

# New records of Orchidaceae from Cambodia V

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## មូលនិយសរង្វេប

កំណត់ត្រាថ្មីនៃប្រភេទកេសរកូលព្រៃចំនួន២៥ប្រភេទ ត្រូវបានរកឃើញនិងកត់ត្រាវត្តមាននៅក្នុងប្រទេសកម្ពុជា ដោយក្នុងនោះរួមបញ្ចូលទាំងការរកឃើញកំណត់ត្រាថ្មីចំនួន០៩ពួក ដែលរួមមានពួក *Acanthophippium*, *Adenoncos*, *Didymoplexiella*, *Eria sensu stricto*, *Erythroides*, *Phreatia*, *Pomatocalpa*, *Seidenfadenia* និង *Thunia*។ ចំណាប់អារម្មណ៍ទៅលើកេសរកូលព្រៃនៅក្នុងប្រទេសកម្ពុជាមានការកើនឡើង ដែលជាហេតុនាំឱ្យមានការបណ្តុះបណ្តាលកេសរកូលនៅក្រៅទីជម្រកធម្មជាតិរបស់វា។ ស្របពេលជាមួយគ្នានេះដែរ ការការពារនិងអភិរក្សកេសរកូលឱ្យកាន់តែមានភាពប្រសើរឡើងនៅក្នុងតំបន់ធម្មជាតិរបស់វាក៏មានភាពចាំបាច់ផងដែរ។ ទីជម្រកធម្មជាតិសំខាន់ៗរបស់កេសរកូលព្រៃចាំបាច់ត្រូវមានការសិក្សានិងកំណត់បង្ហាញ ព្រោះវាជាវិធីសាស្ត្រមួយជួយដល់ការរៀបចំកំណត់តំបន់សម្រាប់រុក្ខជាតិសំខាន់ៗឱ្យបានសមស្រប។

## Abstract

Twenty-five new records of orchid species for Cambodia are reported, including nine new generic records for the genera *Acanthophippium*, *Adenoncos*, *Didymoplexiella*, *Eria sensu stricto*, *Erythroides*, *Phreatia*, *Pomatocalpa*, *Seidenfadenia* and *Thunia*. There is a growing interest in orchids in Cambodia, which has led to substantial ex situ cultivation efforts. At the same time, better in situ protection is needed. Important habitats need to be identified, for which the methodology for the designation of Important Plant Areas would be suitable.

**Keywords** Ex-situ conservation, Important Plant Areas, new genus and species records, plant diversity.

## Introduction

Interest in Cambodian orchids has grown considerably since we published the first article in this series (Schuiteman *et al.*, 2015). There we noticed that little had been added to the 164 species reported for Cambodia by Seidenfaden (1992). Now, seven years later, we are aware of at least 308 species having been found growing naturally in the country, partly through new records published in the literature (Averyanov, 2013; Tagane *et al.*, 2015; Averyanov *et al.* 2016a, 2016b, 2018; Gale *et al.*, 2016; Nuraliev *et al.*, 2016; Suetsugu *et al.*, 2017), partly

through photographs shared with us by Cedric Jancloes, Khou Eang Hourt and Song Det, and partly through plants found during our own fieldwork (Schuiteman, 2016; Schuiteman *et al.*, 2016a, 2016b, 2017). In this paper, we document first records of 25 additional orchid species in Cambodia based on material collected during fieldwork between 2013 and 2018 and subsequently cultivated in the Royal Botanic Gardens, Kew (UK), and at the Forestry Administration in Phnom Penh. Nine genera are here recorded for the first time from Cambodia: *Acanthophippium*, *Adenoncos*, *Didymoplexiella*, *Eria sensu*

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stricto, *Erythrodos*, *Phreatia*, *Pomatocalpa*, *Seidenfadenia* and *Thunia*.

## Methods

Plants were collected in situ in the Battambang, Kampot, Koh Kong, Mondulhiri and Pursat provinces in November 2013, May 2015, November 2016 and April 2018 for cultivation at the Forestry Administration shadehouses in Phnom Penh and in the Royal Botanic Gardens, Kew. During fieldwork, the collected plants were labelled the same day and were kept on sheaths of plastic in the shade and watered once or twice daily. Plants destined for Kew were exported and imported with CITES permits and were first accommodated in the Quarantine House at Kew until governmental plant health inspectors allowed their release into the orchid houses in the Tropical Nursery at Kew. Specimens flowering in cultivation were photographed, and vouchers are kept in the spirit collection at Kew. Global distribution data mentioned follow Govaerts *et al.* (2022), unless indicated otherwise. All photos were taken by André Schuiteman, unless stated otherwise.

## Results

*Acanthophippium gougahense* (Guillaumin) Seidenf. (voucher specimen: cult. Kew 2018-1176, albinistic form: cult. Kew 2022-406; Figs 1–3)

This is a terrestrial orchid that was found growing in leaf litter in shady places in evergreen forest between 430 and 490 m elevation near Ta Tey Leu in Koh Kong Province, flowering on 21 April 2018. Among the specimens brought back for cultivation, one, which was not in flower at the time, produced flowers that lacked the usual red-brown markings, having yellow-and-white flowers instead (Fig. 3). This species is also known from China (Guangdong), Thailand, Vietnam and Peninsular Malaysia.

*Adenoccos vesiculosa* Carr (voucher specimen: cult. Kew 2018-1154; Figs 4 & 5)

This is a small twig epiphyte in tall trees which often grows together with *Microsaccus griffithii* (C.S.P. Parish & Rchb.f.) Seidenf. It is probably fairly common in the Cardamom Mountains, where it was found both in montane forest at c. 900 m (2013) and on *Artocarpus* trees in the village of Thmor Bang at c. 450 m elevation (2018). It was previously known from Thailand, Vietnam and Peninsular Malaysia.

*Bulbophyllum careyanum* (Hook.) Spreng. (voucher specimen: cult. Kew 2013-1672; Figs 6 & 7)

A member of the taxonomically difficult section *Racemosae*, *B. careyanum* is a variable species, especially in

colouration, which ranges from reddish brown with darker spots to ochre-yellow with maroon stripes; the column can be bright yellow or whitish. It is a continental Asian species that has been recorded from nearly every country between northeast India and Vietnam, except Malaysia and, until now, Cambodia. Here it was found in 2013 as an epiphyte in evergreen forest at 430 m elevation in the foothills of the Cardamom Mountains.

*Bulbophyllum dasystachys* J.J.Verm., Thavipoke & Phelps (voucher specimen: Kew cult. 2018-1186; Figs 8 & 9)

This recently described species is a member of section *Hirtula*, of which most species have strikingly hairy flowers, albeit usually quite small and inconspicuous ones. *Bulbophyllum dasystachys* was first described from a cultivated specimen of unknown origin (Vermeulen *et al.*, 2014) and was also known from a photograph taken in the wild in Thailand. A few years later it was recorded from Vietnam (Averyanov *et al.*, 2017). We found it, without flowers, in 2018 near Ta Tey Leu in Koh Kong Province, growing in a tree crown at 490 m elevation in evergreen forest. It subsequently flowered in the National Orchid Collection at Phnom Penh, where the photographs here shown were taken, and more recently at Kew.

*Bulbophyllum mucronatum* (Blume) Lindl. (voucher specimen: cult. Kew 2013-693; Figs 10–12)

This member of section *Minutissima* is a small, mat-forming epiphyte with pseudobulbs that are only about 5 mm tall. We here record it from evergreen montane forest in the Cardamom Mountains (2013) at 895 m and probably also from Pursat Province (2016) at 870 m elevation, although we have not seen the latter in flower. This species was known from Thailand, Laos, Peninsular Malaysia, Sumatra, Java, Borneo, Sulawesi and the Philippines.

*Cleisostoma duplicilobum* (J.J.Sm.) Garay (voucher specimen: cult. Kew 2013-1673 and 2016-2590; Figs 13 & 14)

The flowers of this epiphytic species are remarkably similar in size and colour to those of *C. fuerstenbergianum* Kraenzl., also known from Cambodia, but the latter is easily distinguished by the terete leaves. *Cleisostoma duplicilobum* is a widespread orchid, previously recorded from northeast India, Myanmar, Thailand, Laos, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo and the Philippines. In Cambodia, it was found in deciduous dipterocarp forest at 270 m elevation near Pramoy in Pursat Province (2016) and in evergreen forest at 430 m in the foothills of the Cardamom Mountains (2013).



**Fig. 1** *Acanthophippium gougahense* (Guillaumin) Seidenf., in situ.



**Fig. 2** *Acanthophippium gougahense* (Guillaumin) Seidenf., cult. Kew 2018-1176.



**Fig. 3** *Acanthophippium gougahense* (Guillaumin) Seidenf., albinistic form, cult. Kew 2022-406.



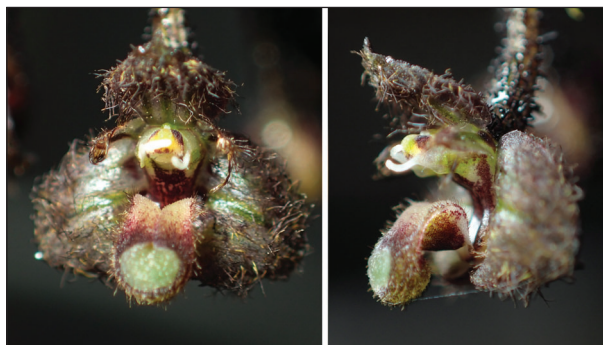
**Fig. 4** *Adenoncos vesiculosa* Carr, cult. Kew 2018-1154.



**Fig. 5** *Adenoccos vesiculosa* Carr, cult. National Orchid Collection Cambodia (© Att Sreynak).



**Fig. 8** *Bulbophyllum dasystachys* J.J.Verm., Thavipoke & Phelps, cult. National Orchid Collection Cambodia (© Att Sreynak).



**Fig. 9** *Bulbophyllum dasystachys* J.J.Verm., Thavipoke & Phelps, cult. National Orchid Collection Cambodia (© Att Sreynak).



**Fig. 6** *Bulbophyllum careyanum* (Hook.) Spreng., cult. Kew 2013-1672.



**Fig. 7** *Bulbophyllum careyanum* (Hook.) Spreng., cult. Kew 2013-1672.



**Fig. 10** *Bulbophyllum mucronatum* (Blume) Lindl., in situ.



**Fig. 11** *Bulbophyllum mucronatum* (Blume) Lindl., cult. Kew 2013-693.



**Fig. 12** *Bulbophyllum mucronatum* (Blume) Lindl., cult. Kew 2013-693.



**Fig. 13** *Cleisostoma duplicilobum* (J.J.Sm.) Garay, cult. Kew 2013-1673.



**Fig. 14** *Cleisostoma duplicilobum* (J.J.Sm.) Garay, cult. Kew 2016-2590.

***Dendrobium parciflorum* Rchb.f. ex Lindl. (voucher specimen: cult. Kew 2018-1181; Fig. 15)**

An epiphytic species of section *Aporum* with fleshy, bilaterally flattened leaves and ephemeral flowers. Our 2018 record is from near Ta Tey Leu in Koh Kong Province, where it occurred at 490 m elevation together with *Bulbophyllum dasystachys* (see above). This species was previously known from northeast India, Thailand, China, Laos, Vietnam and the Philippines

***Didymoplexiella siamensis* (Rolfe ex Downie) Seidenf. (voucher specimen: Schuiteman *et al.* 18-44; Figs 16 & 17)**

Only a single specimen was found, growing in damp forest on a slope above a stream at 490 m elevation, east of Ta Tey Leu in Koh Kong Province, flowering on 22 April 2018. This is a leafless, mycoheterotrophic orchid previously known from Thailand, Laos, Vietnam, eastern China, Taiwan and Japan.

***Eria scabrilinguis* Lindl. (voucher specimen: cult. Kew 2016-2574; Figs 18 & 19)**

This is a species that evidently prefers a shady, humid environment, as it is usually found on mossy boulders and tree trunks along streams in montane forest. In such conditions it was found in 2016 at 870 m elevation, about 24 km southwest of Pramoy in Pursat Province. It is better known as *Eria corneri* Rchb.f., which is a synonym, and was previously recorded from northeast India, Nepal, China, Laos, Vietnam, Taiwan and Japan (Yakushima).

***Erythodes blumei* (Lindl.) Schltr. (voucher specimen: cult. Kew 2018-1239; Figs 20 & 21)**

Being a member of subtribe Goodyerinae, *Erythodes* is related to the famous jewel orchids, of which *Anoectochilus lylei* Rolfe ex Downie was reported here previously (Schuiteman *et al.*, 2016a). However, there is nothing jewel-like about *Erythodes blumei*, which lacks the beautifully marked leaves of *Anoectochilus* and similar orchids. We found only one flowering specimen on 25 April 2018, growing at 530 m elevation in evergreen hill forest, northeast of Ta Tey Leu in Koh Kong Province. This species has been recorded from northeast India, Bangladesh, Myanmar, China, Thailand, Vietnam, Taiwan, Peninsular Malaysia, Sumatra, and Java. For reasons unclear to us, Govaerts *et al.* (2022) gave a much more limited distribution which excluded continental Asia, even though the type is from northeast India (Schuiteman *et al.*, 2022).

***Liparis atosanguinea* Ridl. (voucher specimen: Schuiteman *et al.* 18-23; Figs 22 & 23)**

This is a delicate herb with broad, soft leaves that betray its preference for humid, shady spots on the forest floor.

It was found in flower on 21 April 2018 at c. 440 m elevation in evergreen forest near Ta Tey Leu, Koh Kong Province. It was previously known from the Andaman and Nicobar Islands, Thailand, Vietnam, Peninsular Malaysia, Sumatra and Borneo.

***Liparis cespitosa* (Lam.) Lindl. (voucher specimen: cult. Kew 2015-1286; Figs 24 & 25)**

A widespread and rather common but inconspicuous epiphytic orchid. It is widespread within Cambodia as well. We can report it from evergreen hill forest at 420 m elevation in the Cardamom Mountains (2013), from open woodland on white sand along a stream in Koh Kong Province at c. 350 m elevation (2018), and from a forest remnant along a waterfall at 640 m elevation in Mondulhiri Province (2015). It occurs from East Africa and Madagascar in the west, throughout tropical continental Asia and the Malay Archipelago to as far east as the Society Islands. Govaerts *et al.* (2022) already recorded it from Cambodia but as we have not seen a published reference with a definite Cambodian locality, we have included it here.

***Liparis rheedei* Lindl. (voucher specimen: cult. Kew 2017-24; Figs 26 & 27)**

Unlike most terrestrial *Liparis* species, *L. rheedei* (often misspelled *L. rheedii*) usually occurs in open, sunny positions. It was observed in November 2016 on moss- and herb-covered rocks along rapids under sparse tree cover on Mount Bokor at 910 m elevation. At that time, the specimens were in the fruiting stage. This species is known from Thailand, Vietnam, and occurs throughout the Malay Archipelago to as far east as New Guinea. It has apparently not yet been found in the Philippines. *Liparis rheedei* was already recorded by Govaerts *et al.* (2022) from Cambodia, but we have not seen a published reference with a definite Cambodian locality.

***Luisia psyche* Rchb.f. (voucher specimen: cult. Kew 2016-2552; Fig. 28)**

*Luisia* is one of the few orchid genera known to contain species that are pollinated by beetles (Pedersen *et al.*, 2013; Arakaki *et al.*, 2016; Wakamura *et al.*, 2020), but the pollinator of the decidedly beetle-like *L. psyche* is still unknown. We found this species in 2016 southwest of Pramoy in Pursat Province as an epiphyte on lichen-covered branches in open, deciduous dipterocarp woodland with a dense undergrowth of grasses, at an elevation of 285 m. It was previously known from northeast India, Myanmar, Thailand, Laos and Vietnam.



**Fig. 15** *Dendrobium parviflorum* Rchb.f. ex Lindl., cult. Kew 2018-1181.



**Fig. 16** *Didymoplexiella siamensis* (Rolfe ex Downie) Seidenf., in situ, Schuiteman *et al.* 18-44.



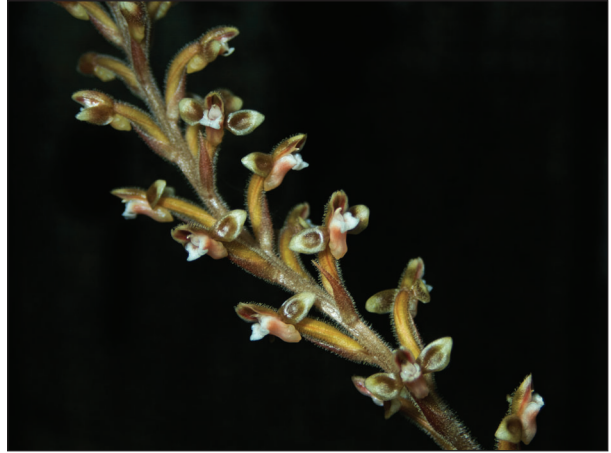
**Fig. 17** *Didymoplexiella siamensis* (Rolfe ex Downie) Seidenf., in situ, Schuiteman *et al.* 18-44.



**Fig. 18** *Eria scabrilinguis* Lindl., in situ.



**Fig. 19** *Eria scabrilinguis* Lindl., cult. Kew 2016-2574.



**Fig. 21** *Erythrodes blumei* (Lindl.) Schltr., cult. Kew 2018-1239.



**Fig. 20** *Erythrodes blumei* (Lindl.) Schltr., in situ.



**Fig. 22** *Liparis atrosanguinea* Ridl., in situ, Schuiteman *et al.* 18-23.





**Fig. 23** *Liparis atrosanguinea* Ridl., Schuiteman *et al.* 18-23.



**Fig. 24** *Liparis cespitosa* (Lam.) Lindl., cult. Kew 2015-1286.



**Fig. 25** *Liparis cespitosa* (Lam.) Lindl., cult. Kew 2015-1286.



**Fig. 26** *Liparis rheedei* Lindl., in situ.



**Fig. 27** *Liparis rheedei* Lindl., cult. Kew 2017-24.



**Fig. 28** *Luisia psyche* Rchb.f., cult. Kew 2016-2552.



**Fig. 29** *Nervilia plicata* (Andrews) Schltr., in situ.



**Fig. 30** *Nervilia viridis* S.W.Gale, Watthana & Suddee, cult. Kew 2016-2540.



**Fig. 31** *Nervilia viridis* S.W.Gale, Watthana & Suddee, cult. Kew 2016-2540.

***Nervilia plicata* (Andrews) Schltr. (voucher specimen: not made; Fig. 29)**

The leaves of this well-known species are so distinctive that we have little doubt that the plant we photographed in November 2016 in humid evergreen forest along a stream at 350 m elevation, c. 8 km north-northwest of Pramoy in Pursat Province, represents this species. Unfortunately, the plant failed to flower in cultivation, so that our identification is not absolutely certain; in theory it could represent an as yet undescribed species with similar foliage. In nearly all species of *Nervilia* the leaves emerge when the flowers have gone over. *Nervilia plicata* occurs throughout tropical continental Asia, Taiwan, the Malay Archipelago and the Philippines, east to New Guinea and northern Australia.

***Nervilia viridis* S.W.Gale, Watthana & Suddee (voucher specimen: cult. Kew 2016-2540; Figs 30 & 31)**

In 2016, we visited some limestone hills in Battambang Province, but were disappointed to discover that the ones we managed to gain access to were covered with secondary forest in which hardly any epiphytic orchids could be found. Nevertheless, our visit was not fruitless, as in some places, especially where the forest was more open, various terrestrial orchids were common. On 20 November, good numbers of *Habenaria hosseusii* Schltr. (Schuiteman *et al.*, 2017), *H. dentata* (Sw.) Schltr., *H. lindleyana* Steud. and *Liparis deflexa* Hook.f. flowered on steep, rocky slopes. Between them grew what undoubtedly was a *Nervilia* species, but no flowers were present, only the characteristic angular-cordate leaves could be seen. The small, round, knobbly tubers finally produced their first flowers at Kew in July 2019, which enabled us to identify it as *N. viridis*, only described the previous year from Thailand (Gale *et al.*, 2018). Coincidentally, in that same year, it was also described as a new species, *N. viridiflora* Q.Liu & J.W.Li, from Yunnan (Tang *et al.*, 2018), but the name was not validly published and *N. viridis* would have had priority in any case. We have here the remarkable circumstance that a species that was unknown to science until 2018 was independently discovered in three different countries at around the same time.

***Phreatia plantaginifolia* (J.Koenig) Ormerod (voucher specimen: cult. Kew 2015-1350; Figs 32 & 33)**

This plant usually produces a single small fan of very fleshy, bilaterally flattened leaves that are not particularly similar to those of a plantain (*Plantago*), after which it was named. It is a common species throughout the Malay Archipelago and the Philippines, although apparently not reaching New Guinea in the east, and has also been recorded from the Andaman and Nicobar Islands, Thailand and Vietnam. Govaerts *et al.* (2022) already

recorded *Phreatia plantaginifolia* from Cambodia, but as we are not aware of any published reference to a specific locality in Cambodia, we include it here. In Cambodia it is one of the more common epiphytic orchids; we can report it from primary evergreen montane forest at 700 m elevation in the Cardamom Mountains (2013), from scrub-like forest on Mount Bokor at c. 1000 m (2015 & 2016), and from open woodland on white sand in Koh Kong Province at c. 350 m (2018). Although this species is usually epiphytic, we also observed it growing on the mossy surface of overhanging slabs of rock on Mount Bokor.

***Pinalia eriopsidobulbon* (C.S.P.Parish & Rchb.f.) Kuntze (voucher specimen: cult. Kew 2013-1730; Fig. 34)**

At first sight, this species could be mistaken for a smaller-flowered form of *Pinalia xanthocheila* (see below), but the latter is easily distinguished by the prolonged lip side-lobes and the three tall, raised crests on the lip. We have only found it once in Cambodia, as an epiphyte in primary montane evergreen forest in the Cardamom Mountains at 665 m elevation, in 2013. We had to wait until 2022 for it to flower at Kew, when it could finally be identified. It was previously known from Myanmar, Thailand, Laos and Vietnam, usually recorded under its synonym *Eria eriopsidobulbon* C.S.P.Parish & Rchb.f.

***Pinalia floribunda* (Lindl.) Kuntze (voucher specimen: cult. Kew 2013-1687; Figs 35 & 36)**

So far, we only know this epiphytic species from one locality in Cambodia. In 2013, it was found in the Cardamom Mountains in relatively dry evergreen montane forest with little undergrowth at c. 900 m elevation. Outside Cambodia it is a fairly common and widespread orchid, known from Myanmar, Thailand, Vietnam, Peninsular Malaysia, Sumatra, Borneo and the Philippines, usually recorded under its synonym *Eria floribunda* Lindl.

***Pinalia xanthocheila* (Ridl.) W.Suarez & Cootes (voucher specimens: cult. Kew 2013-1683, 2013-1704, 2017-61; Figs 37 & 38)**

This species would appear to be more common and widespread in Cambodia than the other two *Pinalia* species that are mentioned above. In the Cardamom Mountains, it co-occurred with *P. floribunda* at c. 900 m elevation but was also found there at 590 m (2013). On Mount Bokor (2016) it was encountered in open scrub-like forest at c. 1,000 m. Outside Cambodia, *P. xanthocheila* (formerly *Eria xanthocheila* Ridl.) has been recorded from Myanmar, Thailand, Vietnam, Peninsular Malaysia, Sumatra, Java and Borneo.



**Fig. 32** *Phreatia plantaginifolia* (J.Koenig) Ormerod, in situ.



**Fig. 35** *Pinalia floribunda* (Lindl.) Kuntze, cult. Kew 2013-1687.



**Fig. 33** *Phreatia plantaginifolia* (J.Koenig) Ormerod, cult. Kew 2015-1350.



**Fig. 36** *Pinalia floribunda* (Lindl.) Kuntze, cult. Kew 2013-1687.



**Fig. 34** *Pinalia eriopsidobulbon* (C.S.P.Parish & Rchb.f.) Kuntze, cult. Kew 2013-1730.



**Fig. 37** *Pinalia xanthocheila* (Ridl.) W.Suarez & Cootes, cult. Kew 2013-1704.



**Fig. 40** *Pomatocalpa maculosum* (Lindl.) J.J.Sm., cult. Kew 2018-1258.



**Fig. 38** *Pinalia xanthocheila* (Ridl.) W.Suarez & Cootes, cult. Kew 2013-1704.



**Fig. 41** *Pomatocalpa maculosum* (Lindl.) J.J.Sm., cult. Kew 2018-1258.



**Fig. 39** *Polystachya concreta* (Jacq.) Garay & H.R.Sweet, cult. Kew 2015-1116.



**Fig. 42** *Seidenfadenia mitrata* (Rchb.f.) Garay, in situ.



**Fig. 43** *Seidenfadenia mitrata* (Rchb.f.) Garay, cult. National Orchid Collection Cambodia.



**Fig. 44** *Thrixspermum merguense* (Hook.f.) Kuntze, cult. Kew 2013-1584.



**Fig. 45** *Thrixspermum merguense* (Hook.f.) Kuntze, cult. Kew 2013-1584.



Fig. 46 *Thunia pulchra* Rchb.f., cult. Kew 2017-73.

***Polystachya concreta* (Jacq.) Garay & H.R.Sweet (voucher specimen: cult. Kew 2015-1116; Fig. 39)**

This is currently considered to be the only tropical orchid species that occurs naturally in the Americas as well as in Africa and Asia. Although it is possible that several different species are masquerading as *P. concreta* (Johan Hermans, pers. comm.), there is no doubt that they are closely related. Probably only one species occurs in Southeast Asia, which for now we will call *P. concreta*. Although Govaerts *et al.* (2022) already recorded *P. concreta* from Cambodia as well as from most tropical Asian countries, we are not aware of any published locality from Cambodia, although it is widespread there. We have found it in the Cardamom Mountains at c. 900 m in rather dry evergreen montane forest (2013), on isolated clumps of trees in secondary hill grassland at 900 m in Mondulhiri Province (2015), and on trees along rapids at 900 m on Mount Bokor (2016).

***Pomatocalpa maculosum* (Lindl.) J.J.Sm. (voucher specimen: cult. Kew 2018-1258; Figs 40 & 41)**

In his revision of *Pomatocalpa*, Watthana (2007) distinguished two subspecies within *P. maculosum*: subsp. *andamanicum* (Hook.f.) S.Watthana and subsp. *maculosum*, which are differentiated on the size of the flowers. Based on this distinction, the specimens we found in Cambodia would belong to subsp. *maculosum*, albeit near the lower end of the size range. Curiously, this subspecies was previously known from Sri Lanka and Java, whereas subsp. *andamanicum* has been recorded from the Andaman and Nicobar Islands, Thailand, Peninsular Malaysia and Laos. In Cambodia we have only found *P. maculosum* once, in 2018, growing as an epiphyte in open evergreen forest bordering swampy grassland at 180 m

elevation in Koh Kong Province, northeast of Areang village.

***Seidenfadenia mitrata* (Rchb.f.) Garay (voucher specimen: not made; Figs 42 & 43)**

This is an attractive epiphyte with short monopodial stems and pendent, terete ('rat-tail') leaves. In 2016, it was the only epiphytic orchid that we encountered on the low limestone hills of Battambang Province, where the open secondary forest at 135 m elevation was probably too young to support a more diverse epiphytic orchid flora. It was previously known from Myanmar, Thailand and Laos.

***Thrixspermum merguense* (Hook.f.) Kuntze (voucher specimen: cult. Kew 2013-1584; Figs 44 & 45)**

This little epiphyte is easily recognised by the two patches of thick, transparent, capitate hairs on the lip. It requires a good macro lens to appreciate its intricate beauty, as the flowers are only about 6 mm in diameter. We have only found it once, in 2013, growing in secondary, evergreen forest at 430 m elevation in the foothills of the Cardamom Mountains. This is a widespread species, known from northeast India, Myanmar, Andaman and Nicobar Islands, Thailand, Laos, Vietnam, Taiwan, Peninsular Malaysia, Sumatra, Java, Borneo, Sulawesi and the Philippines.

***Thunia pulchra* Rchb.f. (voucher specimen: cult. Kew 2017-73; Fig. 46)**

The National Orchid Collection in Phnom Penh has a plant of *Thunia pulchra* that was collected in the Seima Wildlife Sanctuary in Mondulhiri Province, and in 2018 we observed a large plant of this species (not in flower) that had been planted on a tree trunk near a house in Ta Tey Leu village in Koh Kong Province. The owner claimed that it had been collected in nearby forest, where it was said to grow on trees along a river. We were unable to find it there ourselves, unfortunately, but we were kindly allowed to take a piece of the plant, which subsequently flowered at Kew. It is certainly one of the showiest orchids of Cambodia. It had previously been recorded from Myanmar, Thailand and Vietnam.

## Discussion

For almost all species here recorded from Cambodia it can be said that their occurrence was predictable, as they were known to occur in two or more of the neighbouring countries. In this respect, perhaps only the find of *Nervilia viridis* can be considered surprising. Another

noteworthy find is that of *Bulbophyllum dasystachys*, as this is a recently described and probably rare species. On the other hand, not every species that occurs in at least two neighbouring countries can be expected to be found in Cambodia, as suitable habitats may not (or may no longer) be available. We need actual records, ‘ground-truthing’, to confirm predicted species distributions. Only five of the 25 species listed here were seen in flower at the time of collecting in the field, showing once again the usefulness for taxonomy of well-maintained ex situ collections.

A positive development is that there is now a National Orchid Collection at Phnom Penh, maintained by the Forestry Administration (Ministry of Agriculture, Forestry and Fisheries), while the Ministry of Environment is engaged in expanding the orchid collection at Kesor Kol Sok An Phnom Kulen Research and Conservation Centre in Siem Reap Province. These developments will support ex-situ conservation, but at the same time, protecting the remaining orchid habitats in the country is as urgent and necessary as ever. Identifying species-rich orchid habitats in Cambodia should be a priority in conservation efforts. It is highly likely that good orchid habitats in Cambodia coincide with Important Plant Areas (IPAs) as defined by Darbyshire *et al.* (2017), such that the methodology for identifying IPAs could be used to support in situ orchid conservation in the country.

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## References

- Arakaki N., Yasuda K., Kanayama S., Jitsuno S., Oike M. & Waka-mura S. (2016) Attraction of males of the cupreous polished chafer *Protaetia pryeri pryeri* (Coleoptera: Scarabaeidae) for pollination by an epiphytic orchid *Luisia teres* (Asparagales: Orchidaceae). *Applied Entomology and Zoology*, **51**, 241–246.
- Averyanov, L. (2013) New and rare orchids (Orchidaceae) in the flora of Cambodia and Lao PDR. *Turczaninowia*, **16**, 26–46.
- Averyanov, L.V., Averyanova, A.L., Nguyen K.S., Orlov, N.L., Maisak, T.V. & Nguyen H.T. (2018) New and rare orchid species (Orchidaceae) in the flora of Cambodia and Laos. *Novitates Systematicae Plantarum Vascularium*, **49**, 24–41.
- Averyanov, L.V., Nguyen K.S., Maisak, T.V., Konstantinov, E.L., Nguyen T.H. & Bounphanmy, S. (2016a) New and rare orchids (Orchidaceae) in the flora of Cambodia and Laos. *Turczaninowia*, **19**, 5–58.
- Averyanov, L.V., Nguyen K.S., Nong V.D., Nguyen V.C., Truong B.V. & Maisak, T.V. (2017) *Bulbophyllum* sect. *Hirtula* in eastern Indochina. *Taiwania*, **62**, 1–23.
- Averyanov, L.V., Ponert, J., Nguyen P.T., Duy N.V., Khang N.S. & Nguyen V.C. (2016b) A survey of *Dendrobium* Sw. sect. *Formosae* (Benth. & Hook.f.) Hook.f. in Cambodia, Laos and Vietnam. *Adansonia*, **38**, 199–217.
- Darbyshire, I., Anderson, S., Asatryan, A., Byfield, A., Cheek, M., Clubbe, C., Ghrabi, A., Harris, T., Heatubun, C.D., Kalema, J., Magassouba, S., McCarthy, B., Milliken, W., de Montmollin, B., Lughadha, E.N., Onana, J.-M., Saïdou, D., Sârbu, A., Shrestha, K. & Radford, E.A. (2017) Important plant areas: revised selection criteria for a global approach to plant conservation. *Biodiversity and Conservation*, **26**, 1767–1800.
- Gale, S.W., Duangjai, S., Li J., Ito Y., Watthana, S., Termwutthipreecha, P., Cheuk, M.L. & Suddee, S. (2018) Integrative analyses of *Nervilia* (Orchidaceae) section *Linervia* reveal further undescribed cryptic diversity in Thailand. *Systematics and Biodiversity*, **16**, 377–396.
- Gale, S.W., Schuiteman, A., Watthana, S., Sando, T., Souvannakhoummane, K., Averyanov, L. & Suddee, S. (2016) Studies in Asian *Nervilia* (Nervilieae, Epidendroideae, Orchidaceae) VI: *N. mekongensis*, a new species from Thailand, Cambodia, Laos and Vietnam. *Phytotaxa*, **247**, 267–273.
- Govaerts, R., Bernet, P., Kratochvil, K., Gerlach, G., Carr, G., Alrich, P., Pridgeon, A.M., Pfahl, J., Campacci, M.A., Holland Baptista, D., Tigges, H., Shaw, J., Cribb, P., George, A., Kreutz, K. & Wood, J.J. (2022) *World Checklist of Orchidaceae*. Facilitated by the Royal Botanic Gardens, Kew. <http://apps.kew.org/wcsp/> [Last accessed 26 July 2022].
- Nuraliev, M.S., Averyanov, L.V., Kuznetsov, A.N. & Kuznetsova, S.P. (2016) Review of the genus *Plocoglottis* (Orchidaceae) in Cambodia, Laos and Vietnam. *Wulfenia*, **22**, 189–199.
- Pedersen, H.Æ., Watthana, S., Kocyan, A. & Srimuang, K.-O. (2013) Pollination biology of *Luisia curtisii* (Orchidaceae): indications of a deceptive system operated by beetles. *Plant Systematics and Evolution*, **299**, 177–185.



- Schuiteman, A. (2016) *Porpax verrucosa* (Orchidaceae), a new species from Cambodia. *Kew Bulletin*, **71**, 1–5.
- Schuiteman, A., Jenny, R., Khou E.H., Nay S. & Att S. (2017) New records of Orchidaceae from Cambodia IV. *Cambodian Journal of Natural History*, **2017**, 4–9.
- Schuiteman, A., Kailash, B.R. & Shrestha, U.B. (2022) *A Checklist of the Orchidaceae of India*. Monographs in Systematic Botany from the Missouri Botanical Garden 139. Missouri Botanical Garden Press, St Louis, USA.
- Schuiteman, A., Ryan, C. & Nut M. (2015) New records of Orchidaceae from Cambodia I. *Cambodian Journal of Natural History*, **2015**, 131–138.
- Schuiteman, A., Ryan, C., Nut M., Nay S. & Att S. (2016a) New records of Orchidaceae from Cambodia II. *Cambodian Journal of Natural History*, **2016**, 7–14.
- Schuiteman, A., Ryan, C., Nut M., Nay S. & Att S. (2016b) New records of Orchidaceae from Cambodia III. *Cambodian Journal of Natural History*, **2016**, 84–89.
- Seidenfaden, G. (1992) The orchids of Indochina. *Opera Botanica*, **114**, 1–502.
- Suetsugu K., Hsu T.-C., Tagane S., Chhang P. & Yahara T. (2017) *Gastrodia exilis* (Orchidaceae), a newly recorded mycoheterotrophic genus and species in Cambodia. *Cambodian Journal of Natural History*, **2017**, 10–13.
- Tagane S., Yukawa T., Chhang P., Ogura-Tsujita Y., Toyama H. & Yahara T. (2015) A new record of *Aphyllorchis pallida* (Orchidaceae) from Cambodia. *Cambodian Journal of Natural History*, **2015**, 128–130.
- Tang F.T., Li J.W., Pan B., Wu X.F., Luo Y. & Liu Q. (2018) New and newly record orchids of *Nervilia* (Nervilieae, Epidendroideae, Orchidaceae) in China. *Phytotaxa*, **379**, 162–168.
- Vermeulen, J.J., Phelps, J. & Thavipoke, P. (2014) Notes on *Bulbophyllum* (Dendrobiinae; Epidendroideae; Orchidaceae): two new species and the dilemmas of species discovery via illegal trade. *Phytotaxa*, **184**, 12–22.
- Wakamura S., Arakaki N., Moriyama D., Kanayama S., Oike M., Kimura A., Wajima S., Ono H. & Yasui H. (2020) Does the orchid *Luisia teres* attract its male chafer pollinators (Scarabaeidae: *Protaetia pryeri pryeri*) by sexual deception? *Chemoecology*, **30**, 49–57.
- Watthana, S. (2007) The genus *Pomatocalpa* (Orchidaceae) a taxonomic monograph. *Harvard Papers in Botany*, **11**, 207–256.