

# Notes on population size and habitat of the vulnerable *Cryptostylis hunteriana* (Orchidaceae) from the Central Coast of New South Wales

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Habitat details and population sizes are provided for six populations of the rare leafless saprophytic terrestrial orchid *Cryptostylis hunteriana* Nichols (family Orchidaceae) from the Wyong-southern Lake Macquarie area of New South Wales. The extent of potential habitat based on known sites on the Central Coast is examined in a regional context, and annual targeted surveys in similar habitat are suggested. Apart from a population of unknown size in Ku-ring-gai Chase National Park, no populations of *Cryptostylis hunteriana* are at present within conservation reserves on the Central Coast. The paucity of records in the region suggests that any information about ecology or habitat will be beneficial to conservation and management. Adoption of a landscape approach may be the most appropriate avenue to ensure long term conservation. Due to the limited records, the poor representation in reserves and the species' cryptic nature, assessment and survey of all known populations of *Cryptostylis hunteriana* in New South Wales should be undertaken, prior to a review of its current conservation status.

## Introduction

*Cryptostylis hunteriana* Nicholls (family Orchidaceae) is a very rare leafless, saprophytic terrestrial orchid, currently listed on Schedule 2 (Vulnerable) of the NSW *Threatened Species Conservation Act 1995* (TSC Act). It is also listed as Vulnerable on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Within Australia, this species occurs sporadically from Orbost in far-eastern Victoria to the Gibraltar Range in north-eastern New South Wales (Bishop 1996). More recently, a single plant has also been recorded from southern Queensland (Logan 1998).

*Cryptostylis hunteriana* was first collected and described in 1938, from the Marlo race-course in the Orbost district of far-eastern Victoria, where it was apparently quite common. 'Wherever we looked we found the new orchid in the country off the old Bemm Road, from Cape Conran to Orbost, a distance of about twenty-five miles' wrote Nicholls (1938). The first collection from NSW was made along the south-eastern shores of Broken Bay at West Head, north of Sydney in 1954 (Rupp 1955).

As a saprophyte, *Cryptostylis hunteriana* is reliant on the symbiotic relationship with a microrrhizal fungus found in decaying plant matter. The few records of *Cryptostylis hunteriana* on the Central Coast of New South Wales may be due, in part, to the leafless habit, which makes detection difficult. As well, the inconsistent flowering of individuals from season to season presents difficulties for the appropriate management of known populations.

Unlike other species of *Cryptostylis*, it appears that *Cryptostylis hunteriana* has a very poorly developed root system, making it unlikely to spread vegetatively, and restricting re-production and dispersal to seed. Pollination is dependant solely on the ichneumonid wasp, *Lissopimpla excelsa* Costa (syn. *L. semipunctata*), as in the five other Australian species of *Cryptostylis* (Nicholls 1938; Jones 1993; Backhouse & Jeanes 1995). Figure 1 shows the unusual flower of *Cryptostylis hunteriana*.

In view of the potential conflicts between conservation and land use, Wyong Shire Council recently commissioned a Shire-wide survey of significant terrestrial orchids to assist strategic planning in the region (Gunninah Environmental Consultants 2000). No additional populations of *Cryptostylis hunteriana* were located during the summer of 1999, and specimens from known populations could not be re-detected despite considerable search effort. Wyong Council has now developed survey guidelines for threatened terrestrial orchids to assist consultants undertaking survey work for developers in the Shire (Wyong Shire Council 2000).



This paper details population sizes and habitat of *Cryptostylis hunteriana* from three locations on the Central Coast of New South Wales, and reviews three other records for the region. All three populations were discovered opportunistically while surveying other aspects of the vegetation, and typify the most common mode of detection for this species. Little information is available in the literature on the preferred habitat of *Cryptostylis hunteriana*. Documenting the habitat attributes of populations in this area may prompt other workers to find new populations in similar habitat that may otherwise have been considered inappropriate.

Fig. 1. *Cryptostylis hunteriana* from the south coast. Labellum 22–33 mm long.

(Photo: Claire deLacey)

## Conservation status and known records

*Cryptostylis hunteriana* is listed as Vulnerable on both the New South Wales (*TSC Act*) and Commonwealth (*EPBC Act*) threatened species legislation. It is also listed as Endangered in Victoria. Briggs and Leigh (1996) have applied a conservation risk code of 3VC- to this species, indicating a vulnerable species with a distributional range of greater than 100 km, and with unknown representation in conservation reserves. In New South Wales, these authors state that populations of *Cryptostylis hunteriana* are known from Ben Boyd National Park (inadequate population size), Gilbralter Range National Park (unknown population size) and Ku-ring-gai Chase National Park (unknown population size). In Victoria, this species is present in one national park (Croajingalong National Park, unknown population size), one flora reserve (William Hunter Flora Reserve, unknown population size) and state forest estate (Backhouse & Jeanes 1995; Briggs & Leigh 1996). No other populations are known from dedicated reserve. The poor reservation of this species throughout its range, together with the paucity of recent records, has provided the impetus for listing as a Vulnerable species.

Table 1 summarises currently known information on *Cryptostylis hunteriana* populations in New South Wales.

**Table 1. Known populations of *Cryptostylis hunteriana* in New South Wales.**

(Source: National Herbarium records, personal records and Gunninah Environmental Consultants 2000). Populations marked '\*' are detailed further in this paper.

Botanical division	Location	Year	Population size	Land tenure
North Coast	Alum Mountain	1988	unknown	Alum Mtn SF (?)
	Nelson Bay	1997	30–40 plants	private
	Lemon Tree Passage	1997	50 plants	Crown (?)
Northern Tablelands	Dandahra Crags walking trail	1993	unknown	Gilbralter Range NP
Central Coast	West Head	1955	unknown	Ku-ring-gai Chase NP
	Charmhaven*	1979	30 plants	private
	Charmhaven*	1990	2 plants	private
	Chain Valley Bay*	1996	1 plant	Crown
	Vales Point-Wyee*	1997	3 plants	private
	Freeman's Waterhole*	1998	15 plants	Awaba SF
	Wyee*	1999	1 plant	Crown
South Coast	Pigeon House Mountain area	1967	unknown	Croobyar SF (?)
	Stokes Island, near Lake Burril	1970	unknown	unknown
	Pigeon House Mountain area	1996	20 plants	Croobyar SF (?)
	Manyana–Bendalong area	1996	20 plants	unknown

### Previously documented habitat

*Cryptostylis hunteriana* reportedly grows in swampy heaths on sandy soils, chiefly in coastal districts between the Gibraltar Range and eastern Victoria (Jones 1993; Weston 1993; Bishop 1996). In New South Wales, Bishop (1996) notes that this species occupies a variety of habitats, ranging from scrubby swamp fringes to steep bare hillsides in tall eucalypt forest. Jones (1993) suggests that this species grows most often on the flat plains close to the coast, favouring moist soils. Nicholls (1938) describes habitat from eastern Victoria as the 'coastal grass-tree plains which extend from Marlo eastward from the coast one to six miles, the large Tongue Orchid (*C. subulata*) invariably in association'. More recently, Backhouse and Jeanes (1995) have described this Victorian habitat as the *Xanthorrhoea resinosa* plains and adjacent heathlands and heathy woodlands, on moist (sometimes peaty) sandy soils. Flowering occurs from December to February (Nicholls 1938; Jones 1993; Weston 1993), and represents the only indication of the species' presence in an area. In southern Queensland, a single *Cryptostylis hunteriana* was recorded from whitish sandy soil in a coastal habitat in August 1998 (Logan 1998).

### Population and habitat on the Central Coast

Habitat details are presented for three populations discovered by the author during general vegetation survey work in Awaba State Forest near Freemans Waterhole, and at two locations near Wyee. None of these populations have been previously recorded and all occupy similar ecological environments. Notes are also provided on the general habitat attributes of the other three populations known from the Central Coast north of Wyong. Figure 2 shows the approximate location of all six populations of *Cryptostylis hunteriana*.

#### Freemans Waterhole (Awaba State Forest)

On the 14th November 1998, fifteen plants of *Cryptostylis hunteriana* were discovered along the edge of a fire trail in Awaba State Forest near Freemans Waterhole. Prior to this, no records of the species were known from any State Forest estate in the Morisset Forestry District (Binns 1996). The site occurred on a gently sloping (8°) ridgeline at a north-easterly aspect, on soils of the Doyalson (do) soil landscape (Murphy 1993). Vegetation in the area most readily conformed to the Coastal Plains Smooth-barked Apple Woodland of NPWS (2000), and comprised an 8–12 m canopy of *Eucalyptus capitellata*, *Eucalyptus umbra*, *Corymbia gummifera* and the occasional *Angophora costata*. Smaller trees of *Syncarpia glomulifera* and *Leptospermum trinervium* were also present, over an understorey of *Hakea bakeriana*, *Lambertia formosa*, *Tetratheca juncea*, *Epacris pulchella*, *Grevillea sericea*, *Leptospermum polygalifolium* subsp. *cismontanum*, *Banksia spinulosa* var. *collina*, *Persoonia levis*, *Isopogon anemonifolius*, *Bossiaea obcordata*, *Bossiaea heterophylla* and *Lomatia silaifolia*. Ground layer vegetation included a dense cover of *Entolasia stricta*, *Anisopogon avenaceus*, *Lomandra obliqua*, *Goodenia stelligera*, *Mirbelia rubiifolia*, *Lindsaea linearis*, *Melichrus procumbens*, *Hovea linearis*, *Panicum simile*, *Dampiera stricta*, *Ptilothrix deusta*, *Patersonia glabrata*, *Gompholobium pinnatum* and *Xanthorrhoea latifolia* subsp. *latifolia*. Fire was noted to have occurred approximately 18 months to 2 years prior to survey.

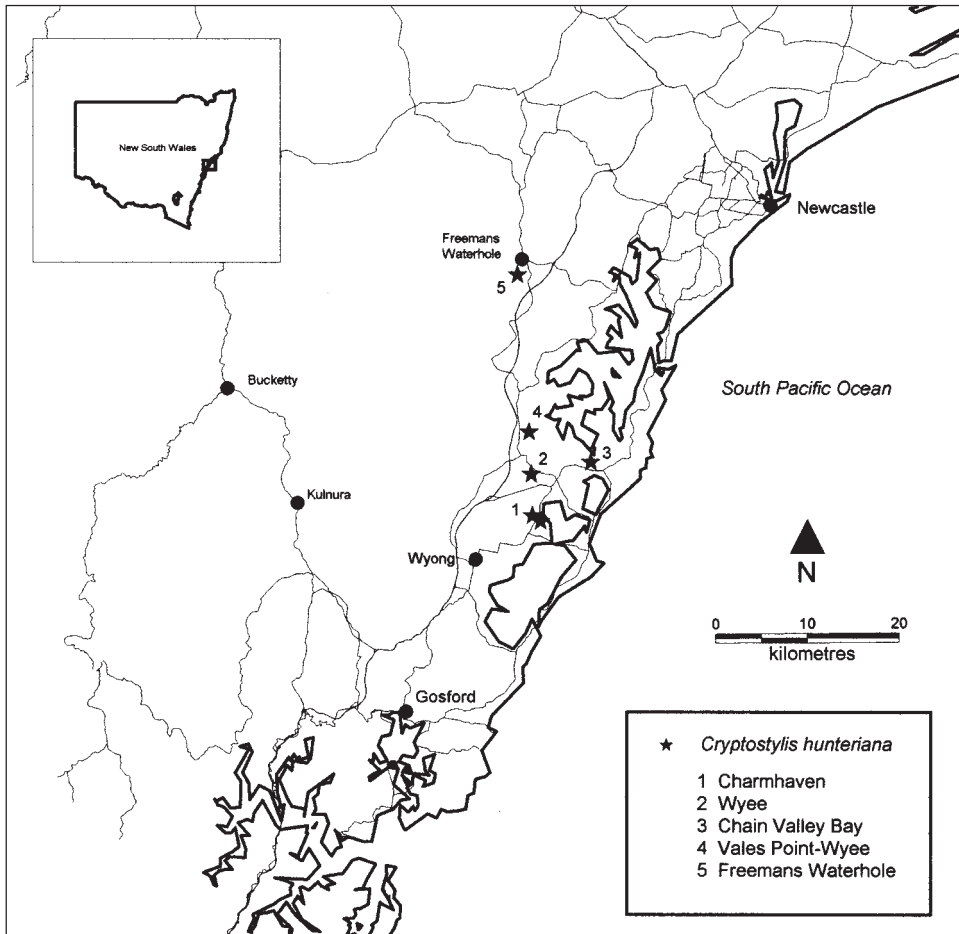


Fig. 2. Locations of *Cryptostylis hunteriana* populations on the Central Coast.

### Vales Point–Wyee

A population of three individual *Cryptostylis hunteriana* were recorded on land owned by Pacific Power near Wyee on the 27th November 1995 (Bell 1995). The site was a gently sloping ( $4^\circ$ ) upper slope with a southerly aspect, on yellow-brown sandy soils of the Doyalson (do) soil landscape (Murphy 1993). Vegetation in the area comprised an open woodland typical of the Coastal Plains Scribbly Gum Woodland (NPWS 2000). Fire was estimated to have occurred approximately 3–5 years previously.

Associated species at this location included a widely spaced canopy of mostly *Eucalyptus haemastoma* to 8 m in height, but also with occasional *Corymbia gummifera*, *Eucalyptus capitellata* and *Angophora inopina*. Understorey vegetation included a shrub layer to 1.5 m of *Leptospermum trinervium*, *Banksia oblongifolia*, *Hakea laevipes* (*dactyloides*), *Leucopogon esquamatus*, *Pultenaea* sp. H, *Platysace linearifolia*, *Comesperma ericinum*, *Lambertia formosa*, *Epacris pulchella*, *Petrophile pulchella*, *Personia levis*, *Isopogon anemonifolius*, *Dillwynia retorta*, *Acacia terminalis*, and *Leucopogon microphyllus*; and a ground layer to 0.5 m of *Actinotus minor*, *Xanthorrhoea latifolia* subsp. *latifolia*, *Hibbertia vestita*, *Lepidosperma laterale*, *Dampiera stricta*, *Poranthera ericifolia*, *Lindsaea linearis*, *Stackhousia nuda*, *Patersonia glabrata*, *Ptilothrix deusta*, *Anisopogon avenaceus*, *Gompholobium pinnatum*, *Tricoryne simplex*, *Melichrus procumbens* and *Aristida vagans*.

A subsequent visit to the site in late 1999 failed to find any trace of the species, despite no obvious signs of disturbance to the site (B. Branwhite, pers. comm.).

### Wyee (Wyee Road)

A single plant of *Cryptostylis hunteriana* was discovered in open woodland vegetation in Crown land on a gentle crest near Wyee, on the 29th November 1999. Searches of the immediate area surrounding the plant failed to locate any additional specimens. A subsequent visit to the site in early February 2000 revealed that the plant was still visible and that fruits were developing. At the time of flowering, estimates of 2–4 years were made since the last fire.

This specimen was located on a gentle undulating crest (2° slope to the south-west) on soils of the Gorokan (gk) soil landscape (Murphy 1993), in a very open 6–8 m woodland of *Eucalyptus haemastoma*, *Corymbia gummifera*, *Banksia serrata* and *Angophora inopina*. Understorey vegetation was comprised of a variety of heathy shrubs to 0.7 m in height (emergents to 1.5 m), such as *Isopogon anemonifolius*, *Banksia oblongifolia*, *Hakea laevipes* (*dactyloides*), *Lambertia formosa*, *Leptospermum trinervium*, *Epacris pulchella*, *Grevillea sericea*, *Persoonia levis*, *Acacia suaveolens*, *Pimelea linifolia* subsp. *linifolia*, *Comesperma ericinum*, *Petrophile pulchella*, *Allocasuarina littoralis* and *Hakea teretifolia*. Ground layer vegetation was well represented and merged with the shrub layer, and included *Lomandra obliqua*, *Actinotus minor*, *Aristida vagans*, *Aristida warburgii*, *Lindsaea linearis*, *Melichrus procumbens*, *Patersonia sericea*, *Pultenaea* sp. H, *Panicum simile*, *Xanthorrhoea latifolia* subsp. *latifolia*, *Hibbertia vestita*, *Stylidium graminifolium* and *Mirbelia rubrifolia*.



Fig. 3. Typical habitat for *Cryptostylis hunteriana* on the Central Coast of New South Wales: Coastal Plains Scribbly Gum Woodland near Wyee.

### Other reported populations

Other records of *Cryptostylis hunteriana* on the Central Coast all occur within the Coastal Plains Scribbly Gum Woodland of NPWS (2000). These locations have been inspected by the author, and all occur in open woodland or open forest of *Eucalyptus haemastoma*, *Corymbia gummifera*, *Eucalyptus capitellata*, *Angophora inopina* and *Angophora costata* over a shrubby or heathy understorey. One population in the Charmhaven area occurs in a remnant of this vegetation type within a heavily urbanised part of Wyong Shire, and is under pressure for future development (Conacher-Travers 2000). A single plant was observed at this location in 1990, but has not been seen since. The second population in Charmhaven represents the largest one for the region (30 plants), but plants have not been detected there since the original 1979 record. Similarly, the single plant recorded for Chain Valley Bay in 1996–97 has not been re-located since.

### Discussion

Previous descriptions of the habitat of *Cryptostylis hunteriana* in the literature notably differ from that reported here for the Central Coast. An open woodland with a heath understorey is not mentioned for this species in most of the popular orchid texts (Jones 1993; Weston 1993; Bishop 1996), although Backhouse and Jeanes (1995) do suggest heathlands and heathy woodlands on moist sandy soils. Jones (1993) also states that *Cryptostylis hunteriana* favours moist soils on the coastal plains, but in the Wyong area soils are typically dry and infertile sandy loams derived from the Triassic Narrabeen series. In three of the populations reported here, flowering has been noted in November rather than the December-to-February period mentioned by other authors. Most other records for the State are for the December–January period (Peter Hind pers. comm.). Interestingly, Logan (1998) reports August flowering for the only known record in southern Queensland.

Five of the six records of *Cryptostylis hunteriana* from the Wyong–southern Lake Macquarie area occur in a vegetation type known in the region as Coastal Plains Scribbly Gum Woodland (NPWS 2000). This vegetation type extends from Wyong to the western parts of Lake Macquarie, and covers an area of approximately 4200 ha. Fig. 3 illustrates this vegetation type near Wye. The sixth population (Awaba State Forest) occurs in Coastal Plains Smooth-barked Apple Woodland, which extends from Wyong to Port Stephens and covers around 33 000 ha. Combined, these two vegetation types occupy approximately 10% of the extant vegetation remaining in the lower Hunter Valley and Central Coast (NPWS 2000). Consequently, there is potential for *Cryptostylis hunteriana* to occur anywhere in the area mapped as these two communities by NPWS (2000), and future survey work carried out in these communities should be considered potential habitat for this species. Surveys in these areas should also be timed to coincide with the flowering period (November to February).

As far as can be ascertained, none of the six populations reported for the Central Coast region have flowered repeatedly over subsequent seasons. Gunninah Environmental Consultants (2000) found no evidence of the species either in new

locations or in previously reported areas. Consequently, this species may well only flower sporadically when conditions are suitable, compounding the problems of understanding and managing this cryptic species.

### Conservation and management

Within the Wyong–Lake Macquarie region, there is currently no known representation of *Cryptostylis hunteriana* within proclaimed conservation reserves. Reserves in this area supporting potential habitat as described above include only Munmorah State Recreation Area (1460 ha) and Lake Macquarie State Recreation Area (677 ha), and comprehensive general vegetation survey has been undertaken in both of these (Payne 1997; Bell 1998). However, repeated targeted surveys for *Cryptostylis hunteriana* during several flowering seasons have not been undertaken, and it remains to be seen whether or not the species is present.

The nearest known formal reservation of *Cryptostylis hunteriana* occurs approximately 40 km to the south of Wyong in Ku-ring-gai Chase National Park on the Hawkesbury River, where a population of unknown size has been reported (Rupp 1955; Briggs & Leigh 1996). This collection was made in December 1954 on West Head Road, and represents the only record for the Central Coast botanical division held by the National Herbarium of NSW (Peter Hind pers. comm.). No other reserve within the Central Coast botanical division is known to support the species. Ku-ring-gai Chase National Park occurs on Hawkesbury Sandstone geology and consequently supports a different suite of vegetation communities (see Outhred, Lainson, Lamb & Outhred 1985). General habitat structure is, however, likely to be similar, although floristics do differ.

The population of *Cryptostylis hunteriana* recorded from Awaba State Forest lies less than 3 km east of Watagan National Park, and possibly offers the best opportunity to formally conserve the species in this part of the Central Coast. This would entail the transferral of land managed by State Forests to the NSW National Parks & Wildlife Service (NPWS). Parcels of Crown land at Wyee and Chain Valley Bay could also be incorporated into NPWS estate, particularly the latter through addition to Lake Macquarie State Recreation Area. The long term survival of the Charmhaven populations on private land are at present uncertain, as urban expansion threatens much of the remnant vegetation in this part of Wyong shire. Populations around Wyee form part of a proposed green belt separating the urban areas of Wyong and Lake Macquarie Shires, and hence informal protection of these areas may be feasible. Indeed, this area also supports populations of the Endangered *Acacia bynoeana*, and the Vulnerable *Tetratheca juncea* and *Angophora inopina*. The last species in particular occurs in close proximity to *Cryptostylis hunteriana* in four of the six populations known. Consequently, there is considerable merit in formally conserving part of this habitat for the regional protection of these four threatened plant species.

In the Central Coast area, the main threats to the long term survival of *Cryptostylis hunteriana* include general habitat loss and fragmentation, frequent fire during the flowering season, weed invasion, and modification of habitat through nutrient enrichment (eg: fertilisers, urban runoff). Backhouse and Jeanes (1995) suggest that



Victorian populations of this species are threatened by the drainage of swamps, weed invasion, unscrupulous collection and altered fire regimes. Loss of habitat for native ichneumonid wasp pollinators is potentially also of importance, although *Lissopimpla excelsa* is widespread throughout Australia and commonly occurs in fragmented and urbanised environments (CSIRO 1991). It has also been suggested that flowering may be inhibited by hot fires during the previous summer (Backhouse & Jeanes 1995), and further investigation is required in this regard. The Central Coast lies within a rapidly developing zone between the metropolitan centres of Sydney, Gosford and Newcastle, and hence all of these potential threats are very real. Appropriate planning is required in this area to reduce the impacts of these threats.

Considering the limited number of known sites of *Cryptostylis hunteriana*, the apparent small population sizes at most sites, the inconsistent flowering from year-to-year, and the inadequate representation in conservation reserves, a comprehensive assessment of all known populations from throughout the State is needed, as well as dedicated survey for the species in appropriate habitat in proclaimed reserves. In the Central Coast region, this would entail searches in areas supporting Coastal Plains Scribbly Gum Woodland and Coastal Plains Smooth-barked Apple Woodland (as defined by NPWS 2000). Considering the fire history of sites known to date, searches may best be undertaken between 12 and 36 months after a fire. The results of such assessment and survey may lead to a revision of the current Vulnerable listing, both nationally and within New South Wales. It is suggested that all known populations be managed in such a way that ground disturbance is avoided within specified buffer zones (perhaps 500m or more), and that fire be excluded during the flowering season of November to February or March. In view of the paucity of records, it may be more appropriate to adopt a landscape approach in regard to conservation, whereby large tracts of vegetated land are protected from development to provide opportunities for genetic dispersal into apparently unoccupied habitat.

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