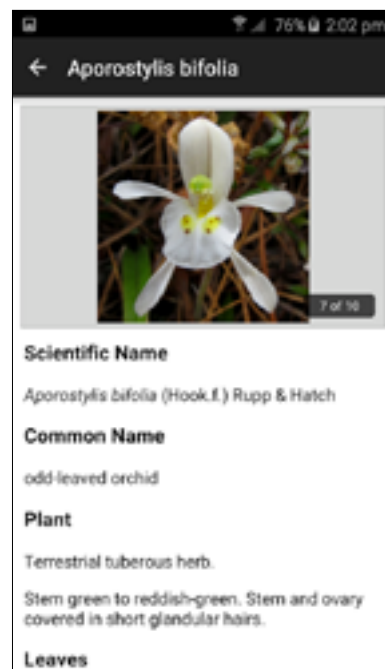
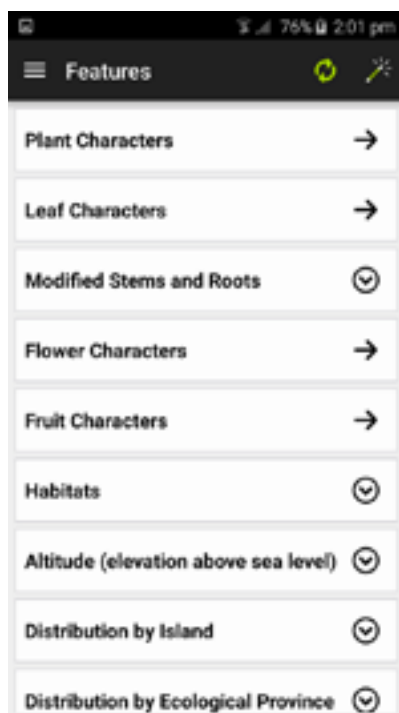


# NZ Orchid Key: a new smartphone app for identifying native orchids

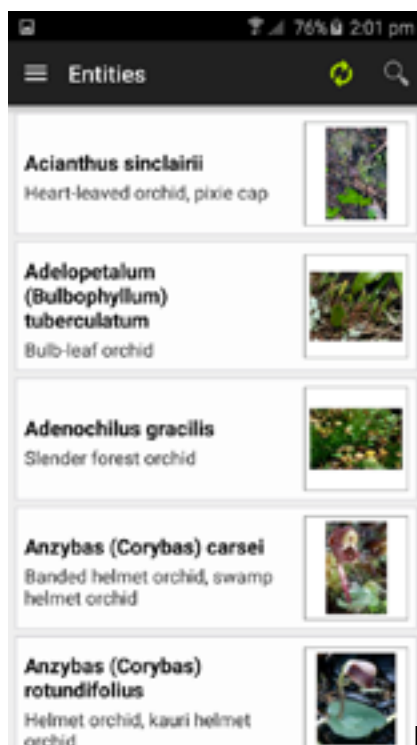
Murray Dawson<sup>1</sup>, Jeremy Rolfe, Michael Pratt and Ian St George

Smartphones have rapidly become the device of choice for New Zealanders and the rest of the world. Their processing power, storage capacity, and portability have come of age, making it possible to run comprehensive productivity apps including identification tools. Uptake of this technology will continue to increase into the foreseeable future.

It is timely then that a powerful app for identifying native orchids is now available for smartphones and tablets from the Android Google Play Store and Apple's iTunes (Fig. 1A–E)<sup>2</sup>.



**Fig. 1** Screenshots of the NZ Orchid Key app. **A**, icon, illustrating the mauve sun orchid (*Thelymitra malvina*). **B**, start-up screen. **C**, feature (character) list. **D**, entity (species) list. **E**, part of a built-in species profile.



This free app, called the NZ Orchid Key, is easy-to-use, has lots of colourful photographs, and covers a wide array of plant characters<sup>3</sup>, including leaves, flowers, habitats, and distribution for identifying native orchids. Users choose whichever characters in the app match the orchid specimen they are identifying through a process of elimination. If a user needs help to understand what a particular character state means, they can bring up an explanation page for it.

Each species within the app is supported by a descriptive profile, providing all the information needed to verify the identification. Species profiles include links out to online resources on native orchids – the

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<sup>2</sup> [https://play.google.com/store/apps/details?id=com.lucidcentral.mobile.nz\\_orchid](https://play.google.com/store/apps/details?id=com.lucidcentral.mobile.nz_orchid) and <https://itunes.apple.com/us/app/nz-orchid-key/id1063192594?mt=8>

<sup>3</sup> In total, 43 characters and 212 character states were chosen for identifying native orchids in the key. An example of a character is 'Flower Colour', and its character states may include the colours 'white', 'pink', 'purple' etc.

original New Zealand Native Orchids website profiles (which were adapted for the app), and also New Zealand Plant Conservation Network (NZPCN) and Flora of NZ online pages.

However, the app itself is a self-contained download, so it can be used in the field without Internet access. Because of its completeness, the NZ Orchid Key also provides a comprehensive resource for learning about this fascinating group of plants.

### Development of the native orchid app

Murray Dawson (Fig. 2) of Landcare Research, Lincoln, led the project, in collaboration with the New Zealand Native Orchid Group (NZNOG).



**Fig. 2** Murray Dawson, in the Allan Herbarium at Lincoln, demonstrating the NZ Orchid Key app. Alongside is a herbarium specimen of *Thelymitra cyanea* (striped sun orchid), one of many specimens that contributed measurements used within the app. Photo: Caroline King.

Kathleen Stewart and Jenny Dent worked with Murray measuring characters from hundreds of herbarium specimens<sup>4</sup> held at Lincoln and Auckland. These measurements filled gaps and supplemented characters available online and in published descriptions (see References).

Michael Pratt provided his species profiles to use within the app, sourced from his outstanding New Zealand Native Orchids website (<http://nativeorchids.co.nz>).

The remaining author of the NZ Orchid Key is Wellington-based Department of Conservation (DOC) botanist and photographer Jeremy Rolfe who contributed orchid images from his extensive collection. Jeremy has co-authored two books on native orchids with Peter de Lange, also of DOC (de Lange et al., 2007; Rolfe and de Lange, 2010), and an identification guide to *Gastrodia* (Rolfe, 2015).

Other images were crowd-sourced from members of the New Zealand Native Orchid Group and the NatureWatch NZ orchid project (<http://naturewatch.org.nz/projects/new-zealand-native-orchids>). Native orchids are a popular subject for photography with devotees throughout New Zealand. Thanks to the generosity of these contributors, the new app contains an amazing collection of more than 1500 pictures that would have taken several lifetimes for one person to accumulate. This is a great example of what can be achieved through outreach, citizen science, and crowd-sourcing.

The NZ Orchid Key first became available as an app late November 2015 (for Android) and early December 2015 (iOS). It is part of a series of free interactive keys for identifying New Zealand native and naturalised plants. Online versions are hosted by Landcare Research ([www.landcareresearch.co.nz/resources/identification/plants](http://www.landcareresearch.co.nz/resources/identification/plants)). The app work extends the accessibility of these online keys, a move that is welcomed by field workers, hikers, gardeners, photographers, educators and students, and anyone interested in plants.

The NZ Orchid Key should raise public awareness of our treasured native orchids, and is a useful tool for those who need help in identifying them.

### New Zealand native orchid taxonomy

There are 120 species of formally described native orchids. However, the total may be up to 160 if we include orchids that don't yet have formal botanical names.

For example, there are a couple of spider orchid species complexes – *Nematoceras rivulare* (or *Corybas rivularis* as it is also known) and *Nematoceras trilobum* (*Corybas trilobus*) aggregates – that have 8–9 informal entities with tag-names within each complex. Several of these entities have recently been studied by botanists, and will be formally named and described as new species in the near future. Many others remain to be critically examined.

In addition to the taxonomic issues of species delineation and description, there has been much debate over the genus-level classification of Australasian orchids. The tendency to split native Australasian orchid genera into related segregate genera has reversed in recent years, meaning that Australian and New Zealand botanists are again accepting older, more conservative genus level treatments (e.g., accepting re-enlarged *Caladenia*, *Corybas*, and *Pterostylis*). As a result, many native orchid species have gone (or are in the process of going) back to their previous names.

#### The Orchidaceae family: some facts

Orchids are an amazing plant family with many interesting features:

- They are one of the two most species rich families of flowering plants in the world (the other is the daisy family, Asteraceae/Compositae)
- Worldwide the Orchidaceae comprise ca. 28,000 accepted species from ca. 880 genera
- Although the Orchidaceae have a near cosmopolitan distribution including arctic and sub-Antarctic regions, most species are found in the tropics and subtropics, where the majority are epiphytes (tree perching species)
- Orchid species have remarkable diversity of flower structures, linked to their highly specialised pollination systems
- Horticulturists have created more than 100,000 garden selections (hybrids and cultivars) from overseas species
- Natural vanilla flavouring comes from the dried seed pods of an orchid (*Vanilla planifolia*) native to Mexico.

<sup>4</sup> A herbarium is somewhat like a library, but instead of books, holds a reference collection of pressed, dried, and labelled plants available for scientific study.

More than half of the New Zealand native orchid species are unique to this country (i.e., they are endemics). Other native species are shared with Australia; their tiny dust-like seeds have blown across the Tasman to arrive in New Zealand, both recently and in the more distant past.

Native orchids are a remarkable and diverse group of plants (Fig. 3–24). They occupy a wide range of habitats throughout New Zealand, from coastal to alpine elevations.

In the wild, native orchids are easily overlooked until seen in flower when they are at their showiest. There are many flower types, including star shaped, hooded, and spider shaped.

### Terrestrial (ground-dwelling) species

Most of our native orchids are ground dwelling perennials, and these terrestrial species die back to an underground tuber after flowering and fruiting.

Many terrestrial species favour poorly drained sites and low fertility soils. They are often encountered growing in semi-open habitats alongside hiking tracks, where they become a favourite of nature watchers and photographers during the flowering season.

Gnat orchids are apparently named after the insects that pollinate them. In New Zealand, these orchids belong to what the NZNOG call the *Acianthus* Alliance – comprising *Acianthus*



**Fig. 3** *Acianthus sinclairii* (pixie cap orchid). **A**, plant in flower showing its single heart-shaped leaf held above ground level. **B**, close-up of flower showing the “pixie cap” – the dorsal sepal cupped over the column. Photos: Ian St George.

*sinclairii*, two *Cyrtostylis* species (*C. oblonga* and *C. rotundifolia*), and *Townsonia deflexa*. All four species are small orchids found in forest and scrubland, with single oval or heart-shaped leaves, and (depending on the species) with 2–4 greenish or reddish flowers. The most common gnat orchid throughout New Zealand is *Acianthus sinclairii* (the heart-leaved orchid or pixie cap orchid; Fig. 3A–B). This is predominantly a winter flowering species. The two species of *Cyrtostylis* are quite similar in appearance to one another, and flower mainly in late winter to early spring; neither is uncommon in some districts. *Townsonia deflexa* (the creeping forest orchid) is rare in the North Island and uncommon in the

South Island, where it is found mainly at montane to subalpine elevations in beech forest. This orchid flowers in summer.

In New Zealand, the only member of *Adenochilus* is the slender forest orchid, *A. gracilis*, and the only member of *Aporostylis* is the odd-leaved orchid, *A. bifolia*. Both are relatively common species found throughout New Zealand, with solitary flowers that peak December to January, and both are found in beech forest and other habitats. As their common names imply, the slender forest orchid has a slender habit in flower, and the odd-leaved orchid (Fig. 4A–B) has two leaves of markedly different size.

### Native orchid conservation

Native orchids have high conservation values and exacting growing requirements so should not be removed from the wild. Native orchids, especially the terrestrial species, will perish in typical home garden conditions and it's also illegal to remove any plant material from public conservation land without a special permit from DOC. Furthermore, all native orchids are CITES<sup>5</sup> species meaning that their export is strictly controlled.

As a general rule, the best conservation strategy is to leave native orchids undisturbed in their natural habitats. They can be appreciated and photographed in the wild, but their flowers should not be picked, because that flower can't then go on to form a seed capsule which can contain hundreds, or thousands, of tiny seeds. If picked, the next generation of plants may be eliminated.

Fortunately, the New Zealand Native Orchid Group (NZNOG) and other regional orchid societies have strict codes of conduct reflecting these conservation values.

Under the New Zealand Threat Classification System (administered by DOC), five species of native orchids are Nationally Critical, one is Nationally Endangered, four are Nationally Vulnerable, and about 30 species are currently At Risk.

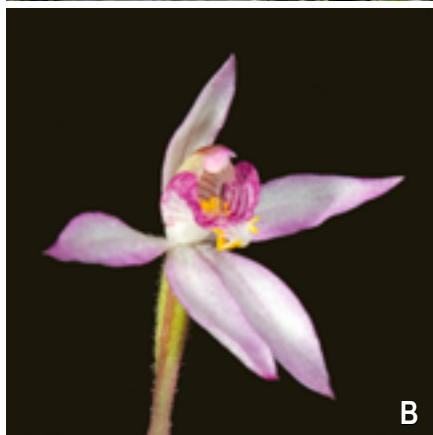
<sup>5</sup> CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.



**Fig. 4** *Aporostylis bifolia* (odd-leaved orchid). **A**, plants showing hairy stems and characteristic pairs of unequal leaves (hence the species name “bifolia” and the common name “odd-leaved orchid”). **B**, close-up of white flower with yellow blotches and brown spots. Photos: Jeremy Rolfe.

Native *Caladenia* orchids have a range of flower colours that include white, green, mauve, and pink tones. All share a similar flower shape, with a hooded dorsal sepal and finger-like petals and lateral sepals (e.g., *Caladenia alata*, which has the common name pink fingers; Fig. 5A–B). *Caladenias* produce characteristically few flowers (usually one, but up to three for some species), and all have long and narrow single leaves that are usually hairy. Species are mainly found on infertile clay soils amongst scrub and light forest, although a few extend up into the alpine zone. Until recently, New Zealand caladenias were placed in the segregate genera *Petalochilus* and *Stegostylia* before

recently returning to *Caladenia*. The re-enlarged genus now includes nine or ten species currently recognised for New Zealand, and there are also several tag-named entities. *Caladenia* is a mainly Australian genus, with more than 300 species (depending on which treatments are accepted), and with one species extending to New Caledonia, Indonesia and Malaysia.



**Fig. 5** *Caladenia alata* (pink fingers). **A**, plant in flower. **B**, close-up of flower showing pink finger-like petals and sepals. Photos: Jeremy Rolfe.

One of New Zealand’s Nationally Critical orchids, *Caleana minor* (Fig. 6A–B), has unusual flowers with an uncanny resemblance to tiny flying ducks. In comparison to most other orchid species, the flowers of *C. minor* are upside-down, so that the labellum<sup>6</sup> is orientated uppermost. Although the flying duck orchid is more common in Australia, in New Zealand it is currently known

only from one small colony within a geothermal area at Rotorua. This species has also been placed in the related genus *Paracaleana*.



**Fig. 6** *Caleana minor* (flying duck orchid). **A**, plant in flower. Photo: Chris Ecroyd. **B**, close-up of flowers showing their resemblance to flying ducks. The “head of the duck” is actually an upside-down orientated labellum covered in raised purple glands. Photo: Ian St George.

Bearded orchids are named after their prominently hairy labella that give them a very distinctive appearance; when they are not in flower, they look similar to the sun orchids, *Thelymitra*. New Zealand has three native species (*Calochilus herbaceus*, *C. paludosus*, and *C. robertsonii*), all shared with Australia which is centre for the genus (with about 26 species). Under the New Zealand Threat

<sup>6</sup> Labellum means lip – in orchid flowers a labellum refers to the highly modified middle (ventral) petal which may differ in size, shape or ornamentation from the two lateral petals.

Classification System, *Calochilus herbaceus*, the copper beard orchid (Fig. 7A–B), is categorised as a Threatened: Nationally Critical species and the other two are At Risk: Naturally Uncommon.



**Fig. 7** *Calochilus herbaceus* (copper beard orchid). **A**, flowers (not fully opened). **B**, close-up of flower showing its unusual bearded labellum. Photos: Jeremy Rolfe.

*Chiloglottis* is a genus of about 24 Australian species with the common names ant orchid, because the dark calli (warty thickenings on the labellum) resemble ants, and bird orchid, perhaps because of a vague resemblance of the flower to a bird. However, what the flower parts are really mimicking, from an insect pollinators point of view, is the flightless female of particular wasp species, to facilitate pollination

by “sexual deception” (called pseudocopulation). *Chiloglottis* species in New Zealand are all shared with Australia, and tend to be found in plantation forestry, especially under pines. Most are categorised as Non Resident Native: Vagrant, meaning that they periodically arrive in New Zealand after the seeds blow across the Tasman from Australia. They were previously placed in the segregate genera *Myrmechila* and *Simpliglottis*, before recently returning to *Chiloglottis*. In New Zealand, the most widespread species is *Chiloglottis cornuta* (ant orchid, green bird orchid; Fig. 8A–B). This species is predominantly self-pollinating, and classed as Not Threatened, so it has overcome the limitations of pollinators being absent in New Zealand. The vagrant *Chiloglottis formicifera* is currently presumed extinct in New Zealand but is abundant in eastern Australia.



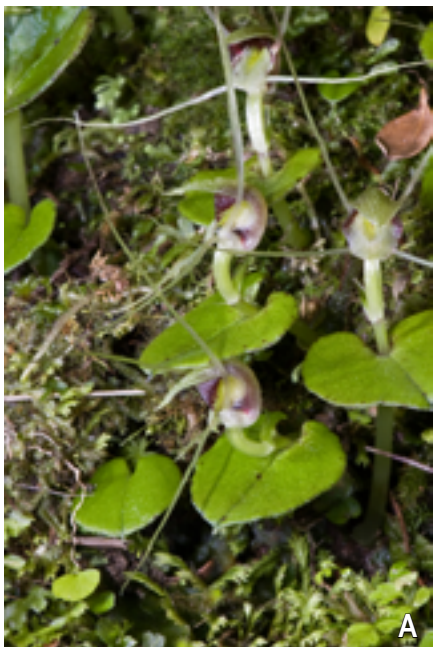
**Fig. 8** *Chiloglottis cornuta* (green bird orchid). **A**, plant showing its low stature when in flower. **B**, plants showing elongation of stems when in fruit. Photos: Jeremy Rolfe.

Spider orchids are named after their solitary flowers which (for most species) have long and slender sepals that give them a spider-like appearance. Exceptions are *Corybas*

*cheesemanii*, the spurred helmet orchid (Fig. 9A–B) and *Anzybas* which lack these elongated sepals. Spider orchids typically have single oval shaped leaves held close to the ground and prefer damp banks or shaded areas in forest. New Zealand has four segregate genera – *Anzybas* (2 spp.), *Molloybas* (1 sp.), *Nematoceras* (11–13 spp., with many tag-names awaiting taxonomic resolution; e.g., Fig. 10A–B), and *Singularybas* (1 sp.). Species from these segregate genera are in the process of moving back to their previous names in *Corybas*.



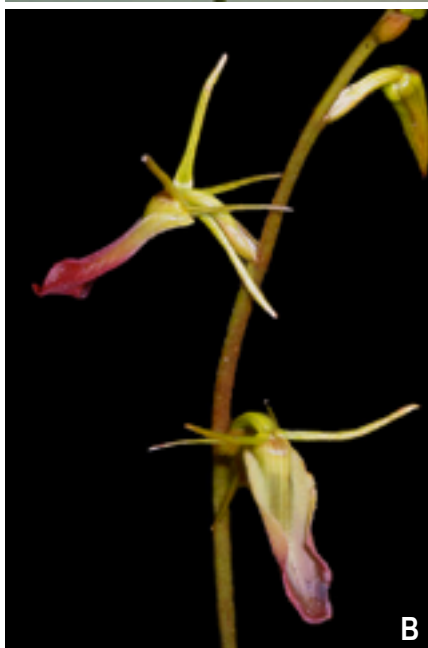
**Fig. 9** *Corybas cheesemanii* (spurred helmet orchid). **A**, plant showing its helmet-like flower, with a pointed cowl-like hood (dorsal sepal) and downward pointing spurs (modified petals) at the base. **B**, colony showing how the flower stems elongate greatly as they develop fruit. Photos: Jeremy Rolfe.



**Fig. 10** *Nematoceras* (*Corybas*) “whiskers”, an informally named spider orchid, currently grouped within the *N. rivulare* species complex, but is nevertheless well known and distinctive. **A**, colony of plants. **B**, close-up of flower showing four long and whisker-like petals and sepals. Photos: Jeremy Rolfe.

*Cryptostylis subulata* is another of the few native orchids that have “upside-down” flowers. Its common names are duck bill orchid and large tongue orchid, after the long and oblong labellum (Fig. 11A–B). This species is only known from bogs north of Kaitiaki, but is common in Australia.

Three unusual genera of native orchids, represented by *Danhatchia australis* and *Molloybas cryptanthus* (both endemic and monotypic<sup>7</sup> species), and all species of *Gastrodia*



**Fig. 11** *Cryptostylis subulata* (duck bill orchid, large tongue orchid). **A**, flowers. Photo: Landcare Research. **B**, close-up of flowers showing the distinctive elongate labella. Photo: Ian St George.

are mycoheterotrophic. That is to say, they are leafless (or with leaves reduced to scales) and completely non-green (lacking chlorophyll). Instead of deriving their energy from photosynthesis, these orchids obtain energy and nutrients from fungi that are parasitic upon host tree roots.

The native potato orchids (*Gastrodia* spp.) are the most widespread of these non-green species and produce bell-shaped brown flowers. Three species are formally accepted for



**Fig. 12** *Gastrodia* “long column” (potato orchid), a tag-name for a plant that may soon be botanically described as a new species. All species of *Gastrodia* are leafless and non-green. **A**, plants in flower showing below-ground rhizomes. Photo: Landcare Research. **B**, close-up of flowers. Photo: John Barraclough, via NatureWatch NZ.

New Zealand (*G. cunninghamii*, *G. minor*, and *G. sesamoides*), and there is one undescribed species complex (*Gastrodia* “long column” agg.; Fig. 12A–B) currently undergoing study. *Gastrodia cunninghamii* (huperei, the black orchid) has relatively long, tuberous rhizomes (which may be up to 250 × 50 mm). These starchy rhizomes were traditionally eaten by Māori after cooking in a hāngī (a buried steam oven) or roasting in fire embers. They must have been difficult to find and

<sup>7</sup> A monotypic genus has only one species for that genus.

dig up as the rhizomes are buried relatively deep in compacted forest soil amongst tangled tree roots. There are about 60 species of *Gastrodia*, native to New Zealand, Australia, Asia, and elsewhere.

New Zealand's most widespread orchid is the common onion-leaved orchid (*Microtis unifolia*; Fig. 13A–B), named after its single (hence “unifolia”) onion-like tubular leaf. *Microtis unifolia* is commonly found in the wild and also in pastures, lawns, and urban areas – even in people's backyards and cracks in street pavements. There are 2–4 other native species of *Microtis*. All onion orchids have small flowers that are green to yellow-green in colour, flower stems that emerge from about one-third the way up the leaf, and single tubular leaves. *Microtis unifolia* is widespread in other countries including Australia, Indonesia, the Philippines, Japan, and China; the other 17 or so species are all endemic to Australia.



**Fig. 13** *Microtis unifolia* (the common onion orchid). **A**, colony of plants. Photo: Ian St George. **B**, close-up of green to yellow-green flowers. Photo: Jeremy Rolfe.

*Orthoceras novae-zeelandiae* is called the horned orchid after its erect lateral sepals resembling horns (Fig. 14A–B); its Māori names are ikaika and paratawhiti. *Orthoceras strictum* is a species of uncertain status in New Zealand, and is not universally accepted as distinct by botanists.



**Fig. 14** *Orthoceras novae-zeelandiae* (horned orchid). **A**, plant in flower. Photo: Ian St George. **B**, close-up of flower showing erect lateral sepals that resemble horns. Photo: Landcare Research.

Leek orchids belong to what the NZNOG call the Prasophyllum Alliance, which in New Zealand comprise two smaller growing species (that have been placed in

*Corunastylis*, *Genoplesium*, and *Prasophyllum*) and two larger species (the *Prasophyllum colensoi* agg. and *P. hectorii*). The *P. colensoi* (Fig. 15A–B) species complex contains at least two tag-named entities requiring further study. There are more than 100 accepted species of *Prasophyllum* native to Australia.



**Fig. 15** *Prasophyllum colensoi* (leek orchid). **A**, plant in flower. Photo: Murray Dawson. **B**, close-up of flower showing upward orientated (“upside down”) reddish labellum. Photo: Ian St George.

Greenhood orchids (*Pterostylis* species; Fig. 16A–B) are named after their hoods<sup>8</sup> which are usually coloured green with translucent white stripes. Greenhood flowers

<sup>8</sup> Hooded orchids have a single helmet-shaped structure (called a galea) that protects the top of the flower. The hood is formed by modification of the upper perianth parts of the flower, usually the dorsal sepal and petals, which are expanded and overlap or are fused along their margins.

have a touch sensitive lip which flips backwards to trap small insect pollinators within the flower. To escape, the insect must crawl over the stigma and through a small tunnel, then past the pollen to freedom. The lip usually resets itself after 30 minutes. Greenhoods have a range of leaf sizes and shapes, but most have grass-like leaves. The preferred habitat for most species is forest and scrub.

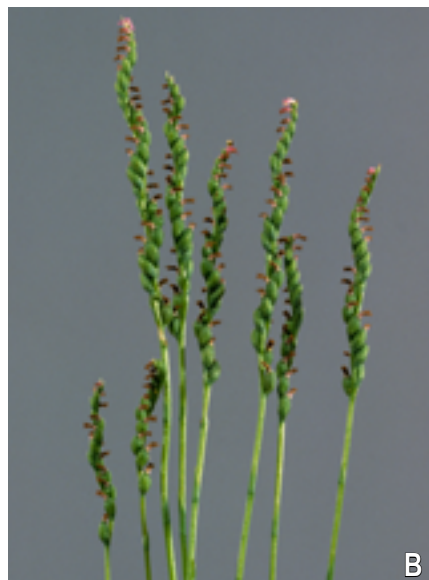


**Fig. 16** *Pterostylis alobula* (winter greenhood), a species that was until recently placed in the segregate genus *Diplodium*. **A**, colony of plants. Photo: Michael Pratt. **B**, close-up of hooded flower. Photo: Jeremy Rolfe.

Greenhoods are well represented in the New Zealand native orchid flora with about 30 species currently recognised, along with several entities with tag-names. Species that were in the segregate genera *Diplodium*, *Hymenochilus*, *Linguella*, and *Plumatichilos* have recently been accepted back into *Pterostylis*. Depending on acceptance of these genus-level changes, *Pterostylis*

contains some 200 species from New Zealand, Australia, New Guinea, Indonesia, and New Caledonia.

*Spiranthes* (ladies' tresses orchid) is a genus of more than 40 species distributed in the Americas, Eurasia, and Australasia. *Spiranthes novae-zelandiae* (Fig. 17A–B) is an endemic species named after this country. It is classified as Threatened: Nationally Vulnerable due to destruction of its wetland habitats. The other *Spiranthes* in New Zealand is *S. "Motutangi"*, a tag-name for an undescribed entity recorded from swamps in the far north of the North Island.



**Fig. 17** *Spiranthes novae-zelandiae* (ladies' tresses orchid). **A**, close-up of flowers arranged spirally around the stem. Photo: Jeremy Rolfe. **B**, young fruit. Photo: Landcare Research.

The sun orchids (*Thelymitra*) are named because most only open from the warmth of the full sun (even then, a few species remain reluctant to

open). Sun orchids have relatively simple star-shaped flowers that may be white, pink, purple, blue, or other colours. They have single long leaves with the flower stem emerging from base of the leaf. About 16 species are currently recognised for New Zealand (some are shared with Australia), and there is one named hybrid and nine or so tag names. Most species prefer infertile clay soils in open areas including track-sides amongst scrub (the spectacular blue-flowered *T. cyanea* is an exception, growing mostly in swamps and wet areas). Most of our native species of sun orchids are found in northern New Zealand. One of several rare sun orchids from Northland includes the Threatened: Nationally Critical spiral sun orchid (*Thelymitra matthewsii*; Fig. 18A–B).



**Fig. 18** *Thelymitra matthewsii* (spiral sun orchid). **A**, plant in flower showing spiralling leaf. **B**, close-up of purple flower. Photos: Jeremy Rolfe.



This is the only native orchid with a leaf that spirals around the flower stem. It was considered extinct in New Zealand until found again in the 1980s (it's also a rare species in Australia). There are 80–100 species of sun orchid, with the majority in Australia (about 50 spp.), and others found in New Caledonia, Timor, Java, and the Philippines.



**Fig. 19** *Waireia stenopetala* (yellow beaks). **A**, flowers showing yellow-green beak-like hood with reddish-brown markings. Photo: Ian St George. **B**, close-up of relatively young leaf showing brown blotching and basal hairs. Photo: Peter Heenan.

*Waireia stenopetala* (beak orchid, horizontal orchid, yellow beaks) is a monotypic genus endemic to New Zealand (in 1997 it was segregated from the Australian genus *Lyperanthus*). The common name yellow beaks refers to the yellow-green beak-like dorsal sepal that creates a hood almost hiding the rest of the flower (Fig. 19A). Although published descriptions state that this

species is glabrous (without hairs), an image taken by Peter Heenan clearly shows a young leaf with basal hairs (Fig. 19B). *Waireia stenopetala* is locally common in the South Island (where it can occur down to sea level), but rare in the North Island (where it is confined to montane and sub-alpine elevations on Mt Ruapehu and the Tararua Range).

#### Epiphytic (tree-perching) species

In addition to our native terrestrial orchids, New Zealand has nine epiphytic species from the genera *Bulbophyllum* (*Adelopetalum* and *Ichthyostomum*), *Dendrobium* (*Winika*), *Drymoanthus*, *Earina*, and *Taeniophyllum*. As well as being tree-perching, some species are also able to grow on rocks, cliff faces or banks (these are called lithophytes).

Epiphytic orchids don't die back each season like the terrestrial species, and are most often seen up close when the tree branches they are growing on have fallen to the ground following storms.

With more than 2000 species found in the warmer regions of the world, *Bulbophyllum* is one of the largest genera in the orchid family, or for that matter any genus of flowering plants. There is huge diversity, although one uniting character is that they all possess pseudobulbs (bulb-like thickenings of the stems from which the leaves arise). Like most of New Zealand's other segregate orchid genera, our native species *Adelopetalum tuberculatum* and *Ichthyostomum pymaeum* are likely to return, or have already returned, respectively, to *Bulbophyllum*. The common name pygmy tree orchid and the species name *B. pygmaeum* (Fig. 20A–B) reflect the diminutive stature of this plant, with small leaves (2.5–13 mm long) and tiny flowers (only 2.5 mm across). The pygmy tree orchid is relatively common on coastal to montane well-lit tree trunks and branches, and is sometimes seen growing on rocky substrates.

*Dendrobium cunninghamii* (Fig. 21A–B) is the sole New Zealand representative of the genus. Until recently, it was separated into its own genus *Winika*, but many botanists have now accepted it back into *Dendrobium*. This native orchid has a range of common names, including

bamboo orchid (after its cane-like stems), Christmas orchid (after its flowering time of Dec–Jan), ladies' slipper orchid (because of the slipper-shaped flower buds), and the Māori names pekapeka and winika.



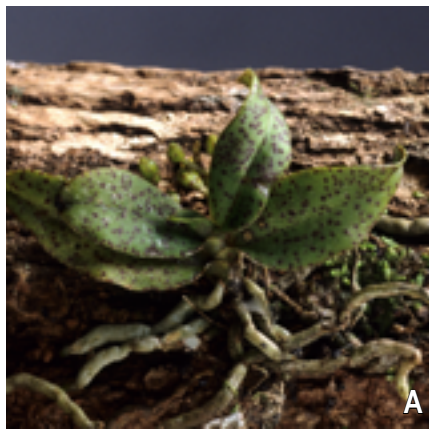
**Fig. 20** *Bulbophyllum pygmaeum* (pygmy tree orchid, piripiri). **A**, stem, leaves, and pseudobulbs alongside a match to show their small size. Photo: Ian St George. **B**, close-up of scabrid leaves and creamy-green flower. Photo: Jeremy Rolfe.

Worldwide, *Dendrobium* is a large genus of about 1200 epiphytic species, found throughout Asia, and extends down to islands of the Pacific and to Australasia. Numerous horticultural selections have been bred from overseas species.

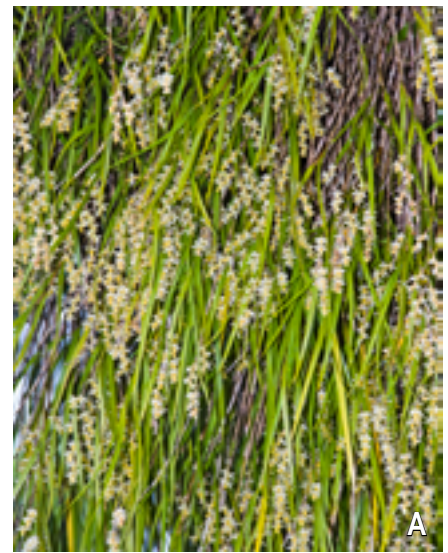
New Zealand has two species of *Drymoanthus*, *D. adversus* (the green fleshy tree orchid, little moa) and the At Risk: Naturally Uncommon *D. flavus* (the spotted fleshy tree orchid, little spotted moa). Like other orchids, *Drymoanthus flavus* (Fig. 22A–B) should not be removed from the wild, but unfortunately it has had some populations destroyed by plant collectors. *Drymoanthus* has a restricted distribution elsewhere as only two other species are known (*Drymoanthus minimus* of New Caledonia and *D. minutus* of Queensland).



**Fig. 21** *Dendrobium cunninghamii* (bamboo orchid). **A**, large plant perching on a tree. Photo: John Barraclough, via NatureWatch NZ. **B**, close-up of flower showing purple lateral lobes on the labellum and slipper-shaped flower bud in the background. Photo: Jeremy Rolfe.



**Fig. 22** *Drymoanthus flavus* (spotted fleshy tree orchid). **A**, plant showing epiphytic habit, conspicuous rhizomes, and characteristically spotted leaves. Photo: Landcare Research. **B**, close-up of flower showing incurved labellum. Photo: Ian St George.



**Fig. 23** *Earina mucronata* (spring earina). **A**, plant showing its long and narrow leaves and numerous flowers. **B**, close-up of flowers showing yellow two-lobed labella. Photos: Jeremy Rolfe.

*Earina* is another epiphytic genus which, like *Dendrobium*, sometimes grows on rocks instead of their usual tree-perching habitat. They are also commonly called bamboo orchids after their cane-like stems. However, in contrast to *Dendrobium*, there are only seven species of *Earina* currently recognised worldwide, and these are restricted to a few South Pacific islands (Vanuatu, New Caledonia, Fiji, Samoa, and New Zealand). New Zealand is well represented with three species, *Earina aestivalis*, *E. autumnalis*, and *E. mucronata* (Fig. 23A–B), which produce numerous flowers.

The tiny ribbon-root orchid (*Taeniophyllum norfolkianum*; Fig. 24A–B) was a remarkable and recent discovery for New Zealand. It was first found late 2009 from one population south of Whangarei. Only 140 plants have reportedly been found, all growing epiphytically on gorse. The ribbon-root orchid (also called the minute orchid,

Norfolk Island ribbonroot, and orchid spaghetti) has no leaves, but instead uses its green roots for photosynthesis to obtain energy from the sun. This rare and unusual species was only known previously from Norfolk Island where it is an epiphyte of Norfolk Island pine.

This concludes our overview of native orchid genera and species, both terrestrial and epiphytic. For a comprehensive list of species and synonyms, see [www.nativeorchids.co.nz/Checklist.htm](http://www.nativeorchids.co.nz/Checklist.htm).

#### Other apps for identifying New Zealand plants

The first LucidMobile™ app version of the online (browser-based) keys was the NZ Coprosma Key, released in December 2014 (Android) and January 2015 (iOS). David Glenly and his collaborators developed that key, and Murray Dawson also managed its translation into an app. *Coprosma* is a plant genus of 53 species recognised in New Zealand

and the identification app received great feedback from users. The new NZ Orchid Key app has proven to be even more popular.

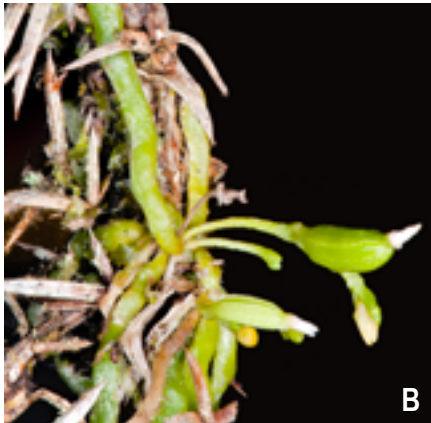
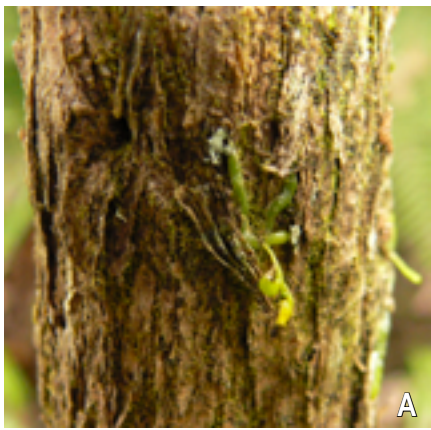
Murray is working on releasing others, including an app for the identification of New Zealand weeds<sup>9</sup>. However, further funding is needed for completion of this work.

#### Acknowledgements

Funding for these interactive key projects was provided by the New Zealand TFBIS (Terrestrial & Freshwater Biodiversity Information System) Programme.

Cissy Pan of Landcare Research created the icon and start-up screen artwork used in the NZ Orchid Key app (Fig. 1A–B). Caroline King of Landcare Research took the publicity photo (Fig. 2) reproduced here. We thank John Barraclough, Chris Ecroyd, Peter Heenan, and Matt Renner for permission to use their outstanding images of native orchids.

<sup>9</sup> An online (non-app) version of the weeds key was outlined in the *New Zealand Garden Journal*, 2011, Vol. 14, No. 1, pp. 2–4 (see [www.nzih.org.nz/RNZIH\\_Journal/Pages\\_2-4\\_from\\_2011\\_Vol14\\_No1.pdf](http://www.nzih.org.nz/RNZIH_Journal/Pages_2-4_from_2011_Vol14_No1.pdf)).



**Fig. 24** *Taeniophyllum norfolkianum* (ribbon-root orchid). **A**, small plant growing epiphytically on gorse. Photo: Matt Renner. **B**, close-up of plant showing an absence of leaves and with green photosynthetic roots. Photo: Jeremy Rolfe.

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### Websites

- (accessed December 2015)
- Flora of New Zealand Online – Taxon Profile – Orchidaceae: [www.nzflora.info/factsheet/Taxon/Orchidaceae.html](http://www.nzflora.info/factsheet/Taxon/Orchidaceae.html).
- NatureWatch NZ New Zealand Native Orchids Project: <http://naturewatch.org.nz/projects/new-zealand-native-orchids>.
- New Zealand Plant Conservation Network: [www.nzpcn.org.nz](http://www.nzpcn.org.nz).
- New Zealand Native Orchids: <http://nativeorchids.co.nz>.
- Ngā Tipu o Aotearoa – New Zealand Plants databases: <http://nzflora.landcareresearch.co.nz>.

**Murray was interviewed on the native orchid app by Radio New Zealand Nine to Noon's host Kathryn Ryan on 18 December 2015. This interview can be heard on the RNZ website at [www.radionz.co.nz/national/programmes/ninetonoon/audio/201783381/app-for-identifying-endangered-native-orchids](http://www.radionz.co.nz/national/programmes/ninetonoon/audio/201783381/app-for-identifying-endangered-native-orchids)**



*Thelymitra pulchella*. Photo: Landcare Research