

An examination of *Pterostylis xerophila* (Orchidaceae) and the confirmation of *P. lingua* as a new species in Victoria

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Introduction

Pterostylis xerophila M.A.Clem. (Desert Greenhood) is a small terrestrial orchid found in inland South Australia and Victoria. This species is only known from eight widely distributed wild populations containing about 150 plants (Duncan 2010). *Pterostylis xerophila* is listed as 'vulnerable' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, 'threatened' under the Victorian *Flora and Fauna Guarantee Act 1988* and 'endangered' in the Department of Sustainability and Environment's (DSE) *Advisory List of Rare or Threatened Vascular Plants in Victoria – 2003* (DSE 2003).

The traditional concept of the genus *Pterostylis* R.Br. (Pterostylidinae: Cranichideae) as interpreted by Brown (1810), Lindley (1840); Bentham (1873), and Janes and Duretto (2010) contains approximately 216 species. Victoria has about 60 species within seven well-recognised groups (Jeanes & Backhouse 2006). One of the most recognisable of these groups, known as the 'rufa group', is characterised by: a basal rosette of sessile, overlapping leaves that are usually withered by flowering; an erect one to multi-flowered inflorescence and flowers where the dorsal sepal and petal margins join to form a galea that encloses the column; lateral sepals synsepalus, fused over their basal half and terminating in long thread-like tips; an actively mobile labellum, attached near the base by an elastic strap, exposed in the set position in front of the lateral sepals; an unlobate, swollen basal region; labellum margins often with conspicuous long white setae and usually some short setae; and a notched apex.

The genus *Oligochaetochilus* Szlach. was first proposed for the 'rufa group' of *Pterostylis* by Szlachetko (2001). Subsequently, Jones and Clements (2002a,b) and Jones *et al.* (2004) accepted the name in a much modified and more restricted form. This later circumscription was confirmed by multigene analysis (Clements *et al.* 2011). Nevertheless,

Abstract

This paper examines all known populations of *Pterostylis xerophila* M.A.Clem. within Victoria based on accurate surveys of known habitat carried out in October 2009–2012, collecting floristic and environmental information relevant to community ecology and condition. Twelve sites were surveyed for *P. xerophila*. Populations of *P. xerophila* were confirmed only in the Murray-Sunset National Park. Populations in Semi-arid Parilla Woodland in the northern Murray-Sunset National Park, Mallanbool Fauna and Flora Reserve (FFR) and Wemen FFR previously thought to be *P. xerophila* were determined by the authors to be *P. lingua* M.A.Clem., a new species for Victoria.

Key words: Semi-arid Parilla Woodland, habitat, threatened species, orchid, *Pterostylis*

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this interpretation has not yet been widely accepted in Victoria and, for the sake of clarity for Victorian users of plant names, the authors have decided to treat the 'rufa group' as *Pterostylis* in this paper. In *Pterostylis* the group is classified as subgenus *Oligochaetochilus* section *Oligochaetochilus* (Janes & Duretto 2010).

Currently the 'rufa group' comprises 17 described Victorian species plus several putative undescribed taxa, some of which may have been previously included within *P. xerophila*. An action in the proposed 2010 Recovery Plan for *P. xerophila* was to accurately identify all populations, particularly the disjunct ones, throughout Victoria (Duncan 2010).

Pterostylis xerophila was described by Mark Clements in 1986, based on plants in cultivation that were collected at Wynbring in the Great Victoria Desert, South Australia (Clements 1989). The species has been a taxonomic 'dumping ground' for a suite of dry-land rufa greenhood taxa (particularly in Victoria). This, combined with infrequent observations of plants, has led to confusion as to the identity, distribution and conservation status of *P. xerophila*.

According to Australia's Virtual Herbarium there are currently only four herbarium specimens determined as *P. xerophila* originating from Victoria, from three sites (Wemen FFR, Mallanbool FFR and Millewa South Bore in the Murray-Sunset National Park). All other sites mentioned for this species in the Recovery Plan (Duncan 2010) are based on field observations that have not been taxonomically confirmed. For example, anecdotal information in the *P. xerophila* Recovery Plan (Duncan 2010) refers to the existence of two populations in Wyperfeld National Park but there are no herbarium collections from this site. Additionally, a population of uncertain taxonomic placement has been recorded by DSE staff from Settlement Road in the Murray-Sunset National Park. Unconfirmed reports of *P. xerophila* from Annuello and Wandown in north-west Victoria are unlikely to be that species, although they warrant investigation and clarification. Reports of 'rufa greenhoods' at Neds Corner, Pink Lakes and Walpeup have been confirmed as *P. sp. aff. biseta* 1 (Janes & Backhouse 2006).

The following questions are addressed in this paper:

- Are all current records of *P. xerophila* in Victoria accurately identified?

- What species have been misidentified as *P. xerophila*?
- What is the associated vegetation of *P. xerophila*?
- Are there differences in vegetation associations between *P. xerophila* and *P. lingua* (Large-tongue Rustyhood) in Victoria?

Methods

Field surveys for *Pterostylis xerophila*

Twelve sites within Murray-Sunset National Park, Wyperfeld National Park, Wemen FFR and Mallanbool FFR were surveyed for the presence of *Pterostylis xerophila* during 2009, 2010, 2011 and 2012. These sites included all previous records from Victoria mentioned for this species in Recovery Plans or on herbarium databases. Surveys were conducted during the prime flowering period of this species, October, as plants can only be accurately identified when flowering. Surveys were conducted with botanists and volunteers from the Australasian Native Orchid Society familiar with this and related species. Surveys for the presence of *P. xerophila* and the number of plants at each of the sites were undertaken by walking parallel transects and tracking using GPS coordinates. The transects were walked approximately every 5–10 m throughout suitable vegetation (Cypher 2002), which ensured an adequate survey effort to detect most flowering plants in a given population. In pre-determined survey areas, between 10 and 15 ha were surveyed. Surveys were focussed on the Ecological Vegetation Community (EVC) for which there were anecdotal reports in Duncan (2010) or from which specimens had been previously collected.

Survey site: Murray-Sunset National Park

Eight areas were surveyed within the Murray-Sunset National Park. Three of these also included vegetation surveys on areas where plants were recorded in the previous decade. Surveys took place in 2010, 2011 and 2012. Sites within the Murray-Sunset National Park included three different EVCs. The herbarium collection from Millewa South Bore was collected in an ecotone between Loamy Sands Mallee and Woorinen Sands Mallee. The site surveys in this study were partly concentrated in these two EVCs near the location of the

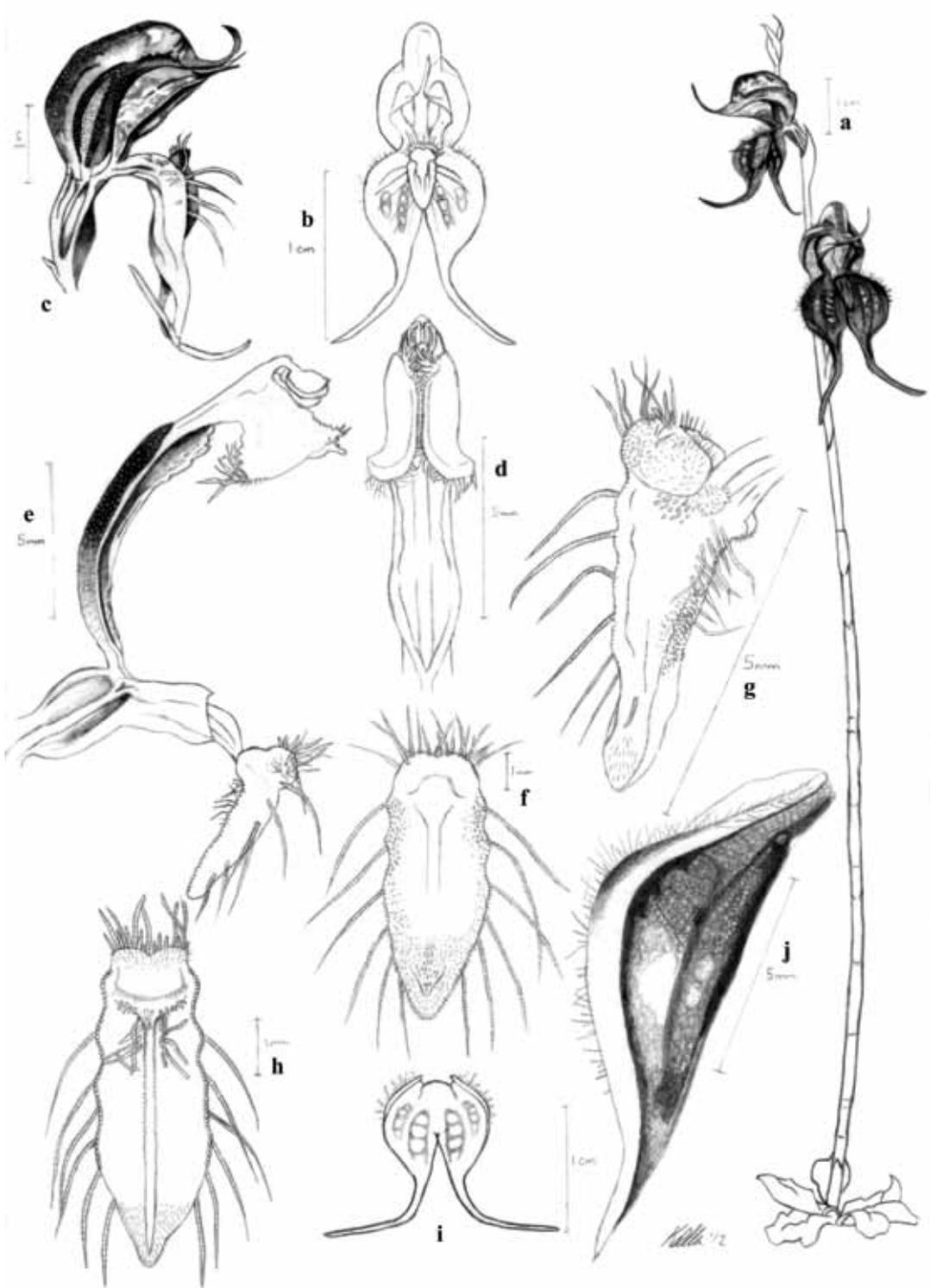


Figure 1. *Pterostylis lingua* from Mallanbool FFR (N. Reiter and K. Vlcek s.n. [ORG 6356]) **a.** plant; **b.** flower from front; **c.** flower from side; **d.** column from front; **e.** column from side; **f.** labellum from above; **g.** labellum from side; **h.** labellum from below; **i.** lateral sepals from front; **j.** petal. Illustration: K.Vlcek

herbarium collection. A previous unvouchered sighting on Settlement Road in the Murray-Sunset National Park was in the Semi-arid Parilla Woodland EVC.

Survey site: Wyperfeld National Park

There were two survey sites for the presence of *P. xerophila* within Wyperfeld National Park, with volunteers. The survey sites were based on anecdotal information and Recovery Plan (Duncan 2010) information, though not confirmed by previous herbarium records. The two sites surveyed in Wyperfeld National Park were Eastern Lookout, in the EVCs Loamy Sands Mallee and Semi Arid Woodland, and Rudds Rocks, in the EVCs Heathy Mallee and Sandstone Ridge Shrub land. Surveys took place in 2011.

Survey site: Mallanbool FFR

Mallanbool FFR was surveyed extensively with volunteers in 2010 and 2011. The herbarium specimen from Mallanbool FFR had been collected in the Semi-arid Parilla Woodland EVC.

Survey site: Wemen FFR

Wemen FFR was surveyed extensively with volunteers in 2012. The herbarium specimens from Wemen FFR had been collected in the Semi-arid Parilla Woodland EVC.

Vegetation surveys

Vegetation composition for sites at which *P. xerophila* and *P. lingua* occurred was recorded using the line intercept method (Kent & Coker 1992) on twelve 50 m transects (six per species). Additionally, broader species composition was recorded by recording all flora within a 30 m² area at all sites where *P. xerophila* and *P. lingua* occurred. The location of each individual *P. xerophila* and *P. lingua* plant was recorded using a GPS and these data were submitted to the Victorian Biodiversity Atlas. Vegetation data was collected from 2010–2012.

Results

Taxonomy

Three specimens lodged under *Pterostylis xerophila* in the National Herbarium of Victoria (MEL) and the Australian

National Herbarium, Canberra (CANB) from Murray-Sunset National Park, Mallanbool FFR and Wemen FFR were examined and determined to be *P. lingua*, a species as yet not recognised to occur within Victoria. Further recent collections originally determined as *Pterostylis* sp. aff. *xerophila* from Settlement Road Murray-Sunset National Park (ORG 6668) and as *P. xerophila* from Mallanbool FFR (N. Reiter 103) and Wemen FFR (N. Reiter 101) were also *P. lingua*.

Only one of the four existing herbarium specimens lodged as *P. xerophila* (Pritchard s.n. from near Millewa South Bore) was correctly identified, and this species was also re-located in this area during this study.

The two species showed marked morphological differences and displayed consistent differences in their habitat preferences and associated species.

1. *Pterostylis xerophila* M.A.Clem. in Jessop, J.P. & Toelken, H.R. (Ed) (1986), *Flora of South Australia* Edn. 4, 4: 2130, fig. 996

Type: SOUTH AUSTRALIA. Cultivated Adelaide ex Wynbring, Great Victoria Desert; on rocky outcrops, 22 Oct. 1978, R. Bates s.n. (AD).

Oligochaetochilus xerophilus (M.A.Clem.) Szlach., Polish Bot. J. 46(1): 24 (2001).

Jones, D.L. in Walsh, N.G. & Entwisle, T.J. (Ed) (1994), *Flora of Victoria* 2: 828, Fig. 173s-t.

Pterostylis xerophila is a deciduous, perennial, terrestrial orchid emerging annually from an underground tuber (geophyte). The species is described as follows (Bates & Weber 1990; Jeanes & Backhouse 2006): plants with a ground-hugging, stem-encircling, crowded basal rosette of four to 10 greenish leaves, that are usually withered at flowering time. A slender greenish stem to 20 cm tall, with one or two closely sheathing bracts, bears one to eight small (to 20 mm long), light green flowers with darker green or brownish stripes and suffusions, on long, slender pedicels. The dorsal sepal has an upturned, pointed apex, while the lateral sepals are deflexed, joined at the base, shallowly concave, sparsely ciliate, and taper quickly to slender, curved free points. The labellum is broadly ovate, fleshy and channelled, irritable, and the margins have four or five pairs of coarse white setae.

Specimen examined: VICTORIA. About 7 km SW of Millewa South Bore, 16.x.2005, A. Pritchard s.n. [J.A. Jeanes 1380] (MEL2296294).

Notes: The treatment of this species in *Flora of Victoria* by Jones (1994) included in the distribution map some collections that we have now identified as *P. lingua*. However, the accompanying illustrations are of *P. xerophila*. Jones (1994) described flower colour as 'reddish brown or brown' but we observed Victorian plants to be green.

2. *Pterostylis lingua* M.A.Clem., *Austral. Orch. Res.* 1: 123, fig. 5A-D (1989)

Type: NEW SOUTH WALES. S end of Cocopara National Park, near Mt. Caley on Barry Scenic Drive, 12 Oct. 1986, R.G. Tunstall 94 (holo CANB!; iso K!, NSW!).

Oligochaetochilus linguus (M.A.Clem.) Szlach., *Polish Bot. J.* 46(1): 24 (2001).

[*Pterostylis squamata* auct. non R.Br.: Fitzg., *Austral. orch.* 1(6): [t.6] (1880).]

[*Pterostylis xerophila* auct. non M.A.Clem.: D.L. Jones, *Fl. Victoria* 2: 828 (1994) pro parte.]

Deciduous herbaceous perennial geophyte. Vegetatively glabrous, with leaves withered at flowering

time (Fig. 1a). Roots filamentous with tubers fleshy and globose. Flowering stem simple, erect, 10–30 cm high, with 4–8 sheathing bracts. Rosette stalk 1–3 cm long, leaves 3–12, linear ovate, size extremely variable, margins entire, surface of leaves becoming rugose with age. Flowers 2–8, erect, 1.5–2.5 cm wide, 2–3 cm long, light to dark brown, occasionally dull green with white opaque striping on the galea (Figs 1b, 1c). Buds initially green, later turning brown just before anthesis. Sheathing bracts 4–10, 1–2 cm long. Column (Figs 1d,



Figure 2. Known distribution in Victoria of *Pterostylis lingua* (rectangle) and *P. xerophila* (triangle)

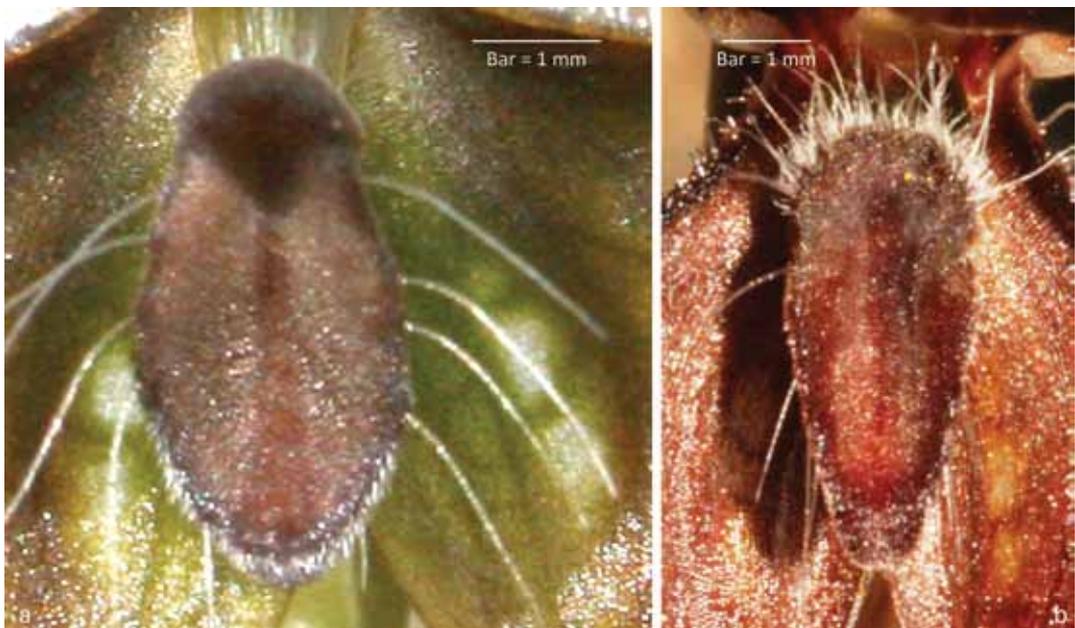


Figure 3. Labellum of **a.** *Pterostylis xerophila* from Murray-Sunset National Park and **b.** *P. lingua* from Mallanbool FFR

1e) 8–15 mm long, curved. Galea arcuate, tips of dorsal sepal and petals not joined. Dorsal sepal 1.5–2 cm long, swollen at the base and then long tapered and acute, the tip hooked and variable in length (Fig. 1c). Lateral sepals 1.5–2.5 cm long, 4–6 mm wide, incurved, either the same or slightly longer than the dorsal sepal, tips of lateral sepals becoming involute (Fig. 1i). Petals oblong to falcate 1–1.5 cm long acuminate, 3–4 mm wide (Fig. 1j). Labellum (Figs 1f, 1g, 1h) oblong–sagitate, 4–6 mm long, 2–3 mm wide, light brown to dark brown with darker brown colouring near basal mound and margins. Filamentous part of the lateral sepals variable, greater than 5 mm long, filamentous part of dorsal sepal 1–3 mm. Margins with sparse pilose multicellular trichomes to 3 mm, basal mound 2 mm high. The underside of the labellum is covered by sparse short trichomes to 0.4 mm, basal mound woolly to pilose with multicellular trichomes 1–1.5 mm high. Column wings 2–3 mm wide, 2–3 mm long, dense trichomes to 1 mm long radiate from the margins. Stigma oblong to 3 mm long to 0.5 mm wide with mucilaginous shiny coating. Capsule 1–1.2 cm long, ripening approximately 4 weeks after pollination.

This description and illustration is based on *N. Reiter* and *K. Vlcek s.n.* [ORG 6356].

Specimens examined: VICTORIA. Extreme SW corner of Wemen FFR, 1.3 km along Collins Rd, 10.ix.2004, *M. Duncan s.n.* [ORG 4558] (CANB656655); Wemen FFR, 12.xi.1996, *J.McGuckin s.n.* (MEL2037233); same location, 19.x.2012, *N. Reiter 101* (MEL2360816; MEL2360817); Mallanbool FFR,

3.viii.1999, *M.A.Clements 9917* (CANB664360); same location, 24.x.2011, *N. Reiter and K. Vlcek s.n.* [ORG 6356] (CANB); same location, 22.x.2012, *N. Reiter 103* (MEL2360818, MEL2360819); Settlement Road, Murray-Sunset National Park, 24.x.2010, *N. Reiter s.n.* [ORG 6668] (CANB; MEL2360820). ORG numbers refer to 'Orchid Research Group' numbers assigned at CANB.

Notes: *Pterostylis lingua* is widespread throughout the western part of New South Wales and also rarely found in the dry inland pastoral region of South Australia.

Field surveys

Pterostylis xerophila was found only within 10 km of the location of the existing herbarium specimen from Millewa South Bore Track in the Murray-Sunset National Park. At sites surveyed on Border track and Millewa South Bore track there were 30 plants of *P. xerophila* in 2009–2010, six in 2011 and one in 2012.

Pterostylis lingua was located at Settlement Road (Murray-Sunset National Park), Mallanbool FFR and Wemen FFR in 2010–2012. Each site contained reasonable numbers (20–1000) of *P. lingua* plants, with 300 plants at Mallanbool FFR and 1000 plants at Wemen FFR. The numbers of flowering plants varied seasonally with no *P. lingua* plants flowering in 2011 on Settlement Road. No plants of *P. xerophila* were found at any of the sites at which *P. lingua* was present.

Pterostylis xerophila was not located within Wyperfeld National Park at the two sites surveyed, Eastern Lookout and Rudds Rocks, previous known sites reported in the 2010 Recovery Plan. Eastern Lookout was severely

Table 1. Vegetation associated with *Pterostylis lingua* and *P. xerophila* in Victoria

Taxa common to <i>P. lingua</i> sites in Mallanbool FFR, Settlement Rd Murray-Sunset National Park and Wemen FFR	Taxa common to <i>P. xerophila</i> sites in Murray-Sunset National Park
<i>Acacia oswaldii</i> F.Muell.	<i>Eucalyptus oleosa</i> F.Muell. ex Miq
<i>Austrostipa elegantissima</i> (Labill.) S.W.L.Jacobs & J. Everett	<i>Eucalyptus socialis</i> F.Muell.
<i>Austrostipa scabra</i> (Lindl.) S.W.L.Jacobs & J. Everett	<i>Triodia scariosa</i> N.T.Burb.
<i>Casuarina pauper</i> F.Muell. ex L.A.S.Johnson	moss and lichen
<i>Chenopodium curvispicatum</i> Paul G.Wilson	
<i>Chenopodium desertorum</i> (J.M.Black) J.M.Black	
<i>Enchylaena tomentosa</i> R.Br	
<i>Olearia magniflora</i> (F.Muell.) Benth.	
<i>Olearia muelleri</i> (Sond.) Benth.	
<i>Olearia pimeleoides</i> (DC.) Benth.	
<i>Zygophyllum apiculatum</i> F.Muell.	
moss and lichen	

damaged by goats and no *P. xerophila* or other *Pterostylis* were found at this site; the surrounding fence had fallen into complete disrepair. *Pterostylis* sp. aff. *biseta* a common and widespread species was found at Rudds Rocks.

Vegetation surveys

Plant species common to all sites at which each of *P. xerophila* and *P. lingua* were located within this study are listed in Table 1. Vegetation analysis showed that sites at which *P. xerophila* was present had the following vegetation coverage (highest percentage elements listed): bare ground (in this case rock) 45%, moss and lichen 17%, *Triodia scariosa* N.T.Burb. 12% and the three co-occurring *Eucalyptus* L'Her. species *Eucalyptus gracilis* F.Muell., *E. socialis* F.Muell. ex Miq. and *E. oleosa* F.Muell. ex Miq. total 19%. The vegetation community *P. xerophila* inhabits is a unique ecotone between Loamy Sands Mallee and Woorinen Sands Mallee. The soil was low sand with igneous rock intrusions. The vegetation composition of *P. lingua* sites showed the following composition (highest percentage elements): *Casuarina pauper* F.Muell. ex L.A.S.Johnson 14%, *Chenopodium curvispicatum* Paul G.Wilson 7%, *Enchylaena tomentosa* R.Br. 7% and moss 6%. The vegetation community *P. lingua* inhabits is Semi-arid Parilla Woodland.

Discussion

Only 30 plants of *Pterostylis xerophila* were found within the survey areas in the Mallee during the course of this study. Vegetation analysis reveals that *P. xerophila* inhabits a unique ecotone that does not presently fit into any EVC currently listed within the Victorian Mallee (DSE 2011). Populations were confirmed in only the Murray-Sunset National Park. No *P. xerophila* were recorded in Wyperfeld National Park in any surveys during this study, although *Pterostylis* sp. aff. *biseta*, a common and widespread species, was found at Rudds Rocks.

The preferred habitat for *P. xerophila* was determined to be rock outcrops in an ecotone between the EVCs Loamy Sands Mallee and Woorinen Sands Mallee, surrounding rock outcrops with igneous intrusions. This correlates with the habitat for the species found in South Australia where it is reported to occur mostly in sand adjacent to rock outcrops but also on the rock outcrops themselves in shallow soils (Bates 2012).

Pterostylis lingua is associated with the ecological vegetation class Semi-arid Parilla Woodland in the Murray Mallee Bioregion. Semi-arid Parilla Woodland as an EVC in Victoria is considered 'vulnerable' (DSE 2011). *Pterostylis lingua* is known from scattered populations from Cootamundra to Bourke in New South Wales and dry eastern slopes and foothills of the Flinders Ranges across the Olary Spur in South Australia. The species is known to occur in a variety of vegetation types including *Callitris* woodland, *Eucalyptus* woodlands and native grasslands.

Distinguishing Desert Greenhood from Large-Tongue Rustyhood

Pterostylis lingua is similar to *P. xerophila* but easily distinguished based on the labellum, which has a densely pubescent basal mound and flattened margin towards the apex, which *P. xerophila* does not (Fig. 3). Plants also typically have four or more widely spaced flowers and are found growing in Semi-arid Parilla Woodland, whereas *P. xerophila* is typically found on semi-exposed rock outcrops and generally only has one to two flowers per stalk. The species have not been found to co-occur. Both species are easily distinguished from other similar Victorian orchids. Sikh's Whiskers (*P. boormanii* Rupp.) has heavily ciliated, winged sepals that are distinctly cupped and Two Bristle Greenhood (*P. sp. aff. biseta*) (Jeanes & Backhouse 2006) has much longer lateral sepals and distinctly paired setae at the base of the labellum.

Conservation status

It is recommended that, based on the survey data in this study and current known population sizes for *P. xerophila* in South Australia, the species be upgraded from 'vulnerable' to 'endangered' under the *Commonwealth Environment Conservation and Biodiversity Protection Act*, due to lower numbers of individuals than previously anticipated in Victoria and relatively restricted suitable intact habitat.

Pterostylis lingua is a new species record for Victoria with a limited distribution in north-west Victoria, known with certainty from only a few populations and less than 1500 individuals; the conservation status of this species is considered 'vulnerable' within Victoria.

Conclusions

The range of *Pterostylis xerophila* in Victoria is more restricted than previously reported by Duncan (2010), due to the mis-identification of specimens from other sites such as Mallanbool FFR and Wemen FFR, which are in fact *P. lingua*. The species is confirmed as present in only a small area within the Murray-Sunset National Park.

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