P. stricta* are known from the South Eastern Highlands and the Sydney Basin Bioregions.

Limit of known distribution

The northern distributional limit of *P. stricta* occurs at Dingo Creek (south-west of Sandy Hollow), and the southern limit occurs at Genowlan Mountain, east of Capertee.

Adequacy of representation in conservation reserves

P. stricta s. str. is not known to occur in any conservation reserve.

P. aff. *stricta* is recorded within the Wollemi National Park, but is poorly conserved.

Critical habitat

Critical habitat cannot be declared for *P. stricta* as it is not listed on Schedule 1 of the NSW *Threatened Species Conservation Act* 1995.

For further information contact

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ACKNOWLEDGEMENTS

The Prostanthera & Westringia Study Group would like to thank the Director of the National Herbarium of New South Wales who kindly gave permission to utilise artworks and modify botanical descriptions contained within this newsletter. Artworks of *Prostanthera askania* are skillfully drawn by Lesley Elkan *Telopea* 7 (3) December 1997. The line drawings of *Plectranthus cremnus* were modified from artworks by Nicola Oram *Telopea* 4 (4) March 1992. Line drawing of orchids by Mr. G.V. Scammell are derived from H.M.R. Rupp (1969) *The Orchids of NSW* and from Harden (1993) *Flora of New South Wales* Vol 4.

The cover illustrations of P*rostanthera lasianthos* is modified from artwork by *Mr.* L. Dutkiewicz in Conn 1984 A Taxonomic Revision of Prostanthera Labill. Section Klanderia (F.v. Muell.) Benth. (Labiatae), *J. Adelaide Bot. Gard.* 6(3): 207-348 (1984).

The illustrations of *Prostanthera discolor* and *P. stricta* are modified from artwork by R.T. Baker in Baker R.T. (1896) Two New Species of Prostanthera from New South Wales, *Proceedings of the Linnean Society New South Wales* Vol. XXI 1896.

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Scanning, word processing and printing equipment kindly provided by Cumberland Flora & Fauna Interpretive Services.