

***EULOPHIA* R. BR. EX LINDL. (ORCHIDACEAE) OF SINGAPORE**

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INTRODUCTION

This paper documents the distribution and status of native *Eulophia* in Singapore. The genus was originally proposed by Scottish botanist Robert Brown in 1821 as *Eulophus* (Comber, 2001; Stevens, 2001). However, two years later English botanist John Lindley suggested a name change to *Eulophia*. The generic name *Eulophus* was later used in the Apiaceae in 1829, only to be invalidated and later to become a synonym of *Perideridia* in the Apiaceae. The generic name *Eulophia* is derived from the Greek *eu-lopōs*, which means “beautifully crest”, referring to the crests on the lip (Gledhill, 2008). The members of the genus are characterised by being terrestrial and that most species bear somewhat flattened pseudobulbs at intervals of the short rhizome. Leaves of most species are pleated (Comber, 2001). The inflorescence arises laterally from the base of the plant, is erect, many-flowered, long-stalked with an unbranched rachis. Flowers are resupinate, with free sepals and petals, and a usually spurred lip. The column is slender and the foot is variable in length. Each flower bears four pollinia.

Eulophia is a large pantropical genus of about 200 species, ranging from Asia, Australia, America, and Africa where it is best represented with the highest diversity and also the most beautiful flowers (Comber, 1990, 2001; Seidenfaden & Wood, 1992). In Southeast Asia, there are 12 *Eulophia* species occurring in Thailand, two of which are endemic;



Fig. 1. Resupinate flower of *Eulophia graminea*. (Photograph by: Peter O’Byrne).

six species in Peninsular Malaysia; seven in Java (two endemic); five in Borneo (two endemic); and five in Sumatra (Comber, 2001). Because *Eulophia* prefers a seasonal climate its congeners are rare in Southeast Asia especially in Malaya, Borneo, and Sumatra, which have more aseasonal climates.

In Singapore, there are only two congeners, namely *Eulophia graminea* and *Eulophia spectabilis* (Fig. 1), although only the latter is considered native and critically endangered, while the former is now considered a weed of uncertain origin and is widespread throughout Singapore (Chong et. al., 2009).

PAST AND PRESENT RECORDS

***Eulophia graminea* Lindl.** — This is a terrestrial herb growing up to 80 cm tall (Comber, 1990, 2001; Seidenfaden & Wood, 1992; Keng et al., 1998). The underground pseudobulbs are large, up to 15 cm long, and produce either leafy stems or flowering stems at intervals. The leafy stems bear about seven leaves (Fig. 2). The leaves are linear and acute, about 10–30 cm long and 6–14 mm wide, with the upper and lower leaves being smaller (Fig. 2). The tall inflorescence is up to 80 cm, branched several times, bearing flowers that about 1.5 cm apart from each other on a glaucous, grey rachis. (Fig. 3). The floral bracts are narrowly ovate and about 7 mm long. The small flowers open widely and are about 3 cm wide (Fig. 1). The sepals and petals are greenish with or without pink or reddish veins, while the lip is white, either with or without pinkish or reddish colour (Fig. 3). The dorsal sepal is narrowly oblong and acute, about 1.1–1.4 cm long by 3–4 mm wide. The lateral sepals are similar to the dorsal sepal but slightly wider. The petals are similar to the sepals but shorter, and are held close to and above the column. The lip is trilobed, with the side-lobes erect and obtuse, while the mid-lobe is larger, ovate, apiculate, with wavy margins and numerous tubercles covering the upper surface (Fig. 4). The column is straight and slender, with a very short foot. *Eulophia graminea* has a natural distribution from Sri Lanka and India to China, the Ryuku Islands in Japan, and throughout most of Southeast Asia, usually in beach vegetation, grassland, and open areas at low altitudes.

Eulophia graminea was previously collected throughout Singapore (Table 1). The habitats include wasteland, grassland, sandy beaches, open and exposed places, and urban areas (Keng et al., 1998).



Fig. 2. *Eulophia graminea* growing among seashore morning glory plants (*Ipomoea pes-caprae*) in sandy beach vegetation near forms have been collected in Singapore: one brownish (typical), the Tanah Merah Ferry Terminal. (Photograph by: Hugh Tan the other greenish. (Photograph by: Hugh Tan Tiang Wah). Tiang Wah).



Fig. 4. The triblobed lip of the *Eulophia graminea* flower (side lobes folded upwards) showing numerous tubercles (tubular projections) on the surface of the mid-lobe. Scale bar = 5 mm. (Photograph by: Peter O'Byrne).

Table 1. Singapore collections of *Eulophia graminea* Lindl. deposited in the Herbarium, Singapore Botanic Gardens (SING; with bar code numbers) and the Herbarium, National University of Singapore (SINU; with accession numbers).

S/No.	Accession/ Bar Code No.	Herbarium	Collector(s)	Collector's No.	Date Collected	Locality
1.	0041356	SING	H. N. Ridley	s.n.	21 Dec.1819	Chanserian Estate
2.	0041360	SING	H. N. Ridley	s.n.	Oct.1890	Changi
3.	0011245	SING	Z. Teruya	2152	7 Jan.1933	Geylang
4.	0041358	SING	J. Sinclair	38883	13 Mar.1950	Pulau Senang
5.	2007014872	SINU	I. Enoch	s.n.	1953	Pulau Ubin
6.	0041357	SING	K. Sidek	95	8 Jun.1967	Pulau Senang
7.	2007014871	SINU	K. Jumali	s.n.	28 Nov.1969	Bukit Timah Nature Reserve
8.	0041353	SING	J. F. Maxwell	80–184	29 Aug.1980	Pulau Sudong
9.	2007014865	SINU	K. S. Chua & H. T. W. Tan	s.n.	24 Jan.1992	Tuas
10.	2007014866	SINU	K. S. Chua & H. T. W. Tan	s.n.	24 Jan.1992	Tuas
11.	2007014870	SINU	I. M. Turner, J. T. W. M. Gan & Y. W. K. Khng	s.n.	5 Apr.1992	Nature Reserves
12.	2007014869	SINU	K. S. Chua, K. B. H. Er, W. K. Koh, I. M. Turner, J. W. H. Yong, G. H. Khoo, S. Y. Toh, S. W. L. Goh & J. A. Hardie	s.n.	29 Jun.1993	Pulau Sakijang Pelepah (Lazarus Island)
13.	2007014863	SINU	K. S. Chua, B. C. Soong, H. T. W. Tan & I. M. Turner	s.n.	28 Jan.1994	Pulau Seringat
14.	0041354	SING	E. P. Tay & E. Tang	94–0088	20 Apr.1994	Sungei Buloh
15.	2007014864	SINU	H. H. Tan	s.n.	3 Mar.1995	—
16.	2007014868	SINU	H. T. W. Tan, A. H. B. Loo & E. E. L. Seah	s.n.	20 Aug.1996	Kampung Pasir, Pulau Tekong
17.	0041359	SING	J. Lai & Ali Ibrahim	53	27 Sep.1996	Pulau Semakau
18.	2007014867	SINU	Y. P. Tng & D. J.-S. Y. P. Tng	s.n.	2000	Pulau Semakau
19.	0043726	SING	A. T. Gwee, A. Samsuri, P. Leong & Ali Ibrahim	268	25 Feb.2003	Pulau Ubin, Chek Jawa
20.	0043726	SING	A. T. Gwee, A. Samsuri, P. Leong & Ali Ibrahim	268	25 Feb.2003	Pulau Ubin
21.	2007014862	SINU	K.-x. Tan	s.n.	3 Dec.2003	Sungei Punggol
22.	2007014861	SINU	J. A. Hardie	s.n.	—	Tuas

Eulophia spectabilis (Dennst.) Suresh. — This is a terrestrial herb growing up to 1 m tall (Comber, 1990, 2001; Seidenfaden & Wood, 1992; Keng et al., 1998). The subterranean pseudobulbs are small and round, about 3 cm in diameter, and produce pseudostems formed from the leaf sheaths at intervals, with each bearing three to five leaves (Figs. 5, 6). The leaves are narrowly lanceolate, plicate, about 50 cm long and 5 cm wide, with a grooved stalk up to 15 cm long (Figs. 5, 6). The tall inflorescence arises from near the base of the leaves. The inflorescence stalk is thick and fleshy, about 65 cm long and bear 10–25 resupinate flowers on a 35-cm long rachis (Figs. 7, 8). Usually, about three to five flowers are open at any point of time. The floral bracts are narrowly triangular, about 1 cm long, and shed after the opening of the flowers. The flowers do not open wide. The dull brownish-olive sepals are narrowly triangular, acute, about 2 cm long by 5 mm wide, with the lateral sepals joined at the brighter green base to the columnfoot (Fig. 8). The dorsally white petals possess some greenish and reddish strips at the base, and are long-oval, roughly acute, about 1.65 cm long by 8 mm wide, overarching the column (Fig. 7). The lip is very slightly trilobed, with broadened lower sides and five main parallel ribs in the middle, margins of apical half very wavy, pale mauve with whitish centre and brown and mauve veins, about 2.25 cm long by 1.5 cm broad (Figs. 7, 8). The column is about 9 mm long, slender and slightly curved. *Eulophia spectabilis* has a natural distribution from Sri Lanka and India to China, throughout most of Southeast Asia to New Guinea, usually in grassland and lightly shaded or open areas up to 850 m altitude (Comber, 1990, 2001; Seidenfaden & Wood, 1992).

Eulophia spectabilis was previously collected from all over Singapore, from Changi and Tampines in the east, Jalan Bahar in the west, Seletar and Chan Chu Kang in the north, and the offshore island of Pulau Ubin (Table 2). The habitats range from wasteland, the partially shaded forest floor, beaches, exposed areas, and even at the urban Benoi Road (Keng et al., 1998).

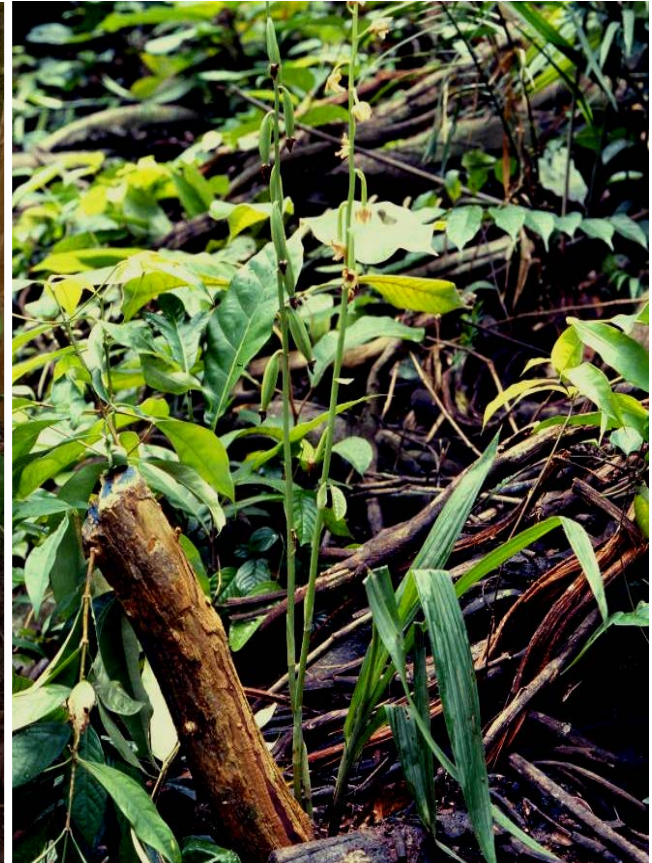


Fig. 5. A rather battered-looking *Eulophia spectabilis* plant growing in the partially shaded forest floor in the vicinity of Upper Pierce Reservoir. (Photograph by: Ang Wee Foong).

Fig. 6. *Eulophia spectabilis* growing in an open area in Bukit Timah Nature Reserve. (Photograph by: Hugh Tan Tiang Wah).



Fig. 7. Open flower of *Eulophia spectabilis*. Scale bar = 5 mm. (Photograph by: Ang Wee Foong).



Fig. 8. Upper part of the inflorescence of *Eulophia spectabilis*. Scale bar = 1 cm. (Photograph by: Alvin Francis Lok Siew Loon).

Table 2. Singapore collections of *Eulophia spectabilis* (Dennst.) Suresh. deposited in the Herbarium, Singapore Botanic Gardens (SING).

S/No.	Bar Code No.	Collector(s)	Collector's No.	Date Collected	Locality
1.	0010803	H.N. Ridley	s.n.	1889	Seletar
2.	0010807	J.S. Goodenough	s.n.	1890	MacRitchie Reservoir
3.	0010808	J.S. Goodenough	s.n.	1891	Changi
4.	0010809	J.S. Goodenough	s.n.	11 Jun.1891	Bukit Mandai
5.	0010804	H.N. Ridley	s.n.	1892	Chan Chu Kang Forest Reserve
6.	0010806	Mohd Amin	s.n.	25 Sep.1916	Tampines
7.	0010810	B.K. Saheb	s.n.	12 May 1917	Tembilau Island
8.	0010805	Mohd Shah	s.n.	5 Dec.1989	Bukit Merah
9.	0116758	Ali Ibrahim et al.	2007–418	Dec.2007	Pulau Ubin
10.	0124462	P. Leong, H.K. Lua & T.W. Yam	2009–349	23 Apr.2009	Jalan Bahar

A recent encounter with *Eulophia spectabilis* was on 26 Jul.2011, when a single flowering and fruiting specimen was observed at the secondary forest around Upper Pierce Reservoir. The orchid was growing in leaf litter on the partially shaded forest floor and showed signs of herbivory damage on its leaves. No other individuals were observed within 20 m of the plant. Although the typical habitats of *Eulophia spectabilis* are that of open, exposed areas such as waste- and grassland which are common in Singapore, it is rarely seen and has been assigned the national conservation status of Critically Endangered (Tan et al., 2008; Chong et al., 2009). *Eulophia spectabilis* also has a dormant phase during dry seasons, when the inflorescence and leaves are shed, leaving only the subterranean pseudobulbs and no traces of the plant are visible above ground (Keng et al., 1998).

DISCUSSION

Although both species share similar habitat preferences and life history strategies, *Eulophia spectabilis* does not appear to be as widespread and plentiful as *Eulophia graminea* in Singapore. *Eulophia graminea* is reported to be a weed in parts of Northern Australia (Australian Department of Agriculture, Fisheries and Forestry, 2011), and naturalised in Florida (Pemberton et al., 2008). It was postulated that one possible route of introduction there could be from contaminated wood chips originating from Asia that contained *Eulophia graminea* seeds. *Eulophia graminea* plants are also observed to sprout in random fashion around Singapore, especially in cultivated areas and reclaimed land (Tan & Hew, 1993), suggesting a possibility of spread by contaminated soil and sand.

Most recently, *Eulophia graminea* was deemed as a cryptogenic weed in Singapore (Chong et al., 2009). We however feel that *Eulophia graminea* should be considered native as it falls within the natural distribution of this species which ranges from India, Hong Kong, Taiwan, Thailand, Indochina, and throughout Southeast Asia and in Sumatra, where it occurs in open places including forest clearings or gaps (Comber, 2001) as well as beach strand vegetation (O'Byrne, pers. comm.) which primeval Singapore no doubt had. This species shares the same open habitat as native terrestrial orchids such as *Arundina graminifolia* and *Spathoglottis plicata*, and was collected by H. N. Ridley as far back as 1889 and 1890. The orchid was also found growing in beach vegetation in Pulau Retan Laut, Pulau Sakeng, and Pulau Semakau (Hardie, 1995) or Singapore Island on a reclaimed land beach (Fig. 2). These pieces of evidence are probably indicative that this species did occur in primeval Singapore but only became more abundant as land clearing expanded their preferred habitat. *Eulophia graminea* is easily overlooked being seasonal in growth and bearing rather unassuming flowers. Today this species is found in most open places in Singapore, in cultivated gardens, planting beds, forest edges, wastelands, as well as naturally in beach edge vegetation. We propose that *Eulophia graminea*'s local status be changed from "Cryptogenic Weed" to "Common".

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