Conservation Assessment of *Chiloglottis platyptera* D.L.Jones (Orchidaceae)

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Chiloglottis platyptera D.L.Jones (Orchidaceae)

Distribution: Endemic to NSW
Current EPBC Act Status: Not listed
Current NSW BC Act Status: Vulnerable

Proposed listing on NSW BC Act: Delist

Reason for change: Nongenuine change based on increased data on distribution and population numbers and knowledge of threats acting on the species.

Summary of Conservation Assessment

Chiloglottis platyptera was found to be ineligible for listing as a threatened species as none of the Criteria are met.

Description and Taxonomy

Chiloglottis platyptera flower in Guy Fawkes River National Park. Image: Gavin Phillips

Chiloglottis platyptera (Barrington Tops Ant Orchid) is a conventionally accepted species (CHAH 2018) that lies phylogenetically within the ant orchid clade of *Chiloglottis* section *Myrmechila* (Jones 2021). It is described by Jones (1991) as a "terrestrial tuberous herb forming extensive colonies. Tuberoids to 14 mm x 9 mm, ovoid, brown, fleshy. Leaves 4–7.5 cm x 14–22 mm, elliptical to oblong-elliptical, ground-hugging, dark green on the upper surface, paler beneath with numerous fine longitudinal veins, margins undulate to crispate; petioles 3–8 mm long. Peduncle 3–

7 cm x ca 1.5 mm, green to reddish, fleshy. Floral bracts 14–18 mm x 4–6 mm, ovate-lanceolate, acuminate, closely sheathing. Pedicel 20–30 mm long, very slender, erect, green or reddish. Flower solitary, 10–12 mm long, greenish brown with a prominent black labellum callus. Dorsal sepal 12.5–13.5 mm x 3–3.2 mm, erect and incurved, more or less spathulate, narrow and tapered in basal three-quarters, then expanded into an ovate-elliptical section before narrowing to an obtuse apex; apical osmophore ca 0.5 mm long. Lateral sepals 9–10 mm x ca 1 mm, linear, connate at the very base, erect in the basal half then recurved and widely divergent, flat, tapered to osmophore; osmophore 0.6–0.8 mm long, dark red to blackish, narrower than lamina. Petals 9.5–10.5 mm x ca 3 mm, asymmetrically linear-oblanceolate, slightly falcate, reflexed against the ovary. Labellum articulated on a very short claw ca 0.1 mm long, obliquely erect in basal third then nearly horizontal, apex sharply recurved; lamina 9–10 mm x 8–8.5 mm, broadly obtrullate, basal narrow part ca 3.5 mm x 2 mm, tapered to base, margins purplish, main part of lamina greenish brown, lateral margins not level with obtuse apex when flattened although appearing so because of recurved apex. Lamina callus black, shiny, occupying most of the adaxial surface of the lamina; major proximal stalked gland ca 1.5 mm long, obliquely erect, apex ca 2 mm wide, handlebar-like, the stalk on the distal side of the gland with clustered, shiny black, sessile calli; major sessile gland ca 2 mm across, more or less semi-circular in shape, distally a broad mass of crowded, sessile calli extending to apex; a few shortly stalked, reddish, clavoid calli to 0.5 mm long flank the major glands; calli vestigial on narrowed base of labellum. Column 8.5–9.5 mm x 5.5–6 mm, erect, sharply incurved above the middle, pale green with purple flecks on the anterior surface; central ridge ca 2 mm across; wings extremely broad, concave, extending much higher than the anther. Anther ca 1.5 mm x 1.5 mm, smooth, with a short rostrum, yellow. Pollinia ca 2 mm long, boomerang-shaped, yellow, mealy. Stigma ca 1.5 mm across, transversely elliptical. Capsule not seen."

Chiloglottis platyptera co-occurs with several other species of *Chiloglottis* on the New South Wales (NSW) Northern Tablelands. Of those, it is closest morphologically to *C. formicifera,* which differs in its flatter labellum apex and much shorter, narrower column wings (Copeland and Backhouse 2022). All other co-occurring species are differentiated from *C. platyptera* by having the callus confined to the basal portion of the labellum only, or in having the apical clubs (osmophores) on the lateral sepals more than 2 mm long (Copeland and Backhouse 2022; NSW Flora Online 2022).

The raising of the segregate genus *Myrmechila*, including the shifting of *Chiloglottis platyptera* to *Myrmechila platyptera*, has been suggested in the past based on molecular and morphological differences (Jones and Clements 2005). However, further molecular work has shown the broad concept of *Chiloglottis* to be monophyletic and reduced *M. platyptera* to a synonym of *C. platyptera* (Miller and Clements 2014). This broad generic concept remains the currently accepted taxonomic view (CHAH 2018; NSW Flora Online 2022) and is used in this assessment.

Distribution and Abundance

Chiloglottis platyptera has a wide range across the Northern Tablelands of NSW, though is patchily distributed across the region (Copeland and Backhouse 2022). This area lies within the NSW North Coast and New England Tablelands Bioregions (Department of Agriculture, Water and Environment 2012) and straddles the traditional lands of the Wonaruah, Geawegal, Biripi, Kamilaroi, Dunghutti, Anaiwan,

Gumbaynggir and Ngarabul peoples (Horton 1996; NSW NPWS 2004, 2005 2013, 2022).

In 2001, the NSW Scientific Committee stated that *Chiloglottis platyptera* was known from 10 sites across 300 km of the Northern Tablelands. It has since been found at many other sites within this range, meaning it is now considered widespread in the area and relatively common in some patches (L. Copeland *in litt.* October 2022; Table 1). The species is now known from at least 20 sites across the Northern Tablelands stretching from Barrington Tops in the south, along the eastern escarpments of the tablelands to near Deepwater in the north, and then extending west to near Tingha (Table 1). A highly plausible single record from further west near Scone on private land may represent the genuine western extent of the species, though this site is unconfirmed.

Table 1 – Abundance of *Chiloglottis platyptera* across all known sites as of November 2022.

Site	Tenure	Subpopulation	Abundance Estimates	Reference
Black Mountain, Scone	Private	Scone	Unknown	NSW BioNet 2022
Stewarts Brook State Forest	State Forest	Barrington Tops	100-200	G. Phillips pers. obs. Nov 2016
Barrington Tops State Forest	State Forest	Barrington Tops	"Small Colony"	Royal Botanic Gardens and Domain Trust 2022
Barrington Tops National Park	NPWS	Barrington Tops	1,000	DEP 2022b
Ben Halls Gap Nature Reserve	NPWS	Ben Halls Gap	>50	Royal Botanic Gardens and Domain Trust 2022
Morrisons Gap	Private Conservation	Ben Halls Gap	26+	P. Gadsby *in litt.* October 2022
Hanging Rock State Forest	State Forest	Nundle	50	L. Copeland *in litt.* October 2022
Nundle State Forest	State Forest	Nundle	Unknown	NSW BioNet 2022
Tomalla Nature Reserve	NPWS	Nundle	200	NSW BioNet 2022
Curracabundi National Park	NPWS	Nundle	Unknown	NSW BioNet 2022
Tuggolo Creek Nature Reserve	NPWS	Nundle	5	L. Copeland *in litt.* October 2022
Tuggolo State Forest	State Forest	Nundle	200+	L. Copeland *in litt.* October 2022
Mummel Gulf National Park	NPWS	Yarrowitch	30+	L. Copeland *in litt.* October 2022

Cottan-Bimbang National Park	NPWS	Yarrowitch	50	L. Copeland *in litt.* October 2022
Western Oxley Wild Rivers National Park	NPWS	Macleay Gorges West	5,000	L. Copeland *in litt.* October 2022, DPE 2022b
Kunderang area, Oxley Wild Rivers National Park	NPWS	Macleay Gorges East	"Rare at this site"	L. Copeland *in litt.* October 2022
Cunnawarra National Park West	NPWS	Macleay Gorges East	50+	L. Copeland *in litt.* October 2022
Beech Lookout, Cunnawarra National Park	NPWS	Macleay Gorges East	“Uncommon”	L. Copeland *in litt.* October 2022
Escarpment Trail, Guy Fawkes River National Park	NPWS	Guy Fawkes	10	G. Phillips pers. obs. Oct 2016
Indwarra National Park	NPWS	Tingha	"Localised and occasional"	Royal Botanic Gardens and Domain Trust 2022
Butterleaf National Park	NPWS	Deepwater	20+	L. Copeland *in litt.* October 2022

While many known sites consist of isolated records, some sites occur in loose clusters united by biogeographic features and continuous vegetation and so are considered to make up discrete subpopulations. Gene flow is likely across these areas given typical dispersal patterns of orchid seed (Jersakova and Malinova 2007) and movement of pollinators (Whitehead *et al.* 2015). This means that the population of *Chiloglottis platyptera* is made up of at least 10 subpopulations, with most either wholly within conservation reserves or a mixture of conservation reserves and state forests.

The largest subpopulations known (Barrington Tops and Macleay Gorges West) are either wholly or largely within conservation reserves and contain thousands of individuals (Copeland and Backhouse 2022). Many other smaller sites also within conservation estate contain relatively large numbers of individuals meaning the species is well reserved overall (Copeland and Backhouse 2022; Copeland *in litt.* October 2022). Some significant sites do occur within state forests; however, these sites often abut others within national parks and nature reserves with no subpopulation known to be wholly within state forests. The only confirmed site on private property is also managed for conservation (P. Gadsby *in litt.* October 2022).

Chiloglottis platyptera is most commonly found in wetter types of tall open forests with a grassy or fern-dominated understorey along the tableland’s escarpment (L. Copeland *in litt.* October 2022). Given the large, contiguous areas of suitable habitat across the region, inherent difficulties in detecting small terrestrial orchids

(Commonwealth of Australia 2013; Copeland and Backhouse 2022), confusion with other similar taxa (Jones 1991), lack of targeted surveys on the species to date (M. Cameron pers. comm. October 2022) and large fluctuations in emergent *Chiloglottis* numbers dependent on disturbance regimes (Phillips and Watts 2021), it is highly likely that substantial numbers of *C. platyptera* and further sites remain unrecorded. This means that current population estimates are extremely conservative, with an approximate minimum of 6,800 plants estimated to date across the known subpopulations. However, this number is likely to easily exceed 10,000 (if not much higher) with further survey at the correct time of year (L. Copeland *in litt.* October 2022). This would also be in line with the findings of recent post-fire surveys on other closely related *Chiloglottis* which resulted in observed numbers increasing 10-100 times dependent on the survey time and conditions from previous estimates (Phillips and Watts 2021).

Extent of Occurrence and Area of Occupancy

The Extent of Occurrence (EOO) is based on a minimum convex polygon enclosing all mapped occurrences of the species, the method of assessment recommended by IUCN (2022) and was measured at 22,504 km^2. Area of Occupancy (AOO) was calculated using 2 x 2 km grid cells, the scale recommended by IUCN (2022), and was calculated to be 96 km^2. Both EOO and AOO were calculated using ArcGIS (Esri 2015), enclosing all confirmed survey records and cleaned spatial datasets. Based on these estimates, *Chiloglottis platyptera* has a highly restricted AOO.

Number of Locations

The most serious plausible threat which results in the lowest number of locations (per IUCN 2022) is damage to plants and habitat by feral pig digging. Pig activity has been recorded at or near to all sites where *Chiloglottis platyptera* has been positively recorded (NSW NPWS 2005, 2009, 2020, 2021; P. Gadsby *in litt.* October 2022; DPE 2022b) and typical home ranges of feral pigs are up to approximately 50 km^2 in montane areas (Saunders and Kay 1996). Therefore, the spatial nature of this threat is such that there are >10 geographically or ecologically distinct areas where a single threatening event could affect all individuals of the species present within a period of one generation, resulting in >10 threat-defined locations.

Ecology

Habitat

Chiloglottis platyptera grows in wetter types of grassy tall open eucalypt forest on the tablelands, preferring damp, sheltered areas including rainforest ecotones (Copeland and Backhouse 2022). It is commonly found in grassy, open *Eucalyptus obliqua* forest where *Poa sieberiana, Lomandra longifolia* and/or *Pteridium esculentum* dominate the groundcover but can occur in wet sclerophyll forest with a more mesic understorey in some areas (L. Copeland *in litt.* October 2022). Aside from the species listed above, co-occurring species in the eastern escarpment sites include *Eucalyptus nobilis, E. radiata, E. pilularis, Banksia integrifolia* subsp. *monticola, Elaeocarpus holopetalus, Leptospermum polygalifolium* subsp. *montanum, Allocasuarina littoralis, Pittosporum undulatum, Tasmannia* spp. and *Dicksonia antarctica* (G. Phillips pers. obs. October 2016, November 2016; NSW BioNet 2022). At more western sites including at the

range limit near Tingha, the habitat of *C. platyptera* can be a layered woodland dominated by *Eucalyptus andrewsii* and *E. laevopinea* (NSW BioNet 2022). *Chiloglottis platyptera* also tends to occur on rich brown loam and clay soils, most often derived from metasediments or basalt (Jones 1991; Copeland and Hunter 1999; G. Phillips pers. obs. November 2016; NSW OEH 2019).

Chiloglottis platyptera is most commonly observed within the Plant Community Types (PCT) of Northern Escarpment Messmate Moist Grassy Forest (PCT 3288) and Northern Escarpment Messmate Cool Wet Forest (PCT 3287), both of which are widespread along the eastern edge of the New England Tablelands (DPE 2022a). It has also been observed in Barrington-Point Lookout Grassy Forest (PCT 3379), Far North Escarpment Blackbutt Grassy Forest (PCT 3278) and Northeast New England Ranges Messmate Forest (PCT 3504) along the tablelands' escarpment as well as in Liverpool Range Montane Stringybark Forest (PCT 3283) and Western New England Silvertop Stringybark Forest (PCT 3727) in more westerly sites (DPE 2022a). The species is also likely to occur in many other PCTs across its large range.

Life History

Chiloglottis platyptera is a deciduous perennial terrestrial orchid which undergoes annual cycles of dormancy and emergence (Eco Logical Australia 2014; Copeland and Backhouse 2022). During dormancy, the species lives as small, ovoid tubers which are buried 1-7 cm below the soil surface, allowing survival through times of stress such as the hot, dry summer months (Bower 2007; Jones 2021). The starchy tubers of many Orchidaceae were consumed as a traditional food source in times of less abundant aboveground foods and were dispersed through transplanting by Aboriginal people (Silcock 2018; APS North Shore Group 2021; ANBG 2023). It is possible *C. platyptera* tubers were similarly eaten and dispersed across country by Aboriginal people. The tubers sprout once seasonal conditions allow, producing a vertical stem which may branch to form multiple lateral roots (Bower 2007; Jones 2021). The main stem gives rise to a pair of leaves at the soil surface, with flowering stems developing simultaneously in reproductively mature plants (Bower 2007; Jones 2021).

Flowering in *Chiloglottis platyptera* occurs predominantly in spring but can occur at any time between July to November (Eco Logical Australia 2014; Jones 2021; Copeland and Backhouse 2022). Flowers typically last up to several days, occasionally persisting for a few weeks (Jones 2021) with flowers closing rapidly once pollinated (G. Phillips pers. obs. November 2016). Pollinated stems last until the fruit develops and dehisces, which may be up to 5 weeks post-flower in congeners (G. Phillips pers. obs. February 2021). The stem then dries out, causing the fruit to dehisce and release seeds before withering completely. Leaves can persist for some time after the flowers wither, especially in the case of non-flowering tubers, but they too tend to die back as the tubers re-enter dormancy over summer (Jones 2021).

The full lifespan of an individual of *Chiloglottis platyptera* is unknown. Tubers in all *Chiloglottis* wither and die after a time without direct replacement of the parent tuber, instead relying on the production of 2-3 genetically identical daughter tubers on the ends of the lateral roots each season to persist longer-term (Jones 2021). The lateral roots can reach up to 20 cm from the parent tuber, allowing rapid expansion of colonies

and enabling migration to fresh sites to avoid overexploitation of soil nutrients and stimulate flowering (Bower 2007). Crowded colonies often have a low proportion of flowering individuals (G. Phillips pers. obs. October 2016, November 2016) and this is likely the result of competition for resources when tubers are dense (Bower 2007). Daughter tuber production can also lead to colonies consisting of very few genetically distinct clones (Bower 2007).

Generation length is unknown in *Chiloglottis platyptera* given lack of data around full lifespan, time to maturity in seedlings and the length of time individual tubers may remain viable in the soil.

Reproductive Ecology

Chiloglottis platyptera is capable of both asexual reproduction through the production of daughter tubers as described above, as well as sexual reproduction. All *Chiloglottis* are pollinated by male thynnine wasps, with *C. platyptera* being pollinated almost exclusively by males of the undescribed species *Neozeleboria* sp. 40 (Bower 1996; Peakall *et al.* 2010). The males are drawn to the flower by two sexually deceptive mechanisms – the osmophores and calli on the flower emit an imitation sex pheromone to attract the male wasps and the callus on the labellum mimics the shape and colour of a female wasp, inviting pseudocopulation (Bower 2007; Peakall *et al.* 2010). Once a male wasp alights on the flower, it attempts to copulate by clasping onto the female-imitating callus and trying to fly away with it (Bower 2007). This brings the wasp into contact with the column positioned above the callus, firstly depositing any pollen already attached to the wasp onto the stigmatic surface, then receiving new pollen from the anther as the wasp attempts to move back out of the flower (Bower 2007).

Male thynnine wasps tend to only visit a single flower in a patch during mating flights, due to patch avoidance behaviour, as well as search for mates along patrol paths tens of metres long (Whitehead *et al.* 2015). This means that localised visitations are minimised and outcrossing rates are maximised across the broader *Chiloglottis* colonies, maintaining a relatively high level of colonial diversity and production of quality seed (Whitehead *et al.* 2015).

The specificity of the pollinator and use of sexual deception means that hybridisation with other co-occurring *Chiloglottis* is minimised (Schiestl and Peakall 2005). *Chiloglottis platyptera* uses a mix of compounds known as Chiloglottones in the imitation pheromone, which is unique among all other sympatric *Chiloglottis* species (Peakall *et al.* 2010). This means that visitation by non-preferred pollinators, or pollinators of other species, is reduced (Peakall *et al.* 2010). Additionally, differences in flower height compared to other *Chiloglottis* correspond to the reproductive behaviour of the specific pollinator *Neozeleboria* sp. The pollinators are known to preferentially attempt copulation at particular heights relative to the ground, corresponding with the typical height of the flowering stem of the partner *Chiloglottis*, minimising visits to other species (Schiestl and Peakall 2005).

Seed Ecology

The seeds of *Chiloglottis*, as in most orchids, are extremely small, undifferentiated and bear no tissues specialised to store nutrients or aid in the development of the embryo (Roche *et al.* 2010; Jones 2021). They have an obligate relationship with mycorrhizal fungi for germination and early life stages, with the orchids effectively parasitising the fungal symbiont for the required nutrients (Roche *et al.* 2010). *Chiloglottis platyptera* appears to make use of the widespread fungus *Tulasnella prima* for germination, as do all *Chiloglottis* species that grow in soil (Roche *et al.* 2010; Linde *et al.* 2014; Ruibal *et al.* 2017), and this relationship appears to continue throughout the life of the orchid (Ruibal *et al.* 2017).

The seeds of *Chiloglottis platyptera* are less than 1 mm long and weigh only several micrograms, with a single fruit containing many thousands of seeds as in many other terrestrial orchids (G. Phillips pers. obs. November 2016; Jones 2021). They are primarily wind-dispersed, with the thin, textured seed coat acting as a wing (Jones 2021). Most seed is dispersed very locally to the parent plant with the majority of orchid seeds falling within only a couple of metres of the parent plant (Machon *et al.* 2003; Jersakova and Malinova 2007). However, the extremely light seeds can still travel great distances (potentially thousands of kilometres) and the tiny proportion of the huge number of seeds produced that are dispersed long-distance is possibly sufficient to colonise new areas (Jersakova and Malinova 2007).

Threats

The NSW Scientific Committee (2001) state that the main threats to *Chiloglottis platyptera* are "invasion of weeds such as *Cytisus scoparius*, disturbance by feral pigs, adverse impacts of roadworks and timber harvesting, and collection of plants. Small populations are at risk from stochastic events." While damage to habitat by feral pigs and the invasion of Scotch Broom (*Cytisus scoparius*) continue to be a threat at some sites, as does the emerging threat of herbivory by feral deer, there remains no direct evidence of any of these threats causing decline in any subpopulation or across the total population of *Chiloglottis platyptera* (DPE 2022b; M. Cameron pers. comm. October 2022; L. Copeland *in litt.* October 2022; P. Gadsby *in litt.* October 2022).

Habitat degradation and herbivory by feral pigs and deer

The primary potential threat to *Chiloglottis platyptera* is the disturbance of habitat and herbivory of plants and tubers by both feral pigs (*Sus scrofa*) and feral deer (various species), both of which are known to be active at most locations at which the orchid occurs (DPE 2022b; M. Cameron pers. comm. October 2022; L. Copeland *in litt.* October 2022; P. Gadsby *in litt.* October 2022). Feral pigs in particular may damage or consume individual tubers through their rooting and digging up of soil and leaf litter while searching for preferred food of bulbs, corms and fungi (NSW DPI 2022b). Tuberous species such as orchids are thus more susceptible to the effects of pig digging as the tubers are dug up and eaten, potentially leading to the loss of colonies (van der Werff 1982; Cowled and Lapidge 2004). However, this damage is localised in nature and has only occasionally been observed near to *C. platyptera* (L. Copeland *in litt.* October 2022). Pig digging is less likely in the forest habitats the species occupies than in more open areas (Hone 1988). Decline of *C. platyptera* due to this threat is yet to be observed, yet it remains the most serious threat to the species.

'Predation, habitat degradation, competition and disease transmission by Feral Pigs, *Sus scrofa* Linnaeus 1758' is listed as a Key Threatening Process under the NSW *Biodiversity Conservation Act 2016* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

Feral deer also pose a potential problem to *Chiloglottis platyptera* through grazing, causing erosion through soil exposure and their ability to act as a vector for weeds, and may impact native plants even at relatively low densities (NSW Scientific Committee 2004; NSW DPI 2022a). Feral deer have been noted at or near to several *C. platyptera* sites but have not yet been directly observed impacting the species (DPE 2022b; P. Gadsby *in litt.* October 2022). However, they may do so in the future given that deer are still an emerging threat around some of the largest subpopulations (NSW NPWS 2005, 2022). 'Herbivory and environmental degradation caused by feral deer' is listed as a Key Threatening Process under the Act.

Invasion of Scotch Broom

Scotch Broom (*Cytisus scoparius*) is a state priority weed in NSW and a weed of national significance (NSW DPI 2018). Invasion of Scotch Broom is most prevalent around the Barrington Tops subpopulation of *Chiloglottis platyptera* and that region is known to have the heaviest infestations of Scotch Broom in Australia (NSW OEH 2017; NSW NPWS 2022). However, not all patches within the subpopulation are affected by Scotch Broom (G. Phillips pers. obs. November 2016). Thus, the threat appears to be localised even within the subpopulation and is likely to remain so given the large control efforts in the area to date and long-term containment of major infestations (NSW NPWS 2022). Other subpopulations are in areas that are relatively free of noxious weeds such as Scotch Broom, or where no infestations have been recorded (NSW NPWS 2005, 2012, 2013), and so this threat appears to be of less concern away from Barrington Tops.

Scotch Broom invades grassy forests such as that preferred by *Chiloglottis platyptera* and can rapidly form a dense shrub layer in contrast to naturally sparser shrub layers (NSW OEH 2017). It is especially troublesome after disturbances such as fire, with rapid colonisation of bare ground from the large soil seed bank that typically develops and remains viable for significant periods of time (NSW OEH 2017; NSW DPI 2018). It can form extremely dense thickets, changing fire regimes due to its high flammability and altering microclimates and floristic composition, leading to reduced recruitment of understorey species (NSW OEH 2017; NSW DPI 2018). 'Invasion and establishment of Scotch Broom (*Cytisus scoparius*) is listed as a Key Threatening Process under the Act.

Other threats

Other recorded threats are considered minor in nature and impact *Chiloglottis platyptera* only in localised instances. These include infrastructure maintenance, timber harvesting operations, grazing by domestic stock and the absence of fire causing overgrowth of habitat (DPE 2022b; L Copeland *in litt.* October 2022; P. Gadsby *in litt*. October 2022). Other adverse fire regimes are currently not regarded as a threat to *C. platyptera* as the plants resprout strongly following fire, even after consumption of the above ground parts, because of the regenerative ability of the protected underground tubers (Eco Logical Australia 2014; L. Copeland *in litt.* October 2022). Indeed, other *Chiloglottis* species are enhanced in growth by even extreme fire,

with emergent numbers increasing dramatically in the seasons immediately following the burn (Eco Logical Australia 2014; Phillips and Watts 2021) and *C. platyptera* likely responds similarly.

Assessment against IUCN Red List criteria

For this assessment it is considered that the survey of *Chiloglottis platyptera* has been adequate and there is sufficient scientific evidence to support the listing outcome.

Criterion A *Population Size reduction*

Assessment Outcome: Criterion not met.

Justification: There is no evidence of current or historical population reduction for *Chiloglottis platyptera* (DPE 2022b; M. Cameron pers. comm. October 2022; L. Copeland *in litt.* October 2022; P. Gadsby *in litt.* October 2022). Additionally, the lack of data around full lifespan, time to maturity in seedlings and the length of time individual tubers may remain viable in the soil means a generation length cannot be estimated and thus precludes assessment under Criterion A.

Criterion B *Geographic range*

Assessment Outcome: Criterion not met.

Justification: *Chiloglottis platyptera* is endemic to the NSW Northern Tablelands and has a highly restricted geographic distribution. While the Extent of Occurrence (EOO) has been calculated as 22,504 km^2, not meeting the thresholds for listing, the Area of Occupancy (AOO) has been calculated as 96 km^2 which meets the threshold for listing as Endangered. In addition to this threshold, at least two of three other conditions must be met to qualify for listing under Criterion B. These conditions are:

a) The population or habitat is observed or inferred to be severely fragmented or there is 1 (CR), ≤5 (EN) or ≤10 (VU) locations.

   Assessment Outcome: Subcriterion not met.

   Justification: *Chiloglottis platyptera* is found at >10 threat-defined locations when considering the most serious plausible threat of damage to plants and habitat by feral pigs.

   Chiloglottis platyptera is not considered severely fragmented. Given the ability of *C. platyptera* to reproduce by both sexual and asexual means (Bower 2007) and the long-distance dispersal potential of orchid seeds (Jersakova and Malinova 2007) relative to current distributions, no subpopulations are considered isolated. All subpopulations are also considered viable as seed set has been observed even in small colonies (G. Phillips pers. obs. October 2016, November 2016) as well as the ability for *Chiloglottis* to produce multiple daughter tubers each season and grow colonies rapidly (Bower 2007; Jones 2021).

b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals.

   Assessment Outcome: Subcriterion not met.

Justification: Continuing decline is not evident in the known subpopulations of *Chiloglottis platyptera* despite plausible threats being present. Feral pigs and deer are known to be active near a number of sites of *C. platyptera* (DPE 2022b; M. Cameron pers. comm. October 2022; L. Copeland *in litt.* October 2022; P. Gadsby *in litt.* October 2022). Both have the potential to cause significant damage through herbivory and damage to habitat (NSW DPI 2022a, 2022b), although pig digging is less likely in the forest habitats *C. platyptera* occupies as opposed to more open areas (Hone 1988) and is yet to be observed directly affecting the species. Major infestations of the highly invasive Scotch Broom are also present near some sites, particularly in the Barrington Tops subpopulation (NSW NPWS 2022). However, there remains no direct evidence of any of these threats causing continuing decline in individual subpopulations or the total population of *C. platyptera* (DPE 2022b; M. Cameron pers. comm. October 2022; L. Copeland *in litt.* October 2022; P. Gadsby *in litt.* October 2022). As such, these threats are considered only to be plausible future threats, not satisfying the definition for continuing decline (IUCN 2022).

c) Extreme fluctuations.

Assessment Outcome: Subcriterion not met.

Justification: The ability of *Chiloglottis platyptera* to persist and grow as dormant, underground tubers (Bower 2007; Jones 2021) means that extreme fluctuations are unlikely in the species. Observed fluctuations that may occur are more likely due to detectability issues arising from the dormant portion of the population which may emerge in greater proportions at times but typically remains undetected in the soil (Commonwealth of Australia 2013; Copeland and Backhouse 2022; Phillips and Watts 2022).

Criterion C Small population size and decline

Assessment Outcome: Criterion not met.

Justification: The current population estimate for *Chiloglottis platyptera* is a minimum of 6,800 mature individuals, though this number is highly conservative and real numbers are very likely to greatly exceed 10,000 (L. Copeland *in litt.* October 2016). Using the 6,800 individual estimates as a conservative minimum, the threshold for listing as Vulnerable is met. In addition to this threshold, at least two of two other conditions must be met to qualify for listing under Criterion C. These conditions are:

C1. An observed, estimated or projected continuing decline of at least: 25% in 3 years or 1 generation (whichever is longer) (CR); 20% in 5 years or 2 generations (whichever is longer) (EN); or 10% in 10 years or 3 generations (whichever is longer) (VU).

Assessment Outcome: Subcriterion not met.

Justification: The is no evidence of estimated, projected or continuing decline in the number of mature individuals in *Chiloglottis platyptera* (DPE 2022b; M. Cameron pers. comm. October 2022; L. Copeland *in litt.* October 2022; P. Gadsby *in litt.* October 2022). Additionally, the lack of data around full lifespan, time to maturity in seedlings and the length of time individual tubers

may remain viable in the soil means a generation length cannot be estimated and thus precludes assessment under Subcriterion C1.

C2. An observed, estimated, projected or inferred continuing decline in number of mature individuals.

Assessment Outcome: Subcriterion not met.

Justification: Continuing decline is not evident in the number of mature individuals of *Chiloglottis platyptera* (DPE 2022b; M. Cameron pers. comm. October 2022; L. Copeland *in litt.* October 2022; P. Gadsby *in litt.* October 2022).

In addition, at least 1 of the following 3 conditions:

a (i). Number of mature individuals in each subpopulation ≤50 (CR); ≤250 (EN) or ≤1000 (VU).

Assessment Outcome: Subcriterion not met.

Justification: Two of the known subpopulations of *Chiloglottis platyptera* are estimated to have >1,000 mature individuals (DPE 2022b; L. Copeland *in litt.* October 2022).

a (ii). % of mature individuals in one subpopulation is 90-100% (CR); 95-100% (EN) or 100% (VU)

Assessment Outcome: Subcriterion not met.

Justification: *Chiloglottis platyptera* has a spread of mature individuals across subpopulations, with the largest known subpopulation (Macleay Gorges West) currently estimated to possess approximately 74% of known mature individuals.

b. Extreme fluctuations in the number of mature individuals

Assessment Outcome: Subcriterion not met.

Justification: The ability of *Chiloglottis platyptera* to persist and grow as dormant, underground tubers (Bower 2007; Jones 2021) means that extreme fluctuations are unlikely in the species. Observed fluctuations that may occur are more likely due to detectability issues arising from the dormant portion of the population which may emerge in greater proportions at times but typically remains undetected in the soil (Commonwealth of Australia 2013; Copeland and Backhouse 2022; Phillips and Watts 2022).

Criterion D Very small or restricted population

Assessment Outcome: Criterion not met.

Justification: *Chiloglottis platyptera* is currently estimated to have a minimum population of 6,800 mature individuals, an AOO of 96 km^2, 22 threat-defined locations and no plausible future threat that may rapidly drive the species to extinction in a very short time.

To be listed as Vulnerable under D, a species must meet at least one of the two following conditions:

D1. Population size estimated to number fewer than 1,000 mature individuals.

Assessment Outcome: Criterion not met.

Justification: *Chiloglottis platyptera* is currently estimated to have a minimum population of 6,800 mature individuals, though this figure is highly conservative and real numbers are very likely to greatly exceed 10,000 (L. Copeland *in litt.* October 2022).

D2. Restricted area of occupancy (typically <20 km^2) or number of locations (typically <5) with a plausible future threat that could drive the taxon to CR or EX in a very short time.

Assessment Outcome: Criterion not met.

Justification: *Chiloglottis platyptera* has an estimated area of occupancy of 96 km^2 and is known from 22 threat-defined locations. Additionally, all identified plausible future threats are likely to be localised in nature and would not rapidly drive the species to extinction in a very short time across its full distribution.

Criterion E Quantitative Analysis

Assessment Outcome: Data deficient

Justification: Currently there is not enough data to undertake a quantitative analysis to determine the extinction probability of *C. platyptera*.

Conservation and Management Actions

Chiloglottis platyptera is currently listed on the NSW *Biodiversity Conservation Act 2016* and a conservation project has been developed by the NSW Department of Planning and Environment under the Saving our Species program. The conservation project identifies priority locations, critical threats and required management actions to ensure the species is extant in the wild in 100 years. *Chiloglottis platyptera* sits within the site-managed species management stream of the SoS program.

Activities to assist this species currently recommended by the SoS program (DPE 2022b) include:

Habitat loss, disturbance and modification

- Undertake broad scale weed control, particularly of Scotch Broom (*Cytisus scoparius*).
- Conduct integrated feral pig management to reduce impacts of pig rooting.
- Undertake control of feral deer where it represents a threat to the species.
- Where required, place markers to avoid impacts of road and track maintenance on the species.
- Install and repair fencing in conservation reserves to avoid stock intrusion where required.

Survey and Monitoring

- Permanently tag locations and conduct baseline surveys at known sites to monitor abundance and recruitment of *C. platyptera* as well as to assess site condition and disturbance levels.
- Monitor spread of weeds, particularly Scotch Broom, at all sites.
- Monitor and assess deer impacts using camera traps.

Stakeholder Engagement

- Alert forestry, road, rail and other infrastructure maintenance staff about the presence of *C. platyptera* and encourage avoidance of disturbance where possible.

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APPENDIX 1

Assessment against *Biodiversity Conservation Regulation 2017* criteria
The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome:
Chiloglottis platyptera was found to be Least Concern and thus ineligible for listing as a threatened species as none of the Clauses were met.

Clause 4.2 – Reduction in population size of species
(Equivalent to IUCN criterion A)
Assessment Outcome: Clause not met.

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
(2) - The determination of that criteria is to be based on any of the following:			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

Clause 4.3 - Restricted geographic distribution of species and other conditions
(Equivalent to IUCN criterion B)
Assessment Outcome: Clause not met

The geographic distribution of the species is:			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted,
and at least 2 of the following 3 conditions apply:			
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,	
	(e)	there is a projected or continuing decline in any of the following:	

		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	habitat area, extent or quality,
		(iv)	the number of locations in which the species occurs or of populations of the species,
	(f)	extreme fluctuations occur in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	the number of locations in which the species occur or of populations of the species.

Clause 4.4 - Low numbers of mature individuals of species and other conditions
(Equivalent to IUCN criterion C)
Assessment Outcome: Clause not met

The estimated total number of mature individuals of the species is:						
	(a)	for critically endangered species			very low, or	
	(b)	for endangered species			low, or	
	(c)	for vulnerable species			moderately low,	
and either of the following 2 conditions apply:						
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):				
		(i)	for critically endangered species		very large, or	
		(ii)	for endangered species		large, or	
		(iii)	for vulnerable species		moderate,	
	(e)	both of the following apply:				
		(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and			
		(ii)	at least one of the following applies:			
			(A)	the number of individuals in each population of the species is:		
				(I)	for critically endangered species	extremely low, or
				(II)	for endangered species	very low, or
				(III)	for vulnerable species	low,
			(B)	all or nearly all mature individuals of the species occur within one population,		
			(C)	extreme fluctuations occur in an index of abundance appropriate to the species.		

Clause 4.5 - Low total numbers of mature individuals of species (Equivalent to IUCN criterion D)
Assessment Outcome: Clause not met

The total number of mature individuals of the species is:			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

Clause 4.6 - Quantitative analysis of extinction probability (Equivalent to IUCN criterion E)
Assessment Outcome: Data deficient

The probability of extinction of the species is estimated to be:			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high.

Clause 4.7 - Very highly restricted geographic distribution of species– vulnerable species (Equivalent to IUCN criterion D2)
Assessment Outcome: Clause not met

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.