



Euphrasia amplidens

pieman eyebright

TASMANIAN THREATENED SPECIES NOTESHEET

Image by Mark Wapstra

Scientific name: *Euphrasia amplidens* W.R.Barker, J. *Adelaide Bot. Gard.* 26(3): 23 (2013)

Common name: pieman eyebright (Barker et al. 2013)

Group: vascular plant, dicotyledon, family **Scrophulariaceae** (now **Orobanchaceae**)

Status: *Threatened Species Protection Act 1995:* **endangered**

Environment Protection and Biodiversity Conservation Act 1999: **Not listed**

Distribution: Endemic status: **endemic to Tasmania**
Tasmanian NRM regions: **Cradle Coast**

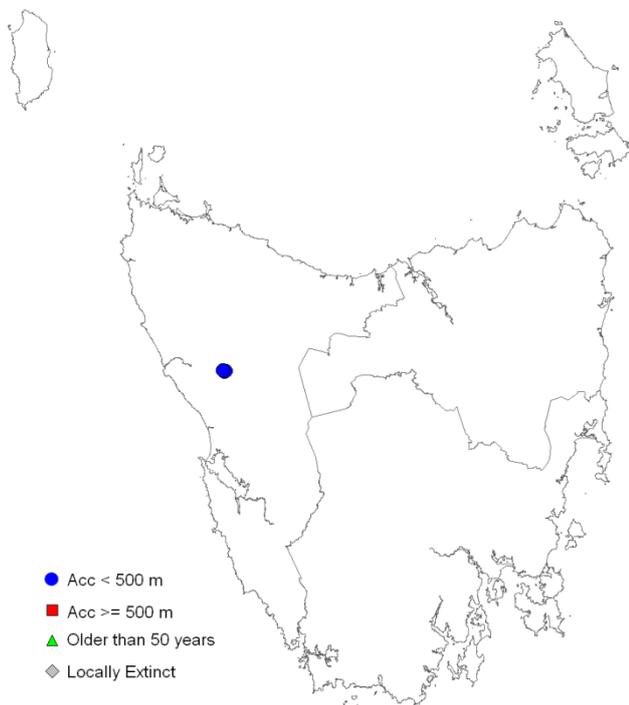


Figure 1. The distribution of *Euphrasia amplidens*, showing Natural Resource Management regions (note: the recently discovered Harman River subpopulation is not shown)

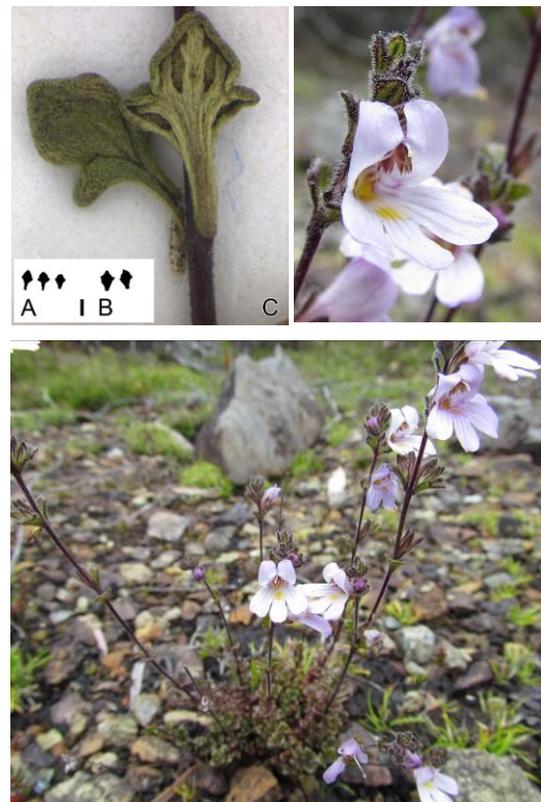


Plate 1. Growth habit and inflorescence of *Euphrasia amplidens*; insets: leaf shape and flowers (images by Mark Wapstra, and Miguel de Salas & Mark Wapstra (for leaf shape insert))

SUMMARY: *Euphrasia amplidens* (pieman eyebright) is a short-lived perennial herb that grows in openings amongst dense shrubby vegetation on ultramafic substrates. It appears to be restricted to a highly localised part of the catchment of the Pieman River in the central west of Tasmania. The species was recognised as unique during the 1980s when known only from specimens collected in the late 1800s but only re-discovered in late 2011. The species is known from two subpopulations extending over 15 km², but estimated to occupy less than 1 ha and support fewer than 250 individuals. This increases the risk of losses through chance events, particularly as similar eyebright species are short-lived and may become restricted to soil-stored seed if conditions become unfavourable for recruitment. Risks are exacerbated by their semi-parasitic nature, making them susceptible to additional factors that may influence their hosts. The seedlings are particularly susceptible to low moisture levels prior to developing their parasitic attachments, making highly localised species such as *Euphrasia amplidens* susceptible to even small changes in rainfall patterns. Other threats include an inappropriate fire regime, and mineral exploration and extraction.

IDENTIFICATION AND ECOLOGY

Euphrasia, commonly known as eyebright, is a genus of semi-parasitic annual or perennial terrestrial herbs. In 2011, specimens from Tasmania's west coast region of a *Euphrasia* species were collected which matched a Tasmanian specimen collected in the 1800s. While previously identified as distinctive (Barker 1982), the species was not formally described until rediscovered and collected in 2011 (Barker et al. 2013). The new species, *Euphrasia amplidens*, appears to be another very narrow range endemic restricted to ultramafic (serpentine) substrates, a phenomenon recognised globally with threatened flora (Anacker et al. 2011). It classifies as a lowland *Euphrasia* species.

Most Tasmanian lowland *Euphrasia* species are annual or relatively short-lived perennials (up to 5 years) (Potts 1997). Branches generally terminate in an inflorescence. Mortality rates can be high, particularly after fruiting, as new

growth from axillary buds is not easily stimulated following reproductive activity, and adventitious shoots are uncommon for lowland taxa. They therefore rely on the successful recruitment of seedlings for persistence. The main flowering period is in spring, though plants can have a secondary flush of flowers in autumn in favourable seasons (Threatened Species Section 2011). Most seed is released from late summer to autumn and germinates in late autumn to winter. Seed production is copious. The vast majority of seed is shed within 30 cm of the plants, contributing to the usually restricted distribution of taxa. Some dispersal by water movement or splash is apparent. Flowering specimens of *Euphrasia amplidens* have been collected in late November and early December, immature fruit in December, and capsules with mature seeds in May (Barker et al. 2013).

Euphrasia species have a soil-borne seed store that anecdotal evidence suggests may remain viable for 20 to 30 years. As plants are generally short-lived, occurrences can dwindle to low numbers or become restricted to soil-stored seed if conditions for germination and the establishment of seedlings are unfavourable. Seedlings are particularly sensitive to low moisture levels prior to making parasitic attachments to the roots of their non-specific hosts (Potts 1997, Threatened Species Section 2011). Seedlings that are not able to form parasitic attachments to hosts are generally stunted and unlikely to survive to maturity. Recruitment is dependent on the availability of open areas, caused either by exposure (e.g. windswept areas, cliff faces, high altitude sites with stunted vegetation, seasonal inundation) or disturbance such as animal or vehicular tracks, grazing or fire. Dwindling occurrences in lowland sites retreat to moister open sites such as those along tracks or in saddles or depressions. Exposure to light appears to be required for germination. The response to fire appears delayed and indirect by increasing openness, with germination generally inhibited by heat or smoke treatment. Seed produced by many lowland taxa will have varying proportions of dormant seed that contribute to the soil seed store. Anecdotal evidence suggests

that the dormancy can be broken by high rainfall over a prolonged time.

The openness of the sites supporting *Euphrasia amplidens* is probably maintained by a combination of naturally poor drainage and fire events. The disturbance history of the area includes some mineral extraction that may have contributed to the openness of the habitat. The sites in open sediment pans are on or close to old tracks and at least one appears to have been worked over with evidence of old mullock piles and some anthropogenic drainage channelling.

Survey techniques

Surveys are best conducted during the peak flowering period in late spring to early summer when plants are readily detectable. The species can be identified when not in flower, though the chance of detection is low. Surveys should target moister open patches as plants are most likely to persist in these sites if occurrences are in decline.

Description

Euphrasia amplidens is a perennial herb to about 15 cm tall with a few to several ascending to erect branches arising from ground level. The leaves are opposite. The uppermost leaves of main inflorescence-bearing branches are subspathulate, 3.5 to 5.8 mm long by 2 to 4 mm wide, with long, narrowly attenuate, petiole-like bases. These leaves have a bluntly obtuse tooth, 0.5 to 0.8 mm long, along each margin about half way along the leaf. The apical tooth is bluntly broadly acute and 1.7 to 2.2 mm long by 1.8 to 2.8 mm wide. Sessile gland patches are exposed on the underside in the distal half of the leaf. Leaves on basal parts and on shoots are much smaller. The inflorescences are dense racemes bearing about 8 to 16 or more flowers, with the lowest one or two nodes bearing 1 to 2 flowers with 1 to 1.5 mm long pedicels. The bracts are similar to the upper leaves, but are densely glandular hairy. The green calyx, with black lined margins, midlines of teeth and below clefts, is about 3 to 5 mm long and covered externally by dense to moderately dense glandular hairs 0.2 to 0.3 mm long. The corolla is about 8.5 to 9.5 mm long along the upper side, and is blue purple on the hood and paler whitish with fine blue-purple lines on the

front of the lobes. The flowers have a mid-yellow spot on lower side of mouth and deep in the throat at the point of insertion of stamens. The stamens are about 3.5 to 4.5 mm long with glabrous filaments and mid-brown anthers about 1.6 to 1.7 mm long. The anther backs are glabrous where the filaments are attached. The laterally compressed obloid capsule is 3.5 to 4 mm long, slightly shorter than the surrounding calyx and with a rounded apex in lateral view. The white seeds are obliquely broad ellipsoid and 1.3 to 1.5 mm long by 6 to 1 mm wide.

[description based on Barker et al. (2013)]

Confusing species

Due to its glabrous anther backs, *Euphrasia amplidens* belongs in section *Striatae* of the genus, but differs from most species of that section by the corolla not being prominently striated. It shares glandular hairs with *Euphrasia gibbsiae*, but differs by its attenuate leaf bases. Such leaf bases are evident in *Euphrasia striata*, *Euphrasia fragosa* and *Euphrasia semipicta* but *Euphrasia amplidens* differs from these by its glandular indumentum, which is dense on the calyces, bracts and rachis and extends onto the leaves and branches. In the field, *Euphrasia amplidens* appears somewhat like *Euphrasia gibbsiae* and *Euphrasia striata*. However, *Euphrasia amplidens* is distinctive in its leaf morphology and may be the only *Euphrasia* species restricted to ultramafic substrates in western Tasmania. The variation amongst the many *Euphrasia* taxa, some of which are not formally described, can make identification to species level difficult and specialist confirmation of any specimens suspected of being *Euphrasia amplidens* is strongly recommended.

DISTRIBUTION AND HABITAT

Euphrasia amplidens is endemic to Tasmania, apparently restricted to the Wilson and Harman river catchments, in the broader Pieman River watershed, west of Tullah, in the State's central west (Table 1, Figure 1). It occurs in riparian scrub on serpentinite.

One of the Wilson River sites is about 1 km from the others, separated from them by a major river, while the other two are about

500 m apart, separated by dense shrubby vegetation seemingly highly unsuitable for the species (Barker et al. 2013). Two of the sites are broad flats with impeded drainage, effectively permanently slightly inundated due to the high regional annual rainfall. They are surrounded by denser shrubby eucalypt woodland dominated by *Eucalyptus nebulosa*. Plants grow on the margins of the open sediment pans and on the edges of small slightly raised islands of heathy vegetation amongst the pans (Plates 1 & 2).



Plate 2. Typical habitat of *Euphrasia amplidens* showing an open sediment pan amongst otherwise dense shrubby eucalypt woodland (image by Mark Wapstra)



Plate 3. *Euphrasia amplidens* (circled) grows in and around the patches of vegetation and on the fringes of the scrub around the open sediment pans (image by Mark Wapstra)

Associated plant species include *Leptospermum lanigerum*, *Baeckea leptocaulis*, *Sprengelia propinqua*, *Epacris glabella*, *Bauera rubioides* and *Gabnia grandis*. The third Wilson River site is on the gentle slope of the ridge above one of the other

sites. Here plants are growing in better drained soils, but are still in small openings in otherwise denser vegetation. At the Harman River site plants are occasional on the riverbank and the drier ridge above.

Elevation varies from about 110 to 380 m. All occurrences are on Cambrian ultramafic geology, identified on geology maps as dominantly serpentinised layered dunite and harzburgite.

POPULATION PARAMETERS

Lowland *Euphrasia* species often display a metapopulation structure. For *Euphrasia amplidens* two subpopulations are known, with the three Wilson River sites having an extent of occurrence of about 43 ha, and an area of occupancy of no more than 1 ha. Field observations of the number of individuals at the three sites indicate numbers such as 71 over about 0.5 ha, 34 in less than 0.5 ha, 12 in about 4 m², and about 25 in 9 m² (Table 1), so that the total number of individuals is so far estimated to be fewer than 250. Overall the known extent of occurrence of the species is about 15 km² with a linear extent of 7 km.

The paucity of collections of *Euphrasia amplidens* is indicative of a naturally rare and restricted taxon. Despite occurring in a somewhat remote region, the fact that the vascular plant species associated with ultramafic substrates in Tasmania have received considerable attention (e.g. Brown et al. 1986, Jarman & Mihaich 1991, Orchard 1991, Gray 2008), including in the west (e.g. Heazlewood Hill, Serpentine Ridge, Serpentine Hill), suggests that the lack of collections from other areas may represent a genuine geographic restriction (Barker et al. 2013).

RESERVATION STATUS

Euphrasia amplidens occurs in the Meredith Range Regional Reserve.

CONSERVATION ASSESSMENT

Euphrasia amplidens was listed as endangered under the Tasmanian *Threatened Species Protection Act 1995* in April 2016, meeting criterion D: total population extremely small or area of

Table 1. Population summary for *Euphrasia amplidens*

	Subpopulation	Tenure	NRM region	1:25000 mapsheet	Year last (first) seen	Area occupied	Number of individuals
1a	south of Wilson River	Meredith Range Regional Reserve	Cradle Coast	Parsons	2011	in clumps over 1 ha	105
1b	slope south and above Wilson River				2012	9 m ²	25
1c	Wilson River east of Harman River				2012	4 m ²	12
2	Harman River, north of Parsons Hood		Cradle Coast	Parsons	2015	occasional	

occupancy very restricted, specifically D1: total population estimated to number fewer than 250 mature individuals) and D2: total population with an area of occupancy less than 1 ha and typically in five or fewer locations that provide an uncertain future due to the effects of human activities or stochastic events, and thus capable of becoming extinct within a very short time period.

THREATS, LIMITING FACTORS AND MANAGEMENT ISSUES

Euphrasia amplidens has an apparently naturally highly restricted distribution and habitat, making stochastic events a risk to sites. The risk to the species is exacerbated by its semi-parasitic relationship with hosts, making it susceptible to additional factors. Anthropogenic disturbance may affect subpopulations adversely if not carefully managed. Potential habitat occurs in often remote sites with dense scrubby vegetation and steep terrain that may require helicopter access for survey.

Inappropriate fire regime: The habitat supporting the species is subject to natural fire events that are likely to contribute to the maintenance of open gaps required for the species to persist in the absence of competition. A lack of fire may result in fewer gaps, preventing the species from establishing and replenishing the soil seed store, which would otherwise decline through natural attrition over time. A high fire frequency may also result in depletion of the soil seed store as recruitment of lowland eyebrights is delayed following fire, with further fire preventing replenishment. A

fire frequency of 10 to 30 years would appear appropriate, if the vegetation is becoming overgrown. Undertaking prescribed burns outside the peak flowering and fruit set period is suggested.

Mining and mineral exploration: *Euphrasia amplidens* occurs in a Regional Reserve. The reserves allow mineral exploration and extraction, and the controlled use of other natural resources, while protecting and maintaining natural and cultural values. The species was re-discovered as a result of impact assessment surveys for a proposed mine which does not pose a direct threat to the species. Further activities in potential habitat for the species will need careful management. Historical mineral extraction may have benefited the species at a highly localised scale by creating open sediment pans suitable for colonisation and persistence.

Stochastic risk: The highly localised distribution of known sites combined with relatively low abundance, makes the species subject to inadvertent or chance events.

Climate change: *Euphrasia amplidens* appears to be dependent on damp bare ground for recruitment and persistence, with germination and establishment dependent on high moisture levels prior to the development of parasitic relationships with their hosts. Its recruitment niches are likely to be due to a combination of factors such as temporary inundation, browsing, formation of animal tracks, and suppression of competition through fire. Many of these factors are susceptible to change due to the possible impacts of climate change through a warming and drying out of

recruitment niches and a resultant increase in shrub cover. Its locally restricted distribution makes the species susceptible to even small changes in rainfall patterns.

Hydrological change: Given the dependence of *Euphrasia* species on damp ground for successful recruitment, *Euphrasia amplidens* is likely to be susceptible to even small changes to hydrology that may occur with changed river flows or development in the region.

MANAGEMENT STRATEGY

Management objectives

The main objectives for the recovery of *Euphrasia amplidens* are to prevent the loss or degradation of known occurrences, and increase the number of known subpopulations through survey.

What has been done?

- A nationally approved Recovery Plan has been produced for Tasmanian lowland *Euphrasia* species (TSS 2011) and while it did not include *Euphrasia amplidens*, it provides guidelines on the management of similar locally restricted species.
- The distribution of the species and estimates of population abundance have been determined from surveys associated with development proposals.

What is needed?

Agencies, groups or individuals may assist with some or all of the following recovery actions. Coordinated efforts may achieve the best and most efficient results.

- provide information and extension support to relevant Natural Resource Management committees, local councils, government agencies, development proponents and the local community on the locality, significance and management of the known subpopulations and potential habitat;
- undertake extension surveys of potential habitat radiating out from the known sites, using geology and vegetation maps as a basis of targeting sites;

- liaise with the Parks and Wildlife Service to develop appropriate fire and other management regimes for reserves supporting the species, and update any relevant management plans;
- monitor known sites for health, recruitment and response to disturbance;
- collect seed from known sites for long-term conservation storage at the Tasmanian Seed Conservation Centre, which is based at Royal Tasmanian Botanical Gardens;
- include the species in any revision of the *Tasmanian Lowland Euphrasia Species Flora Recovery Plan*.

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