

Corybas dienemus

windswept helmet-orchid

TASMANIAN THREATENED SPECIES LISTING STATEMENT



Image by Hans & Annie Wapstra

Scientific name: *Corybas dienemus* D.L.Jones, *Fl. Australia* 50: 572 (1993)

Common name: windswept helmet-orchid (Wapstra *et al.* 2005)

Group: vascular plant, monocotyledon, family **Orchidaceae**

Name history: *Corybas macranthus*, *Nematoceras dienemum*

Status: *Threatened Species Protection Act 1995*: **vulnerable**
Environment Protection and Biodiversity Conservation Act 1999: **Critically Endangered**

Distribution: Endemic status: **Endemic to Macquarie Island**
Tasmanian NRM Regions: **South**

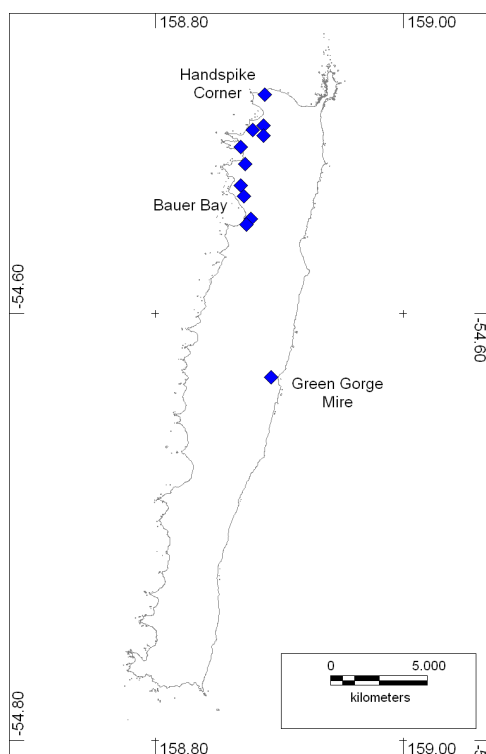


Figure 1. The distribution of *Corybas dienemus* on Macquarie Island



Plate 1. *Corybas dienemus* showing flowers and leaves (image by Hans & Annie Wapstra)

IDENTIFICATION AND ECOLOGY

Corybas dienemus belongs to a group of terrestrial orchids loosely referred to as the 'helmet orchid alliance' (Jones 2006). *Corybas dienemus* was previously included in the genus *Nematoceras* whose members are sometimes called spidery helmet-orchids, an allusion to the long lateral sepals and petals that are much more conspicuous than in other helmet-orchids (Jones 2006). *Nematoceras* is no longer recognised as a genus distinct from the helmet-orchid genus *Corybas* (Backhouse 2010). The spidery helmet-orchids form sparse to dense vegetative colonies. Flowering plants have a single ovate leaf and a solitary hooded flower. The flowers, which are produced in the leaf base or held away from the leaf on a stalk, are mostly greenish with red or purple markings. The dorsal sepal and labellum are large and the long thin lateral sepals and the petals are conspicuous and often held erect (giving the illusion of a spider). The tubular labellum sometimes has a tailed apex and also has two short broad open-ended auricles at the base (Jones 2006).

About 20 spidery helmet-orchids were recognised, most occurring in New Zealand and its subantarctic oceanic islands. Two species occur in Australia, *Corybas dienemus* and *Corybas sulcatus*. Both are apparently endemic to the subantarctic Macquarie Island, which is administered by Tasmania.

Vegetative reproduction, through production of daughter root-tubers on lateral, underground and elongate stolons (stems), is the most common form of reproduction in the spidery helmet-orchids and all species are capable of growing from stolon, stem and root-tuber fragments (Clements et al. 2007).

The ecological role of *Corybas dienemus* and its association with most other species has not been examined and is at present unknown. Like most orchid species, it has been reported to form a mycorrhizal association within its roots (Laursen et al. 1997).

Corybas dienemus flowers in late spring (November) through to early summer (December) (Shaw 2005, Clements & Jones

2007), and surveys are best conducted when the species is flowering. The species is deciduous so surveys are not recommended between late autumn and early spring.

Little is known about the pollination mechanisms in the two *Corybas* species that occur on Macquarie Island. Clements et al. (2007) discuss the two pollination syndromes thought to occur in the spidery helmet-orchids: autogamy (self-pollination) and insect pollination by deceit (scent, mimicry, food reward). The high incidence of maturing seed capsules observed in colonies of *Corybas dienemus* is indicative of autogamy. An endemic black fungus gnat *Bradysia watsoni* Colless (Sciaridae: Diptera) (Greenslade 1990) has been suggested as a potential pollinator of either of the species of *Corybas* present on Macquarie Island (Clements et al. 2007). *Bradysia watsoni* is common on the coastal terraces (Davies & Melbourne 1999) where there are several large colonies of *Corybas dienemus*.

Description

Corybas dienemus is a small (less than 5 cm tall at flowering), deciduous, tuberous terrestrial orchid, forming small clonal colonies. The leaves are solitary and orbicular (lamina 12 to 20 mm long and 14 to 23 mm wide), with a cordate base and apiculate apex. The leaf is dark green above, silvery green beneath, with a thick-textured lamina and fleshy petiole, which is 10 to 20 mm long. The flowers are held erect to semi-erect, supported on a vestigial pedicel about 1 mm long. The flowers are 25 to 30 mm long and 20 to 25 mm wide, and translucent green with reddish purple markings.

The dorsal sepal is oblong, 12 to 15 mm long and 2.5 to 3 mm wide, curved forward over the labellum, with a pointed apex (giving the classic 'helmet' appearance of the alliance). The lateral sepals are 30 to 33 mm long, and held erect above the dorsal sepal. The petals are 23 to 25 mm long, and held erect close to the lateral sepals. The labellum base is tubular, then expanded, and about 10 mm long and 6 mm wide. The boss of the labellum is inconspicuous. The margins of the labellum are straight or incurved with a few small teeth, and

the apex of the labellum has a short tail.

[description from Jones 2006, Clements & Jones 2007]

Confusing species

Two species of *Corybas* occur on Macquarie Island and have been confused prior to the recognition of two distinct entities (Clements & Jones 2007). *Corybas dienemus* may be distinguished from the allied species *Corybas sulcatus* by ‘... its green flowers with purplish-red markings, oblong dorsal sepal that is shallowly incurved with a recurved acute to acuminate apex with involute margins and an ovate labellum with an inconspicuous purplish-red boss’ (Clements & Jones 2007). The two *Corybas* species on Macquarie Island have different leaf shapes and thus can be identified in the field when not in flower.

DISTRIBUTION AND HABITAT

Corybas dienemus is endemic to Macquarie Island (Clements et al. 2007, Skotnicki et al. 2009). It is known to occur at a number of sites in the northern part of the island (Figure 1). The linear range of the species is 15 km, the extent of occurrence 12 km², and the area of occupancy is estimated to be about 1.5 ha (Skotnicki et al. 2009).

Corybas dienemus occurs in mire vegetation, predominantly near sea level at less than 30 m elevation (Plate 2). The soil substrate is waterlogged peat where the water table is very close to the soil surface. The mire vegetation is dominated by bryophytes and sedges (*Isolepis aucklandica*, *Juncus scheuchzerioides*), small herbs (*Epilobium pedunculare*, *Hydrocotyle novae-zeelandiae*), cushion plants (*Colobanthus muscoides*, *Colobanthus affinis*) and bryophytes (Clements et al. 2007). Mire vegetation is restricted to flat low-lying areas, which occur predominantly in the northwest corner of the island, and around Green Gorge (Figure 1). The species can also occur on the boundary of mire and herbfield where it grows beneath the megaherb *Stilbocarpa polaris* (Copson 1984). This ecotone is common on the raised beach platform in the northwest of the island.



Plate 2. Habitat of *Corybas dienemus* (image from Clements et al. 2007)

POPULATION ESTIMATE

Corybas dienemus has been recorded from eleven sites on Macquarie Island (Table 1). Data is available for eight of the twelve sites, plant numbers varying from 100 to 5000+, and the area of occupancy from 20 m² to 10000 m² (Skotnicki et al. 2009).

Corybas dienemus was first detected in 1978 (Brown et al. 1978), recorded as *Corybas macranthus* (a species now known to be endemic to New Zealand). The species has been subject to a considerable survey effort in the period since, with vegetation surveys conducted on the island during most summers, and several new subpopulations have been located (Skotnicki et al. 2009). Four additional sites along the island’s west coast remain to be identified positively as *Corybas dienemus* (Skotnicki et al. 2009).

Given the species’ diminutive nature it is possible that targeted surveys will detect new populations, although it should be noted that based on past experience any new populations are likely to be very localised in nature.

RESERVATION STATUS

Corybas dienemus is endemic to Macquarie Island. The island is entirely dedicated as the Macquarie Island Nature Reserve (under the Tasmanian *Nature Conservation Act 2002*). Macquarie Island is also a World Heritage Site and a UNESCO Biosphere Reserve.

Table 1. Population summary for *Corybas dienemus* in Tasmania (after Skotnicki et al. 2009)

	Location	Tenure	NRM region	1:25 000 mapsheet	Year first seen	Area occupied (m ²)	Number of plants *
1	Handspike Corner	MINR	South	n.a.	1980	10000	5000+
2	Half Moon Bay	MINR	South	n.a.	1977	1000+	500+
3	Elizabeth and Mary Point	MINR	South	n.a.	1980	Not known	Not known
4	Eagle Point	MINR	South	n.a.		Not known	Not known
5	Eagle Cave	MINR	South	n.a.	1976	Not known	Not known
6	Langdon Bay	MINR	South	n.a.	2005	600	Not known
7	Douglas Bay	MINR	South	n.a.	1984	100	Not known
8	Boiler Rocks	MINR	South	n.a.	1979	20+	500+
9	Bauer Bay hut	MINR	South	n.a.	1979	100	500
10	Gentoo Flats	MINR	South	n.a.	2009	20	100
11	Green Gorge Mire	MINR	South	n.a.	1980	2500	1000+

MINR = Macquarie Island Nature Reserve; NRM region = Natural Resource Management region.

* Numbers of plants refer to distinct emergent leaves. It should be noted that due to the ability of the species to propagate clonally, these numbers do not necessarily represent genetically distinct individuals.

The island is also listed on the Register of Critical Habitat and National Heritage List (under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*), and on the Register of the National Estate, until February 2012 (under the *Australian Heritage Commission Act 1975*).

CONSERVATION STATUS

Corybas dienemus was listed in 2009 as vulnerable on the Tasmanian *Threatened Species Protection Act 1995*, meeting criterion B (extent of occurrence estimated to be less than 20,000 km² or area of occupancy estimated to be less than 2,000 km²), specifically B1 (known to exist at no more than 10 locations) and B2 (continuing decline projected in the area, extent and/or quality of habitat, and number of mature individuals), and criterion D (total population estimated to number fewer than 1,000 mature individuals).

THREATS, LIMITING FACTORS & MANAGEMENT ISSUES

Corybas dienemus is endemic to Macquarie Island and has a fragmented and disjunct distribution, and localised occurrences. The extent and quality of *Corybas dienemus* habitat is in decline due to feral rabbit activity. Several other factors

also potentially impact deleteriously on *Corybas dienemus*.

Impact of rabbits: Rabbits (*Oryctolagus cuniculus*) were introduced to Macquarie Island in the 19th century as a food resource for sealers (Scott 1988), and have had a major impact on elements of the island's flora (Copson 1984).

Rabbit numbers on the island have fluctuated considerably over the last 100 years, undergoing a decline in the late 1970s and 1980s due to the introduction of the myxoma virus in 1978 (Scott 1988). However, the rabbit population has expanded significantly in recent years (Scott & Kirkpatrick 2008). The increase has been attributed to a complex suite of factors, including a decrease in the effectiveness of myxomatosis, the eradication of cats, and a changing climate that has permitted rabbits to produce more offspring per year. The threat of rabbits will continue until the rabbit population either collapses or rabbits are eradicated from the island as planned (PWS & BCB 2007).

Rabbits are widespread across the island, including in short herb vegetation and grassland, where they dig and scratch at the vegetation surface. Studies have shown that rabbit activity (grazing and burrowing) alters vegetation structure and composition (Copson & Whinam 1998). They preferentially graze

megaherbs, and at sites where *Corybas dienemus* grows beneath *Stilbocarpa polaris* (Copson 1984), rabbits are removing all *Stilbocarpa polaris* plants and severely altering vegetation structure. In mire communities where rabbit activity is high *Marchantia* (a liverwort) and *Poa annua* (introduced grass) are more abundant (greater cover). Both these species have the ability to out compete surrounding small species (such as *Corybas dienemus*).

This digging action may have a deleterious impact upon the species such as *Corybas dienemus* (Bryant & Shaw 2007), as individuals may be dug up and then die on the soil surface (Shaw 2005). Apart from causing direct damage to individual plants or small colonies, this physical action of digging compromises the stability of the peat soils leading to the degradation or destruction of habitat. In addition, where rabbits are active they deposit large (50 x 50 cm) piles of faeces (Plate 3). The impact of nutrient deposition from scats has not been quantified but it is likely that over time the release of nitrogen from scats will alter soil nutrient processes. Decomposition processes are slow in the subantarctic (Tweedie 2000) and piles of scats can smother individuals or small colonies leading to plant mortality (J. Shaw, pers. obs.).



Plate 3. Rabbit damage at the Bauer Bay subpopulation (April 2007): note diggings, surface disturbance and piles of rabbit faeces (image by Justine Shaw)

Monitoring of known *Corybas dienemus* sites has been undertaken by researchers with the Australian National University on an almost yearly basis over the past ten years (Skotnicki et

al. 2009). It has been observed that the orchid leaves themselves do not appear to be grazed by rabbits. However, covering plants such as *Stilbocarpa polaris* may be removed completely, with a reduction in the vigour of the orchids and an as yet unknown impact on the species' reproductive capacity.

The direct impact (at the subpopulation level) of rabbits on *Corybas dienemus* has only been recorded for the Bauer Bay site (Shaw 2005). At Bauer Bay *Corybas dienemus* occurs in a small drainage line (10 m across) where rabbit activity combined with water flow and slope is leading to slumping of the peat. The site appears to be slipping (Plate 4). Over the past 10 years the Bauer Bay subpopulation has undergone a significant reduction in size. The area once extended 40 x 40 m but is now reduced to 25% of this extent. Bryant & Shaw (2007) observed that a 3 m² area covered by *Corybas dienemus* at Bauer Bay had been disturbed by rabbits in 2007, while a colony of numerous plants within the subpopulation had completely disappeared between 2001 and 2007.



Plate 4. Habitat of *Corybas dienemus* at Bauer Bay and enclosure (September 2007) (image by Helen Achurch)

Trends for the other sites cannot be quantified due to insufficient survey data but rabbits are widespread across the island and they have been observed digging in the vicinity (less than 20 m away) of all subpopulations of *Corybas dienemus*. At Eagle Point and Douglas Point rabbits are very dense and vegetation damage severe.

If rabbit grazing were to continue, survival of

Corybas dienemus is unlikely. However, rabbit eradication is proposed, which will remove this threat. The ability of *Corybas dienemus* to recover from previous disturbance is unknown.

The threat to *Corybas dienemus* from rabbits is great, as the entire range of the species is subject to rabbit grazing. For an island endemic species with so few subpopulations, any loss of individuals or colonies and a reduction in habitat quality threatens species survival.

Browsing by the weka: Historically, the introduced weka, *Gallirallus australis* (a flightless bird from the rail family), was observed removing and eating root-tubers and stems of *Corybas* species (Brown et al. 1978). The past impact of this introduced bird on *Corybas dienemus* is unknown. It could be assumed that removal of individuals was deleterious to small populations. The weka has since been eradicated (Copson & Whinam 2001).

Formation of seal wallows: The formation of seal wallows is known to have impacted the Bauer Bay hut subpopulation in 2006, though signs of recovery have since been observed (Skotnicki et al. 2009).

Introduction of alien species: A new introduction of an alien species (plants, vertebrate, invertebrate or pathogen) could severely affect the species or its mycorrhizal symbiont.

Landslips: Landslips could eliminate subpopulations. However, it is unlikely that all localities would be affected at the same time.

Stochastic events: *Corybas dienemus* has a fragmented and localised distribution on Macquarie Island, with subpopulations occupying only a few square metres each, presenting a risk of extinction from stochastic events.

Climate change: Climate data shows warming of Macquarie Island of over half a degree in 50 years (Tweedie & Bergstrom 2000; Pendlebury & Barnes-Keoghan 2007). The influence of climate change on *Corybas dienemus* is unknown, but it is likely that any drying associated with increased temperatures will negatively impact on the species as it is currently confined to wet mire vegetation, where it is shaded by larger plants.

Low genetic diversity: *Corybas dienemus* is currently known from only five subpopulations and has a limited area of extent. Levels of genetic diversity in the population could be low due to low numbers of individuals recorded at each locality and because vegetative means of reproduction is most common in this genus. In addition, the small population size may lead to inbreeding problems, possibly in combination with insufficient maintenance of populations of pollinating insects and associated mycorrhizal fungi, which in turn may be linked to other threatening factors such as the impacts of rabbits and climate change.

MANAGEMENT STRATEGY

What has been done?

Corybas dienemus is included in the *Threatened Tasmanian Orchids Flora Recovery Plan* (Threatened Species Section 2017).

Botanical survey on Macquarie Island has been extensive over the last 50 years, with vegetation surveys conducted on the island during most summers. *Corybas dienemus* has been specifically targeted by several researchers (Copson 1984, Clements et al. 2007, Skotnicki et al. 2009).

Rabbit-proof enclosures were erected at the Handspike Corner and Bauer Bay sites in 2007/2008 (Plate 4). These enclosures are an initiative of the Parks & Wildlife Service and the Biodiversity Conservation Branch (Department of Primary Industries, Parks, Water and Environment, Tasmania).

Implementation of the *Macquarie Island Rabbit and Rodent Eradication Plan* has already begun with on-ground activities proposed for 2009/2010.

The Royal Tasmanian Botanic Gardens in Hobart houses a live holding of less than 10 individuals of unknown adult provenance (i.e. possibly clonal).

Management objectives

- prevent the loss or degradation of known subpopulations;
- undertake active management, including monitoring, of subpopulations to ensure

their long-term viability;

- identify new subpopulations of the species.

What is needed?

- establish a demographic monitoring program for all known and new found subpopulations, to report on health and recruitment, and gauge the response of the species to disturbance events (including rabbit control measures) as well as seasonal/annual conditions;
- fully implement the Macquarie Island pest eradication plan (PWS & BCB 2007);
- continue stringent biosecurity controls to prevent the introduction of alien species to Macquarie Island;
- confirm the presence of the species at suspected sites on Macquarie Island (Skotnicki et al. 2009) and undertake extension surveys of potential habitat;
- collect seed for long-term storage at the Tasmanian Seed Conservation Centre, contingent on locating the species again and sufficient fertile material being present;
- implement the threatened orchid recovery plan (Threatened Species Section 2017).

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- View:**
www.dpipwe.tas.gov.au/threatenedspecieslists
- Contact details:** Threatened Species Section, Department of Primary Industries, Parks, Water and Environment, GPO Box 44, Hobart, Tasmania, Australia, 7001. Phone (03) 6165 4340.
- Permit:** It is an offence to collect, disturb, damage or destroy this species unless under permit.