Eng Soon Teoh

Orchid Species from Himalaya and Southeast Asia Vol. 3 (R - Z)

Springer

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***Vanda tricolor var. suavis* flourishing in the garden of Karen Tambayong in Cibodas, Java (© Teoh Eng Soon 2022)**

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For Teoh Phaik Khuan, John, Kristine, Chrissie, Ning, and my orchid friends and mentors

Preface

In orchid circles today, discussions frequently centre on species, their discovery, identification and conservation. This publication reflects my effort to produce a photographic record of the orchid species that I have been privileged to come across.

This work is not a comprehensive *flora* of the region. No single sane person should try to write a comprehensive illustrated flora of the region, there being, I am told, 1256 species in India, 4000 species in Indonesia and new ones are continuously being added. Rather, the three volumes reflect a personal journey of half a century with *Orchidaceae*, this wonderful family of flowering plants. It features the orchid species that I have personally encountered and some of the hybrids that I have been privileged to see. It leaves out hybrids bred for the temperate regions because they are well covered by numerous experts in books and articles, and I am not so familiar with these orchids.

Depending on where we live and our exposure, we each have our preferences; therefore, the selected hybrids depicted here reflect my personal narrow perspective.

Comments are kept as brief as possible to provide maximum space for pictures. Nevertheless, they need to contain information that will help in the identification of the species and data on their habitat. I tried to provide a historical perspective in the hybrid section because the past informs on the direction we should be heading. Readers who may wish to know more about orchid cultivation should consult my *Orchids of Asia* or similar publications.

Singapore, Singapore — Eng Soon Teoh

Acknowledgements

I made many friends through my long association with orchids, and many of them accompanied me to search for orchids both in cities and in the wild. They were generous in sharing their time, knowledge, expertise, collections, photographs and connections. I am grateful to these special people who will always be remembered with fondness although most will not be mentioned by name. They are so many, I would inadvertently omit some were I to attempt listing all of them.

I thank the following friends who gave me permission to use their photographs: Henry Oakeley, Ong Poh Teck, Peter O'Byrne, George Alphonso, Hubert Kuzweil, Bhakta Bahadir Raskoti. Nima Gyeltshen, Suranjan Fernando, Sathish Kumar, Emil Yap III, Syed Yusof Alsagoff, Joseph Yeo, Teo Woon Cheng, Ang Wee Fong and Tim Wing Yam as well as the Royal Botanic Gardens, Kew, and the Orchid Society of South East Asia. I am grateful to plantillustrations.com and the Missouri Botanical Garden for providing classic illustrations of orchids. My thanks also to the directors of the Singapore Botanic Gardens and the helpful library staff for assistance during my research.

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About the Author

Eng Soon Teoh, MD, FRCOG, FACS, is a Singaporean gynaecologist with experience in laboratory and clinical research. He is a past president of the Orchid Society of South East Asia and an award judge of the society. His parents loved orchids. This inspired Dr Teoh to begin studying orchids over 50 years ago, focusing on Asian species and orchid biology. He is the author of several popular books and numerous articles on orchids. *Medicinal Orchids of Asia* (2016) and *Orchids as Aphrodisiac, Medicine or Food* (2019), both, published by Springer, received high praise by their reviewers.

Dr Teoh's books on orchids are beautifully illustrated with his photographs, and his earlier *Asian Orchids* (*Orchids of Asia*) sold 25,000 copies. *Lotus: Photographs and Chinese Poems,* a recent book, was praised by Dr Henry Oakeley as 'truly beautiful, erudite, and a masterpiece'.

Renanthera Thour.

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Spectacular *Renanthera* is the source of red (vermillion) in vandaceous orchids (Fig. 94.1). However, Eric Holttum pointed out that the true base colour is yellow, as demonstrated by yellow forms of *Renanthera elongata* and *Renanthera storiei* and such hybrids as *Aranthera* Beatrice Ng 'Conference Gold' AM/MOS.

There are around 20 species distributed from eastern Himalaya to Southeast Asia from sea level to 1400 m in swamps, coastal forests, limestone, scrub and forest edges, always in bright light. Plants are monopodial, epiphytic, or saxicolous, clambering over bushes or trees and producing offshoots when the stem is bent and some of its vascular channels are interrupted. However, seeds commonly germinate on the ground, and many *Renanthera* begin life as terrestrials. Stems are robust, slim and short or stout, long and elongate, bearing persistent, short, oblong, retuse, leathery, dark green leaves arranged in two ranks, jointed to their sheaths which envelop the stem. Flowers are brightly coloured, in red or yellow, and spotted in some species. They are star-shaped, taller than broad. Dorsal sepal and petals are narrow, linear-oblong, spreading. Lateral sepals are elliptic, much broader than the dorsal, margins sometimes undulate. Lip is 3-lobed, small, side lobes erect, mid-lobe bearing calli at the base.

Renanthera are popular with orchid growers in the tropics because they bear large sprays of red or yellow flowers which last for several weeks on the plants. Of the many bigeneric and trigeneric hybrids that have been bred, only those which contain *Arachnis* (e.g., *Aranthera, Holttumara*) are suitable as cut flower because by itself, *Renanthera* does not impart heavy substance to its hybrids. Many *Renanthera* species are large plants and this characteristic is often passed on to their hybrids. A new direction in breeding would be to produce short, compact hybrids.

Renanthera annamensis Rolfe

Renanthera annamensis is endemic to Vietnam, occurring in the South Indochinese endemism centre that is home to 19 additional endemic Vietnamese orchid species. The area covers the lowland region of southern Vietnam adjacent to Cambodia with elevations below 300 m hosting dry evergreen, semi-deciduous and deciduous dipterocarp forests. Ground is covered by silicate basement rock (granite, sandstone, etc.) and it is acidic. *Renanthera annamensis* is rare and critically endangered. Photographs of the orchid purporting to be of the species are generally those of *Ren. citrina* which it closely resembles. *Renanthera annamensis* is illustrated in drawing in *Curtis's Botanical Magazine* [Vol. 133 (ser.4 vol. 3) t. 8118 (1907)], shown here as Fig. 94.2, and in Gunnar Seidenfaden's *Opera Botanica, the Orchids of Indochina,* Fig. 246

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Fig. 94.1 *Renanthera bella* J.J. Wood (© Teoh Eng Soon 2021. All Rights Reserved)

(Seidenfaden and Wood 1992). In the colour illustration, flowers are finely spotted with grey: additionally, sepals are also spotted with red, and petals are marked with a patch of red at the tips. Lip and anther cap are red (Fig. 94.2). Side lobes of the lip of *Ren. annamensis* are small, short and not prominent unlike those of *Ren. citrina*. Midlobe is cordate, apex pointed, whereas midlobe of lip in *Ren. citrina* forms an isosceles triangle that is rounded at the lower angles (Fig. 94.3).

Renanthera bella J.J.Wood

Renanthera bella is endemic to Mount Kinabalu in Sabah, growing in ultramafic forest especially on serpentine rock outcrops at 400 – 1200 m. It is commonly epiphytic on *Gymnostoma sumatranum* (*Casuarinaceae*). Its habitat was ravaged by fire in 1990, and the species is critically endangered (Rice 2008).

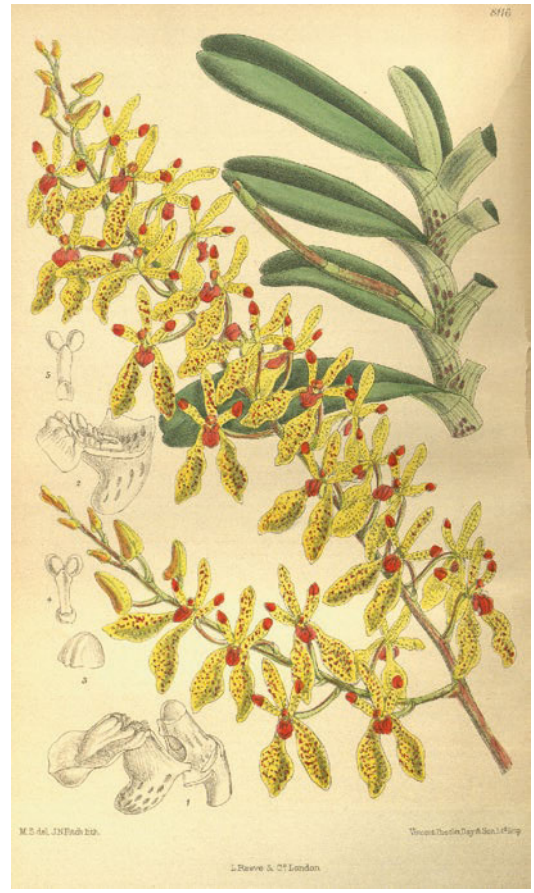

Fig. 94.2 *Renanthera annamensis* Rolfe. (From: *Curtis Botanical Magazine* Vol. 133 (ser. 3 vol. 3) t. 8118 (1907))

Plant is compact. Stem is up to 75 cm tall bearing dark green, coriaceous, bilobed leaves, 12 – 13 × 1 – 1.1 cm. Inflorescence is 45 cm long with 1 – 2 side branches, carrying 12 – 16 flowers, 6 cm across, orange, overlaid with red blotches. Dorsal sepal is erect, lanceolate. Lateral sepals are spreading, about 15 degrees from the midline, lanceolate, narrowed at the lower third to 2 mm near its attachment. Petals are lanceolate, falcate, similarly narrowed at the base, spreading 10 degrees above the horizontal, apex pointing upwards, margins undulate, reflexed along the middle third. Lip is small, 3-lobed (Figs. 94.1 and 94.4).

Plants flower more than once a year and flowers last for a month.

Fig. 94.3 *Renanthera citrina* Aver. (© Teoh Eng Soon 2021. All Rights Reserved)

Renanthera caloptera (Rchb.f.) Kocyan & Schuit. [syn. *Ascoglossum calopterum* (Rchb.f.) Schltr.]

Renanthera caloptera is distributed in the Philippines (mostly in Mindanao but also found in Dinagat), Maluku, Sulawesi, New Guinea and Solomon Islands growing as epiphyte from sea level to 300 m (Cootes 2001). Stem is upright bearing rigid, coriaceous leaves, 20 × 2.5 cm. Inflorescence is branching, paniculate, carrying 60 – 80 flowers, 1.7 cm across. Sepals and petals are oblo-lanceolate, reflexed. Lateral sepals are narrow at the base, undulate over the expanded portion. Lip is 3-lobed with a long, straight spur that ends in a sac (Fig. 94.5). Its synonym (in practice, its common name) refers to this sac, Greek *ascos* 'sac'; *glossa* 'tongue'. The flowers are not attractive; nevertheless, several attractive hybrids have been bred from *Ren. caloptera.*

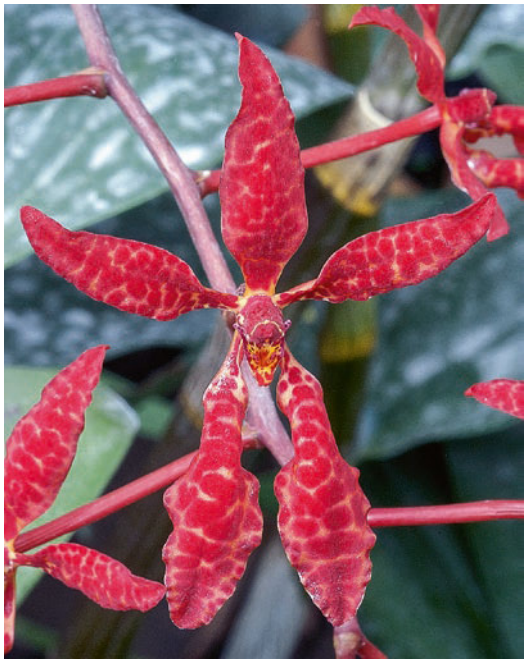

Fig. 94.4 *Renanthera bella* J.J.Wood (© Teoh Eng Soon 2021. All Rights Reserved)

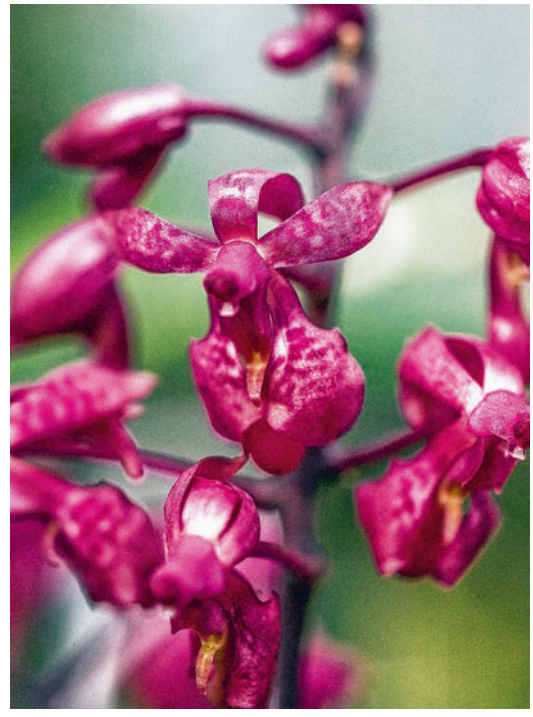

Fig. 94.5 *Renanthera caloptera* (Rchb.f.) Kocyan & Schuit. [syn. *Ascoglossum calopterum* (Rchb.f.) Schltr.] (© Teoh Eng Soon 2021. All Rights Reserved)

Renanthera citrina Aver.

Renanthera citrina is endemic to Vietnam growing as epiphyte on karst in strong sunlight, but it is cool growing at 500 – 800 m. Plants are 15 – 25 cm tall, stout, leafy throughout. Leaves are oblong, unequally bilobed, coriaceous, 7 – 10 × 0.9 – 1.1 cm, persistent. Inflorescence is axillary, branching, to 30 cm long, many to 70 flowers (Figs. 94.3, 94.6 and 94.7). Flowers are 2.5 – 4.5 cm across, pale yellow with few red spots on sepals, petals and anther cap. Dorsal sepal is erect, oblong, spathulate, obtuse. Lateral sepals are 1.5 times longer than the dorsal and much wider, narrow at the basal 10 percent, thereafter expanded, narrowly ovate, undulate, sometimes twisted over the apical portion. Petals are linear, spreading, shorter than the dorsal sepal, straight, slightly or obviously falcate. Lip is 3-lobed. Side lobes are large (as large as the midlobe), erect, divergent, trapezoid, apex acute, white or cream with two crimson stripes. Midlobe forms an isosceles triangle, flat at the apex and rounded at the angles, yellow at the base fading to white at the apex. Two tall, yellow calli are present on the mesochile. Flowers last for a month. They are not fragrant.

Fig. 94.6 *Renanthera citrina* Aver. (© Teoh Eng Soon 2021. All Rights Reserved)

Renanthera coccinea Lour.

Renanthera coccinea is distributed from southern China to Myanmar, Thailand and Indochina. It is the first *Renanthera* species to be cultivated in Singapore, and it was formerly very popular in Malaya. Stems are tall, climbing, bearing light green leaves, 6 × 3 cm, bilobed at the apex. Inflorescence is horizontal, branching in one plane, with 60 – 80 Chinese-red flowers, laxly arranged, 4 cm across, 6 – 7 cm tall. Dorsal sepal is oblong, narrowly elliptic; lateral sepals are ovate, widening from a linear base; margins are undulate, bright red, spreading vertically downwards, slightly parted or overlapping each other. Petals are linear, shorter than the dorsal sepal, red spotted with darker red. Lip is small, 3-lobed, side lobes yellow with red stripes, midlobe covered with red calli at the base, pointed at the apex, exposed surface red (Figs. 94.8, 94.9, and 94.10).

A well-branched plant 2 m high may have a number of inflorescences together and makes a fine display of colour unusual among orchids (Figs. 94.9 and 94.10). Such a plant will have some flowers during a good part of the year (Holttum 1964). That explained its former popularity in Singapore and Malaya before it was outshone by hybrids.

Fig. 94.7 *Renanthera citrina* Aver. (© Teoh Eng Soon 2021. All Rights Reserved)

Renanthera elongata (Bl.) Lindl.

Renanthera elongata is a lowland species found near the sea in sunny locations in Sumatra, Malaysia, Kalimantan and Java. It may also occur up to 1000 m in mixed hill-dipterocarp forest and secondary forests growing on poor soils. Plants are initially terrestrial, but their elongated stem and scrambling habit take them over bushes and limestone or sandstone cliffs (Holttum 1964; Comber 2001; Rice 2008). Stem are up to 4 – 5 m tall, leaves bilobed, rounded at the apex, 7 – 13 × 1.2 – 2.5 cm, sheaths purplish. Inflorescence is up to 40 cm long, branching, with numerous secondary side braches, all straight, many flowered. Flowers are small, 1.6 cm across, red with faint red spots (Figs. 94.11 and 94.12). Plants in full sun will flower fairly often in the tropical lowland (Holttum 1964).

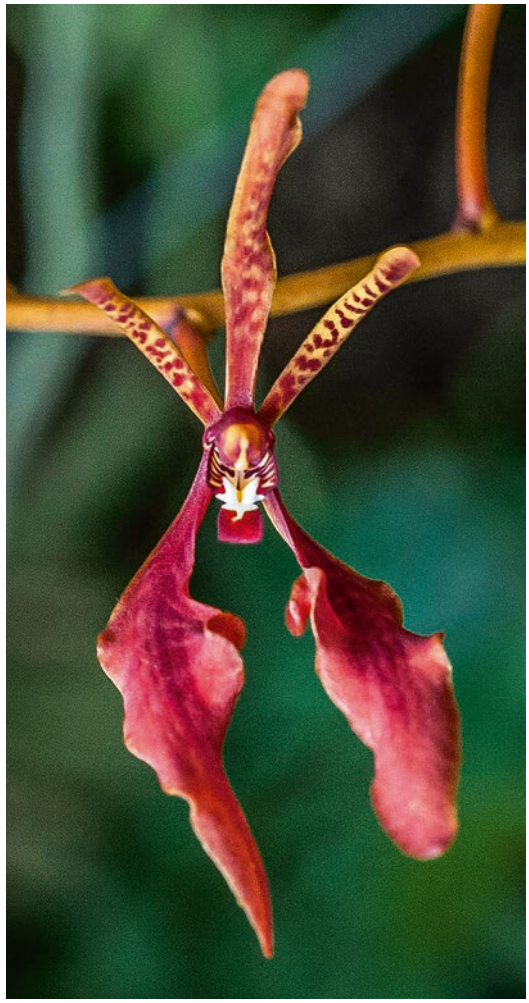

Fig. 94.8 *Renanthera coccinea* Lour. (© Teoh Eng Soon 2021. All Rights Reserved)

Renanthera elongata (Bl.) Lind. f. flava

The yellow form of *Ren. elongata* was collected by George Alphonso from Malaysia (habitat unstated) and flowered in 1978. Plant is similar to the red form but leaves are shorter. Inflorescence is up to 40 cm long with 3 side branches, numerous secondary side branches, and with more but smaller, more compact flowers than those of the red form (Alphonso 1978; Alsagoff and Khew 2013). Flowers are orangey yellow (Fig. 94.13.).

Renanthera histrionica Rchb.f. (syn. *Renanthera histrionica* Ridl.)

Renanthera histrionica occurs in Peninsular Thailand and Peninsular Malaysia growing on old mangrove in the south, and epiphytic or saxicolous at moderate elevations in the north (Holttum 1964). Stems are climbing or pendulous, to 60 cm or longer with curved, channelled, coriaceous leaves, 10 × 0.7 cm. Inflorescence is horizontal, 10 cm long, bearing 1 – 2 flowers. Flowers are non-resupinate (with lip above), 1. 5 cm across, lemon yellow, with small crimson spots along the margins of the sepals and petals. Middle sepal is large, elliptic, spreading, pointing directly downwards. Lateral sepals are smaller, reflexed over the lower half. Petals are falcate, apex blunted, smaller than the middle sepal, spreading. Lip is 3-lobed, side lobes nearly as long as the column, yellow with red spots; midlobe is short (Fig. 94.14).

Renanthera imschootiana Rolfe

Renanthera imschootiana is distributed from northeastern India to Myanmar, Vietnam and southwestern China, epiphytic on tree trunks at elevations up to 1500 m (Kurzweil and Lwin 2015). It is included in the CITES Category 1 List being critically endangered [in India (?) for it was seen to flower in great abundance in Myanmar across the riverine border at Manipur (CS Kumar personal communication)]. Plant is up to 1 m tall, leafy throughout, leaves oblong, bilobed, apically rounded, 6 – 8 × 1.3 – 2.5 cm. Inflorescence is lateral, branching, laxly many flowered. Flowers are bright red, large, 6 cm across with impressive, big, flat lateral sepals.

Fig. 94.9 *Renanthera coccinea* Lour. From Thailand, grown and exhibited in Singapore (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.10 *Renanthera coccinea* Lour. At Guangzhou Botanic Gardens, Guangzhou, Guangdong Province, China (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.11 *Renanthera elongata* (Bl.) Lindl. (© Teoh Eng Soon 2021. All Rights Reserved)

Dorsal sepal and petals are narrow, nearly linear, short, incurved at the apex, orange, densely spotted with red. Lateral sepals are narrow at the base, widening suddenly to become ovate-elliptic, undulate, 3 × 1 cm. Lip is 3-lobed, saccate; side lobes are small, triangular, dark red. Midlobe is dark red, recurved at the apex, bearing 3 prominent, white calli at the mesochile. Column and anther cap are red (Fig. 94.15).

Renanthera imschootiana has produced several outstanding primary hybrids.

Renanthera isosepala Holtt.

Renanthera isosepala was discovered growing in scrub forest in Prachuap, Thailand, by Sagarik and Kamemoto (Kamemoto and Sagarik 1975) and later found to occur swamp and coastal forests in Sabah (Chan et al. 1994). Plants and flowers resemble *Ren. coccinea* from a distance, but flowers are smaller and shape is different. Stem is erect, internodes 2.5 cm long, leaves coriaceous, bilobed, 9 × 2.5 cm. Inflorescence is 40 – 45 cm long, with 3 – 4 lateral branches and bears up to 30 flowers, 2.2 cm across. Sepals are of equal length (hence, *isosepala*). Lateral sepals are twice as broad as the dorsal on the distal half, undulate on their medial margins, and they spread outwards to form an angle of 80 – 90 degrees. Petals are linear-oblong widening towards and rounded at the apex, as long as the sepals, and spread at an angle of approximately 90 degrees to each other. Lip is 3-lobed. Side lobes are orange at the tip and bear two white calli medially at the base. Midlobe is rectangular, crimson (Figs. 94.16 and 94.17).

The Sabah plant originally identified as *Ren. isosepala* (Chan et al. 1994) was subsequently described as a separate species and assigned the name *Ren. chanii* J.J. Wood & R. Rice. Sepals and petals are orange-red, sometimes with darker

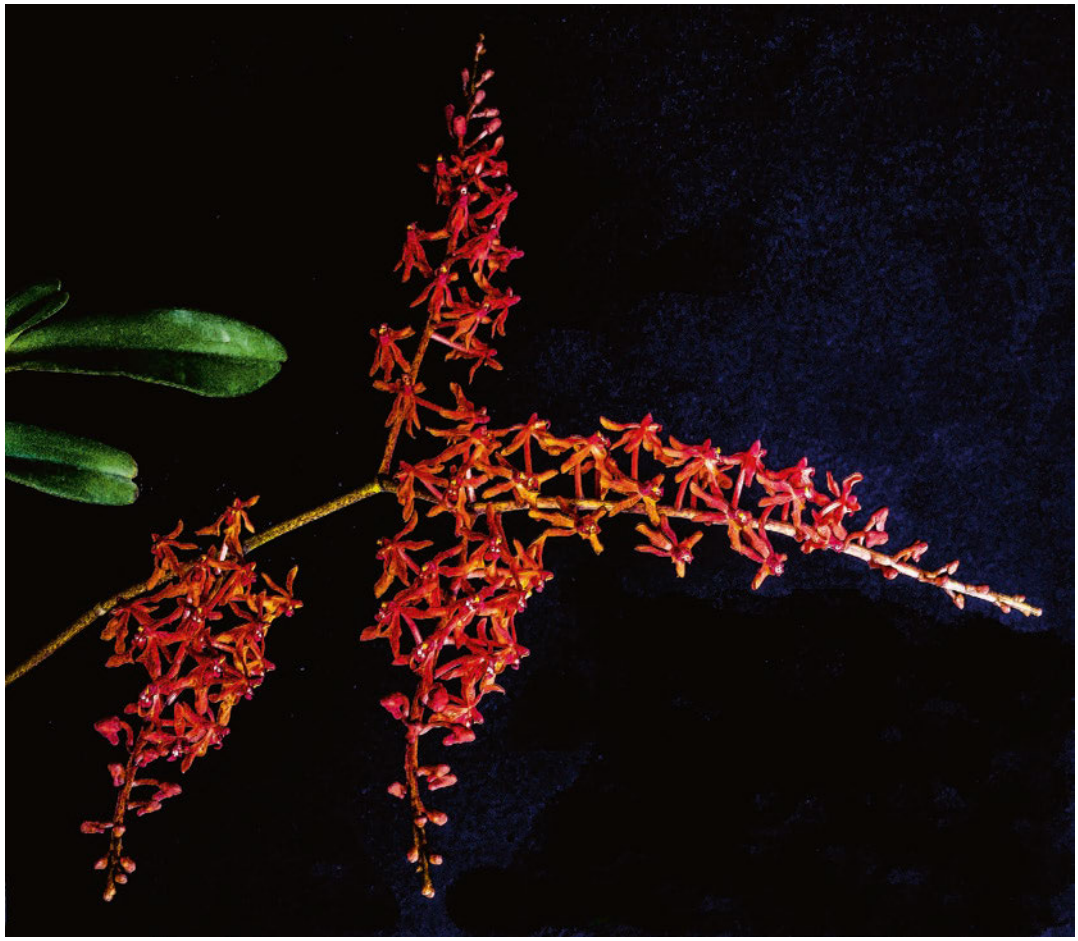

Fig. 94.12 *Renanthera elongata* (Bl.) Lindl. (© Teoh Eng Soon 2021. All Rights Reserved)

red spots. Lip is red, side lobes flushed with yellow, spur red, callus yellow with some red spots, column red (Rice 2008). *Renanthera chanii* is accepted as a distinct species by Kew.

Renanthera matutina (Poir.) LIndl.

Renanthera matutina is a montane species distributed in Sumatra, Peninsular Malaysia and Java (Borneo and Philippines) at 800 – 1200 m. It is a variable species.

Stem is long, climbing, sometimes pendulous, with thick, coriaceous dark grey-green leaves, 7 – 20 × 1.2 – 1.6 cm, sheathing the stem. Inflorescence is 40 – 80 cm long, branching, with numerous (about 24) flowers half of which are open at a time, laxly arranged. Flowers are 2.2 cm across, bright red with darker spotting or streaks on the lateral sepals. Dorsal sepal is erect, lanceolate, acute, 3 cm long. Lateral sepals are narrowly oblong, 2.8 cm long, reflexed at the base, spreading straight downwards and touching each other medially; apical portions are narrowed and acute, tips curved sideways or inwards. Lip is small, 3-lobed, side lobes erect, orange, white and red. Midlobe is red, spurred (Holttum 1964) (Figs. 94.18 and 94.19).

Fig. 94.13 *Renanthera elongata* var. *flava* (Photo: AG Alphonso. From Teoh ES: *ORCHIDS Commemorating the Golden Anniversary of the Orchid Society of South East Asia*, OSSEA, Singapore, 1978).

Fig. 94.14 *Renanthera histrionica* Rchb.f. (syn. *Renanthrella histrionica*) (© Teoh Eng Soon 2021. All Rights Reserved)

Renanthera matutina (Poir.) Lindl. var. angustifolia Hook.f.

The variety formerly known by its synonym, *Renanthera angustifolia* Hook.f. (Fig. 94.20) occurs in Java, Sumatra, Peninsular Malaysia (Galistan 1932) and also in Sabah, Sarawak (Borneo) and the Philippines (Beaman et al. 2001). Lateral sepals are broad, lanceolate, diverging to form an isosceles triangle of 30 degrees. Petals are lanceolate, falcate, broader than those of the type, spreading horizontally. Flowers are scarlet marked by crimson when newly opened turning to orange with age. The flowers last for 2 months on the plant (Galistan 1932).

***Renanthera breviflora* (Rchb.f.) R. Rice & J.J.Wood** is very similar to *R. matutina* var. *angustifolia*, but the flowers are externally pubes-

Fig. 94.15 *Renanthera imshootiana* Rolfe(© Teoh Eng Soon 2021. All Rights Reserved)

cent and yellow (in the Sabah form) with fine red spots. Lateral sepals are dorsally carinate, in contact with each other, bent at the apex and shorter than the petals (hence, the given name, *breviflora* derived from the last characteristic of the lateral sepals). A callus is present on the back wall of the spur. Flowers last for 3 weeks. *Renanthera breviflora* is distributed in Sabah and the Sulu Archipelago (Philippines) (Rice 2008).

Renanthera monachica Ames

Renanthera monachica is a small, epiphytic, lowland species endemic to Luzon, Philippines, occurring in open grassland at 100 m in Rizal, Surigao and Zambales (Valmayor and Baldovino 1984).

Plant is 30 – 60 cm tall with leathery, thickly channelled, purplish leaves, 15 – 19 × 1 – 1.8 cm, arranged in 2 ranks and sheathing the stem. Inflorescence is lateral, simple, rarely branched, several flowered. Flowers are cream heavily spotted with red, star-shaped, 4 cm across and laxly arranged. Dorsal sepal is erect, lanceolate, margin reflexed in the middle. Petals are elliptic, falcate, spreading, apex curving upwards. Lateral sepals are lanceolate, convex, very narrow at the base, inner margins undulate. Lip is saccate, 3-lobed lateral lobes triangular, midlobe oblong, spur obtuse, cylindrical (Fig. 94.21).

Renanthera philippinensis Ames & Quisumb.

Renanthera philippinensis is endemic to Philippines, widely distributed in Luzon, Palawan, Leyte and the Visayas southwards to Mindanao, commonly epiphytic on trees in mangrove swamps, but plant is sometimes terrestrial. Habit is similar to *Renanthera storiei* but plant is smaller. Stems are erect, thick, 40 – 80 cm tall with 2 oblong, thick, leathery, unequally bi-lobed leaves rounded at the apex, 4.5 – 9.5 × 1.5 – 3.4 cm. Inflorescences consist of many flowered panicles. Flower 2.5 – 3.2 tall, 1.8 – cm across, dark red. Lip is 3-lobed, fleshy, deeply saccate, spurred at base; lateral lobes are nearly square, midlobe broadly ovate (Valmayor and Baldovino 1984; Cootes 2001) (Fig. 94.22).

Renanthera storiei Rchb.f.

Renanthera storiei is endemic to Philippines where it occurs in dense forests, open areas and mountains up to 1000 m. The species is widespread from Luzon southwards to Mindanao and also on Palawan. Plants from Surigao are saxicolous on exposed rocks near the sea in full sun, and they are free flowering (Valmayor and Baldovino 1984; Cootes 2001).

The species is robust, 4 m tall. Stem is erect, usually unbranched, bearing 2 fleshy, coriaceous, dark green leaves, 12 – 15 × 2.5 – 4 cm, arranged

Fig. 94.16 *Renanthera isosepala* ©Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.17 *Renanthera isosepala* ©Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.18 *Renanthera matutina* (Poir.) LIndl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.19 *Renanthera matutina* (Poir.) LIndl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.20 *Renanthera matutina* var. *augustifolia* (© Teoh Eng Soon 2021. All Rights Reserved)

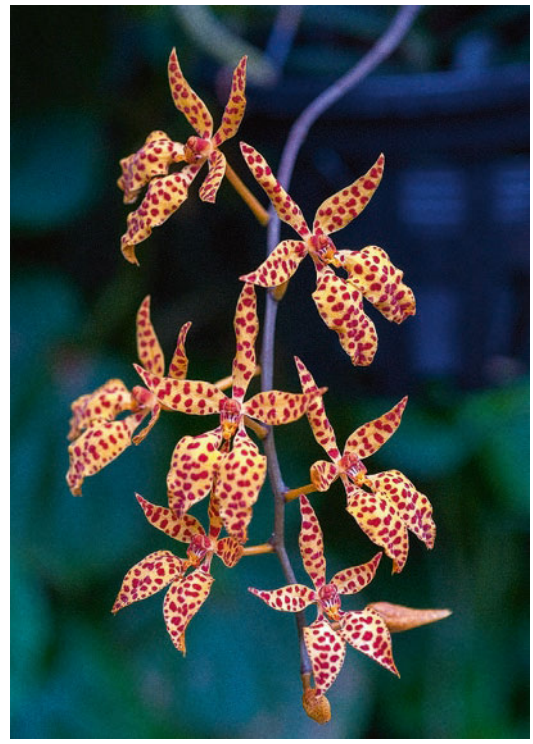

Fig. 94.21 *Renanthera monachica* Ames (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.22 *Renanthera philippinensis* Ames & Quisimb. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.23 *Renanthera storiei* Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

in 2 alternate ranks. Inflorescence is horizontal, branching, paniculate, up to 1 m long and many flowered (Fig. 94.23). Flowers are brilliant red to red orange, 5 – 7 cm long, 3.5 – 5 cm wide. Dorsal sepal is linear, erect. Lateral sepals are pendulous, broadly spathulate, undulate, velvety, brilliant red with dark red blotches. Petals are slightly oblique, linear, in some strains falcate. Lip is 3-lobed, deep orange with small yellow bars and a white centre. Lip is joined to base of column by a thin membrane rendering the lip

Fig. 94.24 *Renanthera storiei* Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

movable. Sidelobes are large, ovate-lanceolate, erect and spreading, concave, crimson with yellow stripes on the inner surface. Midlobe is lanceolate recurved, crimson, with white calli at the base (Fig. 94.24).

Renanthera storiei f. *citrina* Valmayor & D.Tiu

Collected from Surigao in Philippines, flowers of this variety are a clear yellow with faint yellowish markings. This form is very rare (Valmayor and Baldovino 1984).

Renanthera vietnamensis Aver.

Renanthera vietnamensis is endemic to Vietnam. Plants are 15 – 25 cm tall. Inflorescence is 15 – 25 cm long, bearing 6 – 15 yellow and

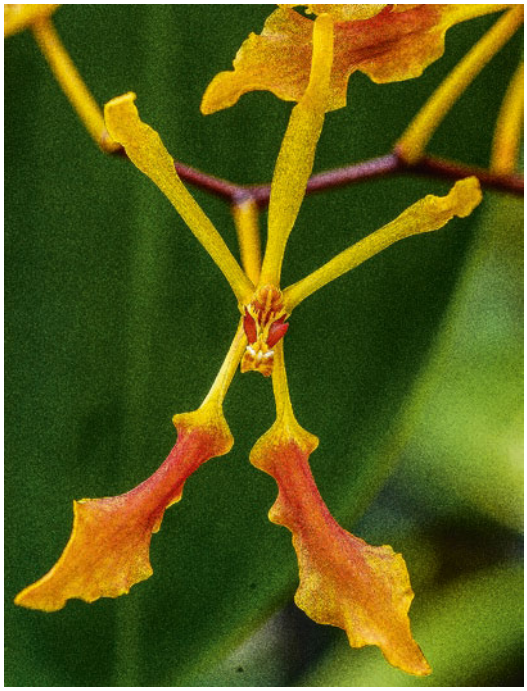

Fig. 94.25 *Renanthera vietnamica* Aver. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.26 *Renanthera vietnamica* Aver. (© Teoh Eng Soon 2021. All Rights Reserved)

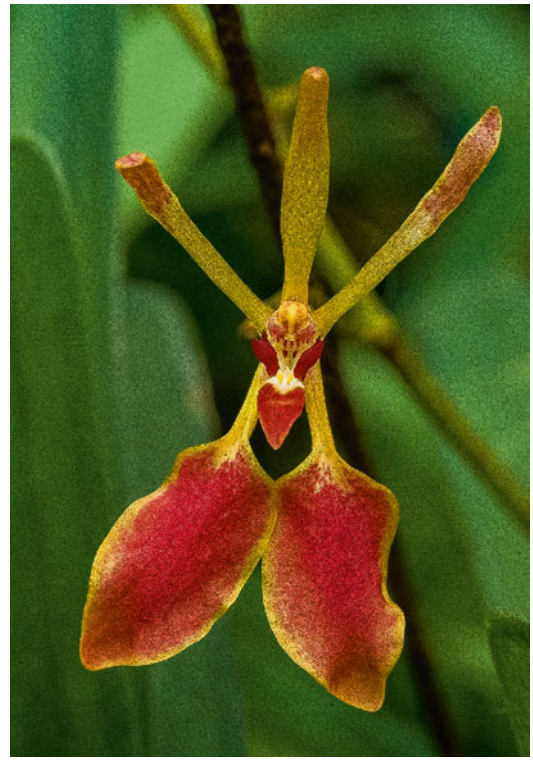

Fig. 94.27 *Renanthera vietnamica* Aver. A possible variant (© Teoh Eng Soon 2021. All Rights Reserved)

scarlet flowers, laxly arranged. Flowers are 2.5 – 4.5 cm across, lasting one month. Dorsal sepal is erect, linear spathulate, yellow overlaid with orange near the distal end. Lateral sepals are shaped like paddles; linear and yellow over the basal quarter, the rest rapidly expanded, ovate, acute, undulate, red with a yellow border. Lip is 3-lobed; side lobes are elliptic, dark red, flaring upwards and sideways. Midlobe is rectangular, recurved, red, or sometimes orange with a hint of red markings and bearing two yellow calluses at the base and a row of three prominent white calluses just below it (Figs. 94.25 and 94.26).

Among a collection of '*Ren. vietnamensis*' at a Singapore nursery, there was a plant which had broad, red, ovate-lanceolate, undulate petals and a lip with a red lanceolate epichile to the midlobe which is atypical of *Ren. vietnamensis* (and other Vietnamese *Renanthera* species), but the rest of the lip form, with yellow and white calluses, corresponds (Figs. 94.27 and 94.28). Markings on

Fig. 94.28 *Renanthera vietnamica* Aver. Detail of variant lip form (© Teoh Eng Soon 2021. All Rights Reserved)

the anther cap was also similar to those present in *Ren. vietnamensis* (compare Fig. 94.28 with Fig. 94.26).

Hybrids

Renanthera and its hybrids are the most eye-catching orchids in a garden, and red being the colour of celebration in the Far East, these orchids are popular with growers who want a landscape garden of orchids. Thus, *Renanthera* always had a role in the programme of leading hybridizers from the very beginning of orchid breeding in Singapore. *Aranthera* Mohamed Haniff (*Arach. hookeriana* x *Ren. coccinea*) was the first *Renanthera* hybrid bred at Singapore Botanic Gardens and named by Eric Holttum for his expert orchid collector and chief garden superintendent at Penang Botanic Gardens (Teoh 2017). It was the first red orchid cut flower, but it has since been replaced by larger, brighter hybrids.

Spectacular primary *Renanthera* hybrids were bred initially in Hawaii with the appearance of *Ren.* Kilauea (*imschootiana* x *storiei*) bred by Nuuanu Orchid Garden by in 1942 and *Ren.* Brookie Chandler (*monachica* x *storiei*) by J.P. Russell in 1950. Early hybrids of *Renanthera* in Singapore developed premature colour fading. When two-thirds of the flowers on an inflorescence were open, the red on the first open blooms turn into a wash-out red or orangey red, and this spreads to more flowers as the buds continue to open. This problem was eliminated when a strong-coloured clone of *Ren. storiei* that did not produce premature colour loss in its offspring was identified. With this new clone, in Singapore, Chong Chok Choy bred *Ren.* Kalsom (*philippinensis* x *storiei*), registered in 1977 by Syed Yusof Alsagoff (Figs. 94.29 and 94.30). This outstanding hybrid has produced numerous attractive progeny, among them the relatively compact *Ren.* Singaporeans (*Ren.* Kalsom x *Ren.* Tom Thumb) (Fig. 94.31) bred by How Wai Ron which would have 25% each of *Ren. imschootiana, Ren. monachica, Ren. philippinensis* and *Ren. storiei. Renanthera* 20th WOC Singapore (Fig. 94.32) is also a beautiful dark red *Renanthera* which has 37.5% *Ren. coccinea* from two ancestors in its pod parent, 25% each of *Ren. philippinensis, Ren. storiei* and 12.5% *Ren. imschootiana*. Whereas inflorescences of *Ren.* Kalsom and *Ren.* Singaporeans are extensively side-branched, *Ren. coccinea* dominance limits the number of side-branches of *Ren*. 20th WOC Singapore usually to two, rarely three. Polyploidy in an ancestor may also play a role in influencing the appearance of the progeny: the *Ren. coccinea* which produced the early Singapore hybrids was hexaploid (Sagarik, personal communication).

The first *Arantheras* to achieve full saturation in all their flowers were *Arnth*. Bloodshot, *Arnth.* Anne Black, *Arnth*. Gracia Lewis (Fig. 94.33) and *Arnth* Beatrice Ng. *Aranthera* Beatrice Ng. also had the distinction of yielding a pure yellow clone, 'Conference Gold' AM/MOS which received a Silver Medal at the Fourth World Orchid Conference in Singapore in 1964 (Teoh 1980). Pure yellow flowers are a rarity in

Fig. 94.29 *Renanthera* Kalsom (*Ren. philippinensis* x *Ren. storiei*), (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.30 *Renanthera* Kalsom (*Ren. philippinensis* x *Ren. storiei*), (© Teoh Eng Soon 2021. All Rights Reserved)

Aranthera hybrids, but *Aranthera* Beatrice Ng. 'Conference Gold' has been able to maintain its yellow colour when bred to *Vanda Seethong* producing a yellow *Holttumara* Emperor Akihito (Fig. 94.34). *Vanda Seethong* has the yellow *V. dearei* in its ancestry. Another yellow *Renanthera* hybrid is *Ren. monachica* x *V.* (syn. *Ascda.*) Fuchs Gold which has yellow flowers with brown spots (Fig. 94.35).

As mentioned above, the first intergeneric hybrid was created by breeding to *Arachnis. Renanthera* was subsequently bred to other genera in the *Vanda-Arachnis* tribe, yielding attractive hybrids with *Vanda, Vandopsis, Phalaenopsis* and *Paraphalaenopsis*. Beautiful multigeneric hybrids were also created with *Renanthera* as a constituent species. *Renantanda*, hybrids between *Renanthera* and *Vanda*, are robust plants that carry large sprays of well-shaped, well-presented, colourful flowers and were formerly very much admired by orchid enthusiasts. Inflorescence does well on the plant but vase-life is short. Although many beautiful *Renantanda* with interesting new colours are now being bred

Fig. 94.31 *Renanthera* Singaporeans (*Ren. Kalsom x Ren. Tom Thumb*) (© Teoh Eng Soon 2021. All Rights Reserved))

Fig. 94.32 *Renanthera* 20th WOC Singapore (© Teoh Eng Soon 2021. All Rights Reserved)

by using improved hybrid *Vanda,* popularity escapes even the best hybrids. Perhaps, it is due to large plant size (Figs. 94.36 and 94.37).

With the exception of crosses with *Phalaenopsis,* plants are robust, heat tolerant and easy to grow in bright light or in full sun. Breeding to *Vandopsis* increased the size of the inflorescence and the size and substance of the flowers. *Renanopsis* Lena Rowold (*Ren. storiei* x *Vdps. lissochiloides*) were highly awarded earning several First Class Certificates from the Royal Horticultural Society and the American Orchid Society when it made its maiden appearance. It was a tall plant, needing to exceed a man's height before it produced its magnificent flowers. Subsequent repeat crossing using shorter flowering parents have brought hybrid to a manageable height. *Rnps* Cape Sable, a backcross of *Rnps.* Lena Rowold to *Ren. storiei*, increased flower count to 100 or more in some clones (Fig. 94.38). Singapore Botanic Gardens produced another spectacular hybrid, *Rnps*. Lion's Splendour by

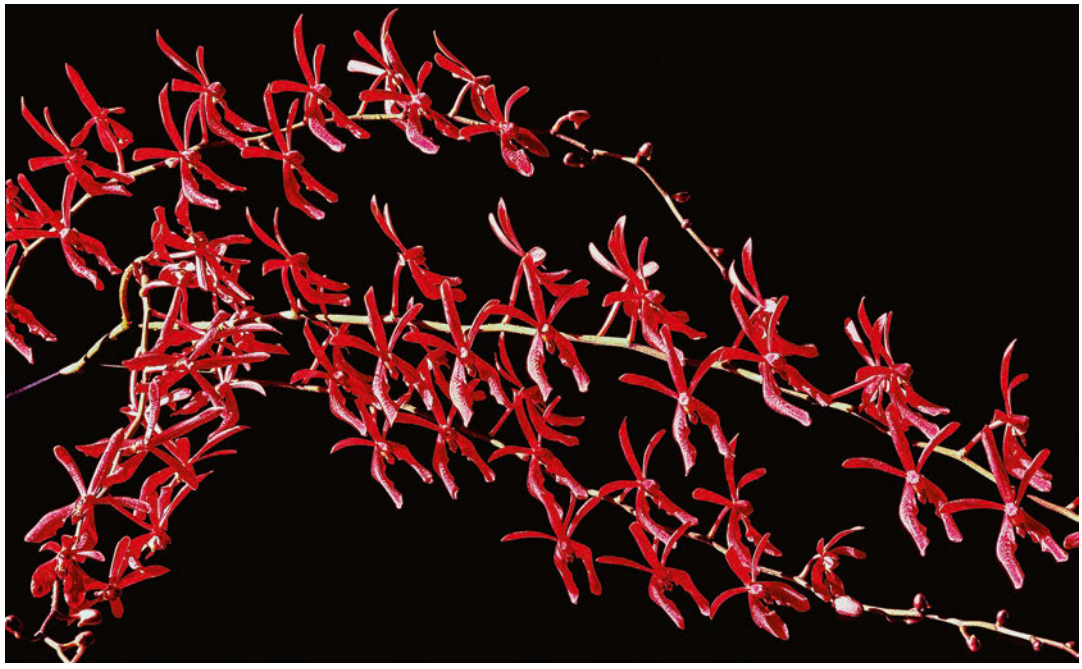

Fig. 94.33 *Aranth*era Gracia Lewis (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.34 *Holttumara* Emperor Akihito (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.35 *Renanthera monachica* x *Vanda* (*Ascocenda*) Fuch's Gold (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.36 *Renantanda Sultanah Zenariah* (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.37 *Vanda* Varut Fuschia x *Renanthera philippinense*(© Teoh Eng Soon 2021. All Rights Reserved)

crossing *Rnps* Lena Rowold to *Ren*. Kalsom (Fig. 94.39). The inflorescence in a tall plant can have 6 side branches. *Renanstylis* Bangkok Beauty (*Renanstylis* Azimah x *Ren.* Bangkok Flame) is an eye-catching red hybrid that has improved on its parents (Fig. 94.40)

During the early 1960s in Hawaii, Ernest T. Iwanaga bred *Renanthopsis* Starfire (*Ren. storiei* x *Phal.* R.H. Montgomery) and John Noa bred *Renanthopsis* Ellen Noa (*Ren. storiei* x *Phal.* Doris). Both hybrids carried long, branching sprays with many apricot-coloured flowers, and they received numerous quality awards (Fig. 94.41). However, the hybrid brings together two species with entirely different ecological back-

Fig. 94.38 *Renanopsis* Lena Rowald x *Ren. storiei* (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.39 *Renanopsis Lion's Splendour* (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.40 *Renanstylis* Bangkok Beauty (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.41 *Renanthopsis* Star Fire 'Bee Lian' AM/MOS (*Phal.* Montgomery x *Ren. storiei*) (From: *Malayan Orchid Review* 7 (2): facing p 39 (1963), Reproduced with permission from Orchid Society of South East Asia)

Fig. 94.42 *Holttumara* Prapin (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 94.43 *Teohara* Teoh Cheng Swee (*Aranda* Kian Kee x *Rnps.* Lena Rowald) (© Teoh Eng Soon 2021. All Rights Reserved)

ground, and they were difficult to maintain over the long term. Dozens of *Renanthopsis* have been bred over the past 50 years, predominantly with *Rem. monachica* and *Ren. storiei,* but none achieved the impact of the early hybrids.

The creation of *Holttumara* (*Arachnis* x *Vanda* x *Renanthera*) showed that multi-generic hybrids could be interesting, and it led Singapore breeders to creature more than a dozen such combinations. The names of such artificial genera which ended with '*ara*' recall the names of people who have been involved with the orchid scene over the past seven decades (Figs. 94.42, 94.43, and 94.44). They are also illustrated in various sections of Vol. 2 and Vol. 3.

Nevertheless, attempts to produce complex intergeneric hybrids may encounter sterility problems due to chromosomal instability resulting from variable ploidy levels. Furthermore, results are less predictable. Syed Yusof Alsagoff and Gillian Khew advised that it is better to use *Renanthera* species because species transmit their characteristics directly to the hybrids, and results are therefore more predictable. Future breeding effort should concentrate on using the newly discovered species (Alsagoff and Khew 2012).

Fig. 94.44 *Waironara* Tango Fire (© Teoh Eng Soon 2021. All Rights Reserved)

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Rhynchostylis Bl. 95

Popularly known as the foxtail orchids, *Rhynchostylis* species and their hybrids are widely cultivated by orchid enthusiasts in the tropical regions of the world. The genus has five species distributed across India, Sri Lanka, Nepal, Bhutan, Myanmar, SW China, Thailand, Indochina, Malaysia and Indonesia in low montane and deciduous forest, with all three species occurring in Thailand. Plants require low night temperature to induce flowering and low temperature for the flowers to develop properly. A strong *Rhynchostylis gigantea* can carry over 1000 flowers on 20 inflorescences. Well-grown plants of *Rhynchostylis retusa are* similarly floriferous (Fig. 95.1).

Plants are epiphytic, monopodial, with short stems bearing coriaceous strap leaves marked by longitudinal lines of a paler colour. Inflorescence is axillary, arching, with many flowers that are cylindrically arranged around the rachis, close, with minimal overlap, opening simultaneously and lasting for several weeks. Sepals and petals are spreading, sepals broader than the petals, lower sepals bow-legged. Lip is entire, caudate, keeled, with apex recurved.

Rhynchostylis species grow well in cooler latitudes, but when they are brought to sea level in Bangkok and nearer the equator (like Singapore), they do not grow so well and will not flower properly unless they are grown in a cool house. However, there is no problem growing and flowering their hybrids with sun-loving, heat-tolerant vandaceous orchids. Plants do well attached to tree trunks or in open teak baskets. Plants need to be provided with good aeration, drainage and 50 percent shade.

Rhynchostylis coelestis (Rchb.f.) A.H.Kent

Rhynchostylis coelestis is distributed in Thailand, Cambodia and Vietnam but most extensively in Thailand, growing as epiphyte in deciduous forests or dry evergreen forests in lowland at Prachuap (upper Peninsular Thailand) and in mountainous areas elsewhere (Kamemoto and Sagarik 1975).

Stems are 17 – 25 cm tall bearing closely arranged, oblong, deeply v-shaped, recurved, coriaceous leaves, 10 – 15 × 3 – 5 cm. Inflorescence is erect, 17 – 23 cm tall, densely flowered. Flowers are 50 or more, densely arranged spirally around the rachis, fragrant, 2 cm across. Sepals and petals are ovate, thick, white or purplish blue, tipped with dark purple. Lip is simple, spathulate, porrect, concave, curving upwards to cover the column, purple or deep bluish purple, darkening towards the apex (Fig. 95.2). Flowering season is April to July with a peak in May. Flowers last for 2 weeks (Kamemoto and Sagarik 1975; Nanakorn and Watthana 2008).

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Fig. 95.1 *Rhynchostylis retusa* (L.) Bl. (© Teoh Eng Soon 2021. All Rights Reserved). Prize-winning plant at Singapore Orchid Show. *Rhy. retusa* growing in the wild can be quite floriferous when the plant is mature and climatic conditions favour flowering.

Rhynchostylis coelestis f. *alba* Kamemoto & Sagarik

The pure white form occurs in northern Thailand (Kamemoto and Sagarik 1975). Habit and flowers are similar to the type, the only difference being the white flowers (Fig. 95.3)

Rhynchostylis gigantea (Lindl.) Ridl.

Rhynchostylis gigantea is distributed from Myanmar to Thailand, Indochina, Hainan and North Borneo, occurring in evergreen forests up to 1000 m. It is not found in southern Thailand (Nanakorn and Watthana 2008). Stems are stout, erect, 5 – 15 × 2 cm with large roots. Leaves are oblong, unequally bilobed, coriaceous, variegated, 20 – 40 × 4 – 6 cm. Inflorescence is axillary, arching, 20 – 30 cm with 50 flowers densely arranged around the rachis, 2.5 – 3.5 cm across and fragrant. Sepals and petals are thick textured, ovate-elliptic, concave, spreading, white with purple blotches; sepals are larger and broader than the petals. Lip is simple, porrect, keeled and with a callus at the apex, purple or crimson. Column and anther cap are dark crimson (Figs. 95.4 and 95.5). There are purple and white colour forms.

A strong plant will usually produce multiple inflorescences. Kamemoto and Sagarik reported that in Bangkok, a large, many-branched specimen plant produced 30 inflorescences (Kamemoto and Sagarik 1975). Flower spikes are initiated in early September, but they remain dormant, elongating and developing flower buds only at the advent of cool weather. Flowering occurs in January to February in Thailand

Fig. 95.2 *Rhynchostylis coelestis* (Rchb.f.) A.H.Kent. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 95.3 *Rhynchostylis coelestis* f. *alba.* (© Teoh Eng Soon 2021. All Rights Reserved)

(Kamemoto and Sagarik 1975), December and January in Myanmar (Tun 2019).

Rhynchostylis gigantea f. *alba*

The *alba* form is less common. Leaves are homogenously green and root tips are light green. Inflorescence is 15 – 30 cm long with many flowers, 1.5 cm across, closely arranged but not overlapping on the rachis. Column is greenish white. Plants on the market are bred from superior clones, and they are fairly common. These market plants are seldom, hardly ever from the wild (Fig. 95.6). Flowering season is December to February (Nanakorn and Watthana 2008). This form is popularly known as the white elephant in comparison with the purple form which is called the red elephant, both names testifying to the admiration for these magnificent orchids, elephants in south Asian cultures being symbolic of regal power.

Rhynchostylis gigantea f. *Chang Daeng*

A 'red' or amethyst purple form known as '*Chang Daeng*' (red elephant) had been around for more than a century, but it was extremely rare. Only eight plants of this colouration were identified from the thousands of plants collected from the wild (Kamemoto and Sagarik 1975). When they are not in flower, such clones can be recognized by the crimson colouring on their leaves and root tips. Inflorescence is 15 – 30 cm long, many flowered, flowers 2.5 – 3 cm across and fragrant. Flowering season is December to March (Nanakorn and Watthana 2008).

Fig. 95.4 *Rhynchostyis gigantea* (Lindl.) Ridl., typical form. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 95.5 *Rhynchostyis gigantea* (Lindl.) Ridl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 95.6 *Rhynchostyis gigantea* f. *alba.* (© Teoh Eng Soon 2021. All Rights Reserved)

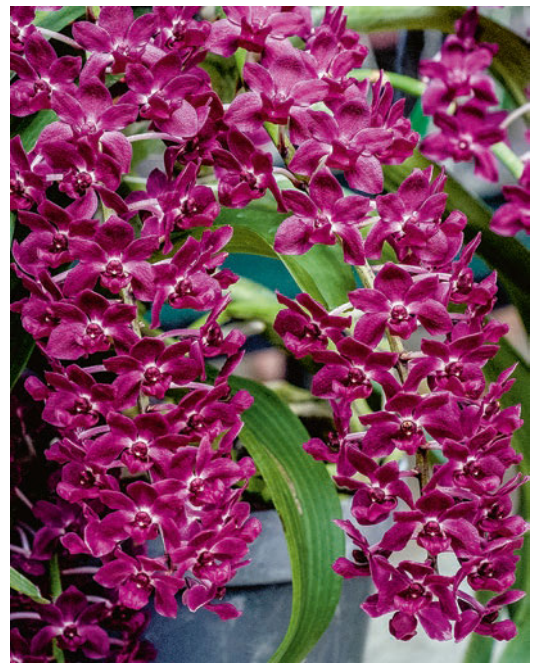

Fig. 95.7 *Rhynchostyis gigantea* f. Chang Daeng. (© Teoh Eng Soon 2021. All Rights Reserved)

In 1954, Rapee Sagarik produced the beautiful red *Rhynchostylis gigantea* 'Sagarik strain' by crossing two red clones of the species (Fig. 95.7).

Rhynchostylis retusa (L.) Bl.

Rhynchostylis retusa is extensively distributed from Bhutan, northeast India, and southern China to Myanmar, Thailand, Indochina, Malaysia and Indonesia. In Peninsular Malaysia, it occurs only in the north which experiences distinctive dry and wet seasons. Plants grow into large communities in exposed places in Peninsular Thailand (Holttum 1964) and Assam (Gogoi et al. 2012) producing spectacular displays when they come into bloom. *Rhynchostylis retusa* was described and illustrated, and its medicinal uses were expounded by van Rheede in his monumental *Hortus Indicus Malabaricus* published in 1703, the first European text on Asian medicinal plants (Teoh 2016).

Stem is short, branching, with 10 – 12 leaves, 25 – 40 × 3 – 4 cm, unequally toothed at the apex, striated with light green. Inflorescence is drooping, 40 cm long, bearing up to 120 white, purple-spotted flowers densely arranged in cylindrical form around the rachis. Flowers are 2 cm across. Lip is light purple.

Rhynchostylis retusa is a variable species. Plants from Peninsular Malaysia have smaller inflorescences with smaller flowers which are white with faint colour spots (Fig. 95.8). The form and colour of different clones of the species that has been further accentuated by line breeding (Figs. 95.9 and 95.10). Some forms

Fig. 95.8 *Rhynchostylis retusa* (L.) Bl. from Peninsular Malaysia. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 95.9 *Rhynchostylis retusa* (L.) Bl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 95.10 *Rhynchostylis retusa* (L.) Bl., a line-bred clone from Thailand. (© Teoh Eng Soon 2021. All Rights Reserved)

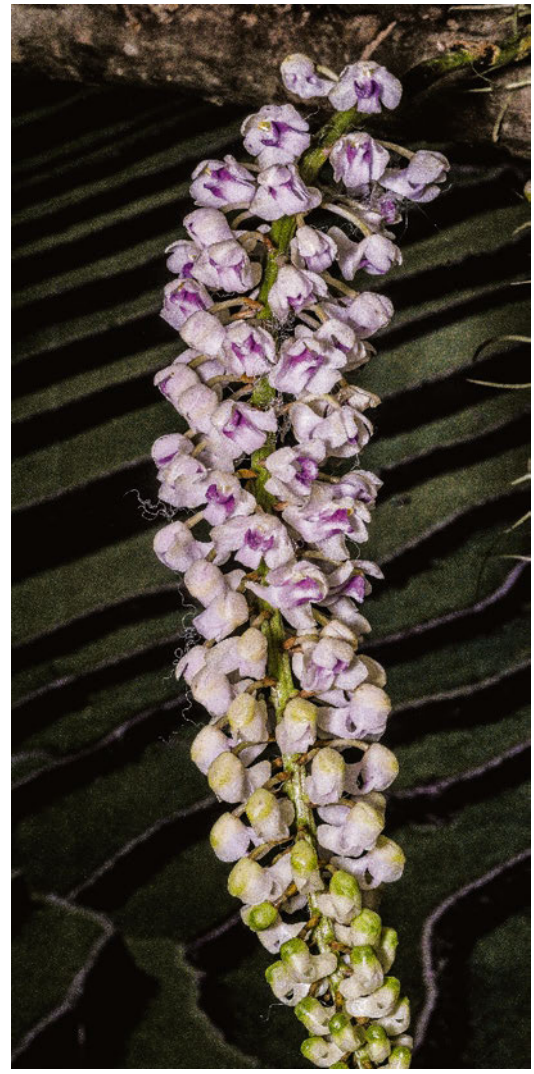

Fig. 95.11 *Rhynchostylis praemorsa* (Willd) Bl. (© Teoh Eng Soon 2021. All Rights Reserved). It is considered to be a variety of *Rhynchostylis retusa* (L.) Bl. Plant from Borneo exhibited in Kuching during 13th Asia-Pacific Orchid Conference in 2020

had been given specific names. *Rhynchostylis praemorsa* (Willd.) Bl. [= *Rhynchostylis retusa* (L.) Bl.] has spotless white sepals and petals and a purple lip (Fig. 95.11).

Flowering season of *Rhynchostylis retusa* is April to May (Nanakorn and Watthana 2008) or later, May to June in Thailand (Vaddhanaphuti 2005) and June to July in Myanmar (Tun 2019). The flowers last for 2 weeks.

Rhynchostylis retusa f. *alba*

Pure white forms of *Rhynchostylis retusa* occur in northwest Thailand, Myanmar and Assam, but they are rare (Tun 2019; Gogoi et al. 2012). Flowers are smaller, 1.5 cm across. Flowering season is June at Taunggyi in Myanmar (Tun 2019).

Hybrids

Intraspecific hybridization of *Rhynchostylis* undertaken by Thai breeders have resulted in a profusion of spectacular plants of all three species. *Rhynchostylis* has also been bred to numerous vandaceous genera including *Aerides, Arachnis, Ascocentrum, Renanthera*, *Seidenfadenia* and *Vanda* producing free-flowering, heat-tolerant hybrids that carry arching or erect (the latter from *Rhy. coelestis*) sprays of colourful, closely arranged flowers of good form and substance (Figs. 95.12, 95.13, 95.14, 95.15 and 95.16). Success was achieved early in the breeding programme because Rapee Sagarik discovered a tetraploid, amethyst-purple *Rhynchostylis gigantea* from which he developed his famous 'Sagarik strain'. Many beautiful intergeneric hybrids were bred from the amethyst purple *Rhy. gigantea*, among them are *Van.* Sagarik Wine *(V. denisoniana* x *Rhy. gigantea*), *Rhnps.* Lanna Thai (*Phal. hygrochila x Rhy. gigantea*) and *Rhyda.* Colmarie (Teoh 2005).

Vandachostylis (*Van.)* Pine Rivers was made by crossing *Rhy. coelestis* to the very successful parent, *V.* (*Ascda.*) Peggy Foo. Some clones are blue (Fig. 95.15), others pink. Another very beautiful, deep-blue *Rhy. coelestis* hybrid is *Van.* Sasicha (*V.* Varut Fuchsia x *Rhy. coelestis*) (Fig. 95.16), named for the daughter of Thailand's top *Vanda* breeder, Adisak Hongsilp. The pod parent is predominantly the blue *V. coerulea,* and the reason the blue of *Van*. Sasicha is so deep is

Fig. 95.12 *Rhynchorides* Memoria Suranaree (*Aerides Lawrence ae* x *Rhynchostylis coelestis*). (© Teoh Eng Soon 2021. All Rights Reserved).

Fig. 95.13 *Rhynchonopsis* Lanna Thai x *Rhynchostylis gigantea.* (© Teoh Eng Soon 2021. All Rights Reserved). This is a beautiful hybrid which is also an attempt to induce *Rhy. gigantea* type to flower in the lowland. Unfortunately the hybrid is not free flowering.

Fig. 95.14. *Vaschostylis* Colmarie is very dark purple, even darker than *Rhy. gigantea* 'Sagarik strain'. (© Teoh Eng Soon 2021. All Rights Reserved)

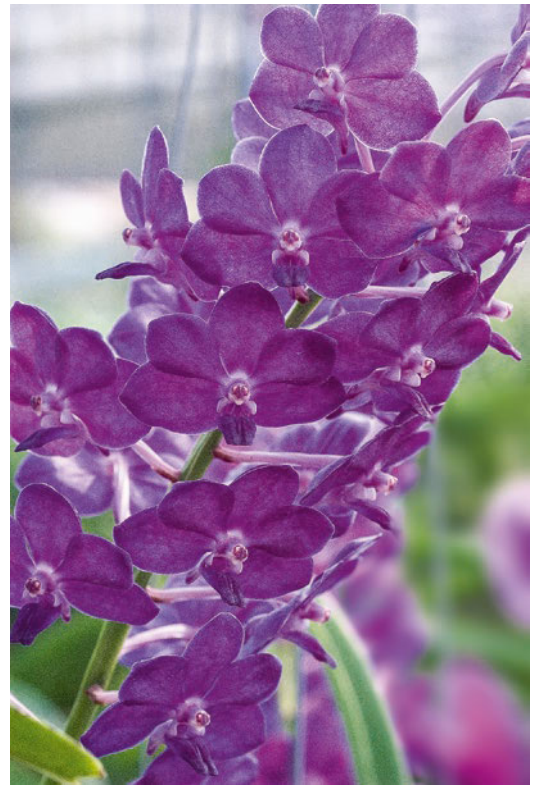

Fig. 95.15 *Vandachostylis* Pine Rivers [*V.* (*Ascda.*) Peggy Foo x *Rhy. coelestis*]. (© Teoh Eng Soon 2021. All Rights Reserved). This very successful hybrid makes use of the famous *V.* Peggy Foo which is in the pedigree of many hybrids. Mericlones of *Van.* Pine Rivers come in pink and blue.

because there are *V. curvifolia, V. luzonica, V. tricolor* and *V. dearei* in its constitution. However, not every clone is deep blue, but they have other attractive characteristics. *Renanstylis* Bangkok Beauty (*Rnst.* Azimah x *Ren.* Bangkok Flame) is a beautiful dark red with wide lateral sepals (Fig. 95.17). The white *Rhynchodenia* Magic Wand (*Rhy. coelestis* x *Seidenfadenia mitrata*) marks a new direction in breeding of *Rhynchostylis* (Fig. 95.18).

Fig. 95.16 *Vandachostylis* Sasicha is a beautiful purple hybrid that brings together the best characteristics of its constituent genera. (© Teoh Eng Soon 2021. All Rights Reserved).

Fig. 95.17 *Renanstylis* Bangkok Beauty (*Rnst*. Azimah x *Ren,* Bangkok Flame). (© Teoh Eng Soon 2021. All Rights Reserved). A truly beautiful, brilliant, deep red hybrid.

Fig. 95.18 *Rhynchodenia* Magic Wand. (©Teoh Eng Soon 2021)

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Robiquetia Gaudich. 96

Forty species of medium-sized, monopodial, epiphytic orchids distributed from Myanmar and Thailand through Malesia to Australia and the Pacific Islands constitute this genus which is named after pharmacologist Paul Robiquet (1780 - 1840) who discovered the first amino acid and codeine. Stem is stout, edentulous, bearing strap leaves that are broadly oblong, distichous, coriaceous, sheathing at the base. Inflorescence is axillary, pendulous, and it carries numerous, crowded, monochromatic flowers in yellow, orange, brown and crimson. Sepals and petals are free and well-extended, but in some species the flowers are less than half-open at their peak (Fig. 96.1). The genus has not been properly explored for its breeding potential, and only a few species are seen in collections.

Robiquetia cerina (Rchb.f.) Garay

Robiquetia cerina is distributed in Papua New Guinea and the Philippines above 350 m. Plants are large, stems broad, compressed, pendulous.

Inflorescence is pendulous, scape longer than the rachis, many flowered, the flowers crowded 'like a bunch of grapes' (Cootes 2001), 8 mm across, partially open, a third at a time, crimson. Sepals are ovate, concave, petals circular. Lip is 3-lobed, side lobes are tiny, and midlobe is triangular (Fig. 96.2).

Robiquetia spathulata (Bl.) J.J.Sm.

Robiquetia spathulata is distributed in Myanmar, Thailand, Malaysia, Indonesia and the Philippines, occurring on trees near rivers in lowlands to 600 m.

Stems are pendulous, 50 cm long, stout. Leaves are 12 - 20 × 4.5 cm, strap-shaped, twisted at the base to present all blades in one plane. Inflorescence is pendulous, 25 cm long, scape 3 - 4 cm, rachis densely many flowered. Flowers are 8 mm across, about 30 per inflorescence, many opening together. In Malayan forms, flowers are only partially open (Holttum 1964) (Fig. 96.3). Sepals and petals are yellow with two reddish brown stripes, yellow in the midline. Lip is 3-lobed, yellow, fleshy; side lobes are erect, triangular. Midlobe is lanceolate, incurved, hooked at the apex and bearing a cream-coloured, spotted spur at the base (Fig. 96.4). Column is white. Flowers sometimes have a musty odour (O'Byrne 2011). Flowering season in Thailand is April (Vaddhanaphuti 2005).

Robiquetia succisa (Lindl.) Seidenf. & Garay

Robiquetia succisa is distributed in Bhutan, Northeast India, southern China, Myanmar, Thailand and Indochina, occurring as epiphyte in

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Fig. 96.1 *Robequetia spathulata* (Bl.) J.J.Sm. at the Coolhouse, National Orchid Garden, Singapore. (© Teoh Eng Soon 2021. All Rights Reserved)

open deciduous and evergreen hill forests or on cliffs at 500 - 1200 m. Stems are long, slim, up to 1 m × 5 mm, usually shorter, with oblong, praemorse leaves, 6 - 12 × 1.5 - 2 cm (Chen and Wood 2009). Inflorescence is axillary, longer than the leaves, branching, laxly many flowered. Flowers are 6–9 mm wide, yellow lightly speckled with tiny, reddish brown dots. Dorsal sepal is ovate, concave, forming a hood over the column. Lateral sepals are ovate, concave, spreading downwards, 45 ° from the midline. Petals are ovate, spreading horizontally. Lip is 3-lobed; lateral lobes are erect. Midlobe is spurred, saccate (Fig. 96.5). It flowers from May to August in Thailand (Vaddhanaphuti 2005; Nanakorn and Watthana 2008).

In Thailand, plant is employed to prepare a 'blood tonic'. Plants are harvested in spring or summer by Chinese herbalists and sun-dried for use in decoction to treat 'heaty coughs' (Teoh 2016).

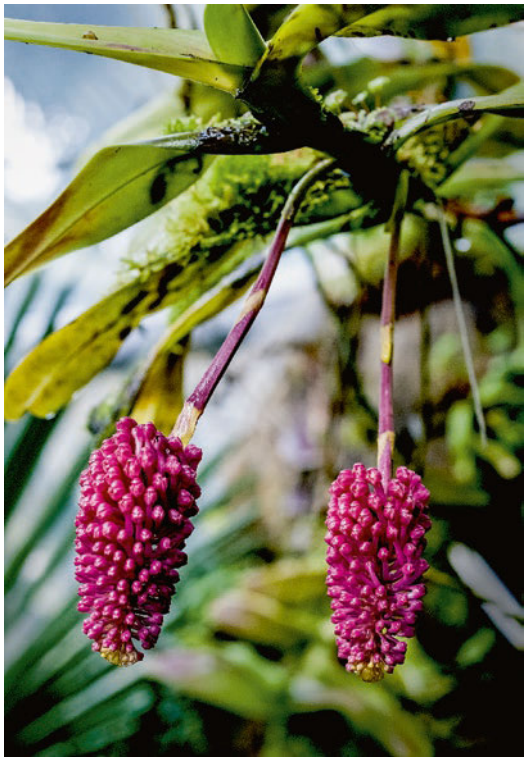

Fig. 96.2 *Robequetia cerina* (Rchb.f.) Garay. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 96.4 *Robequetia spathulata* (Bl.) J.J.Sm. (© Teoh Eng Soon 2021. All Rights Reserved)

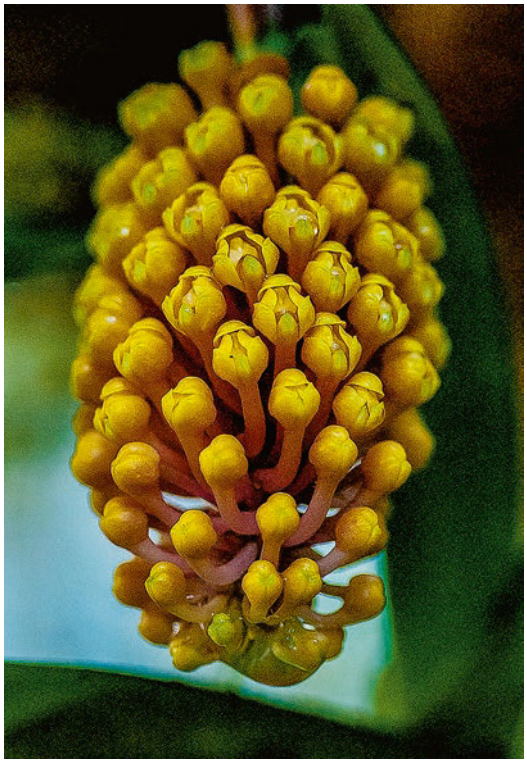

Fig. 96.3 *Robequetia spathulata* (Bl.) J.J.Sm. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 96.5 *Robequetia succica* (Lindl.) Seidenf. & Garay. (©Teoh Eng Soon 2021. All Rights Reserved)

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Sarcanthopsis Garay

97

Sarcanthopsis is a genus of five hardy monopodial epiphytes distributed in Moluccas, New Guinea and the Pacific Islands. The species were formerly included in the genus *Vandopsis.*

The generic name is made up of three Greek words, *sarx* (flesh), *anthos* (flower) and *opsis* (resembling) referring to its resemblance to flowers that were formerly classified as *Sarcanthus*.

Sarcanthopsis warocqueana (Rolfe) Garay [syn. *Sarcanthopsis nagarensis* (Rchb.f.) Garay]

Sarcanthopsis warocqueana, the 'Goliath Orchid', is a giant, hardy epiphyte or lithophyte distributed in Papua and Iran Jaya where it is widespread. It is also found in the Caroline Islands, Solomon Islands, Vanuatu and Fiji (O'Byrne 1994). Plants commonly scramble over trees or rocks in swamp forests and rainforests at sea level to 1000 m. Stems are up to 4 m long, covered with thick, leathery, yellow-green sheaths, and they bear stiff leaves on the upper half. Leaves are strap shaped, distichous, decurved, leathery, unequally emarginated at the apex, 10 - 40 × 25 - 90 cm. Inflorescence is branching, bearing numerous flowers crowded distally on the side branches. Flowers are 2 cm across, heavy textured, cream yellow or with a green tinge, covered with small brown spots and smelling of vanilla. Sepals and petals are racquet-shaped, spreading; petals are horizontal. Lip is 3-lobed; side lobes are small, suberect. Midlobe is porrect, spurred, and bears a smooth callus at the apex (Fig. 97.1).

Hybrids

Only 8 hybrids have been registered, but they separately involved a wide range of genera that include *Papilionanthe, Phalaenopsis, Renanopsis, Taprobanea, Vanda* and *Vandopsis*. Many of these hybrids were made by Oscar Kirsch and Goodale Moir in Hawaii more than 50 years ago, and little progress has been made since. Bred to *Vanda*, it yielded robust hybrids with numerous, fleshy flowers. In 2004, Singapore Botanic Gardens registered *Vananthopsis* Khoo Chin Hean bred by crossing *Sarc. warocqueana* with *V.* Chao Praya Sapphire (Fig. 97.2).

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Fig. 97.1. *Sarcanthopsis warocqueana* (Rolfe) Garay [syn. *Sarcanthopsis nagarensis* (Rchb.f.) Garay]. (© Teoh Eng Soon 2021. All Rights Reserved)

Reference

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Fig. 97.2. *Vananthopsis* Khoo Chin Hean (*Sarc. warocqueana* x *V.* Chao Praya Sapphire). (Photo: © Tim Wing Yam 2021.Reproduced with permission)

Sarcoglyphis Garay

98

A genus with 13 epiphytic species distributed from India and China across mainland Southeast Asia to Indonesia, plants are small and monopodial. Stems are short, with flat, distichous, fleshy leaves that are jointed and sheathing the stem. Inflorescence is axillary, arising low down on the stem, laxly many flowered. Flowers are small, tepals free. Lip is 3-lobed, spurred; side lobes are erect (Chen and Wood 2009). At a glance they resemble *Cleisostoma*.

The generic name is derived from Latin *sarkos* (flesh) and *glyphis* (carving) (Mayr 1998).

Sarcoglyphis mirabilis (Rchb.f.) Garay

Sarcoglyphis mirabilis is distributed in Myanmar, Thailand and Indochina in lowland, evergreen forests at 200 - 300 m. Plant is epiphytic, monopodial, small. Leaves are oblong, deeply grooved, apically bilobed, distichous, coriaceous. Inflorescence is axillary, 10 cm long, pendulous, paniculate, with numerous well-spaced flowers, 1 cm across, facing all directions. Sepals and petals are oblong, spreading, reflexed, of a pale olive-green; the Myanmarese variety from the Kachin state bears white tepals that are tinged with purple (Tun 2019). Lip is 3-lobed, deep purple with erect, rhomboid side lobes. Midlobe is caudate, convex, with an upward pointing hook at the apex. Flowering season is April to June (Vaddhanaphuti 2005).

Hybrids

Despite its small size and attractive flowers, no hybrid has been made with *Sarcoglyphis mirabilis* (Fig. 98.1).

Fig. 98.1. *Sarcoglyphis mirabilis* (Rchb.f.) Garay. (© Teoh Eng Soon 2021. All Rights Reserved)

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Schoenorchis Reinw. ex Bl. 99

A genus of 23 epiphytic monopodial species distributed from India through southern China and Southeast Asia to Queensland, *Schoenorchis* occurs in montane forests. Plants are small to large, with erect or pendulous branching stems rooting at the base. Leaves are terete or flat, lanceolate and coriaceous. Inflorescence is simple or branched, with numerous small flowers, a few millimetres across, in white, pink or mauve. Tepals are not widely spread. Lip is saccate, spurred (Fig. 99.1).

Schoenorchis needs to be grown in a cool environment, and they are difficult to maintain in the tropical lowlands. The generic name is derived from Greek *schoenus* (reed; rush) and *orchis* (orchid), probably referring to the terete leaves (Schultes and Pease 1963).

Schoenorchis fragransi (Par. & Rchb.f.) Seidenf. & Smit.

Schoenorchis fragrans is a miniature epiphyte from deciduous forests at 500 - 1200 m in NE India, Myanmar and Thailand. With offshoots growing from the base, plants form clumps with distichous, lanceolate dark green leaves that are very crowded on the short stem. Inflorescence is short, many flowered, flowers 2 - 3 mm across, pink with yellow anthers, lasting 7 weeks. Lip is 3-lobed, pink with a grey, cylindrical spur and a round callus on the epichile (Fig. 99.2). Flowering season is May to July (Nanakorn and Watthana 2008).

Schoenorchis gemmata (Lindl.) J.J.Sm.

Schoenorchis gemmata is a small- to medium-sized epiphyte distributed from Himalaya and southern China to Java in dry evergreen forests at 450 - 2500 m. Stems are thin, up to 30 cm long. Leaves are oblong-lanceolate, deeply grooved, acute, sessile, up to 15 cm long. Inflorescence is axillary, pendulous, branching, as long or slightly shorter than the leaves, with numerous small flowers, 2 mm across, laxly arranged, mostly facing one direction (Fig. 99.3). Sepals and petals are tiny, crimson. Lip is relatively large comprising 80% of the flower surface, 3-lobed, spurred, epichile ovate, white, thick textured (Fig. 99.4). Flowering season is May in Thailand (Nanakorn and Watthana 2008).

Schoenorchis juncifolia Reinw. Ex Bl.

Schoenorchis juncifolia is distributed in Sumatra, Peninsular Malaysia, Borneo and Java in montane forests at 450 - 2000 m (Comber 2001; Ong et al. 2010). Plants are epiphytic, medium-sized, stems terete, starting erect, branching and bending to be pendulous. Leaves are terete, green, sometimes

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Fig. 99.1 *Schoenorchis juncifolia* Reinw. Ex Bl. (© Teoh Eng Soon 2021. All Rights Reserved)

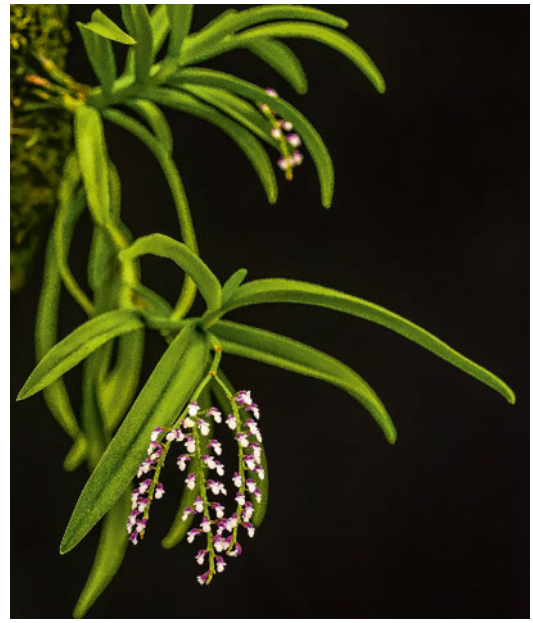

Fig. 99.3 *Schoenorchis gammeta* (Lindl.) J.J.Sm. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 99.2 *Scoenorchis fragrans* (Par. & Rchb.f.) Seidenf. & Smit. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 99.4 *Schoenorchis gammeta* (Lindl.) J.J.Sm. (© Teoh Eng Soon 2019. All Rights Reserved)

Fig. 99.5 *Schoenorchis juncifolia* Reinw. Ex Bl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 99.6 *Schoenorchis secundiflora* (Ridl.) J.J.Sm. (© Teoh Eng Soon 2021. All Rights Reserved)

flushed with violet, 8 - 16 cm long, 3 mm thick. Inflorescences are usually multiple, shorter than the leaves, with up to 25 flowers each, facing all directions. Flowers are 3 mm across, 7 mm long, lilac, curiously shaped (Fig. 99.5).

Lip has a long spur that curves away from the ovary, and the epichile is turned downwards.

Schoenorchis secundiflora (Ridl.) J.J.Sm.

Schoenorchis secundiflora is distributed in Peninsular Thailand and Malaysia, Kalimantan and Java in the lowlands on trees by rivers and old mangrove (Seidenfaden and Wood 1992; Handoyo 2010). Stems are erect, rooting throughout, about 5 cm × 3.5 mm. Leaves are perpendicular to stems, coriaceous, oblong, 6 × 1 cm. Inflorescence is pendulous, up to 12 cm, laxly many flowered. Flowers are 1 cm long 0.6 cm across and fragrant. Sepals are ovate-lanceolate, pale lilac; petals are smaller, lanceolate, pale lilac. Lip is 3-lobed, white, with a dull yellow spur; epichile is porrect, acute, with callus in the centre (Fig. 99.6).

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Seidenfadenia Garay

100

This is a monotypic, epiphytic, monopodial genus that was formerly included in *Aerides*. The genus is named after Gunnar Seidenfaden, the Danish diplomat who was also a taxonomist specializing on the orchids of Thailand.

Seidenfadenia mitrata (Rchb.f.) Garay

Seidenfadenia mitrata is distributed in Myanmar and Thailand occurring in evergreen, low montane forests at 900 - 1000 m. Plant is medium-size with a short stem, 4 - 7 cm long. Leaves are terete, long, pendulous, 20 - 40 cm. Roots are extensive (Figs. 100.1 and 100.2). Inflorescences are multiple, erect, 12 - 30 cm, semi-dense, many flowered (around 30). Flowers are lilac or white, 1.2 - 1.8 cm across and fragrant. Petals and sepals are lanceolate, obtuse, free, spreading. Lip is 3-lobed, purple with a white nectary. Side lobes are small, auriculate, white at the base, purple at the apex. Midlobe is large, ovate,

Fig. 100.1 *Seidenfadenia mitrata* (Rchb.f.) Garay. (© Teoh Eng Soon 2021. All Rights Reserved)

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Fig. 100.2 *Seidenfadenia mitrata* (Rchb.f.) Garay. (© Teoh Eng Soon 2021. All Rights Reserved)

tridentate at the apex, porrect, purple. Column is white, anther cap dark purple (Fig. 100.3). Flowering season is March to May (Vaddhanaphuti 2005; Nanakorn and Watthana 2008; Kurzweil and Lwin 2015).

Hybrids

Seidenfadenia mitrata when crossed to *Luisia thailandica* resulted in upright inflorescences with a cluster of white flowers with a large pink to purple lip (see Vol. 2, *Luisia*). Scape length was improved, but flower count was reduced (Fig. 100.4).

Fig. 100.3 *Seidenfadenia mitrata* (Rchb.f.) Garay. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 100.4 *Luisia thailandica* x *Seidenfadenia mitriata.* (© Teoh Eng Soon 2021. All Rights Reserved)

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Smitinandia Holtt. 101

A small genus of small, monopodial epiphytic orchids with only three species, *Smitinandia* is distributed from Chinese Himalaya and northeast India to Myanmar, Thailand, Indochina, northern Peninsular Malaysia, Kalimantan and Sulawesi growing in dry evergreen and deciduous forests from sea level to 1000 m. Plants are erect or pendent with short, simple or branching stems that are rigid and sheathed by the bases of sessile, distichous, coriaceous leaves. Roots are flat. Inflorescence is axillary, horizontal, arching or pendent, simple or paniculate and bearing numerous flowers. Sepals and petals are free, spreading, pink or white. Lip is 3-lobed, spurred; midlobe is rhomboid, purple or white.

The genus is named after a famous Thai botanist, Tem Smitinand (1920 - 1005), who worked with Gunnar Seidenfaden to publish *The Orchids of Thailand, a Preliminary List* between 1950 and 1965.

Smitinandia micrantha (Lindl.) Holtt. [syn. *Saccolabium micranthum* Lindl.; *Cleisostoma micranthum* (Lindl.) King & Pantl.]

Smitinandia micrantha is distributed from Himalaya to northern Peninsular Malaysia, occurring in primary or secondary evergreen forests at 270 - 1300 m. In Malaysia it is only found in Kedah and Langkawi Islands (Seidenfaden and Wood 1992). Stems are 8 - 10 cm, erect, enveloped by leaf sheaths, internodes 7 mm. Leaves are oblong, praemorse, with rounded tips, 7.5 - 11 × 1.3 - 1.5 cm. Inflorescence is axillary, pendent, thick, fleshy, 5 - 11 cm long, laxly or densely many flowered. Inflorescence in Burmese plants are unusually long, pendulous and densely many flowered (Kurzweil and Lwin 2015; Tun 2019). Flowers are fragrant, small, 0.4 - 1 cm

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Fig. 101.1 *Smitinandia micrantha* (Lindl.) Holtt. in the nursery of Ganesh Pradhan in Kalimpong. (© Teoh Eng Soon 2021. All Rights Reserved)

across, with pink sepals and petals and a dark purple lip. In some clones, flowers are white with pink or purple spots. Sepals are ovate-lanceolate, spreading, thick textured. Petals are smaller, oblong, spreading. Lip is 3-lobed, side lobes triangular, erect. Midlobe is rectangular, convex, purple, apex crenate with a rim of white. Column is white; anther cap is white with a small triangular strip of purple at the midline (Figs. 101.1 and 101.2).

Fig. 101.2 *Smitinandia micrantha* (Lindl.) Holtt. (© Teoh Eng Soon 2021. All Rights Reserved)

Flowering season in Myanmar is February to March (Tun 2019), February to April in Thailand (Nanakorn and Watthana 2008) and March to May in Bhutan (Pearce and Cribb 2002).

The species has not been bred.

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Spathoglottis Bl. 102

A genus of some 50 terrestrial, sympodial species, *Spathoglottis* is distributed from India through Southeast Asia to Australia and the Pacific Islands from sea level to 3500 m. Pseudobulbs are cone-shaped, above ground, and they bear several petiolate, elliptic, plicate, membraneous leaves. Inflorescence is tall, erect, bearing several flowers that open in succession on a relatively short rachis, the plant remaining in bloom for several months. S*pathoglottis* thrives in full sun amidst grasses and ferns (Fig. 102.1). Plants are easy to grow. They flower freely and are popular with gardeners, but they are susceptible to virus. Numerous colourful, free-flowering hybrids have been bred. *Spathoglottis* Primrose (*plicata* x *aurea*) was the first hybrid raised at Singapore Botanic Gardens from seed produced at Penang Hill (Henderson and Addison 1956; Holttum 1978).

The generic name is derived from Greek *spathe* (broad blade) and *glotta* (tongue) referring to the broad midlobe of the lip (Schultes and Pease 1963).

Spathoglottis affinis de Vriese (syn. *Spathoglottis lobbii* Rchb.f.)

Spathoglottis affinis is a low montane species that grows at 600 - 1000 m in open areas at the edge of forests in northern Peninsular Malaysia and eastern Thailand, Indochina and Myanmar. It does not do well in lowland Singapore (Holttum 1978) nor in Bangkok (Kamemoto and Sagarik 1975). Pseudobulbs are small, flattened with 3 - 4 narrow, grass-like, papery leaves 30 - 40 × 2 cm, deciduous during the dry season (November to March). Inflorescence is 40 - 80 cm tall, erect, bearing 5 - 10 small, yellow flowers, laxly arranged, facing all directions. Flowers are 3.5 - 4 cm across, tepals lanceolate, obtuse, spreading; lateral sepals are bearing three thin orange stripes along its lower half. Lip is 3-lobed, yellow with 2 narrow orange stripes on the mesochile. Midlobe is narrow at the base and middle, widening to a wide bilobed apex. Side lobes are oblong, narrow, suberect. There are two slim, horizontal appendages at the side of the mesochile and 2 calli between the basochile and mesochile. Flowering season is October to December in Thailand (Seidenfaden and Wood 1992; Nanakorn and Watthana 2008) (Fig. 102.2).

Spathoglottis aurea Lindl.

Spathoglottis aurea is a small species distributed in Java, Sumatra and Peninsular Malaysia at 900 - 1500 m. It was originally discovered on Gunung Ledang at the Main Range in Peninsular Malaysia (Seidenfaden and Wood 1992). Pseudobulbs are ovoid, clustered with 2 - 3 leaves, 10 - 50 × 2.5 - 4 cm, green, tinged with purple. Inflorescence is up to 60 cm tall, bearing

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Fig. 102.1 *Spathoglottis plicata* and *Arundina graminifolia* growing among grasses and ferns in the open. The land is an exhumed graveyard in Singapore. The area has since been cleared for housing. (© Teoh Eng Soon 2021. All Rights Reserved)

few golden yellow flowers, 3.5 - 5 cm across. Tepals are lanceolate moderately spreading. Lip is 3-lobed; side lobes are large, strap-shaped, obtuse, incurved. Midlobe is linear, spathulate (Seidenfaden and Wood 1992; Comber 2001).

Spathoglottis eburnea Gagnep

Spathoglottis eburnea is a beautiful, ivory white species distributed in Thailand and Indochina. Inflorescence is up to 35 cm tall bearing many flowers 3 - 4 cm across. Tepals are ovate-lanceolate, obtuse, concave, spreading. Lip is 3-lobed; side lobes are rhomboid, rounded, erect, white, flushed with light yellow at the base. Midlobe is short and wide at the mesochile, broadening to an ovate epichile that is blunt, flat and undulate at the apex. Basal calli are laterally flattened, yellow, smooth surfaced, extending as narrow keels into the epichile, flattening towards the apex and sandwiching a third yellow, central keel (Fig. 102.3).

Spathoglottis kimballiana Hook f.

Spathoglottis kimballiana is endemic to Borneo, occurring from sea level to 1500 m growing along rivers on the lower slopes of the Melian Range (Collenette 2008). Plants are medium-sized. Inflorescence is up to 60 cm tall with many

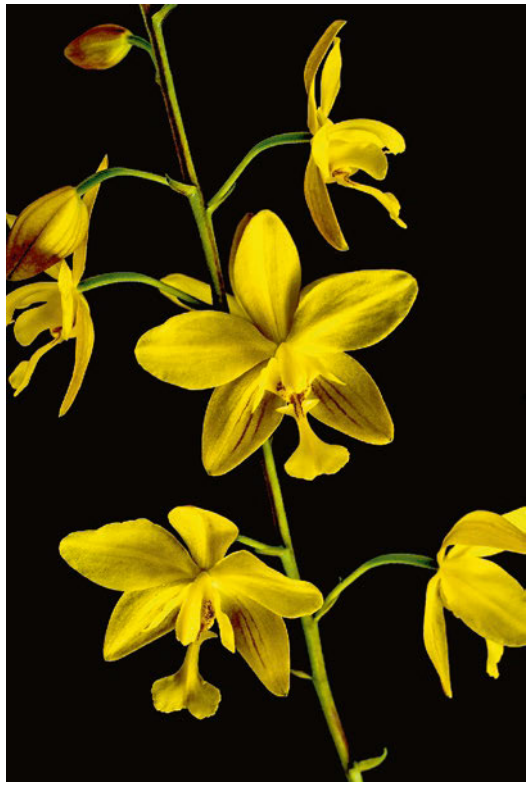

Fig. 102.2 *Spathoglottis affinis* de Vriese (syn. *Spathoglottis lobbii* Rchb.f.). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 102.3 *Spathoglottis eburnea* Gagnep. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 102.4 *Spathoglottis kimballiana* Hook f. (© Teoh Eng Soon 2021. All Rights Reserved)

golden yellow flowers 7.5 cm across. Tepals are lanceolate, moderately spreading. Lip is 3-lobed; side lobes are large, strap-shaped, obtuse, incurved, heavily brown-spotted on the inner surface, the spots extending to the upper half on the narrow mesochile but sparing the auricles at the side. Epichile is hatchet shaped (Figs. 102.3 and 102.4).

Spathoglottis kimballiana var. *angustifolia* Ames

Spathoglottis kimballiana var. *angustifolia* occurs in Philippines. This is a narrow-leaved variety that is popular with gardeners. Flowers are 4 cm across and produced throughout the year (O'Byrne 2001) (Fig. 102.5).

Spathoglottis plicata Bl.

Spathoglottis plicata is distributed from all over Southeast Asia to Australia and the Pacific Islands, occurring in grassland, among ferns and exposed shrubbery from sea level to 1400 m (Fig. 102.1). Pseudobulbs are 4 - 6 cm in diameter, bearing 2 - 5 long, petiolate, elliptic, plicate, membraneous leaves, 75 × 15 cm. Inflorescence is tall, erect, up to 70 cm bearing numerous flowers (and seed pods) close to the apex. Flowers open in succes-

Fig. 102.5 *Spathoglottis kimballiana* Hook f. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 102.6 *Spathoglottis plicata* Bl. (© Teoh Eng Soon 2021. All Rights Reserved)

sion a few at a time with flowers continuing to appear, while seed pods develop through self-pollination, mature and dehisce lower down the rachis. Flowers are 4 cm across, sepals lanceolate, spreading; petals are ovate-lanceolate, spreading. Lip is 3-lobed; side lobes are erect, strap shaped. Midlobe is spathulate expanding from a narrow claw to almost kidney shape at the epichile. Form and colour are variable, the latter from pale pink to purple or white. The best flowering plants are from Java and Sumatra (Grant 1895; Holttum, 1963; Comber 2001) (Fig. 102.6).

Cleistogamous *Spathoglottis plicata* is an aggressive colonizer, commonly found in the company of *Arundina graminifolia* in brightly lit scrub throughout Southeast Asia. It was one of the first orchids to re-establish in Krakatoa following the violent volcanic eruption of 1883 that blew off 70% of the island (Ernst and Steward 1908).

Spathoglottis plicata Bl. f. *alba*

This white form of *Spathoglottis plicata* that I have seen has unusually well-shaped flowers although in some the tepals are not broad (Fig. 102.7).

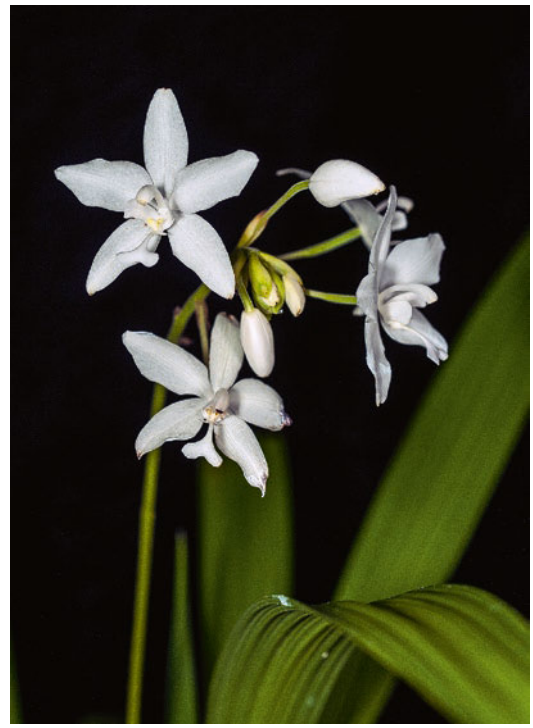

Fig. 102.7 *Spathoglottis plicata* Bl. f. *alba.* (© Teoh Eng Soon 2021. All Rights Reserved)

Spathoglottis portusfinschii Kraenzl.

Spathoglottis portusfinschii is endemic to New Guinea occurring to the north of the Central Highlands from sea level to 1150 m in short grassland, especially on rocky hillsides and gullies (O'Byrne 1994). Plant is medium-sized to large with pseudobulbs 20 - 40 cm tall and 2 - 4 cm in diameter bearing 2 - 5 petiolate, lanceolate, plicate, papery leaves, 45 - 80 × 24 - 80 cm. Inflorescence arises from the base of the pseudobulb, 90 - 100 cm tall, racemose, carrying up to six open, pink or light purple, laxly arranged flowers. Flowers are 3.5 - 5 cm across; sepals and petals are lanceolate, similar, concave, spreading; sepals are covered with tiny white hair on the dorsal surface. Lip is 3-lobed; side-lobes are erect, rhombic, rounded, purple. Midlobe is porrect, spathulate, narrow at the base and broadening to an obcordate epichile. Basal callus is large, suberect, yellow, spotted with crimson and bordered by a pair of triangular appendages densely covered with white hair (O'Byrne 1994) (Fig. 102.8).

Hybrids

Seedpods of *Spathoglottis* mature within weeks, so it is not surprising that this was the first genus Eric Holttum worked with when he started the orchid hybridization programme at Singapore

Fig. 102.8. *Spathoglottis portusfinchii* Kraenzl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 102.9 *Spathoglottis* Lilluokalani. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 102.10 *Spathoglottis* Burleigh Gold. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 102.11 *Spathoglottis* hybrid. (© Teoh Eng Soon 2021. All Rights Reserved)

Botanic Gardens in the 1920s. His first hybrid, *Spathoglottis* Primrose, flowered 27 months from seed sowing (Holttum 1978). Growers in Singapore found that they could raise hybrids by sowing the seeds around a parent plant and avoid resort to asymbiotic culture (David Lim, personal communication).

Spathoglottis hybrids come in a wide range of colours, and they are suitable for landscaping (Figs. 102.9, 102.10 and 102.11). However, *Spathoglottis* is highly susceptible to virus: also they prefer organic fertilizers.

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Spiranthes Lindl.

103

Spiranthes, or tassel grass, are terrestrial herbs occurring in open grasslands, bogs and marshes in pine or oak forests. They are distributed throughout the temperate regions of the Northern Hemisphere from sea level to 3600 m.

Stem is short, bearing basal, conduplicate, linear to linear-lanceolate leaves. Inflorescence is terminal, racemose, densely many flowered. Flowers are small, pink or white, not opening widely, spirally arranged due to a twisting of the rachis. Dorsal sepal is erect, passing over the petals to form a hood. Lateral sepals are lanceolate, oblique. Lip is directed forward, margin undulate, apex recurved.

Spiranthes is bee-pollinated, and it is suggested that the spiral arrangement is an adaptation to the behaviour of bumble bees that work upwards when foraging for nectar. Multiple visitations have been observed, and this would mean that nectar production is continuous or copious (Pearce and Cribb 2002)

The earliest mention of *Spiranthes* is in the *Book of Odes* (*Shih Jing*) which dates from the sixth century BCE. *Spiranthes sinensis* is employed medicinally in China, India, Nepal and Vietnam; Cherokee Indians of North America had medicinal usage for *Spiranthes lucida* (Teoh 2016, 2019).

Spiranthes sinensis (Persoon) Ames

Spiranthes sinensis is widely distributed across Europe and Asia to Australia, New Zealand and the Pacific Islands, occurring in bogs, marshes and grassland from 200 m to 3400 m (Kurzweil and Lwin 2015).

Plants are 15 - 30 cm tall, with 2 - 4 linear-lanceolate, erect, pointed, soft leaves 2 - 10 × 0.5 - 1 cm. Inflorescence is terminal, erect, 10 - 25 cm with numerous crimson, pink or white flowers spirally arranged on the rachis, subtended by prominent, lanceolate, green floral bracts. Flowers are 5 - 6 mm long, not widely open. Sepals are lanceolate, petals linear. Lip is simple, margin undulate, apex recurved (Figs. 103.1, 103.2 and 103.3).

Spiranthes sinensis (Persoon) Ames, f. *alba*

The *alba* form is similar to the type except for the colour of its flowers, and it has a similar distribution.

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Fig. 103.1 *Spiranthes sinensis* (Persoon) Ames. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 103.2 *Spiranthes sinensis* (Persoon) Ames, f. *alba.* (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 103.3 *Spiranthes sinensis* (Persoon) Ames growing in a bog on a sunny hillslope at Taktsang, Bhutan at 2800 m. (© Teoh Eng Soon 2021. All Rights Reserved)

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Stereochilus Lindl. 104

This is a small genus of six epiphytic, monopodial species distributed from NE India and Bhutan to southern China, Myanmar, Thailand and Vietnam. Thailand has three species (Vaddhanaphuti 2005) and China two (Chen and Wood 2009a). Stem is short, bearing sessile, coriaceous, lanceolate leaves. Inflorescence is axillary, racemose and pendent, with small flowers, laxly arranged. Petals are smaller than the sepals. Lip is adnate to the column base and immovable, spurred at the base, indistinctly 3-lobed. Midlobe is spurred with a longitudinal septum inside and often with 1 - 2 calli posteriorly (Chen and Wood 2009b).

The generic name is derived from Greek *steros* (solid) and *cheilos* (lip) which describes the appearance of the lip (Schultes and Pease 1963).

Fig. 104.1 *Stereochilus erinaceus* (Rchb.f.) Garay. (© Teoh Eng Soon 2021. All Rights Reserved)

Stereochilus erinaceus (Rchb.f.) Garay

Stereochilus erinaceus is a small monopodial, epiphytic species distributed in Myanmar, Thailand and Vietnam. Stem is short, erect, bearing lanceolate, acute, coriaceous leaves, 8 × 2 cm. Inflorescence is lateral, arising from the basal part of the stem, racemose, pendent, 7.5 - 15 cm long, with up to 16, but usually fewer, white and cream coloured flowers, 8 mm across. Pedicel and ovary are long, thick, cream and grossly hirsute. Sepals and petals are free, spreading, white to cream finely spotted with crimson: sepals are hirsute on the dorsal surface. Lip is 3-lobed, spurred, white; side lobes are small, erect. Midlobe is oval, incurved. Spur is broadly conical, obtuse, short, cream coloured (Grant 1895; Hawkes 1965; Vaddhanaphuti 2005) (Fig. 104.1).

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Stichorkis Thouars. 105

Stichorkis a genus of 20 species, sometimes or previously classified under *Liparis,* is widely distributed from Himalaya across Southeast Asia to New Guinea. Several species were included in section *Distichae* of *Liparis* (Comber 2001). Plants are erect, robust with 1 - 3 noded pseudobulbs and conduplicate non-membranaceus leaves (Margonska 2009). Inflorescence is arching, bearing prominent floral bracts arranged in two close-set rows and flowers that open singly or two at a time, in alternate rows.

The generic name refers to the compressed, distichous inflorescence, from Greek *stichos* (row) and *orkis* (orchid) (Schultes and Pease 1963).

Stichorkis compressa (Bl.) J.J.Wood [syn. *Liparis compressa* (Bl.) Lindl]

Stichorkis compressa is a montane epiphytic or saxicolous species distributed in Vietnam, West Malesia, Sulawesi and the Philippines at 4000 - 5000 m. Pseudobulbs are ovoid, flattened and widely set on a creeping rhizome. Leaf is single, lanceolate, 35 × 3 cm. Inflorescence is 30 cm long, 8 cm wide, with thick floral bracts arranged in two rows. Flowers are reddish brown, 1 cm across, opening singly in succession. Sepals are lanceolate, dorsal erect, reflexed, 1 × 0.3 cm. Petals are linear, shorter than the sepals, spreading, reflexed. Lip is ovate, narrowed at the base and grooved in the midline (Comber 2001; Wood et al. 2011) (Fig. 105.1).

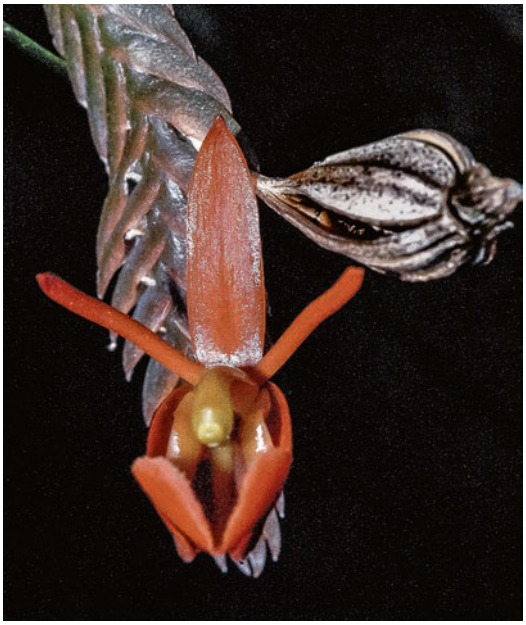

Fig. 105.1 *Stichorkis compressa* (Bl.) Wood. (© Teoh Eng Soon 2021. All Rights Reserved)

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Taeniophyllum Bl.

106

Taeniophyllum is a large genus of epiphytic, leafless orchids with over 170 species distributed from Himalaya through Sri Lanka and Southeast Asia to Australia and the Pacific (half the number occurring in New Guinea) growing on the branches of trees below 1000 m. Plants are small, stems very short, covered with tiny, brown, scale leaves and bearing radiating, terete, green roots appressed to the bark of host trees. Inflorescence is short bearing few small flowers, 1 - 2 opening at a time, in succession. Species are divided into 2 subgenera based on whether the sepals and petals are free or joined at their base to form a tube. Lip is entire or 3-lobed, with a rounded spur. Flowers last a day: flowers of the first subgenus with free tepals open during the daytime, tubular flowers flowering at night. Flowering in some species is gregarious (Holttum 1964; Seidenfaden and Wood 1992).

Taeniophyllum is rarely found even in specialized collections.

Taeniophyllum pusillum (Willd.) Seidenf. & Ormerod (syn. *Taeniophyllum obtusum* Bl.)

Taeniophyllum pusillum is a widespread species distributed from south-central China through continental Southeast Asia and West Malesia, occurring in wet montane forests, mangrove swamps and plantations in fairly open places from 150 to 500 m (O'Byrne 2001). Roots are flat, green, 3 mm wide. Inflorescence is thin; rachis is brown, 2 cm, single flowered, lasting a day. Flowers are 5.5 - 6 mm across, sepals and petals free, white or pale yellow, spreading. Lip is entire, ovate, concave, white with two spots of crimson at the base. Column is white (Figs. 106.1 and 106.2). Floral bracts are persistent, large, arranged in two alternating rows, brown (Fig. 106.2). Flowering is gregarious, more frequent than *Dendrobium crumenatum* (Holttum 1964).

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Fig. 106.1 *Taeniophyllum pusillum* (Eilld.) Seidenf. & Ormerod. (syn. *Taeniophyllum obtusum* Bl.). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 106.2 *Taeniophyllum pusillum* (Eilld.) Seidenf. & Ormerod. (syn. *Taeniophyllum obtusum* Bl.). (© Teoh Eng Soon 2021. All Rights Reserved)

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Taprobanea (L.) Christensen

107

Taprobanea is a mono-specific genus represented by *Taprobanea spathulat*a (L.) Christensen. A climbing, monopodial, epiphytic herb, it occurs in Sri Lanka and the western states of Southern India in semi-arid, desert plains at low elevations up to 1000 m. It thrives in full sun. In habit it resembles *Arachnis* rather than *Vanda.* DNA studies showed that *Taprobanea* fell outside the Vanda clade, hence the separate classification (Gardiner et al. 2013).

The generic name is derived from Greek, *Taprobanea*, the island Sri Lanka.

Taprobanea spathulata (L.) Christensen

Plants grow from the ground and scramble over bushes. Stem is terete, slim, green, 30 - 60 cm, with black, spotted internodes, 2.5 - 3 cm, and roots arising from the lower portion. Leaves are numerous, thin, flat, oblong, distichous, unequally bilobed, red-speckled, up to 22 × 3 cm. Inflorescence is axillary, up to 30 cm with 6 - 10 flat, uniformly chrome yellow, long-lasting flowers, 3.5 cm across that open in succession, a few at a time (Jayaweera 1981) (Fig. 107.1). Some plants are polyploid: n = 19, and plants with 38, 76 and 114 chromosomes have been identified.

Van Rheede in 1693 described the procedures followed by traditional healers in the Malabar coast by which the plant was prepared to treat diarrhoea, dysentery and biliary disorder and the flowers for treating tuberculosis, asthma and mania (Teoh 2016).

Hybrids

Taprobanea spathulata has been bred to *Papilionanthe, Rhynchostylis* and *Vanda.* Outcomes varied depending on the ploidy of the parents. This is illustrated by two old hybrids, *Taproanthe* Cobber Kain (*Ple.* Miss Joaquim x *Tpb. spathulata*) (Fig. 107.2) and its progeny, *Tapropapilanda* Candlelight (*Tpn.* Cobber Kain x *V. sanderiana*) (Fig. 107.3). The phonotype of

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Fig. 107.1. *Taprobanea spathulata* (L.) Christensen. (PHOTO: © Suranjan Fernando)

both hybrids is dominated by the hexaploid *Tpb. spathulata* that is in the ancestry of these two hybrids. *Tapropapilanda* Candlelight (syn. *Vanda* Candlelight) cv. 'Belerang' received an Award of Merit from the Malayan Orchid Society in 1962 (Scott 1962).

Fig. 107.2. *Tapropanthe* Cobber Kain (*Ple,* Miss Joaquin x *Tpb. spathulata*). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 107.3. *Tapropapilanda* Candlelight (*Tpn.* Cobber Kain x *V. sanderiana*). (© Teoh Eng Soon 2021. All Rights Reserved)

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Thecopus Seidenf. 108

Thecopus is a small genus of epiphytic, sympodial orchids with only two species that are distributed in Southern China, Indochina, Thailand, Peninsular Malaysia and Borneo. Pseudobulbs are uninodal and each bears a single petiolate, elliptic, thin, leathery leaf. Inflorescence is lateral, arises near the base of the pseudobulb and is pendulous, racemose, and many flowered. Flowers are large, resupinate, greenish yellow. Column is bent forward, not sigmoid, and foot is hollow with an entrance near the articulate lip base. Anther cap is conical (Seidenfaden and Wood 1992). Plants grow into fairly large clumps and bear several inflorescences with many flowers that open almost simultaneously. They are showy (Fig. 108.1).

The generic name is derived from Latin *theke* (box) and *pous* (foot) referring to the nectary at the column foot (Mayr 1998).

Thecopus maingayi (Hook.f.) Seidenf. (syn. *Thecopus quinquefida* Hook f.)

Thecopus maingayi is distributed in Southern China, Vietnam, Cambodia Peninsular Malaysia, Sabah and Sarawak (north Borneo) in lowland forests, low montane forests and lowland swamp forest at 10 - 1100 m (Beaman et al. 2001; O'Byrne 2011).

Pseudobulbs are clustered, conical, flattened, grooved, 4 cm tall with single, apical, shortly petiolate, elliptic, leathery leaf, 20 × 3 cm. Inflorescence is lateral, almost basal, pendulous, 12 cm long, with up to 10 olive green flowers that open simultaneously. Flowers are 2.5 cm across, cupped, sepals and petals not spreading laterally. Dorsal sepal is ovate-lanceolate, concave, erect, then bending forwards at the middle to form a hood over the column. Lateral sepals are ovate, lanceolate, falcate, concave, moderately spreading. There is a slim crimson stripe over the olive green at the bottom half of the sepal. Petals are small, elliptic, acute, pointing forwards. Lip is obscurely 3-lobed, midlobe square, caudate, white, with 2 keels located at the side of the base and projecting backwards. Column is slim, curving forwards to be parallel with the lip, dark maroon, almost black (Seidenfaden and Wood 1992) (Figs. 108.1 and 108.2).

Thecopus secunda (Ridl.) Seidenf.

Thecopus secunda is distributed in Peninsular Malaysia, Sabah, Sarawak and Kalimantan occurring in lowland forests, sometimes *Kerangas* forest, at 100 - 200 m (Beaman et al. 2001), or 300 - 600 m (O'Byrne 2001). Pseudobulbs are clustered, ovoid, slightly flattened, 4 cm tall, bearing a single, petiolate,

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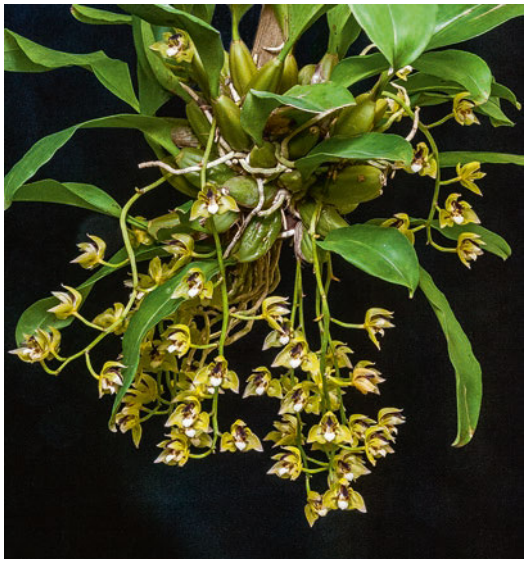

Fig. 108.1 *Thecopus maingayi* (Hook.f.) Seidenf. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 108.2 *Thecopus maingayi* (Hook.f.) Seidenf. (© Teoh Eng Soon 2021. All Rights Reserved)

oblong-elliptic leaf, 20 × 3 cm. Inflorescence is pendulous, 15 cm long, with up to 17 greenish yellow flowers, 3 cm across, opening together. Sepals are lanceolate, spreading; dorsal sepal is concave, curving forwards; the narrowed apex is recurved. Petals are narrower, elliptic, spreading, curving forwards, greenish yellow with a thin maroon stripe at the centre; apex is recurved. Lip is porrect, 3-lobed, side lobes reniform, erect, greenish yellow on both sides but striped with maroon on the inner surface. Midlobe is triangular, with three fleshy keels at the base, convex, epichile turning downwards, white, in some flowers streaked with bright red at the centre, papillose, hair golden yellow and longer over the hypochile, white and shorter over the rest. Column is slim expanding at the apex, curved and dark crimson (Seidenfaden and Wood 1992) (Figs. 108.3 and 108.4).

Fig. 108.3 *Thecopus secunda* (Ridl.) Seidenf. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 108.4 *Thecopus secunda* (Ridl.) Seidenf. (© Teoh Eng Soon 2021. All Rights Reserved)

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Thecostele Rchb.f.

109

Thecostele is a monospecific genus distributed from Himalaya to Southeast Asia in evergreen forests at 500 - 1000 m. Pseudobulbs are clustered, ovoid, with single internode, and bears a single lanceolate leaf at the apex. Inflorescence is lateral, pendulous, unbranched, bearing small white flowers that open widely and are marked with crimson spots and blotches (Nanakorn and Watthana 2008) (Fig. 109.1).

Generic name refers to the box-like base of the column, from Greek *theke* (box) *stele* (column) (Schultes and Pease 1963).

Thecostele alata (Roxb.) Par. & Rchb.f.

Thecostele alata is widely distributed from northeast India through Myanmar and Thailand to Malesia in the lowlands, but it is not common (Seidenfaden and Wood 1992). Pseudobulb is ellipsoid, ridged, bearing a single lanceolate leaf, 15 - 25 × 3 - 3.5 cm at the apex. Inflorescence is pendulous, 20 - 35 cm long, laxly several flowered. Flowers are 1.2 - 1.3 cm across, with narrow-free, spreading sepals and petals that are off-white with purple blotches. Dorsal sepal is erect, oblong, acuminate, concave anterior-flexed at the apex. Lateral sepals are ovate, apex acute. Petals are linear, falcate, spreading just above the horizontal. Lip is 3-lobed; side lobes are small, erect, white with specks of purple. Base of the lip forms a tube separating the lip from the column. Midlobe is obcordate, divided into two side lobules by a deep cleft at the apex, keeled and hairy at the centre, white with splashes of purple (Figs. 109.1 and 109.2).

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Fig. 109.1 *Thecostele alata* (Roxb.) Par. & Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 109.2 *Thecostele alata* (Roxb.) Par. & Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

Thelasis Bl.

110

Thelasis is a small genus with 27 species of small epiphytes or lithophytes distributed from Himalaya and China across Malesia to New Guinea and northern Australia. Pseudobulbs are small, flattened, with several distichous leaves laterally compressed and overlapping at the base. Inflorescence is lateral, racemose, several flowered. Flowers are small, scarcely open, white or green (O'Byrne 1992).

The generic name is derived from Greek *thele* (nipple) (Schultes and Pease 1963), perhaps referring to the breast-shaped pseudobulb (Fig. 110.1).

Thelasis perpusilla (Parish & Rchb.f.) Schuit.

Thelasis perpusilla is distributed in Myanmar, Thailand and Indochina growing as epiphyte or lithophyte in deciduous forests. Pseudobulbs are flat, discoid, bluish green, covered with a reticulum of dark veins. Inflorescence arises from the base on leafless pseudobulbs and is racemose, with two half-open flowers and several buds. Flowers are small, 6 mm broad, white, partially open at the distal half (Figs. 110.1 and 110.2). After flowering, leaves would emerge during the rainy season which lasts from May to October.

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Fig. 110.1 *Thelasis perspusilla* (Parish & Rchb.f.) Schuit. (© Teoh Eng Soon 2021. All Rights Reserved) Photographed growing on granite in deciduous forest in northwest Thailand at the end of the dry season on April 14, 2015

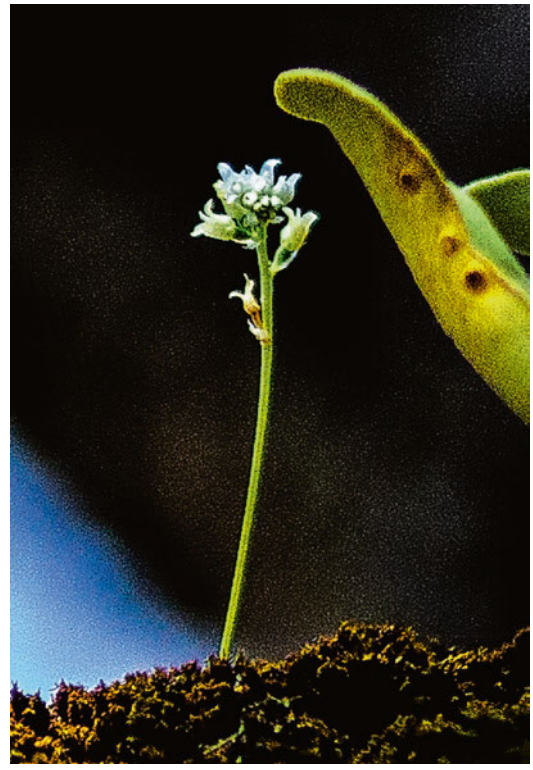

Fig. 110.2 *Thelasis perspusilla* (Parish & Rchb.f.) Schuit. (© Teoh Eng Soon 2021. All Rights Reserved)

Thrixspermum Lour. 111

Thrixspermum is a genus of around 100 monopodial, epiphytic orchid species that are distributed in Thailand, Peninsular Malaysia, Sumatra, Borneo and Java, with the maximum number of species (29) in Peninsular Malaysia. Plants are tall and climbing, or short, creeping along branches or growing on shrubs. Leaves are flat, bilobed and coriaceous. Inflorescence is axillary, bearing ephemeral flowers that open 1 - 2 at a time, often lasting only half a day (Fig. 111.1). Thereafter, the inflorescence continues to elongate slowly and initiates flower buds which remain dormant until they are triggered by a sudden drop in ambient temperature. Flowering is then gregarious. The rainy season in Southeast Asia where *Thrixspermum* is native lasts for 6 months, and it is during this season that maximum lowering of temperature occurs during a nocturnal thunderstorm. In Vietnam, *Tx. leucorachne* blooms during August to September and *Tx. centipeda* (syn. *Tx. arachnoiditis*) from August to November (Kerr 1970). Sepals and petals are similar. Lip is saccate and immobile (Comber 2001) with a callus within the front of the sac (Seidenfaden and Wood 1992).

The generic name is derived from Latin *thrix* (hair) and *sperma* (seed) (Mayr 1998).

Thrixspermum acuminatissimum (Bl.) Rchb. f.

Thrixspermum acuminatissimum is a lowland species distributed from Cambodia and Thailand to Malaysia, Indonesia and the Philippines. In Sumatra, it usually grows on tree trunks in moist locations near the sea. Stem is very short, flattened, carrying 5 leaves borne close together, somewhat like *Phalaenopsis*. Inflorescence extends beyond the leaves, and rachis is zigzag. Flowers are yellow, with linear tepals 3 cm long 1.5 mm across (Fig. 111.2). One or two flowers are open at a time (Comber 2001).

Thrixspermum calceolus (Lindl.) Rchb.f.

Thrixspermum calceolus is distributed in West Malesia, Thailand and Vietnam growing as epiphyte or lithophyte near sea level. Stems are creeping and climbing, to 3 m long bearing flat, bilobed, greyish green leaves at 3 cm intervals (Fig. 111.1). Inflorescence is axillary, scattered along the stem, and bears 1 - 2 white flowers, 5 - 7 cm across. Sepals and petals are elliptic, spreading. Petals are smaller, narrower, spread-

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Fig. 111.1 *Thrixspermum calceolum* (Lindl.) Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 111.2 *Thrixspermum acuminatissimum* (Bl.) Rchb. f. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 111.3 *Thrixspermum calceolum* (Lindl.) Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

ing obliquely upwards. Lip is saccate, shaped like a shoe, white at the apex, yellow over the base (Fig. 111.3).

Thrixspermum centipeda Lour. [syn. *Thrixspermum arachnitis* (Bl.) Rchb.f.]

Thrixspermum centipeda is a widespread species distributed in the lowlands and hill forests up to 2000 m from India and southern China across Southeast Asia to northern Australia. Plants are variable, stems short or long, elliptic in cross-section, and bearing thick, fleshy leaves, 7 - 10 × 1.3 - 2.8 cm, which are unequally bilobed at the apex. Inflorescence is 12.5 - 15 cm long, flattened at the rachis and bearing two rows of persistent, stiff floral bracts, with 1 - 3 ephemeral flowers that open simultaneously. Tepals are narrowly lanceolate, 3 - 4 cm long, 2.5 - 3 mm broad, pale lemon yellow. Lip is 3-lobed, saccate, hirsute within, midlobe fleshy (Comber 2001) (Fig. 111.4).

Fig. 111.4 *Thrixspermum centipeda* Lour. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 111.5 Thrixspermum trichoglottis. (©Teoh Eng Soon 2021)

Thrixspermum trichoglottis (Hook.f.) Kuntze

Widely distributed from Assam and Yunnan eastwards to Taiwan and Indochina and southwards to Andaman Islands, Sumatra, Malaysia and Java, *Thrixspermum trichoglottis* occurs as a small, monopodial, hot to cool growing epiphyte growing on branches of small trees in exposed forests from 250 to 1500 m. Stem is short, under 10 cm tall, 4 mm in diameter, slightly branching. Leaves are oblong-elliptic, bilobulate, 6.5 × 1.5 cm, sheathing the stem at the base. Inflorescence is up to 12 cm long bearing 1 - 2 cream-coloured flowers, 8 mm across (Fig. 111.5). Lip is 3-lobed, saccate and covered with fine, club-tipped papillae on the side lobes and the margins of the midlobe (Fig. 111.6). Flowers are ephemeral. They are pollinated by tiny bees belonging to the genera *Halictus* and *Trigona* (Ong 2011).

Fig. 111.6 Thrixspermum trichoglottis. (©Teoh Eng Soon 2022)

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Thunia Rchb. f.

112

Thunia is a small genus with around six species distributed from Himalaya to southern China and mainland Southeast Asia, up to northern Peninsular Malaysia and Indonesia at 180 - 2350 m, growing in areas with a seasonal dry climate (Chen and Wood 2009b). Plants are terrestrial, saxicolous or epiphytic, medium-sized to large, sympodial but devoid of pseudobulbs and biennial. Stems are erect, sheathed below and leafy above. Leaves are distichous, lanceolate, plicate. Inflorescence is terminal, racemose, appearing on young leafy shoots: rachis zigzag with several flowers. Flowers are showy, tepals narrow and free. Lip is entire, spurred, fringed at the distal margins and with yellow to orange markings at the throat. Flowers only last a few days.

Thunia alba (Lindl.) Rchb.f.

Thunia alba is distributed from Himalaya and southwestern China (SW Sichuan, SE Xizang, S, SE and W Yunnan) to northern Peninsular Malaysia and Indonesia (Chen and Wood 2009a). It undergoes a period of dormancy after flowering, and Holttum (1964) doubted that it would ever flower in southern Peninsular Malaysia or in Singapore. He suggested that it should be bred to *Arundina.*

Stem is erect, 30 - 100 cm with10 thin, lanceolate leaves. Inflorescence is 4 - 10 cm long with 10 large white flowers, 6 cm across. Lip is yellow with orange stripes, hirsute, margin undulate. It flowers in May to June in Thailand (Nanakorn and Watthana 2008), June to July in Nepal (Raskoti 2009) (Fig. 112.1).

Fig. 112.1 *Thunia alba* (Lindl.) Rchb. f. (Photo: (© Bhakta Bahadur Raskoti)

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Fig. 112.2 *Thunia* Gattonensis [*T. alba* var. *alba* (syn. *T. majorensis*) x *T. bensoniae* (syn. *T. winniana*)]. (© Teoh Eng Soon 2021. All Rights Reserved)

Hybrids

There is only a small handful of hybrids involving *Thunia* and these involve only three species. Flowers of *Thunia* Gattonensis (*T. alba* var. *alba* x *T. bensoniae*) are very attractive (Fig. 112.2), but it has not promoted the hybridization of the genus because the flowers are not long-lasting.

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Trias Lindl. (= *Bulbophyllum* Thouars, section *Trias*)

113

Trias is a genus of 14 miniature, epiphytic pseudobulbous species that shared one feature in common – triangulated flowers formed by three outsized sepals while the petals are tiny. Pseudobulbs are clustered, each bearing a single distichous, coriaceous, elliptic leaf. Flowers are borne singly on a very short inflorescence. Sepals are entire, triangular, large, their lower margins touching or slightly overlapping, Three sepals together forming an equilateral triangle. Petals and lip are tiny.

DNA studies indicate that the DNA sequences of all members of *Trias* are embedded among other groups of *Bulbophyllum* (Wonnapinij and Sriboonlert 2015). Thus, the findings support the placement of *Trias* within *Bulbophyllum*.

I have kept *Trias* separate because of the genus (section) being so distinctive and unmistakable, and orchid enthusiasts will continue to use the name *Trias*. The generic name is derived from Greek *trias* (three) which refers to the three sepals that give a distinctive look to the flowers.

Trias oblonga Lindl. [= *Bulbophyllum oblongum (Lindl.)* Rchb.f.]

Trias oblonga is distributed from Thailand to Myanmar and NE India. Plants are small, pseudobulbs spheroid, 1 cm, bearing a single, thick, elliptic leaf, 1.5 - 2.5 × 1 cm at the apex. Flowers are 1.6 cm across. Sepals are triangular, falcate, narrow at the distal half, greenish yellow with several longitudinal rows of tiny purple spots clustered along the veins. Petals are tiny, tipped with purple. Lip is circular, purple (Fig. 113.1) (Nanakorn and Watthana 2008). Flowering season is August to September (Vaddhanaphuti 2005). Plants found in the Taunggyi District of Myanmar are unspotted greenish yellow, and they flower in April (Tun 2019).

Fig. 113.1 *Trias oblonga Lindl.* [= *Bulb. oblongum* (Lindl.) Rchb.f.]. (© Teoh Eng Soon 2021. All Rights Reserved)

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Trias picta (C.S.P. Parish & Rchb.f.) Hemsl. (= *Bulbophyllum pictum* C.S.P. Parish & Rchb.f.)

Trias picta is distributed in northern and western Myanmar and northern Thailand. Plants are epiphytic in evergreen forests at 1000 m. Flowers are 1 - 1.7 cm across. The common form has narrow triangular sepals, but selected clones have broad, overlapping triangular sepals that are pink or cream and heavily spotted with crimson (Fig. 113.2). Petals are small, purple. Lip is small, reddish purple. Pseudobulbs are ovoid, smooth, 1 cm in diameter, carrying a single distichous, coriaceous, ovate to elliptic, dark green leaf, 3 - 6 × 1.5 - 2 cm, at the apex (Nanakorn and Watthana 2008). It flowers in August (Vaddhanaphuti 2005).

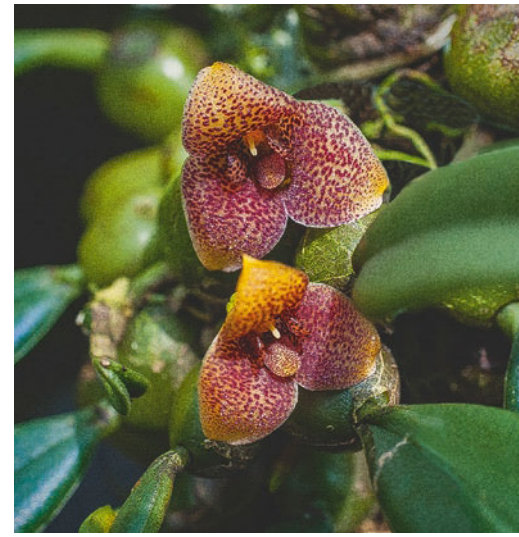

Fig. 113.2 *Trias picta* (C.S.P. Parish & Rchb.f.) Hemsl. (=*Bulb. pictum* C.S.P. Parish & Rchb.f.). (© Teoh Eng Soon 2021. All Rights Reserved)

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Trichoglottis Bl. 114

Trichoglottis is a genus with 86 distinctive, epiphytic, monopodial species distributed from India across southern China and Southeast Asia to Australia and the Pacific Islands. The genus is so-named because of the presence of hair on the midlobe of the lip of the type species, *Trichoglottis retusa*, from Greek *tricho* (hair) and *glotta* (tongue) (Schultes and Pease 1963).

Plants are erect or pendulous. Leaves are distichous, oblong, sessile, praemorse, coriaceous. Strong roots arise opposite the leaves. Inflorescence is axillary, short, usually with a single flower. In Blume's original description of his type species, the short inflorescence carried a solitary flower, but some species have two or more flowers. Other species that have long, paniculate inflorescences bearing many flowers were removed to constitute a separate genus, *Staurochilus*, by Henry Ridley: they are now returned to *Trichoglottis*. Flowers are star-shaped; sepals and petals are free, spreading, in white, yellow, brown or maroon, some with dark brown or crimson bars or blotches. Many flowers with thick texture appear simultaneously along the stem, open together, and they are long-lasting (Fig. 114.1). *Trichoglottis* species are hardy and easy to maintain given a warm, bright climate. Some hybrids have been made with *Vanda.*

Trichoglottis atropurpurea Rchb.f. (syn. *Trichoglottis brachiata* Ames)

Endemic to the Philippines, it is a lowland species occurring from sea level to 300 m, sometimes growing in swamps (Cootes 2001). *Trichoglottis atropurpurea* is undoubtedly the most attractive species in the genus. Stem is up to 60 cm tall with coriaceous strap leaves, 8 × 4 cm. Inflorescence arises on the stem opposite the leaves and is short, single flowered, several appearing together. Flowers are fragrant, 6 cm wide, with broad, spreading sepals and petals of reddish purple or maroon accentuated by a complex white and pink labellum. Lip is 3-lobed; side lobes are erect, elliptic, pink on the inner surface. Midlobe is shaped like an inverted trident, white at the centre and pink along the margins. A large white, hirsute callus covers the base and extends as a hirsute ridge along the central narrow lobule almost to the apex. Side lobules of the midlobe are narrow, plain and rounded at their apices. Anther cap is maroon (Fig. 114.2). Flowers are thick textured and last for several months from spring to summer (Teoh 2005).

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Fig. 114.1 *Trichoglottis orchidea* (J.Koenig) Garay (syn. *Trichoglottis cirrifera* Teijsm. & Binn.). (© Teoh Eng Soon 2021. All Rights Reserved)

Trichoglottis bipunctata (C.S.P.Parish & Rchb.f.) Tang & F.T. Wang

Trichoglottis bipunctata is distributed in Myanmar, Thailand and northern Peninsular Malaysia. Stems are 50 cm or longer with strap leaves that are narrowed over the distal third to a blunt tip. Young leaves are spotted with purple (Seidenfaden and Wood 1992). Inflorescence carries 1 - 2 small flowers, 0.8 - 1 cm across, canary yellow. Lip is large, with tiny side lobes. Midlobe is oval, convex, papillose, white with maroon tinting at the base between the side lobes (Fig. 114.3). Flowering season is February to April in Thailand (Nanakorn and Watthana 2008)

Trichoglottis geminata (Teijsm. & Bonn.) J.J.Sm. (syn. *Trichoglottis wenzelii* Ames)

Trichoglottis geminata is distributed in Borneo, Maluku, Sulawesi and the Philippines from sea level to 200 m, on limestone in Sarawak (Beaman et al. 2001; Cootes 2001). Stem is up to 40 cm tall, leaves leathery, 12 × 2 cm. Inflorescence is

Fig. 114.2 *Trichoglottis atropurpurea* Rchb.f. (syn. *Trichoglottis brachiata* Ames). (© Teoh Eng Soon 2021. All Rights Reserved)

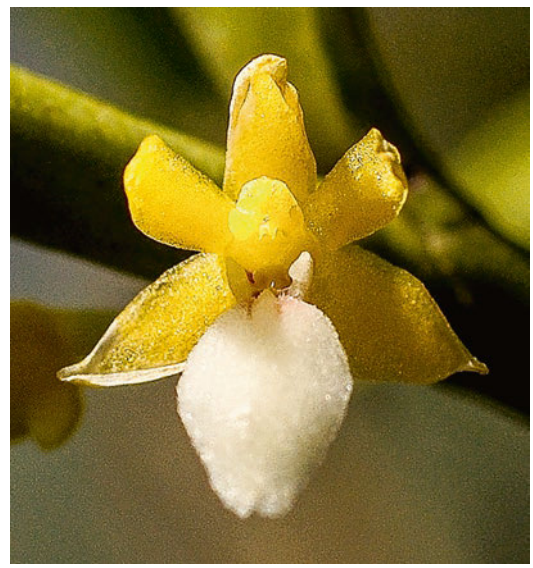

Fig. 114.3 *Trichoglottis bipunctata* (C.S.P.Parish & Rchb.f.) Tang & F.T.Wang. (© Teoh Eng Soon 2021. All Rights Reserved)

short, usually bearing Two flowers (hence, the name, *geminata*). Flowers are 1.5 cm across. Sepals and petals are free but not well extended, yellow with maroon bars. Sepals are ovate, petals much smaller, lanceolate, curving inwards. Lip is 3-lobed; lateral lobes are small, erect, white. Midlobe is oblo-lanceolate, tapering into a narrow tail at the apex, white with crimson marks at the base (Fig. 114.4).

Trichoglottis lanceolaria Bl.

Trichoglottis lanceolaria occurs in Vietnam, Thailand, Peninsular Malaysia, Sumatra and Java at 100 - 1200 m, in lowland hill forest on limestone at 7 - 900 m in Sarawak (Beaman et al. 2001). Stems are pendulous, 70 cm long, slender, rooting only at the base. Leaves are elliptic, coriaceous, 10 × 0.7 - 1 cm. Inflorescence is short, several borne close together, opposite the leaves, single flowered. Flowers are 7 mm wide. Sepals and petals are lanceolate, concave, moderately cupped, of a dull brownish yellow. Lip is 3-lobed; side lobes are small, erect separated by a fleshy, yellow callus. Midlobe is circular, spurred (Fig. 114.5).

Fig. 114.4 *Trichoglottis geminata* (Teijsm. & Bonn.) J.J.Sm. (syn. *Trichoglottis wenzelii* Ames). (© Teoh Eng Soon 2021. All Rights Reserved)

Trichoglottis latisepala Ames

Endemic to the Philippines, *Trichoglottis latisepala* grows in coastal and lowland forests up to 1000 m. Stems are pendulous, up to 1 m long, with coriaceous leaves, 10 - 12 × 1.5 cm, purplish when exposed to bright light (Cootes 2001). Inflorescences are multiple, short, each arising opposite a leaf and bearing 2 - 6 pink to lilac flowers, 1.2 cm across that open simultaneously. Dorsal sepal is oblong, shorter than the wing-shaped lateral sepals that are 6 mm long × 5 mm wide. Petals are smaller, oblong-lanceolate, spreading (Fig. 114.6).

Trichoglottis orchidea (J.Koenig) Garay (syn. *Trichoglottis cirrhifera* Teijsm. & Binn.)

Trichoglottis orchidea is distributed in Nicobar Islands, Thailand, Laos, northern Peninsular Malaysia and Java, from 200 - 1000 m (Seidenfaden and Wood 1992; Handoyo 2010). Stems are long, climbing, pendulous with ellip-

Fig. 114.5 *Trichoglottis lanceolaria Bl.* (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 114.6 *Trichoglottis latisepala* Ames. (© Teoh Eng Soon 2021. All Rights Reserved)

tic leaves 10 × 2 cm. Inflorescence is single flowered. Flower is 1 cm across, bright yellow with reddish-brown blotches. Lip is 3-lobed, white, spurred: side lobes are small, erect. Midlobe is keeled at the base, fleshy, oblong, blunt and reflexed at the apex, and bears, near the base, two spreading, narrow, linear lobules, 2 mm long (Figs. 114.1 and 114.7) (Seidenfaden and Wood 1992). Flowering season is June to August in Thailand (Nanakorn and Watthana 2008).

Trichoglottis paniculata J.J. Sm.

Trichoglottis paniculata is endemic in Sulawesi growing as epiphyte at 1200 - 2000 m. This rare plant has branching stems that scramble over bushes and trees (O'Byrnne 2011). Leaves are slim, lanceolate, greenish brown. Flowers are 2 cm across, somewhat cupped. Sepals and petals are spathulate, yellow or off-white, with 4 - 5 small, short, transverse blotches. Lip is 3-lobed; side lobes are erect, curving inwards. Midlobe is saucer-shaped white with a dark brown callus at the base (Fig. 114.8).

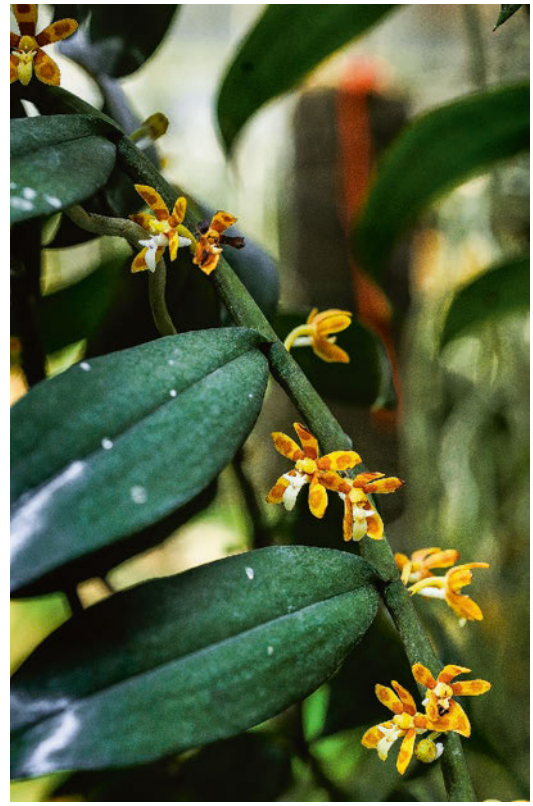

Fig. 114.7 *Trichoglottis orchidea* (J.Koenig) Garay (syn. *Trichoglottis cirrifera* Teijsm. & Binn.). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 114.8 *Trichoglottis paniculata* J.J. Sm. (© Teoh Eng Soon 2021. All Rights Reserved)

Trichoglottis philippinensis Lindl.

Trichoglottis philippinensis is distributed in Borneo and the Philippines. Stems are 60 cm tall, leaves 7 × 3.5 cm. Inflorescence is short, single-flowered. Flowers are 4 cm wide, star shaped; sepals and petals are spreading, yellow, yellow with extensive brown blotches or brown with a yellow border. Sepals are lanceolate, petals narrower, elliptic. Lip is cream coloured, 3-lobed; side lobes are erect, golden yellow. Midlobe has the inverted trident form similar to that of *Trichoglottis* atropurpurea, but it is not so sharply defined; there is a hairy callus in the centre (Figs. 114.9 and 114.10). Some taxonomists consider the two to be varieties of a single species (Cootes 2001; O'Byrne 2001).

Trichoglottis pusilla (Teijsm. & Binn.) Rchb.f.

Trichoglottis pusilla is a small species growing on tree tops in Java and Sumatra at 100 - 200 m. Stem is robust, 12.5 cm tall, with coriaceous, deeply channelled, strap leaves, 5.5 - 12 × 1 cm. Inflorescence is axillary, short, bearing up to three comparatively large flowers, 2.3 cm across. Flowers are fragrant, not widely spreading. Sepals and petals are spathulate, convex due to margins being reflexed, white with thin, transverse purple stripes. Lip is 3-lobed; side lobes are erect, white with purple along their upper margin. Midlobe is fleshy, transversely ovate, spurred at the base, white and olive green with scattered, faint purple streaks (Comber 2001) (Fig. 114.11).

Fig. 114.9 *Trichoglottis philippinensis* Lindl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 114.10 *Trichoglottis philippinensis* Lindl. (© Teoh Eng Soon 2021. All Rights Reserved)

Trichoglottis scaphigera Ridl.

Originally collected in Penang, a century ago and only known from Penang Hill (Holttum 1964), *Trichoglottis scaphigera* was recently discovered in Sabah (Lamb 2008). Stems are climbing, pendulous; leaves are 7 - 13 × 1.2 - 1.8 cm. Flower is almost sessile, solitary, 1.8 cm across, yellow with brown blotches or bars, thick textured. Sepals and petals are elliptic, obtuse, spreading: dorsal sepal reflexed at the margin, lateral sepal reflexed at the inner margin. Lip is 3-lobed; side lobes are tiny, pointing forward with a pair of hairless, linear extensions from the lateral margin. Midlobe is globose, fleshy, with a large round, hairy callus at the apex. Lip is white with

Fig. 114.11 *Trichoglottis pusilla* (Teijsm, & Binn.) Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

brown patch at the apex. Column is white, anther cap yellow (Figs. 114.12 and 114.13). The species is quite distinctive (Holttum 1964).

Trichoglottis simplex J.J.Sm.

Trichoglottis simplex is endemic in Sumatra, occurring at 1200 - 1600 m. Lip is unlike other species being entire, oblong, elliptic, but it is spurred and hairy on the upper surface (Comber 2001). It is possibly the least attractive species. Stem is pendulous, branching, apex curving upwards, 37 - 64 cm long with oblong-elliptic, leaves, 10 × 2 cm. Inflorescences are axillary, 1 - 4 from a node. Tepals are elliptic, yellow with brown blotches, not spreading widely (Fig. 114.14).

Trichoglottis smithii Carr.

Trichoglottis smithii is distributed in Sumatra and Borneo occurring in lowland, sometimes riverine, forests at 10 - 300 m (Beaman et al. 2001)

Fig. 114.12 *Trichoglottis scapigera* Lindl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 114.13 *Trichoglottis scapigera* Lindl. (© Teoh Eng Soon 2021. All Rights Reserved)

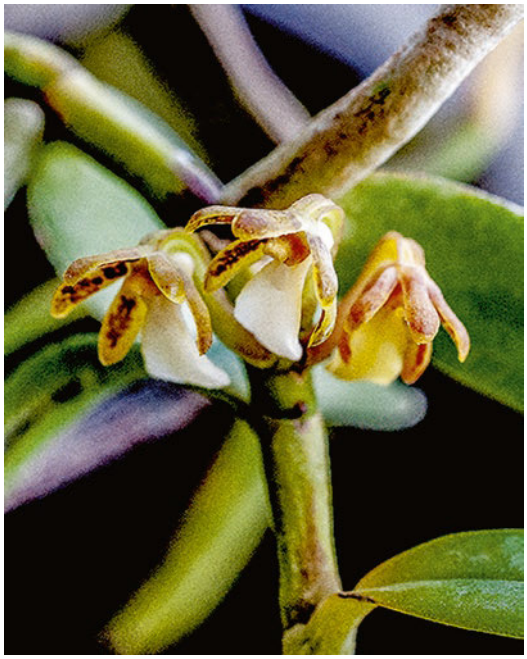

Fig. 114.14 *Trichoglottis simplex* J.J.Sm. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 114.15 *Trichoglottis smithii* Carr. (© Teoh Eng Soon 2021. All Rights Reserved)

and on the slopes of Mount Kinabalu up to 1300 m (Lamb 2008).

Plants climb tree trunks in open forests on poor soils such as *Kerangas* forests or ultramafic substrate, in light shade. Plants of this attractive species in cultivation are mostly from Borneo.

Stems are erect, climbing, clustered, up to 2 m long with elliptic leaves, 4 - 5 × 1 - 2 cm. Inflorescence is very short, scape a few mm, single flowered, but numerous flowers appear simultaneously on mature stems. Flower is slightly fragrant, 2.5 - 2.65 cm across, creamy white with reddish brown bars and blotches on the sepals and petals and with dark purple on the lip (Lamb 2008).

Lip is 3-lobed; side lobes are elliptic, erect, white, marked by a thin, central purple stripe. Midlobe is tridentate; side lobules are triangular, narrow at the mesochile and broadest at the epichile. Midlobe is white with horizontal splashes of purple, bearing a central keel with white stiff hair radiating from it (Fig. 114.15).

Trichoglottis subviolacea (Llanos) Merr. (syn. *Trichoglottis bataanensis* Ames)

Trichoglottis subviolacea is endemic but widespread in the Philippines growing as epiphyte from sea level to 200 m. It was first discovered in Bataan; hence, Oakes Ames named it *Trichoglottis bataanensis* in 1905 (Cootes 2001).

Stem is pendulous up to 1 m long with dark green, leathery leaves, 10 × 1.5 cm (Fig. 114.16). Inflorescences arise opposite the leaves: they are short, bearing 4 - 6 flowers in a cluster (Figs. 114.16 and 114.17). Flowers are 1 cm across, yellow, with orange to brown spots. Lip is 3-lobed; side lobes are small, erect, white. Midlobe is cordate or circular, white with a well-outlined, bisected patch of crimson at the centre.

Fig. 114.16 *Trichoglottis subviolacea* (Lianos) Merr. (syn. *Trichoglottis bataanensis* Ames). (© Teoh Eng Soon 2021. All Rights Reserved)

Trichoglottis tinekeae Schuit.

Trichoglottis tinekeae is endemic to Borneo, having been found only in Sabah and Sarawak in lower montane, wet *Kerangas* forest at 1000 - 1200 m (Beaman et al. 2001). Plants grow on small trees in or at the edge of heath forests between 900 and 1200 m, usually 1 - 2 m above

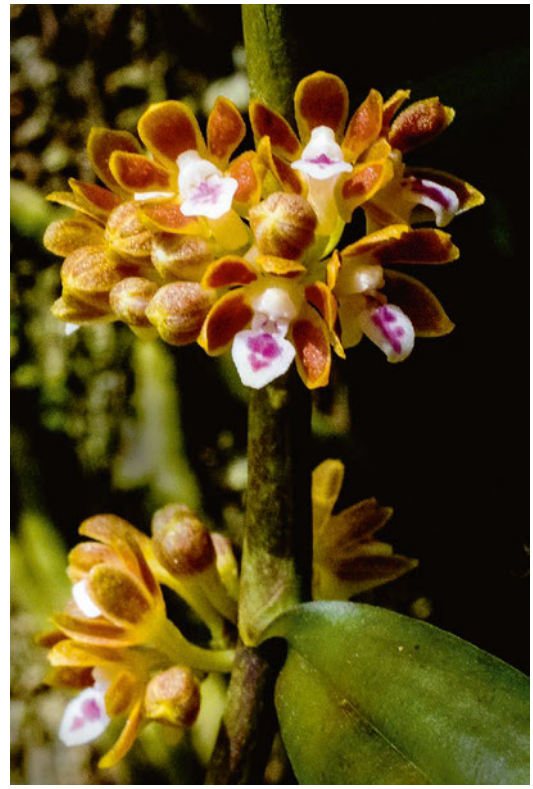

Fig. 114.17 *Trichoglottis subviolacea* (Lianos) Merr. (syn. *Trichoglottis bataanensis* Ames). (© Teoh Eng Soon 2021. All Rights Reserved)

the forest floor, and on rocks in limestone outcrops (Lamb 2008). Stems are up to 50 cm long, clustered, branching; leaves are elliptic, 4 - 9 × 0.6 - 1.3 cm, green sometimes blotched with purple. Inflorescences emerge opposite leaf blades, short, single flowered, rarely two. Flower is 1.5 cm across; sepals are lanceolate and petals linear, all spreading, yellow with 1 - 2 brown blotches or bars (Fig. 114.18). Lip is 3-lobed; side lobes are tiny, white. Midlobe is ovate, crenate along the apical margin, cream with a semicircular patch of brown over the apical half and a cluster of hair at the base (Lamb 2008).

Subgenus *Stauroglottis*

The 12 - 14 species in this subgenus bear flowers that are similar in form to the preceding species of *Trichoglottis*, but their inflorescence is large, longer than the leaves, generally branching, and

Fig. 114.18 *Trichoglottis tinekeae* Schuit. (© Teoh Eng Soon 2021. All Rights Reserved)

with many flowers. Most species occur in the Philippines, but their distribution extends to Indonesia, Malaysia, Indochina, Thailand, Myanmar and Sikkim (Seidenfaden and Wood 1992).

Trichoglottis agusanensis Ames & Quisimb. [syn. *Staurochilus agusanensis* (Ames & Quisimb.) Fessel & Luckel]

Endemic to the Philippines, *Trichoglottis agusanensis* is a rare, medium-sized, monopodial epiphyte with a restricted distribution confined to the Agusan Valley of Mindanao. Stems are 20 - 40 cm tall, leaves leathery, recurved, oblong, 12 - 15 × 4 cm. Inflorescence is upright, reaching beyond the top of the plant, with Two side branches held close to the main rachis and bearing 22 orangey brown flowers, many partially overlapping one another in a tight cluster. Flowers are 2 - 2.5 cm across, fleshy; sepals and petals are spathulate, spreading, cream with brown blotches and stripes. Petals are slightly falcate, but the form is obscured by a triangular extension at the midpoint of the lower margins. Lip is porrect, saccate, 3-lobed; side lobes are small, erect, cream with yellow on the inner surface. Midlobe

Fig. 114.19 *Trichoglottis agusanensis* Ames & Quisimb. [*Staurochilus agusanensis* (Ames & Quisimb.) Fessel & Luckel]. (© Teoh Eng Soon 2021. All Rights Reserved)

is tridentate yellow, marked with small brown spots and stripes, finely hirsute: lateral extensions broad, triangular (Fig. 114.19).

Trichoglottis loheriana (Kraenzl.) L.O.Williams [syn. *Staurochilus loherianus* (Kraenzl.) Karas.]

Trichoglottis loheriana is a small epiphyte endemic to Quezon and Rizal Provinces in Luzon, Philippines, at up to 800 m (Cootes 2001). Inflorescence is paniculate, up to 40 m long, bearing 10 - 20 waxy, yellow-green, fragrant flowers of heavy texture, 3 - 4.5 cm across. Dorsal sepal is erect, convex, oblong, rounded at the apex, marked by Five rows of tiny, irregular brown spots. Lateral sepals are elliptic, convex,

Fig. 114.20 *Trichoglottis loheriana* (Kraenzl.) K,O,Williams [syn. *Staurochilus loherianus* (Kraenzl.) Karas]. (© Teoh Eng Soon 2021. All Rights Reserved)

antrorse (curved upwards) near the tips, devoid of, or with minimum, brown markings. Petals are arcuate, narrower and shorter than the sepals, expanded towards the tip where they turn upwards, forming faint sigmoids. Several rows of tiny, irregular markings traverse the petals. Lip is 3-lobed; side lobes are small, erect, brown on the inner face, white externally. Basochile is broad, bearing a flat, greenish yellow callus; mesochile forms a narrow waist and is keeled; epichile is ovate, white and bears a complex, two-layered, smooth, yellow callus at the tip (Fig. 114.20). Flowering season is March to May.

Trichoglottis luzonensis Ames [syn. *Staurochilus luzonensis* (Ames) Ames]

Endemic to the Philippines, *Trichoglottis luzonensis* is a robust, stout, monopodial epiphyte distributed in Agusan (in Mindanao), Aurora, Camarines and Quezon (in Luzon) at elevations up to 500 m (Fessel and Balzer 1998; Cootes 2001). Stems are 60 cm tall, with leathery leaves, 20 × 3 - 5 cm. Inflorescence is suberect, up to 45 cm, branching extensively and bearing over 50 yellow flowers with brown blotches and stripes (Fig. 114.21). Flower is 3.2 - 5 cm across; sepals and petals are spathulate, narrow, incurved, lateral sepals falcate. Lip is 3-lobed; lateral lobes are erect, triangular, apex rounded. Midlobe is elliptic, with a central white, finely-hirsute ridge (Figs. 114.21 and 114.22).

Trichoglottis tamesisii Quisumb. & C. Schweinf. [syn. *Staurochilus tamesisii* (Quisumb. & C. Schweinf.) Fessel & Luckel]

Endemic to the Philippines, *Trichoglottis tamesisii* was discovered in Los Baños, Philippines (Fessel and Balzer 1998). Plant is medium-sized; stem is erect with strap leaves, rounded at the apex. Inflorescence is erect, with 1 - 2 side branches, green, streaked with purple, bearing up to 20 flowers, 2.5 cm across and laxly arranged. Flowers are taller than wide, completely white at the back and on the ovary, overlaid with crimson to purple on the front leaving a narrow border of white along the margins and a jagged streak of white in the midline of the tepals. Tepals are spathulate, spreading; lateral sepals are twisted to face inwards. Lip is obscurely 3-lobed, longer than the tepals. Midlobe is elliptic white, yellow at the base and bearing two keels bordered by crimson along the mesochile merging to form a hairy callus at the narrowed epichile. Column is white (Figs. 114.23 and 114.24).

Hybrids

Orchid hybridizers have generally been reluctant to work with *Trichoglottis* because the resultant hybrid would have very few flowers or, worse, only a single flower per inflorescence. Crossing *Trgl. atropurpurea* to *Trgl. philippinensis* resulted in a very free flowering hybrid which is intermediate in shape and size between the two parents with the deep coloration of *Trgl. atropurpurea* (Fig. 114.25). Inflorescence of *Trichovanda* Thai Velvet (*Trgl. atropurpurea* x *V.* Kinsweiler) carries six large, heavy-textured flowers again with the coloration of *Trgl. atropurpurea* (Fig. 114.26).

Trichoglottis has been bred to *Aerides, Arachnis, Paraphalaenopsis, Phalaenopsis*

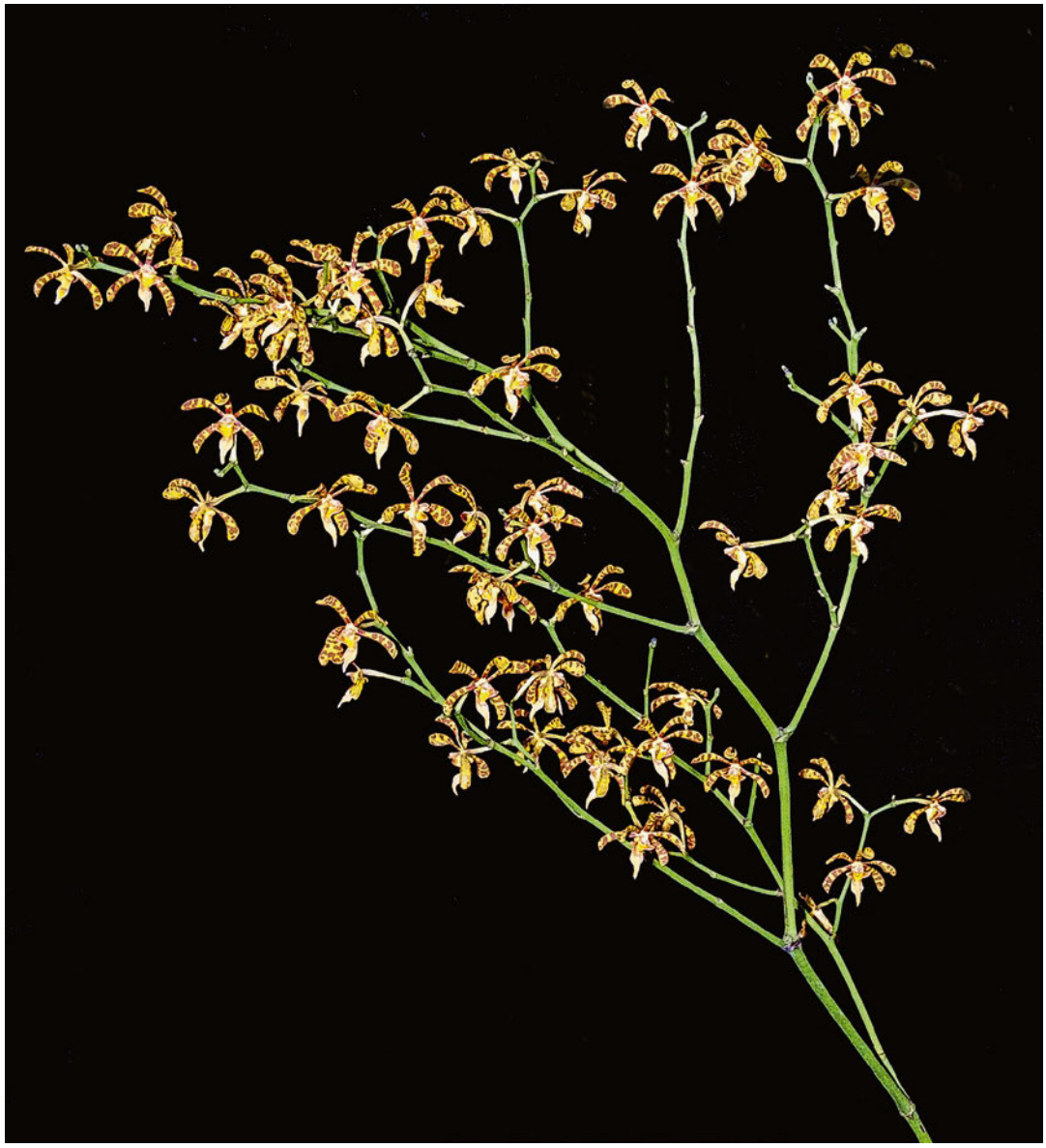

Fig. 114.21 *Trichoglottis luzonensis* Ames [syn. *Staurochilus luzonensis* (Ames) Ames]. (© Teoh Eng Soon 2021. All Rights Reserved)

Renanthera and *Vanda*. It is also present in five polygeneric hybrids, *Andrewara, Irvingara, Paulsenara, Taprotrichothera* and *Vandoglottanthe*, the last two containing the *Taprobanea* and *Papilonanthe* respectively. However, the total number of hybrids number 35 and only 4 species have been employed. Further breeding with this genus is encouraged.

Fig. 114.22 *Trichoglottis luzonensis* Ames [syn. *Staurochilus luzonensis* (Ames) Ames]. (© Teoh Eng Soon 2021. All Rights Reserved)

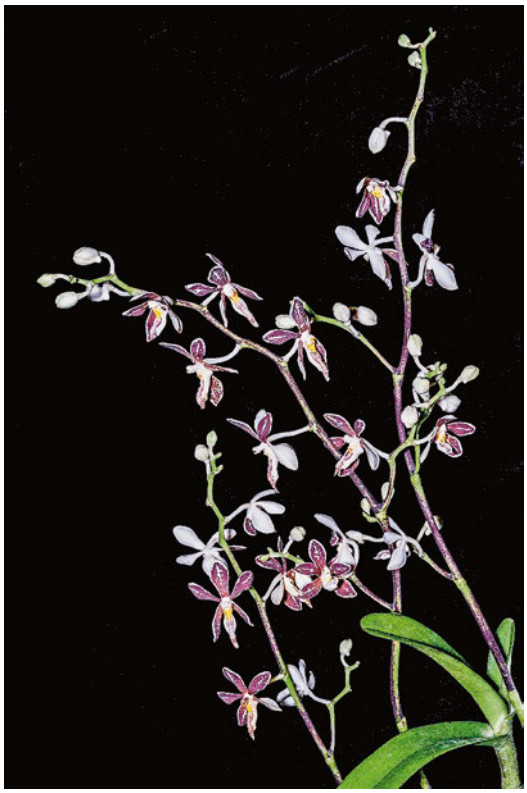

Fig. 114.23 *Trichoglottis tamesisii* Quisumb. & C, Schweinf. [syn. *Staurochilus tamesisii* (Quisumb. & C, Schweinf.) Fessel & Luckel]. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 114.24 *Trichoglottis tamesisii* Quisumb. & C, Schweinf. [syn. *Staurochilus tamesisii* (Quisumb. & C, Schweinf.) Fessel & Luckel]. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 114.25 *Trichoglottis* (*Trgl. atropurpurea* x *Trgl. philippinensis*). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 114.26 *Trichovanda* Thai Velvet (*Trgl. atropurpurea* x *V.* Kinsweiler). (© Teoh Eng Soon 2021. All Rights Reserved)

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Trichotosia Bl.

115

Once included as a section in the genus *Eria*, the 50 species of *Trichotosia* now constitute a separate genus as originally proposed by Blume in 1825. They are distributed from northeast India and southern China across Southeast Asia to some Pacific Islands. Plants are commonly hairy all over, but in some species hirsutism is limited to the inflorescence and leaf sheaths. Plants do not have pseudobulbs. Stems are leafy, inflorescence axillary, unbranched, with single or many flowers. Floral bracts are hairy and prominent.

Trichotosia is seldom cultivated by collectors of species orchids. The generic name is derived from Greek *trichotos* (hairy) (Schultes and Pease 1963).

Trichotosia dasyphylla (Parish & Rchb.f.) Kraenzl.

Trichotosia dasyphylla is a miniature species distributed in eastern Himalaya, southern China, Myanmar, Thailand, Laos and Vietnam as epiphyte in evergreen forests at 900 - 1000 m.

Plant is epiphytic, rhizome creeping, tufted. Stem is short, 2 - 3 cm bearing a rosette of 2 - 4 ovate, bluish green leaves measuring 10 - 15 × 4 - 6 mm, and covered with short, fine white hair. Inflorescence is axillary, single flowered. Flower is yellow, 6 - 7 mm across, covered with white hair all over the sepals and petals. Dorsal sepal is ovate-lanceolate, erect. Lateral sepals are very much larger than the dorsal, ovate, lanceolate, concave, not spreading widely but bracketing the lip. Petals are small, lanceolate. Lip is obovate-oblong, rounded at the apex (Fig. 115.1).

It flowers from May to July in Thailand (Nanakorn and Watthana 2008)

Trichotosia ferox Bl.

Trichotosia ferox is distributed in Peninsular Thailand, Malaysia, Sumatra, Kalimantan, Java and Lombok occurring in exposed locations of evergreen forests at 600 - 1450 m. Plants are covered with red hair throughout, but the extent of the hirsutism varies (Seidenfaden and Wood 1992). Stems are up to 70 cm long, pendulous, non-branching, with sessile, lanceolate leaves, 10 × 1.5 - 2.5 cm. Inflorescence is axillary, 10 cm long, bearing 4 - 8 cream or pink flowers flushed with red towards the base of the lateral sepals and lip. Flowers are 8 mm across; sepals are lanceolate, spreading; petals are smaller, narrow, oblong, obtuse. Lip is simple, spathulate, clefted at the apex, white (Comber 2001) or red (Fig. 115.2).

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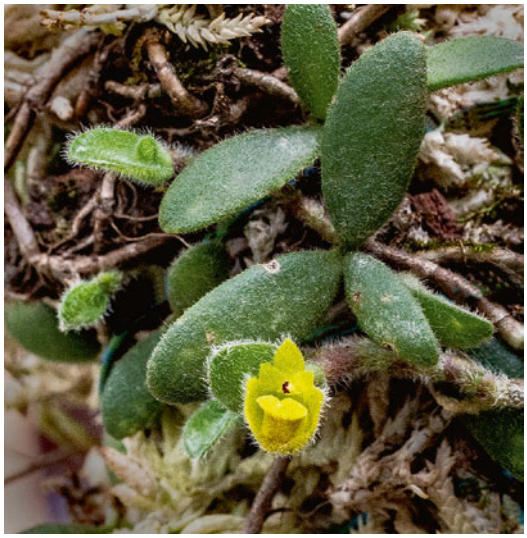

Fig. 115.1 *Trichotosia dysphylla* (Prish & Rchb.f.) Kraenzl. (© Teoh Eng Soon 2021. All Rights Reserved)

Trichotosia vestita (Wall ex Lindl.) Kraenzl.

Trichotosia vestita is distributed in Sumatra, Peninsular Malaysia and Borneo in lowland, foothills and low montane forests (Seidenfaden and Wood 1992; Comber 2001). 'It is perhaps the most attractive *Trichotosia* in Sumatra' (Comber 2001).

Plants are large, epiphytic, with terete stems up to 2 m × 7 mm, bearing long, lanceolate pendent leaves, 14 - 17 × 3 - 4 cm. The entire plant is covered with fine reddish hair. Inflorescence is 20 - 30 cm long, rachis zigzag bearing red-haired, green floral bracts and 6 - 10 cream-coloured flowers with red lips. Flowers are 3 cm across, not opening widely. Sepals are ovate-lanceolate, brown and hirsute on the outer surface, smooth and cream on the inner surface. Petals are small, spathulate, spreading forward between the sepals. Lip is 3-lobed, brownish red; side lobes are erect. Midlobe is ovate, clefted and recurved at the apex, with a central papillose keel (Fig. 115.3).

Fig. 115.2 *Trichotosia ferox.* Bl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 115.3 *Trichotosia vestita* (Lindl.) Kraenzl. (© Teoh Eng Soon 2021. All Rights Reserved)

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Vanda Jones ex R.Br. 116

Vanda ranks among the top five most popular genera with growers of tropical Asian orchids. Now with the inclusion of *Ascocentrum, Christensonia, Euanthe, Neofinetia*, *Trudelia* and *Aerides flabellata*, there are nearly 73 species, 2 subspecies and 4 natural hybrids in the genus (Gardiner et al. 2013). *Vanda lombokensis* was not included in the list. *Vanda* is distributed from Himalaya to Sri Lanka and across Southeast Asia to some Pacific Islands. Apart from the species that previously belonged to *Ascocentrum* and *Neofinetia*, plants are generally large, monopodial, epiphytic, with coriaceous, recurved, strap leaves (Fig. 116.1). Offshoots arise from the base. Inflorescence is lateral, with several to many small, medium size or large, heavy-textured flowers. Sepals and petals are free, often similar, but in some species, the petals are much smaller than the sepals. Lip is tri-lobed. Colours range from white to yellow, brown, pink, red, blue and purple, often with spots or tessellations. Several species are variable, a few with officially designated varietal names.

Plants like free air movement and high humidity. Formerly, they were grown in pots or baskets containing pieces of charcoal. Currently, in Southeast Asia, the trend is to grow plants by suspending them without any container, alternatively set in a small plastic or teak basket, allowing the roots to hang freely over damp ground. Folia feeding becomes a necessity in such a set-up. Plants may also be grown attached to trees.

There is extensive interspecific hybridization within *Vanda* aimed at producing round flowers with overlapping tepals, improved colour, distinct tessellations or spots, unusual lip and miniaturization. *Vanda* is interfertile with most species in *Vandeae.*

Five *Vanda* species (*V. coerulea, V. concolor, C. cristata, V. tessellata* and *V. testacea*) have limited medicinal usage in China, India and Nepal. The herbal usage, phytochemistry of *Vanda* and the inclusion of *Vanda* in cosmetics are discussed in detail in *Medicinal Orchids of Asia* (Teoh 2016).

Vanda aliceae Motes, L.M. Gardiner & R.D.L. Roberts

Endemic to Malaku, *Vanda aliceae* is a medium size species that resembles *V. furva* (syn. *V. lindenii*) and *V. saxatilis*. Plant is up to 30 cm tall with recurved, coriaceous, strap leaves, 18 × 2.2 cm. Inflorescence is erect or horizontal, 10 - 15 cm, bearing 6 - 12 flowers, 5 cm across. Sepals and petals are spathulate, undulate, yellow with a wide central strip of cinnamon over the lateral sepals. Petals are spotted with cinnamon at the centre; dorsal sepal is sparsely spotted with cinnamon at the base. Lip is 3-lobed; side lobes are small, erect, white, with fine purple spots on the inner surface. Midlobe is fleshy, thick, white, marked by thin lines of purple on the mesochile,

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with a large, brown callus at the apex, a pair of curved digitate, hirsute lobules at the side and a pale cinnamon spur at the base (Fig. 116.2). Flowers fit the description of *V. furva* (syn. *V. lindenii*) and *V. saxatilis*, but in *V. aliceae* the white lobules at the midlobe of the lip is curved and hirsute (Fig. 116.3). *Vanda furva* does not have hair on the lobules, and in *V. saxatilis,* the lobules are straight. It is too early to know whether an effort to improve on the form of the species will blur these differences.

Vanda arcuata J.J.Sm.

Vanda arcuata was recently rediscovered in Sulawesi after being considered extinct for almost a century (O'Byrne 2011). Stems are 40 - 50 cm or taller. Inflorescence bears 5 - 9 long-lasting flowers, laxly arranged on an inflorescence that is as long as the leaves. Flowers

Fig. 116.1 *Vanda tessellata* (syn. *V. roxburghii*) (© Teoh Eng Soon 2022. All Rights Reserved)

Fig. 116.2 *Vanda aliceae* MotesL.M.Gardiner & RD.L.Roberts. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.3 *Vanda aliceae* Motes, L.M.Gardiner & RD.L.Roberts. (© Teoh Eng Soon 2021. All Rights Reserved). Showing detail of lip form

resemble *Vanda tricolor*, but they are only 4.5 cm across and emit a vanilla scent. Flowers are rather open, with yellow, spathulate, undulate sepals and petals that are densely covered with chocolate spots and blotches at the centre leaving a broad border of unspotted yellow along the margins. Lip is 3-lobed with a short white spur. Side lobes are erect, divergent, white. Midlobe is oblong, convex, chocolate, with three yellow keels from the base to the mesochile. A pair of lanceolate, thin, flat to slightly curved lobules projects from the border of the mesochile, and beyond this, on the epichile, the margin bulges outwards (Fig. 116.4). Flowering season is January to June (O'Byrne 2011).

Vanda bicolor Griff

Vanda bicolor is distributed in Himalaya and Myanmar in open forests and on riverbanks at 700 - 2000 m (Pearce and Cribb 2002). Stem is 15 - 25 cm tall, sheathed by the bases of 7 - 17 deeply grooved, coriaceous, decurved, strap leaves 7 - 21 × 1 - 1.2 cm. Inflorescence is erect, bearing 2 - 6 flowers 4 - 5 cm across. Sepals and petals are spathulate (lateral sepals and petals falcate), brown with tessellations; the sepals are longer and broader than the petals. Lip is yellow, marked with purple on the midlobe (Fig. 116.5).

Vanda brunnea Rchb. f.

Vanda brunnea is distributed from southern Yunnan to Myanmar, Thailand and Vietnam, growing in open forests or at the margins of forests at 800 – 2000 m (Chen and Bell 2009). Stem is 20 - 50 cm tall, leaves linear, strap, 15 - 25 × 2 cm. Inflorescence is erect, 20 - 40 cm with 5 - 10 flowers, 4 - 4.5 cm across. Flowers are thick textured, fragrant with orange to brown, broadly spathulate sepals and petals. Lip is 3-lobed; side lobes are round, erect, diverging. Midlobe is light green, convex, expanded in the middle by two semicircular lobules, and the apex is divided into two diverging lobules (Fig. 116.6). Kamemoto and Sagarik (1975) stated that this species is a tetraploid form of *Vanda denisoniana.*

Flowering is variable under cultivation (Grove 1995).

Fig. 116.4 *Vanda arcuata* J.J.Sm. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.5 *Vanda bicolor* Griff. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.6 *Vanda brunnea* Rchb. f. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.7 *Vanda celebica* Rolfe. (© Teoh Eng Soon 2021. All Rights Reserved)

Vanda celebica Rolfe

Vanda celebica is endemic to Sulawesi. Once thought to be extinct, it was recently rediscovered growing at 600 - 800 m on the island. Inflorescence is short with up to eight flowers, 3 - 4 cm across. Flowers are very fragrant at night, smelling of lilies; when old, it emits the scent of cucumber (O'Byrne 2011). Sepals and petals are spathulate, undulate over the apical half, cream on the back and splashed with brownish red in front. Lip is 3-lobed; side lobes are erect, rounded, white, with small crimson spots on its inner surface. Midlobe is ovate, concave, with erect lateral margins, purple on top with three white keels, white below and bearing a forward-pointing white tooth on either side. Column is brownish red at the base fading to cream with the anther cap (Figs. 116.7 and 116.8).

Fig. 116.8 *Vanda celebica* Rolfe photographed at Cibodas Botanical Garden, Indonesia (PHOTO: Joseph Yeo)

Vanda coerulea Griff. ex Lindl.

Vanda coerulea is a popular large, epiphytic, montane *Vanda* species distributed in India (Arunachal Pradesh and Meghalaya), Bangladesh,

Myanmar, Thailand and SW China occurring at elevations of 100 – 1600 m (Kamemoto and Sagarik 1975; Pearce and Cribb 2002; Chen and Bell 2009). It is critically threatened in India but still occurs in many colour forms in Myanmar. Plants are usually epiphytic in open forests where they are well exposed to the sun. Climate in their natural habitat in Thailand is cool and moist. Whereas day temperature may reach 100 degrees F (37.8 Celsius), night temperatures drop to 50 degrees F (10 Celsius) from March to May, and flowering occurs throughout the year peaking in August (Kamemoto and Sagarik 1975).

Plant is robust; stem is up to 1.7 m tall; leaves are strap shaped, unequally bilobed at the tip, coriaceous, 15 - 30 × 2.5 cm. Inflorescence is axillary, erect or ascending, generally 60 cm long, simple or branched, bearing 10 - 15 well-spaced, tessellated or solid blue flowers on a rachis that exceeds the height of the topmost leaves. In the wild in the Shan State of Myanmar, inflorescences are up to 1.5 m long with over 300 flowers (Tanaka et al. 2003). Shape, size and colour vary among different populations of the species. In the colder, high mountain regions, the flowers are larger, of better shape, and colour is deeper (Nyan Tun 2019). There are numerous colour forms from white to pink, mauve, light blue and dark purple, generally with tessellations, but some forms are solid coloured. Sepals and petals are ovate narrow at the base, spreading, lateral sepals larger and rounder than the dorsal sepal and petals. Petals are commonly twisted at the base bringing the back surface to the front, but there are improved forms where no twisting occurs. Margin of petals may also be undulate. Lip is 3-lobed, small, with a short spur. Side lobes are small, narrow, curved, apex pointed like a claw, white. Midlobe is lingulate, dark purple, with 2 calli at the base and 3 keels running to the obovate apex (Figs. 116.9 and 116.10).

Vanda coerulea flowers throughout the year with a peak in August. Flowers last for 3 weeks (Kamemoto and Sagarik 1975). Delphinidin

Fig. 116.9 *Vanda coerulea* Griff. ex Lindl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.10 *Vanda coerulea* Griff. ex Lindl. (© Teoh Eng Soon 2021. All Rights Reserved)

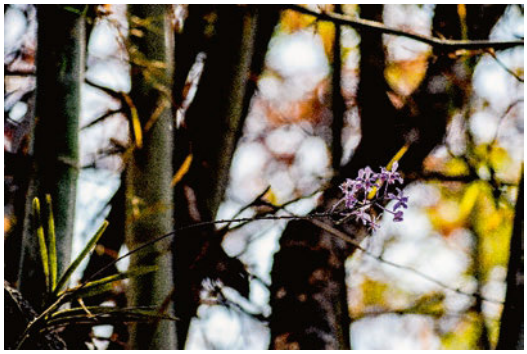

Fig. 116.11 *Vanda coerulescens* Griff. (© Teoh Eng Soon 2021. All Rights Reserved). Photograghed in the wild in northern Thailand. Inflorescence is extremely long with flowers clustered at the apex

gives rise to violet or blue, the latter a rare colour in orchids.

With so many desirable characteristics, it is not surprising that *Vanda coerulea* has been used extensively in hybridization. Hybridists value *Vanda coerulea* for its ability to produce long, erect sprays with large, blue or pink flowers in its progeny. The only quality *V. coerulea* lacks is heavy substance.

Vanda coerulescens Griff.

Vanda coerulescens is distributed in India, China, Myanmar and Thailand, occurring in open, semi-deciduous forests at 650 - 1200 m in Myanmar (Kurzweil and Lwin 2015) and Thailand. Plant is small. Stem is 2 - 8 cm tall, sheathed by coriaceous, deeply grooved, slightly decurved, strap leaves 7 - 12 × 1 - 1.3 cm. Inflorescence is 15 - 60 cm long, arising from near the base of the stem, bearing 10 - 20 light purple or lavender flowers, laxly arranged near the apex of the inflorescence (Fig. 116.11). Flowers are 1.5 - 3.0 cm across. Sepals and petals are spathulate, undulate; sepals are twisted (Fig. 116.12). Lip is 3-lobed, spurred; side lobes are small, erect, light purple. Midlobe is oblong, arched, dark purple, with three darker keels and a shallow cleft at the apex. Spur is slim, directed backwards, curved and pointed downwards at the tip (Fig. 116.13). Flowering season is February to April (Nanakorn and Watthana 2008).

Fig. 116.12 *Vanda coerulescens* Griff. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.13 *Vanda coerulescens* Griff. (© Teoh Eng Soon 2021. All Rights Reserved). Photographed in the wild in northern Thailand. Note the shape of the thin, curved spur

Vanda cristata Wall. ex Lindl. (syn. *Trudelia cristata* (Wall ex Lindl.) Senghas ex Roeth]

Vanda cristata is distributed from southwest China to Myanmar, Bangladesh, northeast India, Bhutan and Nepal in montane, broad-leaf forests at 1000 - 2300 m. Plants are epiphytic on mossy

tree trunks and large branches, exposed to bright light and cool to warm growing. In Bhutan, *V. cristata* is commonly found on trunks of *Rhododendron arboretum* and *Skimmia* species (Pearce and Cribb 2002).

Plant is stout with a strong stem and thick, coriaceous, decurved strap leaves. Inflorescence is axillary, short, with 2 - 6 flowers, 3.5 - 5 cm across. Sepals and petals are free, narrow, elliptic, thick, not spreading widely, light lemon yellow or greenish yellow. Lip is distinctive, 2 - 2.5 cm long, 3-lobed, yellow, marked with longitudinal, maroon stripes over the midlobe. Side lobes are small, erect, broadly triangular, brown with streaks of dark brown, almost black, on the inner surface. Midlobe is large, thick, ovate, as long as the lateral sepals; elevated at the sides and sunken at the centre; white, striped longitudinally with crimson or reddish brown, the stripes longer at the centre, short at the sides: the white surface is scalloped (Fig. 116.14). Midlobe divides into two fishtail-shaped, wide side lobes at the apex; the secondary lobules sometimes dentate (Fig. 116.15). Flowering season is February to May in Myanmar (Nyan Tun 2019), March to May in Nepal and NE India (Raskoti 2009) and April to June in Bhutan (Pearce and Cribb 2002).

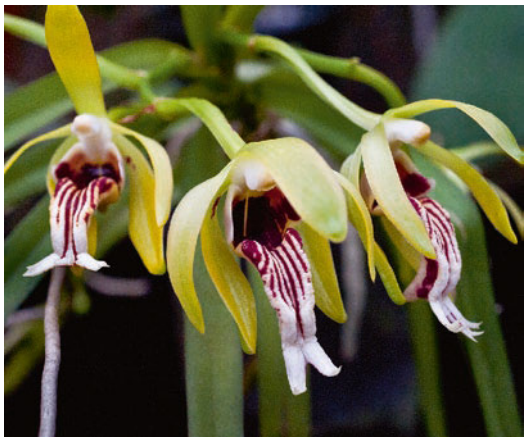

Fig. 116.14 *Vanda cristata* Wall. ex Lindl. (syn. *Trudelia cristata* (Wall ex Lndl.) Senghas ex Roeth,]. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.15 *Vanda cristata* Wall. ex Lindl. (syn. *Trudelia cristata* (Wall ex Lndl.) Senghas ex Roeth,]. (© Teoh Eng Soon 2021. All Rights Reserved). Midlobe of the lip is striped with reddish brown or maroon and apex separates into 2 lobules that divide again into a pair of secondary lobules with dentate margins

This species has been moved to and fro from *Vanda* to *Trudelia*, and it is now back to *Vanda*, possibly for good.

Vanda dearei Rchb.f.

Vanda dearei is endemic in Borneo, occurring as epiphyte in riverine forests from sea level to 300 m (Handoyo 2010). Stem is very stout, to 1 m tall, bearing recurved, centrally grooved, thick strap leaves, 25 - 30 × 4.2 cm, close and sheathing the stem. Leaves are long-lasting, but the lower part of the stem frequently loses its leaves. Inflorescence is short, with 3 - 4 (6) fragrant, cream to yellow flowers, 8 (7 - 9) cm across. Sepals and petals are oval, heavy textured, narrow at the base and crisp at the edges. Dorsal sepal and petals fade to white at the base. Lip is 3-lobed; side lobes are small, erect, white or cream. Midlobe is convex, yellow, with two pairs of lobules at the sides: the upper pair white to cream, horizontal; the lower pair lanceolate, obtuse, flexed downwards, yellow (Figs. 116.16 and 116.17).

Fig. 116.16 *Vanda dearei* Rchb.f. AM/OSSEA. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.17 *Vanda dearei* Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

Vanda dearei has been a major source of yellow in *Vanda* for 80 years. Well-grown, mature plants can flower continuously, with a peak in summer.

Vanda denisoniana Benson & Rchb.f.

Following the encouragement of Rapee Sagarik in the 1970s for hybridizers to explore the potential of *Vanda denisoniana,* the species has emerged as an important source of yellow in many vandaceous hybrids.

The species is distributed in the northern highlands of Myanmar and Thailand and flowers from January to March. It is a variable species with colours ranging from white to pale green, yellow, orange and brown: plants with such flowers are diploid. Plants with sulphur yellow flowers marked with brown to copper spots or bars were known as variety *hebraica* Rchb.f.: these plants are tetraploid (Kamemoto and Sagarik 1975). Seidenfaden reckoned that variety *hebraica* should be a different species, *Vanda brunnea* (Seidenfaden 1988), despite the lip being nearly similar to that of *V. denisoniana.* 'A team of taxonomists have now concluded that the spotted form is a hybrid between *V. brunnea* and *V. denisoniana* and should be designated as *V.* x *hebraica* Motes & L. M. Gardiner & D. L. Roberts.' To further explore this issue, chromosome counts should be performed on *V. brunnea* and *V. herbraica*. The former should be diploid because if they are tetraploid, *V. hebraica* would be triploid.

Plants are moderate size: leaves recurved, 25 × 2.5 cm. Inflorescence carries up to 14 (more commonly up to 8) fragrant, waxy, heavy-textured, unspotted, ivory white, chartreuse, yellow or golden yellow flowers, 5 - 6 cm across on a short scape. Sepals and petals are ovate, spreading, overlapping.

Lip is 3-lobed, lemon yellow; side lobes are ovate, spreading obliquely downwards. Midlobe is convex, rectangular with three white keels over the mesochile and divided into two side lobes at the epichile (Figs. 116.18 and 116.19).

Fig. 116.18 *Vanda denisoniana* Benson & Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

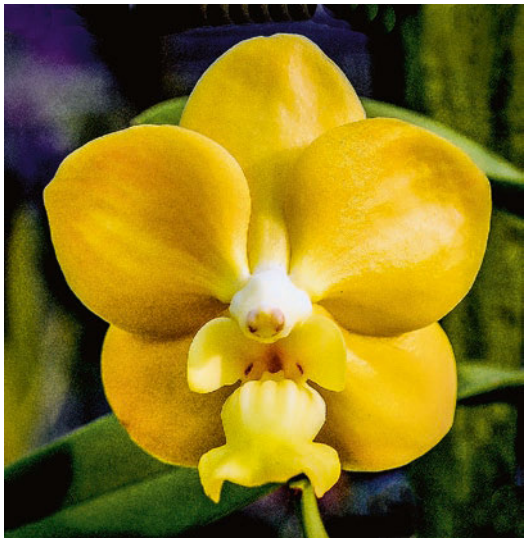

Fig. 116.19 *Vanda denisoniana* Benson & Rchb.f. The reflexed side-lobes at the epichile of the lip is unusual. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.20 *Vanda foetida* J.J.Sm. (© Teoh Eng Soon 2021. All Rights Reserved)

Vanda foetida J.J.Sm.

Vanda foetida is endemic in southern Sumatra. Plant is 80 cm tall with close-set, coriaceous, deflexed, deeply grooved leaves, 27 × 3.5 cm, bilobed at the apex. Inflorescence is erect, short with 1 - 3 large, heavily textured flowers, 5.5. cm across, of pale lilac rose. Sepals and petals are ovate, concave, colour fading to white at the base and there faintly dotted with brown along the veins. Dorsal sepal and petals are incurved at the apex. Lip is 3-lobed, shaped like an insect in flight. Side lobes are small, erect, divergent, yellow with few specks of brown on the inner surface, from the front resembling the insect's antennae. There are four lobules to the midlobe, the basal pair rounded, spreading, orange with a yellow border. The central portion of the lip is convex, A-shaped, lilac, with three white keels, diverging into two lobules at the apex. Column and anther are white (Fig. 116.20). Scent is unpleasant (Holttum 1964).

Vanda furva (L.) Lind. [syn. *Vanda lindenii* Rchb. f.]

Related to the Bornean *V. scandens*, *Vanda furva* is a medium size epiphyte distributed in Mindanao, Palawan, Maluku and Papuasia from sea level to 500 m in sunny locations (Cootes 2011). Stem is erect, 50 cm tall, bearing leathery, strap leaves, 25 × 2 cm. Inflorescence is up to 15 cm, bearing six scented, yellow and brown flowers, 6 cm across. Sepals and petals are spathulate, undulate, yellow with brown spots and blotches at the centre. Lip is 3-lobed; side lobes are ovate, erect, porrect, white, with purple spots at the front and inner surfaces (Fig. 116.21). Midlobe is spurred, fleshy, thick, boat-shaped, white, with purple markings above, green on the undersurface. A pair of white, finger-like, curved, upward pointing, hirsute lobules projects from the side of the mesochile (Fig. 116.22). It flowers throughout the year with peaks from September to November and January to February (O'Byrne 2001).

Fig. 116.21 *Vanda furva* (L.) Lind. [syn. *V. lindenii* Rchb. f.; *V, mindanaoensis* Motes, L.M.Gardiner,& D.L.Roberts]. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.22 *Vanda furva* (L.) Lind. [syn. *V. lindenii* Rchb. f.; *V, mindanaoensis* Motes, L.M.Gardiner & D.L.Roberts]. (© Teoh Eng Soon 2021. All Rights Reserved)

Vanda hastifera Rchb.f.

Vanda hastifera is endemic to Borneo where it grows as a sun-loving epiphyte in mangrove, lowland, coastal and hill forests (Beaman et al. 2001). Plant is large, stems over 1 m, branching, slim, pendulous, leggy, leaves short and thin for *Vanda*, recurved, bilobed and pointed at the tips. [The species name refers to this pointed tip of the leaves rather than to any characteristic of the flowers: from Latin *hastifer*, carrying a lance-head (Mayr 1998).] Inflorescence bears a few fragrant, yellow and brown flowers, 5 cm across. Sepals are spathulate, golden yellow, streaked with reddish brown at the centre; dorsal sepal is erect, lateral sepals spreading, recurved at the apex. Petals are spathulate, undulate, spreading, golden yellow streaked with reddish brown at the centre. Lip is 3-lobed; side lobes are erect, white. Midlobe is divided into three rounded lobules, the basal pair white and the apical lobe yellow with a central orange crest. Midsection of the lip is bordered by spikey, white cilia (Fig. 116.23).

It flowers from November to June with a peak from March to May (O'Byrne 2011) or 'almost continuously' (Grove 1995) in cultivation.

Fig. 116.23 *Vanda hastifera* Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

Vanda hindsii Lindl.

Vanda hindsii is distributed in Papua New Guinea, Solomon Island and Queensland, epiphytic or saxicolous in the lowlands. The species is widespread in Papua New Guinea (O'Byrne 1994). Plant is large. Inflorescence bears 5 - 12 fragrant, long-lasting, brownish flowers, 3 - 4.5 cm across (Fig. 116.24). Sepals and petals are of equal size, spathulate, undulate, spreading (the petals horizontal), each with eight irregular brown stripes over a white base, the stripes turning to maroon towards the apex. Lip is 3-lobed.

Vanda insignis Bl.

Vanda insignis occurs at sea level in Nusa Tenggara (Sunda Islands) and Timor. Habitus is similar to *Vanda tricolor*. Inflorescence is axillary, upright, rachis crowded with 8 - 10 orange and pink flowers with thick texture, 6 - 7 cm across whose segments are not overlapping. Sepals and petals are ovate, margins folded backwards at the bottom half causing that part to be narrowed. Lateral sepals are broader than the other segments; margins of petals undulate. Colour is evenly orange or brown throughout the sepals and petals, and they are spotted with maroon or a darker brown. Lip is 3-lobed; side lobes are semi-erect, white. Midlobe is large, cupped, deeply convex, pink with two white side lobules at the base (Figs. 116.25 and 116.26). Flowering is variable. In Singapore it has been observed to flower in January, April, August, September and December, with a peak in December.

The species is unmistakable. *Vanda insignis* is a parent of *Paravanda* Josephine van Brero

Fig. 116.25 *Vanda insignis* Bl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.24 *Vanda hindsii* LIndl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.26 *Vanda insignis* Bl. (© Teoh Eng Soon 2021. All Rights Reserved)

(*Pvda*. JVB), which led to *Pvda*. Tan Chay Yan, a numerous award-winning hybrid that rekindled a widespread interest in orchid cultivation throughout Southeast Asia after WWII. *Paravanda* JVB is an outstanding parent with numerous beautiful progeny.

Vanda jennae O'Byrne & Vermeulen

Vanda jennae is endemic to central Sulawesi, occurring in a dry, grassy valley at 1000 - 1200 m, epiphytic on low scrubland trees. Inflorescence is 20 cm tall and bears 5 - 8 candy-striped, slightly fragrant flowers 4.5 - 5.5 cm across. Sepals and petals are spathulate, ivory white, with eight crimson, longitudinal broken stripes. Petals are undulate and curved downwards. Lip is 3-lobed, side lobes are erect, white; midlobe is oblong, narrow, white, with faint crimson stripes and a semicircular greenish white expansion at the apex (Fig. 116.27). 'The lip is highly mobile and wobbles in every breeze' (O'Byrne 2011). It flowers from February to October with a peak from May to July (O'Byrne 2011).

Vanda lamellata Lindl.

Vanda lamellata is distributed from Ryukyu Islands to Taiwan, Borneo, the Philippines and the Marianas, occurring from coastal cliffs to 300 m. Plants are medium size. Stems are 20 - 40 cm tall, leaves oblong, recurred, folded, leathery, 15 - 25 × 1.5 - 2 cm. They have a tendency to form large clumps, and each stem may bear up to eight erect inflorescences, many with 18 - 25 white, ivory or yellow flowers marked with crimson spots or brown stripes on the lateral sepals. Lip is pink to crimson. Flowers are 3 cm across and long-lasting. Plants flower throughout the year with peak flowering from November to January in the Philippines (Valmayor and Baldovino 1984)

The common form is yellow and brown (Fig. 116.28).

Fig. 116.27 *Vanda jennae* O'Byrne & Vermeulen. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.28 *Vanda lamellata Lindl.* (© Teoh Eng Soon 2021. All Rights Reserved)

Vanda lamellata var. boxalii Rchb.f.

Flowers of variety *boxalii* are ivory white or cream, and lateral sepals are marked with dark brown. Lip is rose purple. Inflorescence of this beautiful variety is erect and may carry up to 40 flowers (Fig. 116.29). Peak flowering season is November to March, but var. *boxalii* flowers several times throughout the year. Plants are larger and narrower than those of the common form (Valmayor and Baldovino 1984). The variety occurs in southern Taiwan and in Zambales Province in Luzon at 1000 m (Cootes 2001).

Fig. 116.29 *V. lamellata* var. *boxalii* Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

Vanda lamellata var. *remediosae* Ames & Quisumb.

This is another beautiful variety with white flowers that are diffusely spotted with crimson over the base of the petals and more densely spotted and striped with crimson on the inner half of the lateral sepals. Lip is 3-lobed; side lobes are erect, white on the lateral surface, light pink on the inner surface. Midlobe is spathulate, apex bending upwards, white at the base, pink or light purple over the distal half and with three white keels (Fig. 116.30). It is a lowland epiphyte occurring from sea level to 300 m in the Sulu Archipelago of the Philippines (Cootes 2001). It flowers several times a year (Valmayor and Baldovino 1984).

Vanda limbata Bl.

Vanda limbata is distributed in Java, Madura, Nusa Tenggara, Sulawesi and the Philippines from sea level to 700 m (Valmayor and Baldovino 1984; O'Byrne 2001, 2011; Handoyo 2010). It is

Fig. 116.30 *Vanda lamelllata* var. *remediosae* Ames & Quisumb. (© Teoh Eng Soon 2021. All Rights Reserved)

a variable species. Plants are medium-sized, stems up to 1 m, 2 cm in diameter, freely branching with oblong, elliptic, centrally grooved, coriaceous leaves, 20 × 1.6 - 2 cm. Plants from Java, Madura and Nusa Tenggara bear semi-erect inflorescences with a slightly zigzag rachis that carries 12 - 15 flowers, 3 - 4 cm across, appearing laxly arranged due to their extremely long, slim ovaries. Flowers are of good shape, sepals and petals spathulate, spreading, orange to brown with a thin line of yellow at the margins (Fig. 116.31) and lightly tessellated, or they may be heavily spotted (Fig. 116.32). Lip is porrect, 3-lobed; side lobes are erect, cupped. Midlobe is pale mauve; oval, convex; apex rhomboid, elevated at the centre, laterally decurved.

Inflorescence of plants from the Philippines are paniculate, 15 - 25 cm long, and carry 25 - 30 red flowers, 3 - 4 cm across. Lip is lilac to mauve (Figs. 116.31, 116.32, and 116.33). The lip form is characteristic in all varieties. A cuboid callus is present between the two side lobes (Fig. 116.32). *Vanda limbata* flowers from July to August in Java and in June in the Philippines (Grove 1995).

Fig. 116.31 *Vanda limbata* Bl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.32 *Vanda limbata* Bl., spotted variety from Java. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.33 *Vanda limbata* Bl., Philippine variety. (© Teoh Eng Soon 2021. All Rights Reserved)

Vanda lindenii* Rchb.f.** (see ***Vanda furva)

Vanda lombokensis J.J.Sm

Vanda lombokensis is a newly rediscovered species from Lombok Island located east of Java and Bali. It was introduced into England from Alor which is some 900 km east of Lombok (Cooper 1942) shortly before WWII. In June 1942, *V. lombokensis* 'Virginia Courtauld' received a First Class Certificate from the Royal Horticultural Society; flowers were 8.5 cm across (Anonymous 1942). Plant is medium size to large with narrow, deeply wedged, recurved leaves, 24 - 30 × 2 cm, praemorse and finely dentate at the tips. It is a variable species with 11 colour forms (Sudirman 2019) with most having a leopard pattern of spots on the sepals and petals that coalesce into irregular blotches towards the apex in a few. Inflorescence is upright, scape zigzag, bearing 8 - 10 laxly arranged, yellow, heavily brown-spotted flowers, 7.5 cm across (Figs. 116.34, 116.35, 116.36, 116.37, 116.38 and 116.39). Sepals and petals are ovate, spreading. Margins of dorsal sepal and petals are reflexed over the lower half, undulate on the upper half. Whereas *V. lombokensis* can be placed in the *V. tricolor* group, petals of most plants are not twisted, but an occasional plant may have the petals bending slightly downwards at the distal third. Lower sepals are wide; edges crisped sometimes undulate over the upper margin. Lip is 3-lobed; side lobes are small, triangular, spreading, white. Midlobe has two white or cream-coloured, cordate side lobes extending from the mesochile. Epichile is orbicular, together with central mesochile; it is pyriform. Over this pear-shaped area, it is white with red spots or green with red spots. Column is white with a pair of characteristic hemispherical, red projections beside the foot. Anther cap is white.

Fig. 116.34 *Vanda lombokensis* J.J.Sm. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.35 *Vanda lombokensis* J.J.Sm. a typical form. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.36 *Vanda lombokensis* J.J.Sm. side view of flower. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.37 *Vanda lombokensis* J.J.Sm. With green lip finely spotted with brown. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.38 *Vanda lombokensis* J.J.Sm. (© Teoh Eng Soon 2021. All Rights Reserved). Sepals and petals are covered with large, maroon blotches

Vanda luzonica Loher ex Rolfe

Vanda luzonica is a medium size to large epiphyte distributed in Bulacan, Rizal and Zambales provinces in Luzon, Philippines, at 500 m. Volcanic eruptions destroyed many of this once-

Fig. 116.39 *Vanda lombokensis* J.J.Sm. or perhaps a natural hybrid. (© Teoh Eng Soon 2021. All Rights Reserved)

common, attractive species on Mount Pinatubo in 1991 (Cootes 2001). Stems are up to 1.5 m long, erect, then pendulous, branching. Leaves are distichous, leathery, decurved, 25 - 40 × 2 - 3 cm. Inflorescence is axillary, racemose, semi-erect, bearing up to 12 waxy, white flowers, 4 - 6 cm across with purple blotches near the apices of the tepals. Sepals and petals are ovate, spathulate, spreading, flat in one vertical plane, in some clones with only a narrow gap in between. Lip is 3-lobed, deep purple. Side lobes are small, erect, white. Midlobe is broad and round at the base, narrower and rectangular over the apex, purple with three white keels (Figs. 116.40 and 116.41). Plants flower at various times throughout the year, in January, March, April, November and December (Valmayor and Baldovino 1984).

Vanda mariae Motes

Vanda mariae is a small epiphytic species occurring only in Mindanao (Philippines) and recently described by Martin Motes who named it after Mary Motes (Motes 2016). Plant is 18 - 40 cm tall, stem initially erect, becoming pendent as it elongates, with distichous, strap leaves, 16 - 18 × 1.4 cm which are curved and deeply

Fig. 116.40 *Vanda luzonica* Loher ex Rolfe. (© Teoh Eng Soon 2021. All Rights Reserved)

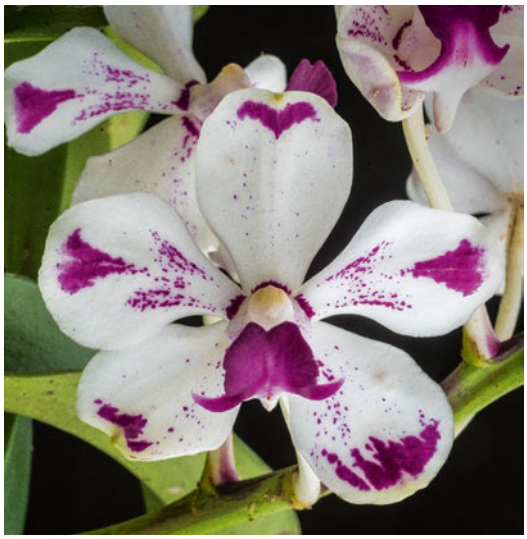

Fig. 116.41 *Vanda luzonica* Loher ex Rolfe. (© Teoh Eng Soon 2021. All Rights Reserved)

channelled. Numerous offshoots are produced near the base when the main stem is still short. Inflorescence is axillary, racemose, numerous, 15 cm long with 6 - 9 small red flowers, laxly spaced. Flowers are 2.5 cm across. Sepals are spathulate, spreading; bases of lateral sepals are decurved and narrowed at the base, yellow with streaks of red which coalesce at the distal half to form a large red patch surrounded by a rim of yellow. Petals are spathulate, falcate, spreading, undulate at the apex and similarly coloured. Lip is 3-lobed, porrect, spurred; side lobes are erect, obliquely diverging, triangular, white. Midlobe is glabrous, yellow with four brown stripes at the broad, ovate mesochile. Epichile is flexed at the base, narrower than the mesochile, and divided by a cleft into 2 globose, chocolate brown lobules (Fig. 116.42). Basal calli are paired, prominent, glabrous, white or yellow (Figs. 116.43 and 116.44).

Vanda merrillii Ames & Quisumb.

Vanda merrillii is endemic to the Philippines, epiphytic around 500 m in the provinces of Aurora, Nueva Ecija and Quezon in Luzon and Negros in the Visayas (Cootes 2001). Plants are up to 1.5 m tall, leggy with age, otherwise with distichous, oblong, leathery leaves, 30 × 3 cm. Inflorescence is axillary, racemose, laxly several (7 - 11) flowered. Flowers are waxy (as though lacquered), thick, fragrant in some clones, 4 cm across. Flowers are white at the back, vermillion

Fig. 116.42 *Vanda mariae* Motes. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.43 *Vanda mariae* Motes. Lip detail. (© Teoh Eng Soon 2021. All Rights Reserved)

spotted or solid red to brown in front (Figs. 116.45 and 116.46). Sepals and petals are spathulate, with undulate margins; dorsal sepal and petals are reflexed and narrowed at the bottom half. Lip is 3-lobed. Lateral lobes are erect, ovate, white. Midlobe is porrect, wide at the basal half, with a pair of semicircular extensions at the side. The distal portion is narrow, rectangular, flat or rounded at the apex. Lip is yellow with four brown keels at the base (Fig. 116.46): in solid brown flowers, the apical portion of the lip is pink (Fig. 116.45). Flowering season is April (Davis and Steiner 1952).

Fig. 116.45 *Vanda merrillii* Ames & Quisumb. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.44 *Vanda mariae* Motes. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.46 *Vanda merrillii* Ames & Quisumb. (© Teoh Eng Soon 2021. All Rights Reserved)

There are two varieties: *Vanda merrillii* var. *immaculata* has yellow flowers devoid of markings, and flowers are slightly larger than the standard type. *Vanda merrillii* var. *rotori* (Fig. 116.46) also lacks bars and blotches: its tepals are oxblood red and midlobe is red (Grove 1995).

Vanda mindanaoensis Motes, L.M.Gardiner & D.L.Roberts

Vanda mindanaoensis is a medium size, epiphytic species occurring in southern Mindanao growing at sea level to 500 m. Recently described as a distinct species by Motes, Gardiner and Roberts, it had hitherto been regarded as *V. scandens* (see below), a Bornean species (Holttum 1964; O'Byrne 2011) that also occurs in Palawan and Mindanao (Cootes 2001). Motes, Gardiner and Roberts, when they described *Vanda mindanaoensis*, observed an affinity to *Vanda lindenii* Rchb.f., but they stated that it differed in having a labellum with 'hirsute, curved lobules and red side lobes'. They did not compare it with *Vanda scandens* which has hirsute, curved lobules and red marking on the lip. Inflorescence is erect bearing 7 - 8 waxy, yellow, brown-spotted flowers, 2.4 cm across. Base colour is pale yellow, overlaid with scattered, tiny, irregular orange-brown spots that merge into a brown patch at the apex, this being most prominent in the lateral sepals (Fig. 116.47). Dorsal sepal is spathulate, basal half decurved, distal half undulate, bending forwards, convex apex horizontal, tip sometimes pointing downwards. Lateral sepals are broader than the dorsal, convex, falcate, apex turning forwards, margins undulate. Petals are slightly smaller than the lateral sepals, spathulate, spreading horizontal. Lip is trilobed, fleshy, saccate. Side lobes are erect, semicircular, white marked with maroon along the distal curvature with short, thi maroon stripes descending from the coloured ridge along the medial surface. Midlobe is thick and fleshy, rhomboid, pale green with 3 maroon ridges. A small, white finger-like, papilose extension flares out from the mesochile and the papillae stretches a third of the distance along he lower margin of the lip. The rest of the lip is smooth. Sac is narrow and pink on the outside. Column is short, yellow: anther cap yellow.

Fig. 116.47 *Vanda mindanaoensis* Motes, L.M.Gardiner & D.L.Roberts(© Teoh Eng Soon 2022)

Vanda perplexa Motes & Roberts

Originally described by Blume incorrectly as *Vanda furva* in 1835, the species remains in cultivation, but no data is available on its habitat or origin until very recently. It was recently recognized as a distinct species and named *Vanda perplexa* in reference to its provenance (O'Byrne 2011). Martin Motes and D.L. Roberts subsequently reported that it is native to the Lesser Sunda Islands, and it is the commonest orchid species in Komodo National Park (Motes and Roberts 2013). Inflorescence is 15 - 30 cm long with up to 18 fragrant, orange-coloured flowers, 3.5 cm across, with a lilac lip. Dorsal sepal and petals are spathulate, reflexed and narrowed at the basal half and undulate at the upper half, orange to brown with a thin pale yellow border. Lateral sepals are wider, margin regular, similarly coloured. Lip is long, campanulate, pink-to-pale mauve (Fig. 116.48). It flowers from May to December with a peak from August to October (O'Byrne 2011).

Vanda roeblingiana Rolfe

Vanda roeblingiana is a distinctive species endemic to Luzon in the Philippines, occurring as epiphyte commonly on oak in Baguio, Bangui and Bontoc at 1600 m. Plants are 40 - 70 cm tall with leathery leaves, 20 - 30 × 3 - 4 cm. Inflorescence is racemose bearing up to 15 sometimes fragrant flowers, 4 - 5 cm across. Sepals and petals are spathulate, spreading, pale yellow or cream, heavily marked with reddish brown spots and blotches but leaving a thin border of yellow at the margins. Lip is unique: 3-lobed; side lobes are very small, erect, white. Midlobe is long; basochile is white, widened into a pair of triangular extensions at the side. Mesochile is oblong reddish brown with three white keels. Epichile fans out on both sides simulating the wings of a bird, yellow veins dividing it into ten or more narrow, reddish brown, contiguous strips, uppermost and lowermost strips falcate, margin crenulate. Column and anther cap are white (Fig. 116.49).

Main flowering season is August to September. Some plants may flower in April to May (Valmayor and Baldovino 1984)

Vanda sanderiana Rchb.f. (syn. *Euanthe sanderiana* Schltr.)

Vanda sanderiana is endemic to the Philippines occurring as epiphyte in dipterocarp forests at low to medium altitudes seldom above 500 m in Davao, Cotabato and Zamboanga provinces (Valmayor and Baldovino 1984). The local name is 'waling-waling', alluding to a moth in flight. Stem is 25 - 100 cm tall with recurved, coriaceous leaves, 25 - 40 × 2 - 3 cm. Inflorescence is axillary, erect, racemose bearing 7 - 10 flat, round flowers, 6 - 10 cm across, crowded on a scape 20 cm long. Dorsal sepal and petals are ovate, mauve or off-white with small, oval-shaped, brown spots at the base. Lateral sepals are larger, obovate, light greenish yellow marked with brown or purple reticulations. Lip is small,

Fig. 116.48 *Vanda perplexa* Motes & Roberts. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.49 *Vanda roeblingiana* Rolfe. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.50 *Vanda sanderiana* Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

3-lobed; side lobes are erect, green. Midlobe is fleshy, inflated at the base into a balloon-shaped structure, rounded at the sides, brown with three dark brown (almost black) longitudinal ridges at the centre and crenate at the apex. Column is very short (Fig. 116.50). Flowering season is August to September. Flowers last for 5 - 7 weeks (Davis and Steiner 1952).

Flowers of *V. sanderiana* are the largest in the genus. They are also flat, and in good clones sepals and petals are overlapping. They are long-lasting. Plants are robust. For all these reasons, breeders employ *Vanda sanderiana* to improve the form and size of their projected hybrids.

Vanda sanderiana was placed in a monotypic genus, *Euanthe*, by Rudolf Schlechter in 1914 because its distinct lip does not have a spur. Use of the name *Euanthe sanderiana* was supported by Holttum (1964) and Cootes (2001). However, DNA studies using RAPD technology found a 50.2% genetic similarity between *Euanthe sanderiana* and strap-leaf *Vanda*, the latter averaging 56% similarity when compared between species of the same leaf type, whereas with terete leaf *Vanda* (now reclassified as *Papilionanthe*), similarity averaged 44.6% (Lim et al. 1999). Chromosome homology (Kamemoto and Shindo 1964) and the ease with which *V. sanderiana* hybrids with other strap leaf *Vanda* are carried into numerous generations justify the placement of the species in the genus *Vanda*. This is recognized by Kew.

Vanda sanderiana var. *albata* (Rchb.f.) Rchb.f.

Flowers of the alba form are smaller than those of the type. Dorsal sepal and petals are white with greenish markings at the base. Lateral sepals are green or yellowish green. Lip is a green, colour intensifying towards the apex (Fig. 116.51).

Fig. 116.51 *Vanda sanderiana* var. *albata* (Rchb.f.) Rchb.f. (© Teoh Eng Soon 2021. All Rights Reserved)

Vanda scandens Holtt

Vanda scandens is distributed in northeastern Borneo (Beaman et al. 2001; O'Byrne 2011) and also recorded in Palawan and Mindanao). In Sabah and Sarawak, it occurs as epiphyte in limestone hills at 90 m (Beaman et al. 2001). The species is closely related to *Vanda hastifera* (Holttum 1964).

Stem is up to 1.5 m, erect, then pendulous, with leathery leaves, 150 × 2.5 cm. Inflorescence is 10 - 12 cm long bearing 5 - 7 yellow-brown flowers 3 - 3.8 cm across, laxly arranged. Sepals and petals are spathulate, undulate, spreading, convex, yellow, marked with brown spots, stripes and blotches. Lateral sepals and petals are curved downwards. Lip is 3-lobed; side lobes are small, erect, white, with fine purple spots on the inner surface. Midlobe is porrect, spurred, oblong, fleshy, white at the base turning to greenish yellow at the apex and marked by with two purple, longitudinal lines at the centre. A pair of thin, horn-shaped, papillose, white extensions from the upper margin of the midlobe is a distinguishing characteristic of *V. scandens* (Cootes 2001) (Fig. 116.52). Plant may flower anytime during the year but peak flowering is from June to August (O'Byrne 2011).

Vanda sumatrana Schltr.

Vanda sumatrana is endemic in Sumatra occurring at 300 - 1000 m (Comber 2001). Plant is large, stem 75 × 1.5 cm with strap, decurved, unequally bilobed, coriaceous leaves, 35 × 5 cm. Inflorescence is erect, up to 15 cm, with 5 - 10 fragrant, brown and yellow flowers, 6 - 7 cm across. Sepals and petals are spathulate, rounded at the apices, brown, edged in yellow; lateral sepals and petals undulate. Lip is 3-lobed. Side lobes are small, white. Midlobe is yellow, sometimes orange, porrect, with two basal, lanceolate lobules. Central-apical portion of midlobe is circular, with three purple keels at the base (Fig. 116.53).

Fig. 116.52 *Vanda scandens* Holtt. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.53 *Vanda sumatrana* Schltr. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.54 *Vanda tessellata* (Roxb.) Hook. ex G.Don. (© Teoh Eng Soon 2021. All Rights Reserved). line bred to desired form and coour in Bangkok

Vanda tessellata (Roxb.) Hook. ex G.Don (syn. V. roxburghii R. Br.)

Vanda tessellata is distributed from Indian and Chinese Himalaya, Nepal, Bangladesh, and Myanmar to Sri Lanka, occurring in evergreen forests at 300 - 500 m. Plants are medium size; stems are erect, to 80 cm tall, branching, with narrow decurved, coriaceous leaves, 7.5 - 10 × 1 - 1.2 cm. Inflorescence is erect, bearing 5 - 12, well-displayed, very fragrant flowers, 5 - 7 cm across. This is a variable species with some variation in the shape of the sepals and petals, a wide range of colours (grey, white, cream, yellow, brown and red), with tessellations or without (Figs. 116.54, 116.55, 116.56 and 116.57). Sepals and petals are spathulate, undulate, spreading, lateral sepals broader than the rest. Lip is 3-lobed; side lobes are erect, white, streaked with thin purple lines on the inner surface. Midlobe is ovate, convex, purple with three long and two short white keels and a narrowed extension at the apex. Peak flowering occurs September to November, the season extending to May (O'Byrne 2001).

Fig. 116.55 *Vanda tessellata* (Roxb.) Hook. ex G.Don, yellow form. (© Teoh Eng Soon 2021. All Rights Reserved)

Vanda tricolor Lindl.

Vanda tricolor today is a variable species with regard to shape and colour of the flowers. It is constituted by what was formerly regarded as

Fig. 116.56 *Vanda tessellata* (Roxb.) Hook. ex G.Don. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.57 *Vanda tessellata* (Roxb.) Hook. ex G.Don. (© Teoh Eng Soon 2021. All Rights Reserved)

two species, *Vanda tricolor* and *Vanda suavis*, each with several varieties. The World Checklist of Selected Plant Families (WCSP) does not assign distinct species status to *Vanda suavis*: it includes it as a variety of *Vanda tricolor*. WCSP also lists many varieties that have been shown and recorded, but it regards them as synonyms for either var. *tricolor* or var. *suavis*. Since several of the latter varieties are being grown and exhibited, and some may form distinct breeding lineages, it is worthwhile to describe them. To simplify the classification, the secondary subdivisions are downgraded to 'forma' (f.).

Vanda tricolor Lindl. var. *tricolor*

Vanda tricolor is a variable species, endemic to Indonesia, occurring as epiphyte in damp, evergreen forests from 700 to 1600 m in Java and Bali. Formerly, it was often found growing on trees at the edge of tea plantations in Java (Comber 1990). Whereas *V. tricolor* is now widespread in cultivation, wild populations in Java and Bali are small and fragmented (O'Byrne 2001; Gardiner 2007). The orchid is pollinated by *Xylocopa latipes* (a Carpenter bee species). At Mount Merapi National Park, 14 insect species belonging to four orders were observed to visit the flowers, but only the *Xylocopa* was found with pollen (Kusumastianto et al. 2015). Conservation efforts are being made by self-pollinating the wild species and improving in vitro germination and culture (Dwiyani et al. 2012; Rineksane and Sukarjan 2015).

A detailed DNA study of 34 specimens with known geographic origin collected from four Indonesian Botanical Gardens suggests that *V. tricolor* originated in West and Central Java before spreading to East Java and Bali, such events occurring two and half million to one and half million years ago (Gardiner 2007). The symmetrical *V. tricolor* (Figs. 116.58, 116.59, 116.60 and 116.61) should therefore be closer to its primitive ancestor than var. *suavis* (Figs. 116.1, 116.62, 116.63, 116.64, 116.65, 116.66, 116.67, 116.68, 116.69, 116.70 and 116.71).

Fig. 116.58 *Vanda tricolor* Lindl. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.59 *Vanda tricolor* Lindl. [From: Linden, J.J., *Lindenia*, *Iconography of orchids*, vol.6: t. 396 (1893), artist: A Goossens; as *Vanda tricolor* Lindl.] Courtesy of plantillustrations.org and Missouri Botanic Gardens

Fig. 116.60. *Vanda tricolor* var. *planilabris* [From: Linden, J.J., *Lindenia*, *Iconography of orchids*, vol. 4: t. 167 (1892) as *Vanda tricolor* Lindl. artist P. de Pannemaeker] Courtesy of plantillustrations.org and Missouri Botanic Gardens

Flower form is variable in the species. DNA analysis of seven plants grown from seed obtained by self-pollination of a *V. tricolor* var. *suavis* showed a genetic similarity that ranged from 0.4 to 0.8 (Wibisono et al. 2018): a value of 1 indicating homogeneity or the least genetic variation. A heterozygous parent and epigenetic factors associated with in vitro culture could possibly contribute to the genetic variation among the seven plants. *Vanda tricolor* var. *suavis* 'Sanderae' bore exceptionally large flowers that measured 7.4 cm in height and 8.0 cm across, whereas flowers of standard *V. tricolor suavis* are 5 - 6 cm across, and flowers of *V. tricolor* var. *tricolor* are even smaller (Oeij 1940, reporting from Soekaboemi, Java).

Plant is large, stem to 1.5 m tall, branching, bearing coriaceous, well-spaced, recurved, praemorse leaves, up to 40 × 4 cm. Inflorescence is axillary, up 25 cm long, rachis zigzag, bearing 6 - 10 sweet-scented flowers, 5 - 6 cm across, with base colours of white, cream or yellow heavily spotted with chocolate brown. Lip is purple. All flowers open together (Figs. 116.1, 116.58, 116.59, 116.60, 116.61, 116.62, 116.63, 116.64, 116.65, 116.66, 116.67, 116.68, 116.69, 116.70, and 116.71). Dorsal sepal is spathulate, bottom half maximally decurved, leaving less than a fifth of its width visible in front: heavily spotted at the centre with a clear unspotted strip along the margin. Lateral sepals are broader than the dorsal sepal or petals, ovate, falcate, narrow towards the base, convex, margin slightly undulate, spotted with dark chocolate. Petal is fan-shaped, twisted at the base so that the front spotted surface faces downwards, and the white posterior surface is visible from the front. Apical margins of the petals are undulate. Lip is 3-lobed. Side lobes are small, erect, white or yellow. Midlobe is wide at the base, with four lobules, a pair of semicircular lobules at the mesochile, with the epichile divided into two rounded lobules. In some strains, the lateral margins of the midlobe are reflexed, and the lip is narrowed (Fig. 116.63). Midlobe is white at the base, purple over the distal half and with three white, longitudinal lines along the centre.

Vanda tricolor commonly produces side shoots at the bottom and lower portions of the main stem. A well-grown, specimen plant flowering simultaneously from all the numerous leads is an unforgettable sight (Fig. 116.1). The species exists in numerous forms which were assigned varietal names during the nineteenth century, varieties *suavis, planilabris, insignis, pallens, partensonii, praetexta, russeliana, superba* and *warneri*, to which more were added in the twentieth century, varieties *purpurea, pallida, flava* and Eastonii (Anonymous 1937). Illustrations of varieties made during the nineteenth century can be matched to existing clones in cultivation today (Figs.116.59, 116.60, and 116.61; 116.66, 116.67, 116.68 and 116.69). *Vanda tricolor* and *V. tricolor* var. *suavis* were sent to Europe by Thomas Lobb who discovered the plants in Java in 1846 (Arnold 1940).

Fig. 116.61 *Vanda tricolor* f. *planilabris*. (© Teoh Eng Soon 2021. All Rights Reserved). The distal third of the lip is downturned and of a paler colour than the upper portion. The flower form and lip pattern is as illustrated by Comber (1990) who had an unrivalled familiarity with the orchids of Indonesia

Vanda tricolor var. *tricolor* f. *planilabris*

This variety was described and illustrated by J.J. Linden in 1892 and 1893, but the varietal name is currently not accepted by Kew. It is a popular, attractive form that is widely cultivated today. It flowers better in the lowlands than var. *suavis*.

Flowers are round, but tepals are spathulate, undulate, reflexed and very narrow at the basal half: they do not overlap. Colour is brilliant, commonly yellow overlaid with irregularly shaped, brown to maroon spots. The spots are fine in some flowers; in others they are coarse. Petals are twisted through 90 degrees at the base, thus exposing the white posterior surface when viewed from the top. Lip is 3-lobed. Side lobes are circular, erect, white. Midlobe is flat (hence, Latin *planilabris*), broad, oblong, slightly narrowed at the mesochile, rounded beyond and with a broad, shallow cleft at the apex, purple striped with white at the base (Figs. 116.59, 116.60, and 116.61).

This form may be considered to typify *Vanda tricolor* var. *tricolor* which is native to West Java. It is distinct from *Vanda tricolor* var. *suavis* which occurs in East Java, Bali and Pulau Alor.

Vanda tricolor var. *suavis*

Fragrant *V. tricolor* var. *suavis,* the finest variety of the species, is distributed in East Java and Bali (also in Pulau Alor). The variety is variable, and there are several colour forms. Plants are similar to the type in habit, but they are larger up to 1.7 m tall when well grown, with leaves that are broader and more flat, unequally

Fig. 116.62 *Vanda tricolor* var. *sauvis* Lindl.[From: Cogniaux A, Goossens A: *Dictionaire iconographique des orchidees* (*1896 - 1907*) vol. 16: t.4; artist A. Goossens. as *Vanda suavis* Lindl.] Courtesy of plantillustrations.org and Missouri Botanic Gardens

Fig. 116.63 *Vanda tricolor* var. *suavis*. (© Teoh Eng Soon 2021. All Rights Reserved)

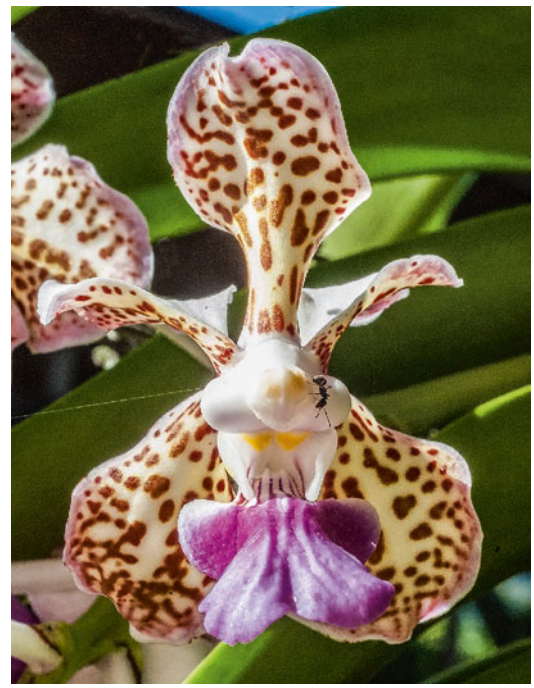

Fig. 116.64 *Vanda tricolor* var. *suavis.* (© Teoh Eng Soon 2021. All Rights Reserved) Note that the flaring wide lip is quite different from the narrow lip of the flower in Fig. 116.63. Compare with Fig. 116.65

bilobed at the apex (Galistan 1932; Arnold 1940). Inflorescence is stout, erect, produced freely from the base to the top, with 7 - 10 fragrant flowers or more, shorter than the leaves. Flowers are large, 6 - 8 cm tall, 5 - 7 cm across, with tepals narrowed at their lower half and speckled with distinct reddish brown spots on a white base. In some forms, the markings appear as lines at the base of the petals and sepals (Figs. 116.62 and 116.63), or the spots are replaced by brown streaks (Fig. 116.65). Petals are commonly twisted bringing the reverse white surface to the front. Lip is 3-lobed. Side lobes are small, erect, circular, white. Midlobe is divided into four lobules, and it has three keels running down the centre (Fig. 116.64). In some flowers, the midlobe is expanded at the mesochile by two semicircular flat lobules; it then narrows and turns abruptly downwards before fanning out into two lobules towards the apex. The apex is split into two lobules by a deep cleft, and it is paler than the rest of the midlobe which is crimson to dark purple (Figs. 116.67, 116.68 and 116.69).

Fig. 116.65 *Vanda tricolor* var. *suavis* Lindl. [From: van Houtte L.B, *Flore des serres et des jardin de l'Europe* (1845-1880) vol 15: (1862), as *Vanda suavis* var. *hrubyana*.] Courtesy of plantillustrations.org and Missouri Botanic Gardens

Although *V. tricolor* var. *suavis* occurs in nature at 900 – 1500 m, it grows and flowers well at sea level in dappled sunlight in the tropics. When fully mature, it reaches 2 m and bears numerous offshoots which flower simultaneously. The majority of hybrids made with *Vanda tricolor* were made with var. *suavis.*

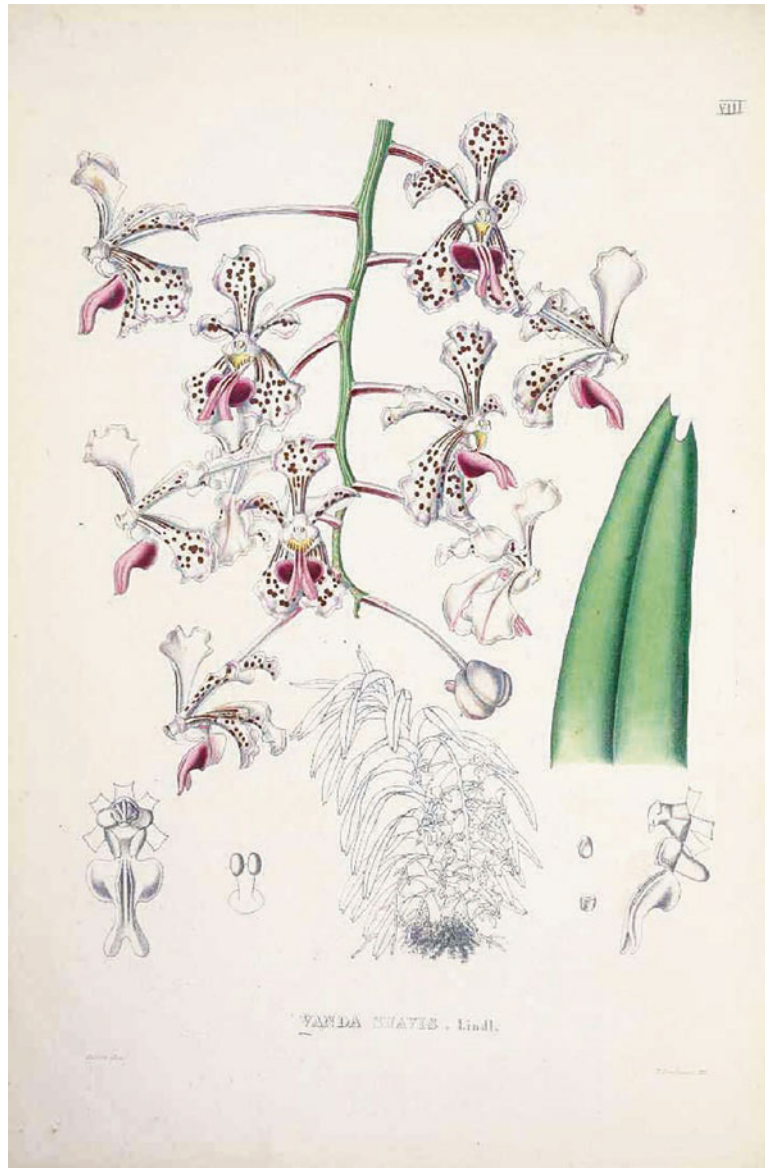

Fig. 116.66 *Vanda tricolor* var. *suavis.* [From: Linden, J.J., *Prescatorea* (1860), t. 8 as *Vanda suavis* Lindl.] Courtesy of plantillustrations.org and Missouri Botanic Gardens

Fig. 116.67 *Vanda tricolor* var. *suavis*. (© Teoh Eng Soon 2021. All Rights Reserved). Compare flowers with those in Fig. 116.66

Fig. 116.69 *Vanda tricolor* x f. *suavis*. (© Teoh Eng Soon 2021. All Rights Reserved). The distal third of the lip is downturned and of a paler colour than the upper portion. Compare with Fig. 116.68

Fig. 116.68 *Vanda tricolor* var. *suavis* [From: Miner H.S., *Orchids. The royal family of plants* (1885), t.20 (as *Vanda suavis*) Courtesy of plantillustrations.org and Missouri Botanic Gardens

Fig. 116.70 *Vanda tricolor* from Bali. (© Teoh Eng Soon 2021. All Rights Reserved). Compare with Fig. 116.71

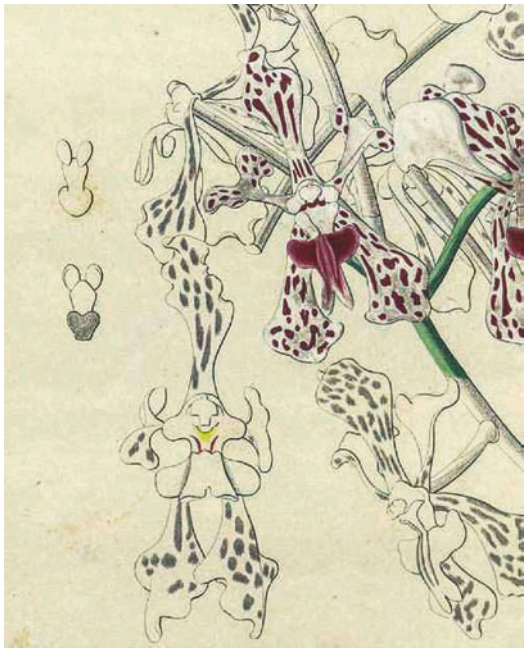

Fig. 116.71 *Vanda tricolor* var. *suavis* [From: Reichenbach H.G., Arnott G.A.W., *Xenia Orchidaceae* (1858 - 1900) Vol. 1: t.12, 1858] Courtesy of plantillustrations.org and Missouri Botanic Gardens

Vanda tricolor var. *suavis* f. *hrubhana* van Houtte

In this form, the brown markings on the sepals and petals appear as streaks rather than as spots (Fig. 116.65). Side lobes of the lip and basochile are white; epichile is broad and pink. The central keel extends as a tongue beyond the apex and bifurcates at the tip. Forma *hrubhana* was featured by L.B. van Houtte in 1862 in his *Flore des serres et des jardins de l'Europe* ,but it is rarely seen in cultivation today because the colour pattern is less attractive.

Vanda tricolor var. *suavis* from Bali

An unusual form of *Vanda tricolor* is cultivated by Ayub S, Permata at Cibodas in Java (Fig. 116.70). Plant is large. Inflorescence is horizontal bearing 13 flowers and 2 buds when the researcher saw it hanging high up beyond reach. Flowers were of standard size but narrowed from side to side, white with brown spots and a purple lip. Lateral sepals spread vertically downwards, their inner margins touching, margins undulate. H.G. Reichenbach and Arnott illustrated a plant in which the lateral sepals of some flowers extended vertically downwards parallel to each other (Fig. 116.71).

Vanda tricolor var. *suavis* f. *purpurea* (syn. *Vanda tricolor* f. *purpurea* Carr)

Native to Pulau Alor in East Nusa Tenggara, *V. tricolor* var. *purpurea* has a background suffused with rose-lilac towards the edges of the sepals and petals, the spotting a rich deep maroon. C.E. Carr reported that 'This plant was seen by Mr. (John) Laycock in the garden belonging to Heer Baumann, the District Officer. He was so struck with it that he caused some plants to be collected and shipped to Singapore where they are growing well. In 1930 I took eight plants to Kew where they are now established. This plant is quite the best proportioned and most beautifully coloured variety of *V, tricolor* Lindl. that I have seen' (Carr 1932).

In Carr's description, it is stated that stem is stout, up to 110 cm, 1.2 cm diameter with 14 linear-lorate leaves near the apex, 20 - 40 cm × 2.5 - 3.5 cm, yellow green with dull purple at the margins; apex unequally bilobed, toothed, sometimes with a larger tooth in the notch. Inflorescence is axillary, 15 cm, laxly five flowered. Flowers are widely expanded. Sepals and petals are spathulate, margins recurved, undulate: petals falcate, white, densely spotted maroon inside and suffused rose-lilac towards the white margins. Tepals are about 2.75 cm long; sepals 1.9 cm wide, petals 1.2 cm wide. Lip is 3-lobed, spurred, with two yellow, orange spots, hairy, cushion-like calli separated by a narrow groove at the base above entrance to the spur.

Side lobes are erect, slightly twisted and converging towards apex, quadrate, concave inside, convex outside, white, dotted with purple inside towards the anterior margin and towards the base. Midlobe is panduriform, recurved towards the apex. The apex is bilobed, lobes broad, rounded, bright rose-lilac with six short radiating purple streaks. Spur is at right angle to the blade of the lip, keeled on the back, cream, papillose and slightly hairy inside.

It is illustrated in J.J. Linden's, *Lindenia*, *Iconography of orchids*, vol.13: t. 587 (1897) as *Vanda suavis* var. *magnificens* (Fig. 116.72). A similar colour form, *V. tricolor* 'Vieques' distinguished by the unusual colouring of its flowers received an Award of Merit from the American Orchid Society in 1982 (Grove 1995).

Vanda tricolor var. *suavis* f. *flava* [*Vanda tricolor* sub. var. *flava* (Lindl.) A.H.Kent]

This yellow form also lacks the ability to produce anthocyanin in its flowers (Fig. 116.73). Sepals and petals are pale lemon yellow overlaid with pale brown spots. Lip, column, anther cap and posterior surface of the tepals are white.

Fig. 116.72 *Vanda tricolor* var.*purpurea* Carr. [From: Linden, J.J., *Lindenia*, *Iconography of orchids*, vol.13: t. 587 (1897) as *Vanda suavis* var. *magnificens*.] Courtesy of plantillustrations.org and Missouri Botanic Gardens

Vanda tricolor var. *suavis* f. 'Pallida'

'Pallida' is a form lacking anthocyanin in its flowers which are cream with yellow ochre spots on the sepals and petals. Lip is washout, pale blue with no trace of the deep purple or white markings (Fig. 116.74).

Vanda tricolor var. *suavis* f. Merapi

Attention should be drawn to this form of *V. tricolor* var. *suavis* because it is able to survive the occasional extraordinary high temperatures when hit by the pyroclastic flows resulting from eruptions of the volcano. This resistance to high temperature is conferred by a heat shock protein HSP70Vt which differs from HSP70 of other plant species in having a specific amino acid (Semiarti and Rozikin 2015). In the self-pollinated offsprings, *V. tricolor* 'Queen Maxima', the HSP70 has the amino acid super family PTZ00009 which is 87% similar to the HSP70 protein of *Phal. equestris* (Semiarti et al. 2020). It would be good if *Vanda h*ybrids could inherit this HSP70Vt to enable them to survive when they are occasionally unintentionally exposed to intense heat.

Fig. 116.73 *Vanda tricolor* f. *flava.* (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.74 *Vanda tricolor* f. *pallida*. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.75 *Vanda ustii* Golam, Claus. & de Mesa (syn. *Vanda luzonica* var. *immaculata*). (© Teoh Eng Soon 2021. All Rights Reserved)

Vanda ustii Golam, Claus. & de Mesa (syn. *Vanda luzonica* var. *immaculata*)

Vanda ustii is endemic to the Philippines occurring at 1250 m in Luzon. Plants are large with thick roots that may reach 3 m in length. Inflorescence is longer than the leaves and carry up to 12 fragrant, distinctively coloured flowers 4 - 5 cm across (O'Byrne 2011). Dorsal sepal and petals are spathulate, spreading, narrowed at the lower half through reflexed margins: petals are twisted at the base to face downwards. Lateral sepals are broad, ovate, falcate. Sepals and petals are cream. Lip is 3-lobed; side lobes are small, erect, white. Midlobe is porrect, large, obcordate, white with a pair of white keels at the base, and purple from the middle to the rounded apex (Figs. 116.75, 116.76 and 116.77). Flower may be as broad as it is tall or be slimmer from side to side (cf. Figs. 116.66 and 116.67), Flowering season is October to December (O'Byrne 2011), but in cultivation in Singapore, it has flowered in April and July.

Fig. 116.76 *Vanda ustii* Golam, Claus. & de Mesa (syn. *Vanda luzonica* var. *immaculata*). (© Teoh Eng Soon 2021. All Rights Reserved)

Vanda vietnamica (Haager) L.M Gard. (syn. *Christensonia vietnamica*)

Formerly regarded as a species in the monotypic genus *Christensonia*, it was transferred to *Vanda* when DNA studies in 2012 showed that it should be included in *Vanda*.

Vanda vietnamica is a lowland species growing in low montane deciduous forests in Vietnam. Plant is medium size, stem up to 30 cm tall, branching at the base, with close-set, dark green leathery leaves. Inflorescence is 12 cm long with eight yellowish green flowers that face all directions (Fig. 116.78). Sepals and petals are ovoid, spreading, with edges slightly folded backwards. Lip is 3-lobed, spurred; spur and side lobes are yellowish green; midlobe is white. Side lobes are erect, small, spathulate, recurved at the upper margin and fused to the column foot. Midlobe is narrowly ovate, white with yellowish green at the base, margin wide, elevated, reflexed and crenate

Fig. 116.78 *Vanda vietnamica* (Haager) L.M Gard. (syn. *Christensonia vietnamica*). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.77 *Vanda ustii* Golam, Claus. & de Mesa (syn. *Vanda luzonica* var. *immaculata*). (© Teoh Eng Soon 2021. All Rights Reserved). Flower is narrow from side to side

(Fig. 116.79). The base of the midlobe can be deflexed by the pollinator (Christenson 1994). It may flower throughout the year but mainly from May to August.

Hybrids

Going through the characteristics of the various *Vanda* species, it comes as no surprise that *Vanda coerulea* would be bred to *V. sanderiana*, using the former as the pod parent. Registered in 1931, the hybrid, *Vanda* Rothschildiana is outstanding and still compares favourably with advanced hybrids having the same two parents in the background. The cross has been repeated many times, and excellent *V.* Rothschildiana is readily available in the market (Fig. 116.80). It has been used to produce over 250 second-generation hybrids.

Fig. 116.79 *Vanda vietnamica* (Haager) L.M Gard. (syn. *Christensonia vietnamica*). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.80 *Vanda* Rothschildiana (*Vanda sander*iana x *V. coerulea*). (© Teoh Eng Soon 2021. All Rights Reserved

Hybridizers know that another way to improve on a species is to perform line-breeding, and this has been done for several *Vanda* species, including *V. coerulea, V. denisoniana, V. sanderiana* and *V. tessellata* in Thailand (Fig. 116.81).

Vanda coerulea has also been bred to *Vanda* hybrids with *V. coerulea* in their constitution: for example, *V.* Pakchong Blue (Fig. 116.82) has the tetraploid *V.* Doctor Anek as its pod parent and therefore has slightly over 50% *V. coerulea* in its make-up, a considerable amount of *V. sanderiana* and small amounts of *V. dearei*, *V. tricolor* and V. *luzonica*. In its background, there is *V.* Robert's Delight (Fig. 116.83). *Vanda* Golamco's Blue Magic (*V.* Gordon Dillon x *V. coerulea*) is made up of genes from the same spectrum of species as

Fig. 116.81 *Vanda sanderiana*, a line-bred plant. (© Teoh Eng Soon 2021. All Rights Reserved

Fig. 116.82 *Vanda* Pakchong Blue. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.83 *Vanda* Roberts Delight cv. Blue (*V.* Kasem's Delight x *V.* Madame Rattana. (© Teoh Eng Soon 2021. All Rights Reserved

Fig. 116.84 *Vanda* Golamco's Blue Magic. (© Teoh Eng Soon 2021. All Rights Reserved

V. Pakchong Blue, and their flowers are rather similar (Fig. 116.84). *Vanda* Chulee Classic is almost white with blue tessellations, and a mature plant has many flowers on a tall inflorescence (Fig. 116.85). *Vanda* Vandana Prakash (*Vanda* Chulee Classic x *V.* Bitz's Heartthrob) is another beautiful blue-purple (Fig. 116.86). All these hybrids rely on *Vanda coerulea* to produce their charm. *V.* Kulwadee Fragrance also employs *Vanda coerulea* ((nearly 22%) to add purple to its spotted, round flowers (Fig. 116.87)

Vanda sanderiana is another spectacular species admired for its large, round flowers, but it has three negative characteristics: Flowering is seasonal and the plant is large. That is why it is seldom seen in modest collections. Flowers are

Fig. 116.85 *Vanda* Chulee Classic (*V.* Chulee x *V.* Somsri Blue Classic). (© Teoh Eng Soon 2021. All Rights Reserved

Fig. 116.86 *Vanda* Vandana Prakash (*V.* Chulee Classic x *V.* Bitz's Heartthrob). (© Teoh Eng Soon 2021. All Rights Reserved

Fig. 116.87 *Vanda* Kulwadee Fragrance (*V.* Godon Dillon x *V.* Guo Chai Long). (© Teoh Eng Soon 2021. All Rights Reserved) The achievement here is the production of a very round flower and the purple spotting

not well spread out on the inflorescence, the latter not extending beyond the topmost leaves.

Breeding with *V. sanderiana* sought to overcome these negative aspects without losing the excellent features of the species. In the early period, this was all carried out in Hawaii. Primary hybrids of *V. sanderiana* were backcrossed to *V. sanderiana*, and the process continued until the percentage of *sanderiana* genes exceeded 75%, resulting in *V. sanderiana* look-alike with better inflorescence characteristics, brighter, clearer colours and full round form and an ability to bloom more than once a year. To give an example: *V.* Rothschildiana *x V. sanderiana* = *V.* Onomea, x *sanderiana* = *V.* Jennie Hashimoto (already 87.75% *sanderiana*), x *sanderiana* = *V.* Alicia Ono (93.75% *sanderiana*). These hybrids form the backbone of *V. sanderiana* crosses, and some of them are invariably present in the ancestry of excellent modern *Vanda* hybrids. The search for improvement is endless (Figs. 116.88 and 116.89), but breeders always need to know their pedigree and what they are looking for – be it cleaner colours, darker colours, new colours, better shape, more flowers, etc.

At the encouragement of Rapee Sagarik, Thai growers started growing *Vanda* by importing flasks and composts of the plants from Hawaii during the 1950s and sixties. By this time, they could employ two approaches, backcrossing to the desired species (e.g. *V. coerulea* or *V. sanderi-*

Fig. 116.88 *Vanda* Pimchai Beauty (*V.* Thanrak x *V.* Thong Chai). (© Teoh Eng Soon 2021. All Rights Reserved

Fig. 116.89 *Vanda* Udomsri (*V.* Thonglorsand x *V.* Alicia Ono). (© Teoh Eng Soon 2021. All Rights Reserved

ana) or by breeding with two hybrids that had the desirable species in their make-up. *Vanda* Lenavat (*V.* Joan Rothsand x *V. sanderiana*) is an example of the first approach: it is 75% *V. sanderiana. Vanda* Memoria Madame Pranerm (*V.* Waipuna x *V.* Eisenhower) is an example of the second approach (*V.* Waipuna being *V.* Ellen Noa x *V.* Eisenhower). Encouraged by such successes, Thai nurserymen have gone on to produce dozens of outstanding hybrids. They generally employed the second approach because sourcing for a perfect plant of a species that will breed well is difficult, and breeding one may take a very long time to achieve.

Pink and Red Vanda

The existence of pink forms of *Vanda coerulea* suggested that it was possible to produce large, round, pink or red *Vanda* through breeding or by mutation through mericloning. By the late 1980s, red forms of purplish hybrids were already beginning to appear, and over the years their numbers have increased (Fig. 116.90). The red colour is intensified by the presence of *Vanda curvifolia, V. luzonica* and *V tricolor* in their remote ancestry. Bright red (vermilion, Chinese red) can only be achieved by incorporating *V. curvifolia* or resorting to an intergeneric breeding to *Renanthera*; *V. luzonica* and *V. tricolor* together with *V. coerulea* produce pink to crimson-coloured, usually tessellated, flowers.

Primary hybrids of *V. luzonica* retain the pink colour in their flowers (Fig. 116.91), and *V. luzonica* is in the background of many advanced pink hybrids, additionally helping to increase their

Fig. 116.90 *Vanda* Kultana Red (*V.* Lumpini Red x *V.* Doctor Anek). (© Teoh Eng Soon 2021. All Rights Reserved

Fig. 116.91 *Vanda* Boschii (*V, luzonica* x *V. tricolor*). (© Teoh Eng Soon 2021. All Rights Reserved). The general shape and colour of this hybrid so closely resembles *V. luzonica*, it is often mistaken for the latter

flower count and substance. *V. tricolor* var. *suavis* has the same role. They complement each other because *V. luzonica's* pink is concentrated at the periphery and base of the sepals and petals, whereas *V. tricolor's* colour is spread over the body. Lacking in size and roundness, primary hybrids *of V. luzonica* and *V. tricolor* are not showy, but the two species display their magic when they are present in the remote ancestry of *Vanda* hybrids, even when their genetic contribution is apparently small. *V.* Kultana Red is mainly *sanderiana* (67%) and *coerulea* (25%) with *tricolor* contributing only 3.24% and *luzonica* 1.37%. Yellow *V. dearei* makes up 2.93%.

Yellow and Orange Colours

Yellow was achieved by the inclusion *of V. dearei*. John Noa in Hawaii crossed *V. sanderiana* with the clear yellow *V. dearei* and named the hybrid after his wife Ellen Noa when it flowered in 1946. This spotted yellow hybrid is the foundation of most modern yellow hybrids. *V.* Ellen Noa x *V. sanderiana* = *V.* Eisenhower, x *V. sanderiana* = *V.* Eisensander, a beautiful *sanderiana* type with a yellow base to its flowers from the 12.5% *V. dearei*. Colour of its hybrids can be a clean creamy yellow devoid of spots, blotches or stripes but at the risk of a shortening of the inflorescence and reduction in floral count (Fig. 116.92).

This can be overcome if the parentage contains other species that possess long inflorescences with many flowers (Fig. 116.93).

Hybrids of *V. denisoniana* are also yellow or orange, depending on which variety was employed. Inflorescence was longer and carried more flowers, albeit they were smaller. Some breeders found that their hybrids with *V. denisoniana* were spotted probably because its natural hybrid, *V. herbraica* (*denisoniana* x *brunnea*) was present in the ancestry. Many modern yellow hybrids have both *V. dearei* and *V. denisoniana* in their constitution (Fig. 116.94). *Vanda dearei* and its immediate or close progeny are intolerant of cold, whereas *V. denisoniana* and its hybrids are more cold tolerant.

Vanda insignis is recognized for its ability to produce heavily textured orange-coloured flowers that are heavily spotted with brown when employed in breeding. It is the parent of many vandaceous intra-generic and intergeneric hybrids, the most notable one being the tetraploid *Papilionanda* Josephine van Brero, parent of

Fig. 116.92 *Vanda* Kwa Geok Choo (*V.* Amelita Ramos x *V.* Harvest Time). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.93 *Vanda* Nopporn Gold. (© Teoh Eng Soon 2021. All Rights Reserved). It is remarkable that this immaculate white hybrid couldbe produced with species in its heritage that ae coloured

Fig. 116.94 *Vanda* Memoria Thianchai (*V.* Fuchs Harvest Moon x *V.* Kenny Gold). (© Teoh Eng Soon 2021. All Rights Reserved)

Ppda. Tan Chay Yan and a host of similar hybrids. Another interesting hybrid of *V. insignis* is *V.* Kekaseh (*V. insignis* x *V. cristata*) bred by Gracia Lewis in Singapore and registered in 1968 (Elliott et al. 2005). The beautiful moderate size (5 cm broad) flowers of good form are yellow with brown spots contrasted with a large, bright red lip. Lips of both parents are large. The pink of the pod parent's lip is transformed into vivid deep red by the dark purple of *V. cristata's* lip, but it is a pity that the shape of *V. cristata's* lip is not replicated in the hybrid (Fig. 116.95). Colour pattern of *V. Kekaseh* is passed on to its hybrid (Motes 1997). Recently, *V. insignis* was crossed with *V. tricolor* var. *suavis* resulting in then attractive V. Emrys Chew (Fig. 116.96). It would be interesting to see whether *V.* Emrys Chew can initiate a line of attractive vandaceous hybrids.

Vanda lamellata produces floriferous hybrids when it is employed as a pod bearing parent to breed to other *Vanda*. *Vanda* M.V.Tannins (*V. lamellata* x *V.* Memoria Thianchai) well supplied with proper nutrients flowers continuously producing an inflorescence at every leaf axil. *Vanda dearei* and *V. denisoniana* in its ancestry has conferred a beautiful unspotted yellow and brown flower (Fig. 116.97). Bred to *V. merrillii*, *V. tessellata* produced a strong, straight inflorescence that bore well-spaced, well-presented purplish, lacquered flowers, with improved spacing of the flowers (Fig. 116.88). Colour is unusual for this form of *Vanda* (Fig. 116.98).

Fig. 116.95 *Vanda* Kekaseh (*V. insignis* x *V. cristata*) [PHOTO: reproduced with permission form Elliott J et al (2011): *Orchid Hybrids of Singapore 1893 - 2003*. Orchid Society of South East Asia, Singapore]

Fig. 116.96 *Vanda* Emrys Chew (*V. insignis* x *V. tessellata*). (© Teoh Eng Soon 2021. All Rights Reserved)

Spotted Vanda

Breeding spotted *Vanda* is another direction (Figs. 116.87 and 116.99), perhaps introduced inadvertently when original attempt was to

Fig. 116.97 *Vanda* M.V.Tannins (*V. lamellata* x *V.* Memoria Thianchai). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.98 *Vanda* Greg Scott (*V. merrillii* x *V. tessellata*). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.99 Vanda Suksumran Spots x V. Blitz's Heartthrob. (© Teoh Eng Soon 2021. All Rights Reserved)

breed unblemished yellow *Vanda*. However, spotted *Vanda* have their own distinction: spots must be sharply defined, the pattern attractive, colours bright and clear. These spots are usually arranged along the veins of the sepals and petals. Newly discovered or rediscovered species like *V. jennae* (Fig. 116.27), *V. lombokensis* (Figs. 116.35, 116.36, 116.37, 116.38, 116.39 and 116.40) and better clones of *V. arcuata* (Fig. 116.4), *V. insignis* (Figs. 116.25 and 116.26), *V. lamellate* (Figs. 116.29 and 116.30), *V. limbata* (Fig. 116.32), *V. lobelingiana* (Fig. 116.46) and (Figs. 116.56, 116.57, 116.58, 116.59, 116.60, 116.61 and 116.62) could add variety to the spotted *Vanda* when employed as parents.

A Pure White Vanda

Pure white is an extremely rare colour in *Vanda* as even alba forms have patches of green. Thus, for *Vanda* Nopporn White Diamond, to be pure white throughout the flower is most unusual, especially with the wide range of colourful species in its ancestry. The flower is round and

Fig. 116.100 *Vanda* Nopporn White Diamond (V. Nopporn Gold x V. Muang Thong(© Teoh Eng Soon 2021. All Rights Reserved)

large, and the hybrid is free-flowering (Fig. 116.100).

Breeding for Fragrance

Flowers *of Vanda tessellata* are noted for their fragrance which is imparted to several generations of their progeny (Figs. 116.101, 116.102, 116.103 and 116.104). *V.* Mimi Palmer (*V.* Tan Chay Yan x *V. tessellata*) is the most famous hybrid that emits a strong fragrance which is unaffected when the colour form changes. Various forms of the species have been line-bred in Thailand to improve on form and colour, and when they are employed to repeat the *V.* Mimi Palmer, the flowers were quite different from the original and among themselves: an example is illustrated (Fig. 116.103). *V.* Overseas Union Bank (*V.* Mimi Palmer x *V.* Kasem's Delight) an F2 hybrid from *V. tessellata* is also quite fragrant (Fig. 116.104).

Vanda dearei (Figs. 116.16 and 116.17) emits a more delicate fragrance which is moderately transmitted to its first generation hybrids. Several *Vanda* species are also fragrant, but they have not been bred with transmission of fragrance as an important objective.

Fig. 116.101 *Vanda* Mimi Palmer (*V.* Tan Chay Yan x *V. tessellata.* (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.102 *Vanda* Mimi Palmer (*V.* Tan Chay Yan x *V. tessellata.* (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.103 *Vanda* Mimi Palmer (*V.* Tan Chay Yan x *V. tessellata.* (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.104 *Vanda* Overseas Union Bank (*V.* Mimi Palmer x *V.* Kasem's Delight). (© Teoh Eng Soon 2021. All Rights Reserved)

Breeding for Floriferousness and Miniaturization

The introduction of the sensational *Vanda* (formerly *Ascocenda*) Yip Sum Wah by Roy Fukumura of Hawaii in 1965 which garnered top quality awards from all over the world demonstrated the potential of the miniature *Vanda* species then placed in the genus *Ascocentrum*. Immediately, there was tremendous interest to breed small *Vanda* that could flower continuously throughout the year. In fact, the beautiful blue *Ascocenda* (= *Vanda*) Meda Arnold was already registered by Dr. C.P. Sideris also of Hawaii in 1950, but it did not attract attention until the appearance of *V.* Yip Sum Wah. Interest in *V* Meda Arnold then followed. Over the next 15 years, *V.* Meda Arnold featured as a parent in 49 registered hybrids, and it is now in the background of numerous attractive blue *Vanda* (Fig. 116.105). *Ascocentrum* brings vivid colours to *Vanda* (Figs. 116.106 and 116.107), and although initially flower size may be small, after several generations of backcrossing to large *Vanda* spe-

Fig. 116.105 *Vanda* Blue Boy x *V.* Varut Fuschia. (© Teoh Eng Soon 2021. All Rights Reserved) This prizewinning *Vanda* at the 2019 Penang Orchid Show derives its floriferousness from its 25% *V. curvifolia* parentage. The blue comes from a 53% *V. coerulea,* intensified by the *curvifolia* and small amounts of *V. luzonica, V.tricolor* and *V. dearei* in its make-up

Fig. 116.106 *Vanda* Wacharin (*V.* Sagarik Gold x *V.* Yip Sum Wah). (© Teoh Eng Soon 2021. All Rights Reserved). This hybrid is 75% *Ascocentrum* and behaves like *Ascocentrum*

Fig. 116.107 *Vanda* Somsri Nugget. (© Teoh Eng Soon 2021. All Rights Reserved) Hybrid is floriferous and it carries several inflorescences on a tall plant which does not have many side branches. *Ascocentrum* is present along one lineage but not in both

Fig. 116.108 *Vanda* Siriporn Pink. (© Teoh Eng Soon 2021. All Rights Reserved)

cies, an *Ascocend*a can produce extremely large flowers (Fig. 116.108). With the passage of decades, it also became apparent to grower that these miniature *Vanda* become beautiful specimen plants if (1) they have considerable amounts of *Ascocentrum* in both lines of their parentage and (2) they are well cared for (Fig. 116.106).

Vanda falcata (syn. *Neofinetia falcata*) which is distributed in Korea and Japan is a unique miniature species that bears fragrant flowers with narrow, curved sepals and petals and a long spur. The species is ideal for the temperate region, whereas its hybrids also thrive in the tropics. Suh hybrids are admired for their resemblance to the form of *V. falcata.*

Today, few plants of *Vanda* are sufficiently well grown and mature to demonstrate their full potential. When Sir Jeremiah Colman exhibited a *V. tricolor* var. *planilabris* before the judges of the Royal Horticultural Society and won an Award of Merit, the plant carried seven spikes of flowers (Anonymous 1938). In 1940, *V. tricolor* var. *suavis* 'Sanderae' grown by HN Oeij in

Fig. 116.109 *Vanda* Adisak Happiness (V. Siam Spots x V. Bitz's Heartthrob). (© Teoh Eng Soon 2021. All Rights Reserved) *Ascocentrum curvifolium* is present in its remote parentage of its pod parent but there is no *Ascocentrum* in the pollen parent. This hybrid has the biggest *Vanda* flower to date. *Asctm. curvifolium* contributed to the overall roundness of the flowers

Soekarboemi (Sukabumi), Java, had three flowers spikes, the longest 35 cm long with 17 huge, erect flowers, 8 cm across, the second spike bearing 16 flowers. The grower had broken off the third spike in order not to stress the plant (Oeij 1940). Flowering in their natural habitat in the Shan state of Myanmar, *V. coerulea* can produce inflorescences 1.5 m long that carry more than 300 flowers as attested by the photographs of Yoshitaka Tanaka. Individual flowers may reach up to 10 cm across (Tanaka et al. 2003).

With regard to hybrids, when C.A Chevalier requested registration of his hybrid *Vanda* (now *Pda.*) Mevrouw L. Velthuis (*Pda.* Miss Joaquim x *V. sanderiana*), he submitted a photograph to the *Orchid Review* of a tall inflorescence that carried more than a dozen well-shaped flowers (Chevalier 1939). The only hybrid of *Pda*. Mevr. L. Velthuis the researcher have come across that carries more than a dozen flowers is a well-grown plant of *Pda.* Ng Boon Gee (*Pda.* Mevr. L. Velthuis x *V.* Poy Thong) AM OSSEA bred and exhibited by Singapore's Gardens by the Bay (Fig. 116.110) but there others (Teoh 2021).

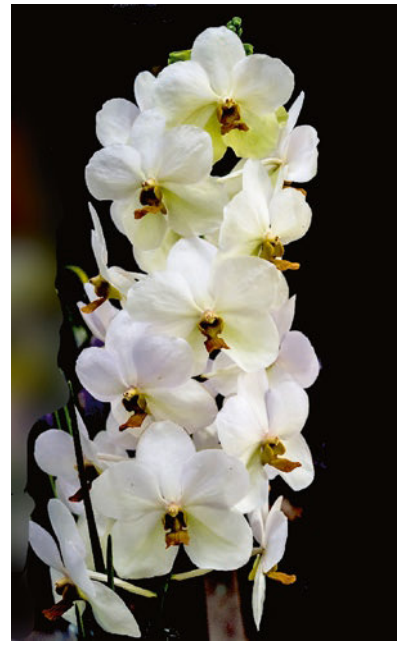

Fig. 116.110 *Pda.* Ng Boon Gee (*Pda.* Mevr. L. Velthius x *V.* Poy Thong). (© Teoh Eng Soon 2021. All Rights Reserved)

Intergeneric Hybrids

Vanda is inter-fertile with other vandaceous species. Bigeneric and polygeneric hybrids are described throughout this book. Notable combinations are with *Aerides*, *Arachnis, Papilionanthe, Paraphalaenopsis, Phalaenopsis, Rhynchostylis, Renanthera* and *Vandops*is. Compactness and increased flower count can be improved by breeding with genera that have many flowers on the rachis like *Aerides, Renanthera* and *Rhynchostylis* (Figs. 116.111, 116.112, 116.113, 116.114, 116.115, 116.116, 116.117 and 116.118), and in the process several multigeneric genera (with more than two genera in its constitution) were created. Breeders are also exploring ways to produce unusual flowers (Fig. 116.119).

Fig. 116.111 *Vanda* Singapore Orchid Growers Assn AM/OSSEA (*Pda.* Josephine van Brero x *V.* Ratchaburi Fuchs-Ktsura). (© Teoh Eng Soon 2021. All Rights *Reserved*). A robust hybrid with rose pink flowers, large and round for its type

Fig. 116.112 *Renanatanda* (*Ren.* Kalsom x *V.* Doctor Anek). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.113 *Renantanda* (*V.* Doctor Anek x *Ren. philippinense*). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.114 *Paravanda* Sze Chain Fai (*Pps. laycockii* x *V.* Madame Kenny). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.115 *Vandaenopsis* Jiaho's Orange (*Vdps*. Irene Dopkin x *Phal.* Zuma's Pixie). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.116 *Perreiraara* LeBleu Blue (*Van*. Sasicha x *Aer. lawrenceae*). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.117 *Perreiraara* Mu Qi Malisa Wendy (*Van.* Pine Rivers x *Aer. lawrenceae*). (© Teoh Eng Soon 2021. All Rights Reserved)

Many hybrids of *Vanda* are depicted in discussions of other vandaceous genera.

A Southeast Asian Staple

Most *Vanda* cultivated in lowland, equatorial Singapore come from the Philippines, Indonesia, Malaysia or Thailand, and the plant which is probably the best adapted and most floriferous is *Vanda lamellata*. It was natural that in the attempt to produce free-flowering plants for easy cultivation in equatorial gardens, *Vanda lamellata* would be bred to *Arachnis hookeriana*. This breeding resulted in the compact, ever-blooming *Aranda* Deborah which could bear up to 12 inflorescences on a single 1 m tall plant and simultaneously initiate offshoots.

Aranda crosses which flowered soon after the World War II were never as productive as *Aranda* Deborah, and, moreover, the plants were large. Success in breeding early, free-flowering, colourful *Aranda* was achieved by employing outstanding *Vanda* hybrids rather than the species to breed to *Arachnis,* the first example being *Aranda* Wendy Scott (*Arachnis hookeriana* x *V.* Rothschildiana).

Producing precocious lowering, free-flowering and colourful *Aranda* is still an important activity for orchid hybridizers in Southeast Asia because it caters for the cut flower industry.

Fig. 116.118 *Waironara* Tango Fire (*Ren. storiei* x *Prra.* Bangkok Sunset). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 116.119 *Vanda* Peaches (*V. falcata* x *V. curvifolia*). (© Teoh Eng Soon 2021. All Rights Reserved) An attractive hybrid. Parents are both small plants with small but distinctive flowers

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Vandopsis Pfitz. 117

Vandopsis is a small genus of hardy, monopodial, epiphytic orchids with only five species distributed from Himalaya and China through Southeast Asia reaching up to New Guinea. *Vandopsis* are stout, erect plants with broad, coriaceous strap leaves. Inflorescence is simple, stout, erect or arching with numerous flowers of heavy texture. *Vandopsis* is related to *Arachnis* and *Trichoglottis.* Bred to other Vandaceous genera, *Vandopsis gigantea* and *Vdps. lissochiloides* conferred thick texture to the flowers.

The generic name is derived from *Vanda* (an orchid genus) and Greek *opsis* (resembling).

Vandopsis gigantea (Lindl.) Pfitz.

Vandopsis gigantea is distributed in Bangladesh, China (Yunnan, SW Guangxi), Tenasserim in Myanmar, northern, southwestern and Peninsular Thailand, Indochina and the Langkawi Islands (Malaysia). In the peninsula, they are littoral lithophytes (Kamemoto and Sagarik 1975). Plant is large, stems stout, 30 cm or longer, bearing many coriaceous, lorate, recurved leaves, 40 - 50 × 5.5 - 7.5 cm. Inflorescence is pendent, stout, up to 33 cm long, densely many (up to 15) flowered. Flowers are slightly fragrant, long lasting, 6 - 7 cm across, fleshy, a dull yellow with reddish brown blotches. Sepals and petals are ovate-spathulate, fleshy, slightly concave, spreading or cupped (Fig. 117.1). The outer surface of the sepals is suffused with purple. Flowering season is April to June.

Vandopsis lissochiloides (Gaud.) Pfitz.

Vandopsis lissochiloides is distributed in Thailand, Laos, Indonesia and the Philippines, growing in open grassland, in mangrove at sea level or on cliffs and large rocks at 1000 m. Despite being very large, it is a commonly cultivated garden plant in Indonesia and the Philippines (O'Byrne 2001). Inflorescence is 200 - 240 cm long, laxly many flowered. Flowers are 6 - 7 cm across, opening a few at a time. Tepals are ovate, elliptic; margins are folded backwards, leathery, bright yellow with red to maroon spots. The reverse side is a washout red. Lip is 3-lobed; side lobes are erect, small, narrow, white. Midlobe is spathulate, white at the base, merging to red at the middle and dark red at the apex. Column is white; anther cap is maroon (Fig. 117.2). Main flowering season is April to June with some plants still in flower till September (O'Byrne 2001).

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Fig. 117.1 *Vandopsis gigantea* (Lindl.) Pfitz. (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 117.2 *Vandopsis lissochiloides* (Gaud.) Pfitz. (© Teoh Eng Soon 2021. All Rights Reserved)

Vandopsis undulata (L.) J.J.Sm.

Vandopsis undulata is distributed in Eastern Himalaya, Yunnan, Myanmar and Vietnam, occurring in broad-leaved forests at 1500 - 2300 m. Plant is epiphytic or terrestrial; stem is erect, up to 40 cm tall, bearing oblong, leathery leaves, 5.5 - 13 × 0.9 - 2 cm. Inflorescence carries 4 - 8 flowers, laxly arranged. Flowers are white, fragrant, 3 - 3.6 cm across. Sepals and petals are lanceolate, convex, undulate, spreading; dorsal sepal and petals recurved at the apex. Lip is 3-lobed; lateral lobes are erect, embracing the column, yellow ochre. Midlobe is lanceolate, triangular, convex, creamy yellow, with a central callus streaked with purple (Fig. 117.3). It flowers from April to May in Bhutan (Gurung 2006).

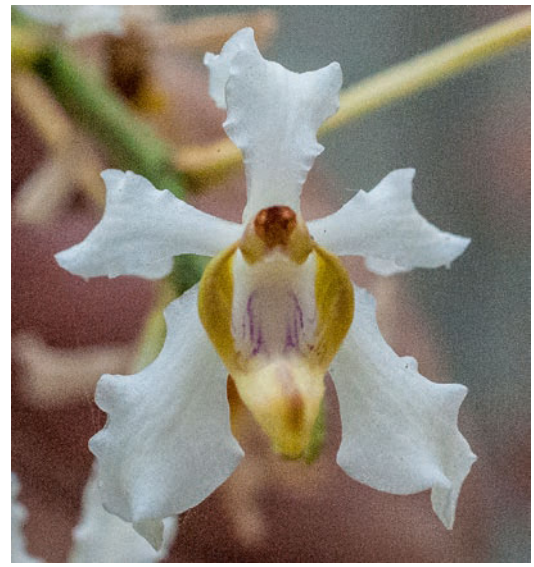

Fig. 117.3 *Vandopsis undulata* (L.) J.J.Sm. (Lindl. Pfitz. (© Teoh Eng Soon 2021. All Rights Reserved)

Vandopsis parishii (Rchb.f.) Schltr. (see *Phalaenopsis hygrochila* J.M.H.Shaw)

Vandopsis parishii is now included in genus *Phalaenopsis* and renamed *Phalaenopsis hygrochila* J.M.H.Shaw.

Hybrids

Renanopsis Lena Rowold (*Renanthera storiei* x *Vdps. lissochiloides*) bred by Oscar Kirsch of Hawaii created a sensation whenever it was exhibited at flower shows during the 1950s and early 1960s (Fig. 117.4). However, plants had to grow very tall before it would flower. A later remake using short flowering parents brought *Rnps.* Lena Rowold down to a manageable height.

Rnps. Lena Rowold was a fertile hybrid. Bred to Vandaceous species and hybrids, it has produced many beautiful red progeny, such as *Rnps.* Cape Sable (with *Ren. storiei*), *Rnps.* Lion's Splendour (with *Ren.* Kalsom), and *Limara* Lim Lean Teng (with *Arach.* Maggie Oei) (Figs. 117.5, 117.6 and 117.7).

Vandopsis gigantea has also proven to be a good parent producing hybrids with heavy substance in bright yellow when properly employed (Fig. 117.8).

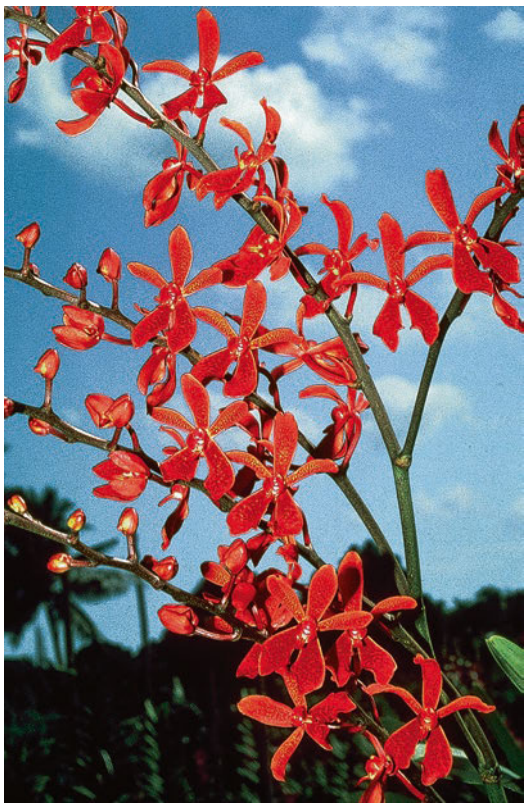

Fig. 117.4 *Renanopsis* Lena Rowold (*Vdps, lissochiloides* x *Ren. storiei*). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 117.5 *Renanopsis* Cape Sable (*Rnps. Lena Rowold* x *Ren. storiei*). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 117.6 *Renanopsis* Lion's Splendour (*Rnps.* Lena Rowold x *Ren. Kalsom*). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 117.7 *Limara* Lim Lean Teng (*Rnps*. Lena Rowold x *Arach.* Magge Oei). (© Teoh Eng Soon 2021. All Rights Reserved)

Fig. 117.8 *Vanvanda* Ladda (*Vdps. gigantea* x *V. denisoniana*). (© Teoh Eng Soon 2021. All Rights Reserved)

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Vanilla Plum ex Miller

118

Vanilla is a climbing plant with terete stems that bear a leaf and a root at every node. There are 110 species distributed throughout the tropics. Tropical America is home to 52 species, Southeast Asia (including New Guinea) 31 species. Inflorescence is axillary, carrying several ephemeral, resupinate flowers that last only half a day in some species. Flowers are of good size, with free sepals and petals and a tubular lip. Seed pods are long, large, with a smooth surface.

Over 95% of commercial vanilla is derived from *Vanilla planifolia* which is native to Central America. However, there is more *Vl. planifolia* growing in Asia than in any other continent, with Indonesia and China having the second and third largest acreage under cultivation, losing only to Madagascar. Vanilla pods of native Southeast Asian *Vanilla* species are only mildly aromatic. *Vanilla planifolia* has been bred to Asian species, for instance, *Vl. aphylla*, to enhance resistance to *Fusarium*, but so far, they have not yielded sufficiently aromatic hybrids (Divakaran et al. 2006).

Queen Elizabeth I was fond of adding vanilla to her food and drink. It was also a fashionable drink in France during the eighteenth century when it was thought to have aphrodisiac properties (Teoh 2019).

Vanilla aphylla Bl.

Vanilla aphylla is distributed in Tenasserim in Peninsular Myanmar, in Perlis in northern Peninsular Malaysia and in Java. It is a lowland species which thrives and flowers well in Singapore. Plants are not large. Stems are slightly flattened, green, fleshy, up to 200 cm, internodes 6 - 8 cm, leaves reduced to small triangular green scales (Holttum 1964). Flowers are cream to greenish yellow, 6 cm across, lasting one day till evening. Sepals and petals are similar, lanceolate, obtuse, spreading. Lip is tubular, enclosing the column. Midlobe is semicircular and covered with pink trichomes from the base to the epichile: margin is everted, undulate and crenate, white (Fig. 118.1).

Vanilla planifolia Andrews.

This is a Mesoamerican species, but it is more widely cultivated in tropical Asia and may be considered a naturalized species. The climbing vine extends endlessly if growing conditions are right, and a single plant can cover several ten of metres square. Leaves are elliptic, plicate, acute. Inflorescence bears up to 20 flowers, but flowers

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Fig. 118.1 *Vanilla aphylla* Bl. (© Teoh Eng Soon 2021. Al Rights Reserved)

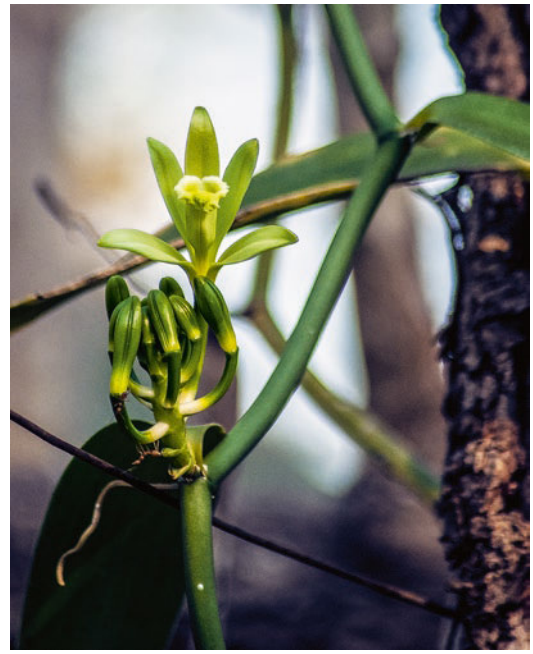

Fig. 118.2 *Vanilla planifolia* Andrews. (© Teoh Eng Soon 2021. Al Rights Reserved)

open singly each day, in succession. A large plant may remain continuously in bloom. Flower is 5 cm across, not fully spreading; sepals and petals are narrowly lanceolate, obtuse, apple green. Lip is complex, tubular, apple green. Pods are up to 20 cm long (Fig. 118.2).

Vanilla x *tahitensis*

Vanilla x tahitensis is principally cultivated in French Polynesia, but it is also cultivated in Papua and Indonesia together with *Vl. planifolia*. Tahitian vanilla has a distinct spicy flavour and commands a higher market value. Since 2014, for marketing purposes, it is authenticated by chromatography. Different authors provided different accounts on the introduction of this hybrid *Vanilla* species to Polynesia, variously stated to be from the Philippines, France or West Indies (Brunschwig et al. 2017), and perhaps all are correct. Whereas most natural hybrids are constituted by two species, genetic analysis showed that *Vl. x tahitensis* is made up of 31% *Vl. planifolia* and 6% *Vl. odorata*, and other markers are shared among several species (more than two) which were not identified. (Brunschwig et al. 2017; Hu et al. 2019).

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Zeuxine Lindl.

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Zeuxine is a genus of well-adapted tropical herbs which are distributed throughout the Old World. Plants possess creeping rhizomes: those of section *Zeuxine* being underground, the plants are tolerant of high light levels. Rhizomes of section *Psychechilos* are above ground. Stems are erect bearing ovate or elliptic leaves below the terminal inflorescence. Flowers are white, greenish or yellow, resupinate, not widely open, petals and sepals forming a hood around the column. Apex of the lip is broadened and bilobed. The number of flowers on an inflorescence is variable.

Zeuxine affinis (Lindl) Benth ex Hook f.

Zeuxine affinis is distributed in northeast India, Bhutan, Bangladesh, southern China, Myanmar, Thailand, Laos, Vietnam and Malaysia, growing in shade in forests at 800 - 1700 m (Chen et al. 2009) or in evergreen and semi-evergreen forests and grasslands in India (Sarsidharan 2019). Plants are terrestrial, up to 30 cm tall, stem stout, with hyaline sheaths. Leaves are ovate-lanceolate, 1 - 3.5 × 0.6 - 1 cm, turning brown to reddish at flowering period. Inflorescence is terminal, racemose, pubescent, 5 - 20 cm, with large floral bracts and numerous small white flowers (Fig. 119.1). Sepals are ovate, brown and hirsute on the outer surface. Petals are ovate, white, glabrous, meeting to form a hood over the column. Lip is saccate at the base, bilobed at the epichile; the lobes are divergent and, in some, with a slightly wavy margin (Fig. 119.2). It flowers in December in northern Thailand (Vaddhanaphuti 2005). It

Fig. 119.1 *Zeuxine affinis* (Lindl) Benth ex Hook f. (© Teoh Eng Soon 2021. All Rights Reserved)

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Fig. 119.2 *Zeuxine affinis* (Lindl) Benth ex Hook f. (© Teoh Eng Soon 2021. All Rights Reserved) Close-up of flowers

Fig. 119.3 *Zeuxine longilabris* (Lindl.) Trimen in natural habitat in semi-deciduous forest in northern Thailand. (© Teoh Eng Soon 2021. All Rights Reserved)

flowers and fruits in March–April in India (Sarsidharan 2019).

Zeuxine longilabris (Lindl.) Trimen.

Zeuxine longilabris is a montane perennial herb distributed in India, Bangladesh and Sri Lanka. It occurs in marshy areas in Assam; in evergreen, shola and semi-evergreen forests in Kerala (Barooah et al. 2019); and in semi-deciduous forests in northern Thailand (Fig. 119.3). Vegetative growth occurs during the rainy season, leaves fall in late autumn, and plant flowers in winter. Flower is showy with long, twin white, dentate lobules to the lip: hence, *longilabris*.

Fig. 119.4 *Zeuxine longilabris* (Lindl.) Trimen. (© Teoh Eng Soon 2021. All Rights Reserved) (Photographed at the Jawaharlal Nehru Tropical Botanical Garden and Research Institute, Parlode, Kerala, India)

Plants occur in evergreen, shola and semi-evergreen forests in shady locations. Stem is 13 - 25 cm tall, with 3 (or 4) ovate, membranous leaves, 3.5 × 1.2 - 2 cm, sheathing the stem. Inflorescence is terminal, 12 - 20 cm tall, brown, densely hirsute bearing several white flowers, 1 - 1.5 cm long, laxly arranged. Ovary and sepals are olive green, hirsute. Petals are small, falcate, 7 - 8 × 2 = 2.5 mm, forming a hood over the column. Lip is white, large, 1 - 1.2 cm long, with ovate epichile divided into two lobules by a deep central cleft (Fig. 119.4). Lower half of the outer margin of the lobules is serrated. It flowers and fruits in February to March in Kerala (southwestern India) (Sarsidharan 2019).

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