

Hybridisation between the Lemon Doubletail (*Diuris abbreviata*) and the Veined Doubletail (*D. venosa*) at Barrington Tops.

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Abstract

An occurrence of natural hybridisation between the Lemon Doubletail Orchid (*Diuris abbreviata* Benth.) and the Veined Doubletail Orchid (*Diuris venosa* Rupp) at the Barrington Tops, NSW, is described. The parents and hybrids were found in close proximity to each other with most of the hybrids clustered nearest to *D. abbreviata*. The hybrid's floral colouration, tepal morphology and flowering time were intermediate between those of the parents. Factors likely to limit hybridisation between *D. abbreviata* and *D. venosa* are discussed.

Introduction

The Doubletails or Donkey Orchids (*Diuris* spp.) are among the most attractive and conspicuous of Australia's terrestrial orchids. They may form colourful massed displays at favourable sites in good seasons. There is considerable variation in flower shape and markings within and between populations (Jones 1970a, b) adding to their charm. The heterogeneity in field populations is compounded by occasional natural hybridisation between species (Jones 1970a, b; Ulherr 1970; Beardsell 1975; Bates 1986; Jones 1988; Bower 2001). Some hybrids are distinctive enough to have been formally named, usually as species before their hybrid status was recognised. These include (Note: current names for species are used here, which may differ from those in the original manuscripts);

- *Diuris X palachila* – representing first generation (F1) crosses between members of the *Diuris maculata* and *D. lanceolata* groups (Jones 1970a, b). Plate 1 shows *D. X palachila* from the Mullion Range near Orange, NSW. The parents at this locality are *Diuris pardina* (Plate 2) and *D. chryseopsis* (Plate 3). *D. X palachila* is a fertile hybrid and may backcross extensively with its parents forming hybrid swarms (Jones 1970a, b, Beardsell 1975)

containing forms intermediate between the original parents and *D. X palachila*. Plants resembling *D. X palachila* also result from crosses between *Diuris behrii* and *D. pardina* (Jones 1988).

- *Diuris X fastidiosa* – a cross between *Diuris palustris* and *D. chryseopsis* (Clements 1989).
- *Diuris X polymorpha* – a putative cross between *Diuris platichila* and *D. chryseopsis* (Clements 1989).
- *Diuris X nebulosa* – a spectacular cross between the golden-flowered *Diuris aurea* and the purple-coloured *D. punctata* (Jones 1991).

Several other putative *Diuris* hybrids have been reported in the wild, including hybrid swarms involving three parent species;

- *Diuris corymbosa X D. chryseopsis* (Ulherr 1970).
- Hybrid swarms involving crosses and backcrosses between *Diuris corymbosa*, *D. chryseopsis* and *D. pardina* (Bates 1986).
- Hybrid swarms between *Diuris maculata*?, *D. platichila* and *D. chryseopsis* (Messmer 1944 as interpreted by Bates 1986 and Clements 1989).
- *Diuris alba X D. chrysantha* (Jones 1988)
- *Diuris abbreviata X Diuris venosa* (Jones 1988).



Plate 1. *D. X palachila* fr



Plate 2. *Diuris pardina*
Mullion Range

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a X *D. chrysantha* (Jones

abbreviata X *Diuris venosa* (988).



Plate 1. *D. X palachila* from the Mullion Range near Orange, NSW.



Plate 2. *Diuris pardina*
 Mullion Range



Plate 3. *Diuris chryseopsis*
 Mullion Range

Photos Colin Bower

The last hybrid in the above lists appears only to have been reported in brief notes by Jones (1988). This article details an occurrence of this hybrid at Polblue Swamp, on the Barrington Tops in the NSW Hunter Valley.

Location and Habitat

The hybrid and its parents were growing amongst Snow Grass (*Poa sieberiana* var. *sieberiana*) and herbs (*Geranium* sp., Prickly Starwort (*Stellaria pungens*) and others) in grassy tall open forest dominated by Mountain Gum (*Eucalyptus dalrympleana*) and Snow Gum (*E. pauciflora*) between the Polblue Camping Area and Polblue Swamp. The following observations were made on 3 December 2005.

The parent plants and hybrids were all growing within a rectangular area measuring 7.5 x 2.5 metres. A total of twenty two flowering plants comprised 12 *Diuris venosa* (Plate 4), five *Diuris abbreviata* (Plate 5) and five hybrids (Plate 6). The long axis of the rectangle containing the plants was oriented approximately north-south.

All but one of the *D. venosa* plants were in the northern half of the rectangle and all but one of the *D. abbreviata* were in the southern half. Four of the hybrids were located closer to the *D. abbreviata* plants in the southern half of the rectangle than to *D. venosa*, while one was isolated in the northern half. The four hybrid plants in the southern half of the rectangle averaged only 0.53 m (range 0.17 to 0.85 m) from the nearest *D. abbreviata* plant and 1.34 m (range 0.74 to 1.78 m) from the nearest *D. venosa* plant. The distances of the hybrids from the two parents were significantly different (Student's T test, P=0.023). This result suggests that the mother plant(s) for the hybrids is more likely to be *D. abbreviata* than *D. venosa*, with the pollen coming from *D. venosa*, because seed is more likely to fall and germinate close to the mother than to the pollen donor.

Hybrid Characteristics

Diuris abbreviata and *D. venosa* are very dissimilar species, making the hybrid between them easy to identify. The most distinctive floral features of the parents and hybrid are summarised in Table 1.

Table 1. Differences between the Lemon Doubletail (*Diuris abbreviata*) and Veined Doubletail (*D. venosa*) Orchids and the hybrid between them.

Feature	<i>D. venosa</i>	<i>D. abbreviata</i>	Hybrid
Flower background colour	Whitish	Deep yellow	Pale yellow to cream
Labellum markings	Variable radiating purple veins	Small maroon marks on labellum lamina and base	Intermediate mauve/maroon markings on labellum lamina
Dorsal sepal markings	Variable radiating purple veins on the front of the dorsal sepal	Small maroon marks at the base of the dorsal sepal at the back only	Heavily marked on the back of the dorsal sepal
Petal position	Angled forward and down beside the labellum	Angled back away from the labellum	Angled out to the side, intermediate between the parents, but variable
Labellum shape	Triangular with a pointed apex	Oblong, wider than long with a blunt apex	Intermediate shape with a shallow pointed apex.

Table 1 and Plates 4 to the colour and shape of segments are intermediate of the parents.

Phenology

The flowering time of the hybrid is intermediate between that of its parents.

Table 2. Phenology of *Diuris venosa* Orchids and the hybrid between them.

Flower stage
Buds
Open flowers
Closed flowers
Total flowers
% Open flowers
No. of plants
Average flowers per plant

Discussion

The photographs and observations above clearly show the evidence of hybridisation between *Diuris venosa* and *Diuris abbreviata* at Barrington Tops. The hybrids are intermediate in form from the parents, and have an intermediate flowering time. In contrast to the occurrences of hybrids in the past (Jones 1970a, b, Bates 1970), plants and hybrids in the present were in very close proximity. There was no evidence of hybridisation involving crosses between the parents, which suggests that the F1 hybrid is fertile. The numbers of plants were too small to test the possibility of F1 fertility. The capacity to form hybrid swarms is a common feature of many orchid species.

The widespread, but relatively rare occurrence of hybridisation between *Diuris venosa* and *Diuris abbreviata* at Barrington Tops is a new discovery.

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***abbreviata*) and Veined**

- Hybrid**
- Pale yellow to cream
- Intermediate mauve/ maroon markings on labellum lamina
- Heavily marked on the back of the dorsal sepal
- Angled out to the side, intermediate between the parents, but variable
- Intermediate shape with a shallow pointed apex.

Table 1 and Plates 4 to 6 show that both the colour and shape of the hybrid floral segments are intermediate between those of the parents.

Phenology

The flowering time of the hybrid also lies between that of its parents (Table 2). On 3

December 2005 the hybrid was in full bloom with 15 flowers open (88%), two finished and no buds present. By contrast, most *Diuris abbreviata* flowers had finished with only six open out of 21 (29%) and no buds remaining. Flowering of *D. venosa* was later than for *D. abbreviata* and the hybrid; on 3 December ten flowers (40%) were still in bud and there were no finished flowers.

Table 2. Phenology of the Lemon Doubletail (*Diuris abbreviata*) and Veined Doubletail (*D. venosa*) Orchids and the hybrid between them (no. of flowers).

Flower stage	<i>D. venosa</i>	<i>D. abbreviata</i>	Hybrid
Buds	10	0	0
Open flowers	15	6	15
Closed flowers	0	15	2
Total flowers	25	21	17
% Open flowers	60.0	28.6	88.2
No. of plants	12	5	5
Average flowers per plant	2.1	4.2	3.4

Discussion

The photographs and observations reported above clearly show the existence of natural hybridisation between *Diuris abbreviata* and *D. venosa* at Barrington Tops. The hybrids are intermediate in form and colour between the parents, and have an intermediate flowering time. In common with most occurrences of hybrids in the genus *Diuris* (Jones 1970a, b, Bates 1986), the parent plants and hybrids in this study occurred in very close proximity to each other. There was no evidence of a 'hybrid swarm' involving crosses between the hybrids, or back to the parents, which might indicate that the F1 hybrid is fertile. However, the numbers of plants were too low to discount the possibility of F1 fertility and hence a capacity to form hybrid swarms.

The widespread, but relatively uncommon occurrence of hybridisation in the genus

Diuris indicates pollinators occasionally move between species. The available evidence indicates that *Diuris* species are almost exclusively pollinated by small native bees (Bower 2001). The pollination mechanism has been clearly established for only the *Diuris maculata* species group, which has been shown to mimic 'egg and bacon' pea flowers (Beardsell *et al.* 1986) (Indsto *et al.* 2006). Members of the *D. maculata* group are pollinated by bees that specialise on red and yellow pea flowers as sources of nectar and pollen. It is unlikely that such specialists would be responsible for hybridisation between members of the *D. maculata* group and species belonging to other groups in the genus. The most likely scenario is that hybridisation in *Diuris* is mediated by more generalist bee species that forage on a wide variety of plants. The pollinators and pollination mechanisms of *Diuris abbreviata* and *D. venosa* are unknown. However, given the morphological



Plate 4. *Diuris venosa*, Polblue Camping Area, Barrington Tops, NSW



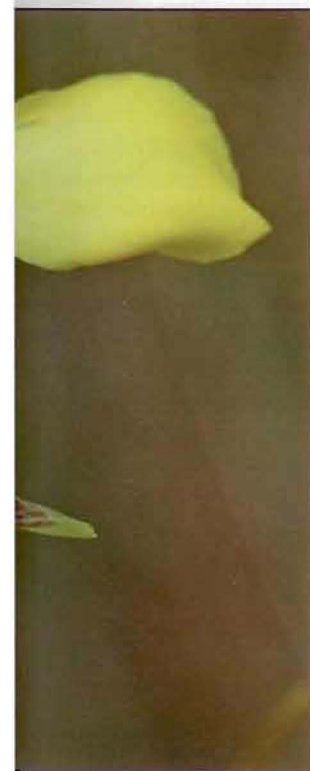
Plate 5. *Diuris abbreviata*, Polblue Camping Ground, Barrington Tops, NSW



Plate 6. *Diuris abbreviata*, Barrington Tops, NSW



SW



ops, NSW



Plate 6. *Diuris abbreviata* X *D. venosa*, Polblue Camping Ground, Barrington Tops, NSW

Photos Colin Bower

dissimilarity of these two species, it is likely they are adapted to different bee pollinators and that hybridisation is mediated by other generalist bees that may only be occasional visitors.

Apart from pollinators, what other factors are likely to limit hybridisation and genetic introgression between *Diuris abbreviata* and *D. venosa*? Differences in the flowering times of two species may limit opportunities for hybridisation. In 2005 there was a strong overlap in flowering times, but this may vary between seasons. It is possible that in most years, *D. abbreviata* will have largely finished flowering before *D. venosa* starts. Sterility of the F1 hybrid would also limit introgression (Jones 1988). There is much still to learn about hybridisation in *Diuris* that will require detailed study of pollination in all the species groups.

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The annual Kabi Show weekend of 25 - 26 August Pine Rivers Showground was a wonderful success!

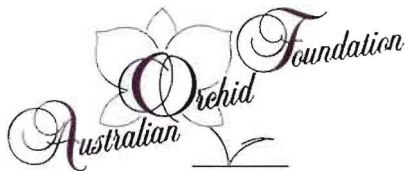
This year, a couple of new plants were introduced. A continuous display of nearly 200 epiphytic and terrestrial orchids was on display at two areas. Each slide changed every 10 seconds. Each included among the orchids a number of short advice cards. The Kabi show attracted a great deal of interest over the two days and a number of plants were sold and burned and sold with the Kabi.

This year a concerted effort to raise the sell sponsorship for the show was so successful that all costs were covered and sponsored before the show. The surplus and the non cash sponsors were disposed of. I thank all sponsors, operators and members for their support. All sponsors acknowledged by large hall.

We also had visits from the Coast Group, the Native Toowoomba and the Society. All of these Societies on the wonderful display of Native Orchids and though it was quite an imaginative

I'd like to especially thank you for your support. The Society brought 40 plants with two of them being very early morning, travelling about their plants benched price matter of fact, Nev Rose of NOSTI won the Charm the show.

As usual, we had a wo



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