



Diversity of wild orchids at Kali Tiger Reserve, Uttara Kannada district, Karnataka, India

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Abstract

Kali Tiger Reserve, located in Uttar Kannada district of Karnataka, India, comprises various habitat types, from 300 to 1200 m above sea level, including evergreen, semi-evergreen forests, moist deciduous forests with rich leaf litter, grasslands and lateritic plateaus. The orchids of the place have been studied from 2020 to today revealing 91 species including 50 epiphytes, 36 terrestrial, 3 mycoheterotrophs and 2 both terrestrial and epiphytic. A complete list of orchids in the reserve, data on their ecologies and geographic distributions, accompanied by illustrations, are provided here.

Résumé

La réserve de tigres de Kali, située dans le district d'Uttar Kannada, dans le Karnataka, en Inde, comprend divers types d'habitats, de 300 à 1200 m d'altitude, notamment des forêts sempervirentes et semi-sempervirentes, des forêts humides de feuillus avec une riche litière de feuilles, des prairies et des plateaux latéritiques. Les orchidées du lieu ont été étudiées de 2020 à aujourd'hui révélant 91 espèces dont 50 épiphytes, 36 terrestres, 3 mycohétérotrophes et 2 à la fois terrestres et

épiphytes. Une liste complète des orchidées de la réserve, des données sur leurs écologies et leurs répartitions géographique, accompagnées d'illustrations, sont fournies ici.

Keywords: Dandeli-Anshi Tiger reserve, orchids, wildlife sanctuary.

Mots clés : réserve de tigres Dandeli-Anshi, orchidées, réserve faunique.

Introduction

The Orchidaceae are one of the most diverse families of monocots, many of which have beautiful flowers. Kali Tiger Reserve (KTR) is located in Uttara Kannada District of Karnataka State. Covering the taluks of Haliyal, Karwar and Joida, the reserve is part of the Uttara Kannada district of Karnataka (fig. 1). It lies between latitude $14^{\circ} 57' 23.04''$ North; longitude $74^{\circ} 15' 7.56''$ East and latitude $15^{\circ} 9' 56.16''$ North; longitude $74^{\circ} 43' 10.56''$ East. The Tiger Reserve comprises of two important protected areas of the region i.e. Dandeli Wildlife Sanctuary (475.018 sq. km) and Anshi National Park (339.866 sq. km). These two reserves are located side by side in a lane at Central Western Ghats covering evergreen and semi-evergreen forests, grasslands and small patches of lateritic plateaus (fig. 2).

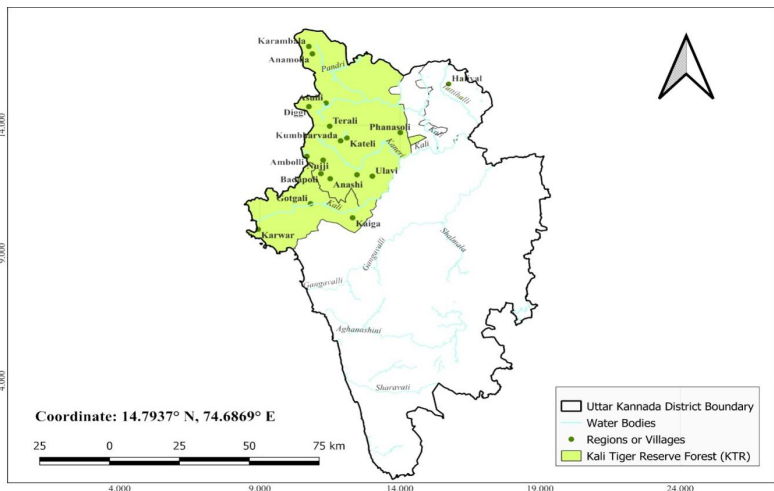


Figure 1: Kali Tiger Reserve, Uttara Kannada District, Karnataka.



Figure 2. Landscape of different Kali Tiger Reserve ecosystems. A: evergreen forest at Anmode Ghat – B: semi-evergreen forest at Dandeli – C: hill top grassland at Diggi, Kumbarwada – D: hill slope grassland at Castle Rock – E: riparian vegetation at Anshi – F: dry-deciduous forest at Rangarook – G: moist-deciduous forest at Kulgi – H: lateritic plateau at Castle Rock.

The south-west monsoon brings heavy rainfall in KTR with an average 2500 mm (range 1250-4000 mm). Rainfall gradient is very distinct in KTR. It is more than or equal to 5000 mm on the Western part which gradually becomes less than or equal to 2000 mm on the eastern part. Temperature varies from 13°C to 37°C,

January and February the coldest months and April and May being the warmest months (Gururaja & Ramachandra, 2012). The altitude in the KTR ranges from 300 to 1200 m.

Sringeshwara & Sanjappa (2019) recorded 197 orchid species including a variety of wild orchids in the state of Karnataka. KTR includes seven ranges: Anshi, Castle Rock, Gund, Kadra, Kulagi, Kumbarwada and Phansoli. The flora of Anshi National Park includes 923 species, including 54 species of wild orchids recorded by Puneekar & Laxminarashimhan (2011). *Zeuxine reflexa* King & Pantling (1898: 291), hitherto known only from Arunachal Pradesh, West Bengal and later in Karnataka, has very recently been added to the Anshi flora (Shreyas & Kotresha, 2022).

Material methods

Continue field visits were carried out from 2020-2023 to each range for the documentation of wild orchids during flowering and fruiting seasons. The orchids have been identified using the floras in particular from Abraham & Vatsala (1981); Rao (1998); Rao & Sridhar (2007); Bhattacharjee & Chowdhery (2018); Gogoi et al. (2021) and Jalal (2022). For almost all taxa names we followed the nomenclatural references accepted by POWO (2023). A sample of each taxon was collected and deposited in the herbarium of Karnatak Science College Dharwad (HKSCD). The specimens were pressed and dried as per standard herbarium preparation methods (Das, 2020).

Results

In total, 91 wild orchids comprising 32 genera (table 1) were recorded. Out of which top 5 dominant genera from the record includes *Habenaria Willdenow* (1805: 5) (13 species), *Dendrobium Swartz* (1799: 82) (10 species), *Oberonia Lindley* (1830: 15) (9 species), *Porpax Lindley* (1845: 62) (6 species) and *Peristylus Blume* (1825: 404) (5 species). Fifty species are epiphytic, 36 are terrestrial, 3 are mycoheterotrophic and 2 are epiphytic and terrestrial. We were able to observe 64 species at Anshi, 77 at Castle Rock, 26 at Gund, 19 at Kadra, 26 at Kulagi, 40 at Kumbarwada and 26 at Phansoli (fig. 3).

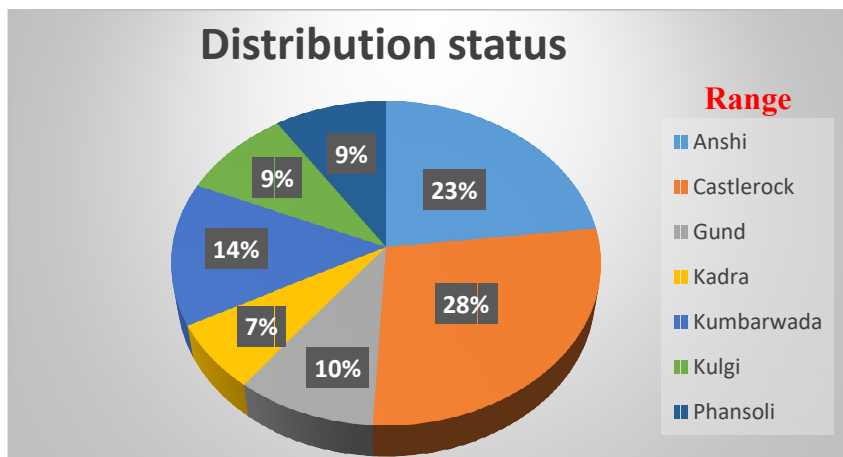


Figure 3. Total distribution of wild orchids in different ranges

The diversity of orchids varies greatly depending on the different altitudes. The altitude strata between 600 and 900 m seem to be the most concentrated. We were able to observe from 300 to 600 m, 30 species (25 epiphytes and 5 terrestrial), from 600 to 900 m, 56 species (25 epiphytes, 28 terrestrial and 3 mycoheterotrophs), from 900 to 1200 m, 7 species (5 epiphytic and 2 terrestrial) (fig. 4).

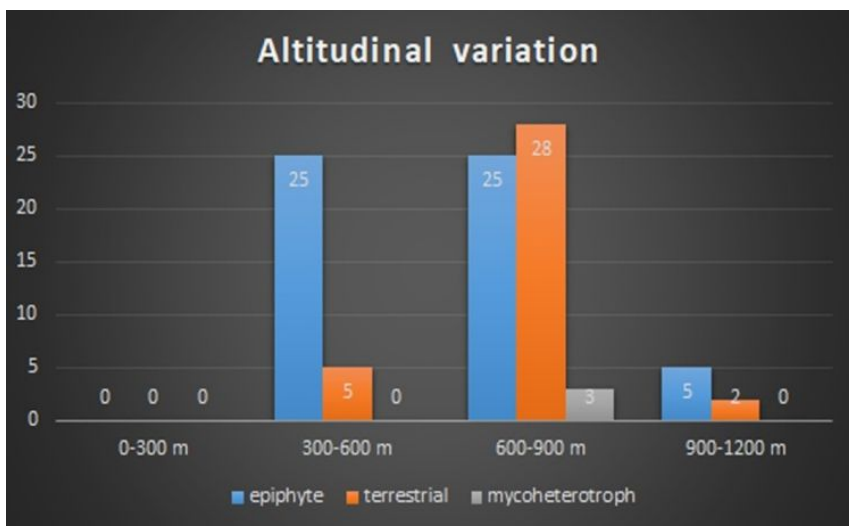


Figure 4. Orchid distribution in different altitude.

Table 1. Checklist of wild orchids in KTR (fig. 5-11). Ht-habit – Ec-ecology – A-Anshi – C-CastleRock – G-Gund – K-Kadra – KM- Kumbarwada – KU- Kulgi – P- Phansoli – AR- altitude range (1: 300-600 m ; 2: 600-900 m ; 3: 900-1200).

B-bamboo patches – E-evergreen forests – FE-forest edges – HSG-hill slope grasslands – HTG-hill top grasslands – LP-lateritic plateaus – M-moist-deciduous forests – S-semi-evergreen forests –*- present.

	Ht	Ec	A	C	G	K	KM	KU	P	AR
<i>Acampe ochracea</i> (Lindley) Hochreutiner	E	E & S						*	*	2
<i>Acampe praemorsa</i> (Roxburgh) Blatter & McCann	E	S & M	*	*	*	*	*	*	*	1
<i>Aerides crispa</i> Lindley	E	E & S	*	*			*			1
<i>Aerides maculosa</i> Lindley	E	E & S	*	*	*	*	*		*	2
<i>Aerides ringens</i> (Lindley) C.E.C. Fischer	E	E, S & M	*	*	*	*	*	*	*	2
<i>Aphyllorchis montana</i> Reichenbach f.	MY	E & S		*						2
<i>Bulbophyllum fimbriatum</i> (Lindley) Reichenbach f.	E	E & S	*	*						2
<i>Bulbophyllum sterile</i> (Lamarck) suresh	E	S & M	*	*		*	*		*	1
<i>Bulbophyllum stocksii</i> (Bentham ex Hooker) Vermeulen, Schuiteman & de Vogel	E	S & M	*	*			*	*		1
<i>Cheirostylis parvifolia</i> Lindley	E & T	E & M	*	*		*				2
<i>Chiloschista confusa</i> M.J. Mathew, J. Mathew, P. M Salim & Szlachetko	E	E & S	*	*						1
<i>Cleisostoma tenuifolium</i> (Linnaeus) Garay	E	E & S	*	*	*			*	*	1
<i>Cottonia peduncularis</i> (Lindley) Reichenbach f.	E	S & M	*	*	*	*	*	*	*	1
<i>Coelogyne imbricate</i> (Hooker) Reichenbach f.	E	S & M	*	*	*	*	*			1
<i>Crepidium versicolor</i> (Lindley) Sushil K. Singh, Agarwala & Jalal	T	E & S	*	*			*		*	1
<i>Cymbidium aloifolium</i> (Linnaeus) Swartz	E	E & S	*	*						2
<i>Cymbidium bicolor</i> Lindley	E	E & S	*		*	*				1
<i>Dendrobium aqueum</i> Lindley	E	E & S		*						2
<i>Dendrobium barbatulum</i> Lindley	E	E & S	*	*						1
<i>Dendrobium crepidatum</i> Lindley & Paxton	E	E & S	*							1
<i>Dendrobium crispum</i> Dalzell	E	M						*	*	1
<i>Dendrobium herbaceum</i> Lindley	E	E & S	*	*						3
<i>Dendrobium macrostachyum</i> Lindley	E	E & S	*	*	*	*	*			2

<i>Dendrobium microbulbon</i> A. Richard	E	E & S	*	*			*				2
<i>Dendrobium nanum</i> Hooker	E	E & S		*							2
<i>Dendrobium nodosum</i> Dalzell	E	E & S	*	*			*				2
<i>Dendrobium ovatum</i> (Linnaeus) Kranzel	E	E, S & M	*	*	*	*	*	*	*	*	1
<i>Didymoplexis pallens</i> Griffith	MY	B	*								2
<i>Diplocentrum congestum</i> Wight	E	E & S	*	*		*					1
<i>Epipogium roseum</i> (D. Don) Lindley	MY	E & S	*	*							2
<i>Eulophia densiflora</i> Lindley	T	S & M		*				*	*		2
<i>Eulophia nuda</i> Lindley	T	S & M	*	*	*						2
<i>Gastrochilus flabelliformis</i> (Blatter & McCann) C. J. Saladanha	E	E & S		*							2
<i>Habenaria brachyphylla</i> (Lindley) Aitchison	T	FE		*							2
<i>Habenaria commelinifolia</i> (Roxburgh) Wallich ex Lindley	T	S & M		*			*				2
<i>Habenaria crinifera</i> Lindley	T & E	E & S		*							2
<i>Habenaria digitata</i> Lindley	T	HTG					*				2
<i>Habenaria diphylla</i> (Nimmo) Dalzell	T	HSG & LP			*	*					1
<i>Habenaria gibsonii</i> Hooker	T	E & S		*			*				2
<i>Habenaria grandifloriformis</i> Blatter & McCann	T	S & M	*	*	*	*					2
<i>Habenaria heyneana</i> Lindley	T	HTG & HSG	*	*			*				2
<i>Habenaria longicorniculata</i> J. Graham	T	S & M	*	*			*				2
<i>Habenaria marginata</i> Colebrook	T	S & M	*					*	*		2
<i>Habenaria ovalifolia</i> Wight	T	FE (-E & SE)	*	*			*				2
<i>Habenaria plantaginea</i> Lindley	T	E & M		*			*	*			2
<i>Habenaria suaveolens</i> Dalzell	T	LP	*	*			*				2
<i>Liparis deflexa</i> Hooker	T	S & M		*			*				2
<i>Liparis odorata</i> (Willdenow) Lindley	T	E & M	*	*			*				2
<i>Luisia macrantha</i> Blatter & McCann	E	S & M	*	*							1
<i>Luisia tenuifolia</i> Blume	E	S & M	*	*							2
<i>Luisia zeylanica</i> Lindley	E	S & M	*	*	*	*	*	*	*	*	2
<i>Malaxis densiflora</i> (Richard) Kuntze	T	E & S		*	*		*				2

<i>Nervilia concolor</i> (Blume) Schlechter	T	S & M	*	*							2
<i>Nervilia infundibulifolia</i> Blatter & McCann	T	S & M	*	*	*		*	*	*		2
<i>Nervilia plicata</i> (Andrews) Schlechter	T	S & M	*	*	*		*	*			2
<i>Nervilia simplex</i> (Thouars) Schlechter	T	S & M	*	*	*		*	*			2
<i>Oberonia bicornis</i> Lindley	E	E & S	*	*							2
<i>Oberonia brachystachys</i> Lindley	E	E & S	*	*							1
<i>Oberonia brunoniana</i> Wight	E	E & S	*	*							3
<i>Oberonia ensiformis</i> (Smith) Lindley	E	E & S	*		*	*		*	*		1
<i>Oberonia falconeri</i> Hooker	E	S & M	*	*				*	*		2
<i>Oberonia mucronata</i> (Don) Ormerod & Seidenfaden	E	S & M			*			*			1
<i>Oberonia proudolockii</i> King & Pantling	E	E & S		*							3
<i>Oberonia recurva</i> Lindley	E	E & S	*	*	*	*					3
<i>Oberonia verticillata</i> Wight	E	E & S	*	*							1
<i>Pecteilis furcifera</i> (Lindley) Mark A. Clements & David L. Jones	T	M			*			*	*		2
<i>Pecteilis gigantea</i> (Smith) Rafinesque	T	E & S	*	*			*				2
<i>Peristylus aristatus</i> Lindley	T	E & S		*							1
<i>Peristylus densus</i> (Lindley) Santapau & Kapadia	T	LP		*			*				3
<i>Peristylus plantagineus</i> (Lindley) Lindley	T	E & S	*	*			*				3
<i>Peristylus lawii</i> Wight	T	E & S	*	*							1
<i>Peristylus stocksii</i> (Hooker) Kraenzlin	T	S & M		*			*	*	*		2
<i>Polystachya concreta</i> (Jacquin) Garay & H.R. Sweet	E	S & M	*	*			*	*	*		2
<i>Porpax braccata</i> (Lindley) Schuiteman, Yan Peng Ng & H. A. Pedersen	E	E & S	*	*							2
<i>Porpax exilis</i> (Hooker) Schuiteman, Yan Peng Ng & H. A. Pedersen	E	E & S	*	*							2
<i>Porpax filiformis</i> (Wight) Schuiteman, Yan Peng Ng & H. A. Pedersen	E	E & S	*	*							1
<i>Porpax jerdoniana</i> (Wight) Rolfe	E	E & S	*	*	*						1
<i>Porpax microchilos</i> (Dalzell) Schuiteman, Yan Peng Ng & H. A. Pedersen	E	E & S					*				2
<i>Porpax reticulata</i> Lindley	E	E & S	*	*			*				3

<i>Pteroceras monsooniae</i> Sasidhar & Sujanapal	E	E	*								1
<i>Rhynchostylis retusa</i> (Linnaeus) Blume	E	S & M	*	*	*	*	*	*	*	*	2
<i>Smithsonia maculata</i> (Dalzell) C. J. Saldanha	E	E	*	*							1
<i>Smithsonia straminea</i> C.J. Saldanha	E	S & M	*	*	*		*	*	*		1
<i>Smithsonia viridiflora</i> (Dalzell) C. J. Saldanha	E	S & M	*	*							1
<i>Tropidia angulosa</i> (Lindley) Blume	T	S & M		*					*		2
<i>Vanda tessellata</i> (Roxburgh) Hooker ex G. Don	E	S		*							2
<i>Vanda testacea</i> (Lindley) Reichenbach f.	E	S & M	*	*	*	*	*	*	*	*	2
<i>Vanda wightii</i> Reichenbach f.	E	S & M		*							2
<i>Zeuxine gracilis</i> (Breda) Blume	T	S & M	*	*				*			1
<i>Zeuxine longilabris</i> (Lindley) Trimen	T	S & M	*	*	*	*	*	*	*	*	1
<i>Zeuxine reflexa</i> King & Pantling	T	E & S	*								2

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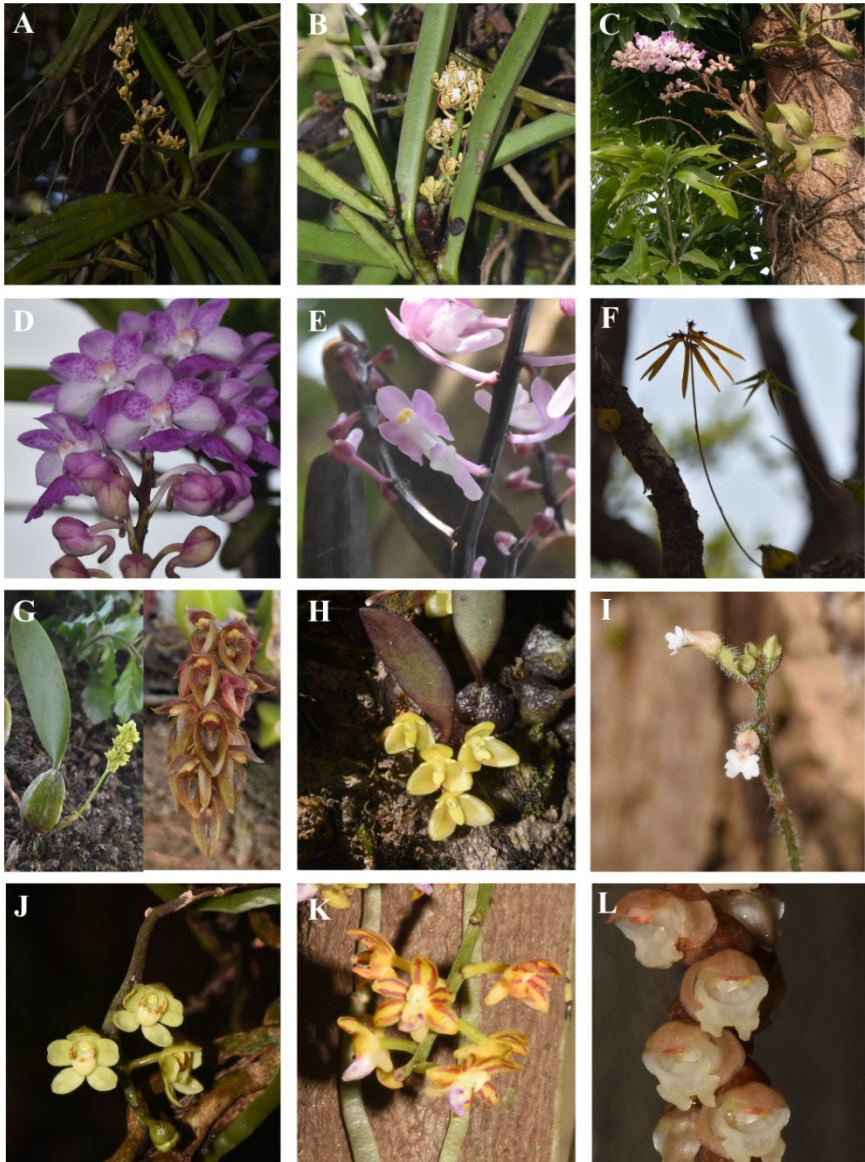


Figure 5. Orchids from Kali Tiger Reserve. A: *Acampe ochracea* – B: *Acampe praemorsa* – C: *Aerides crispa* – D: *Aerides maculosa* – E: *Aerides ringens* – F: *Bulbophyllum fimbriatum* – G: *Bulbophyllum sterile* – H: *Bulbophyllum stocksii* – I: *Cheirostylis parvifolia* – J: *Chiloschista confusa* – K: *Cleisostoma tenuifolium* – L: *Coelogyne imbricata*.

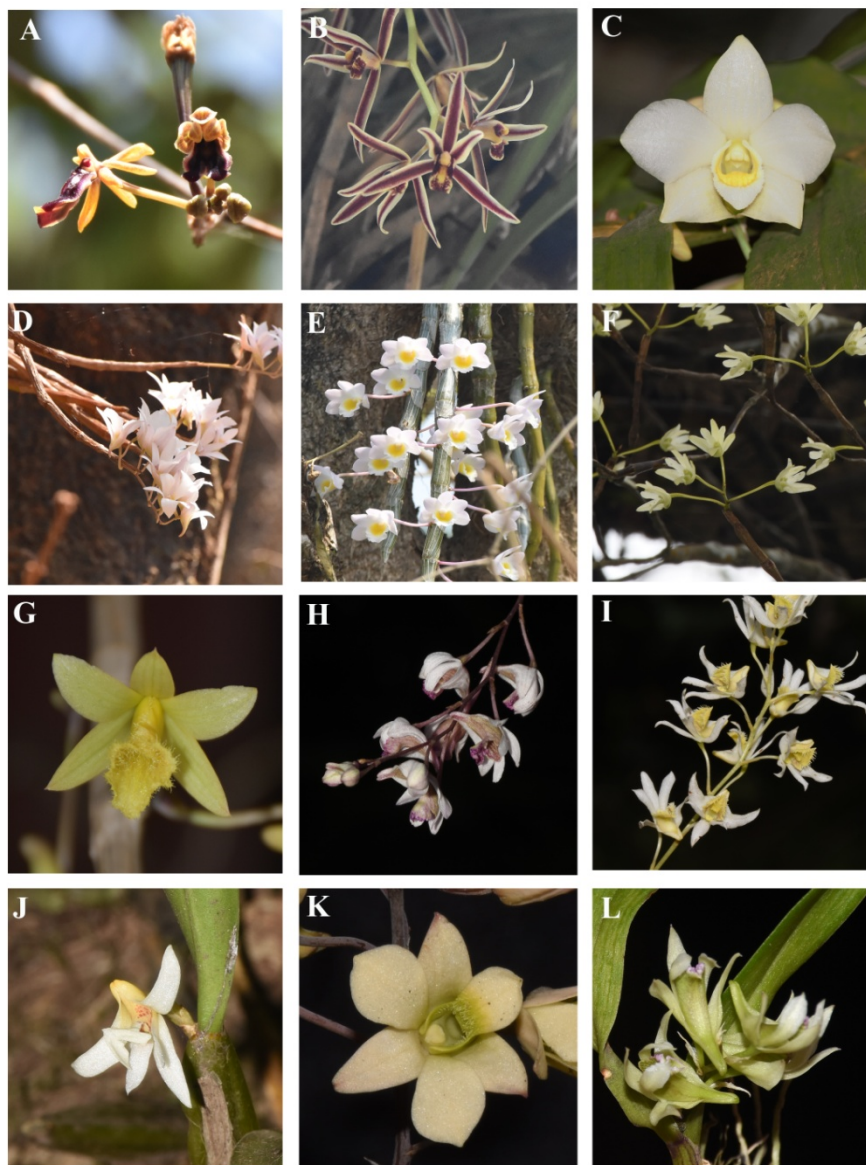


Figure 6. Orchids from Kali Tiger Reserve. A: *Cottonia peduncularis* – B: *Cymbidium bicolor* – C: *Dendrobium aqueum* – D: *Dendrobium barbatulum* – E: *Dendrobium crepidatum* – F: *Dendrobium herbaceum* – G: *Dendrobium macrostachyum* – H: *Dendrobium microbulbon* – I: *Dendrobium nanum* – J: *Dendrobium nodosum* – K: *Dendrobium ovatum* – L: *Dendrobium peguanum*.

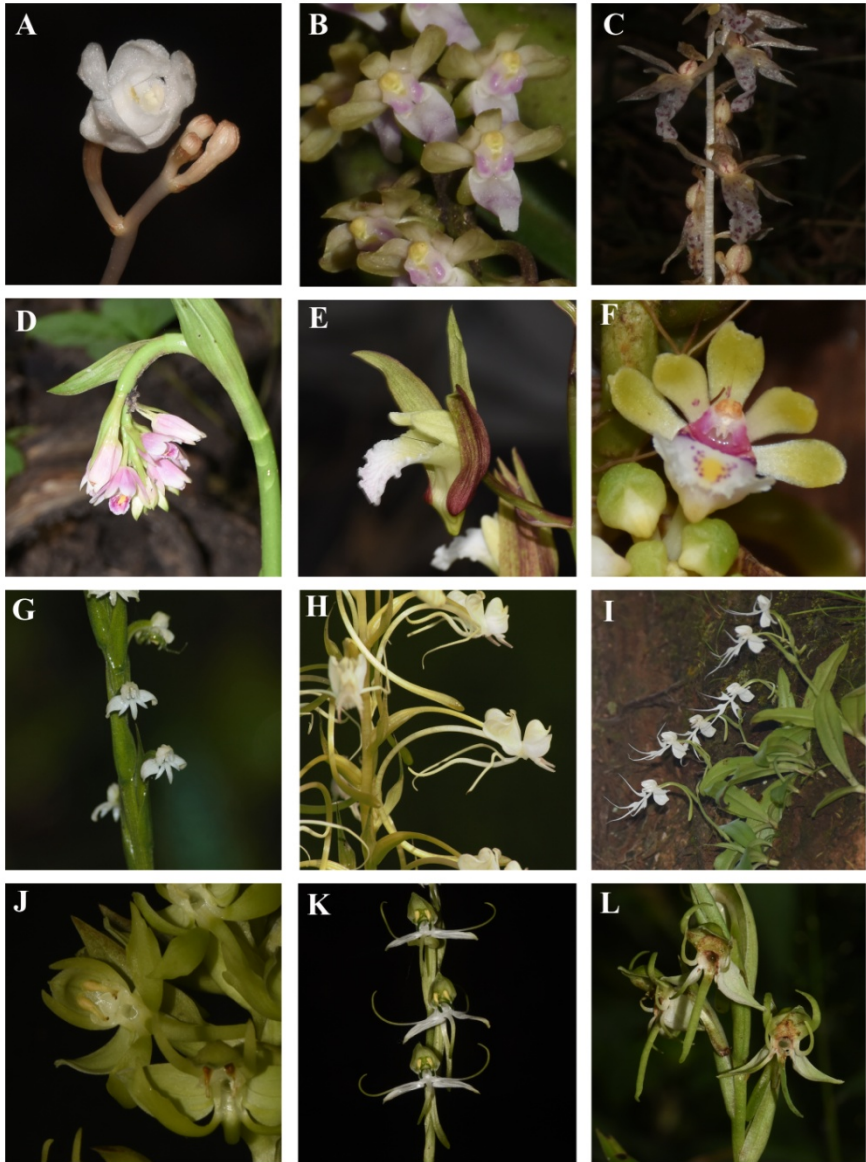


Figure 7. Orchids from Kali Tiger Reserve. A: *Didymoplexis pallens* – B: *Diplocentrum congestum* – C: *Epipogium roseum* – D: *Euolophia densiflora* – E: *Euolophia spectabilis* – F: *Gastrochilus flabelliformis* – G: *Habenaria brachyphylla* – H: *Habenaria commelinifolia* – I: *Habenaria crinifera* – J: *Habenaria digitata*, K: *Habenaria diphylla* – L: *Habenaria gibsonii*.

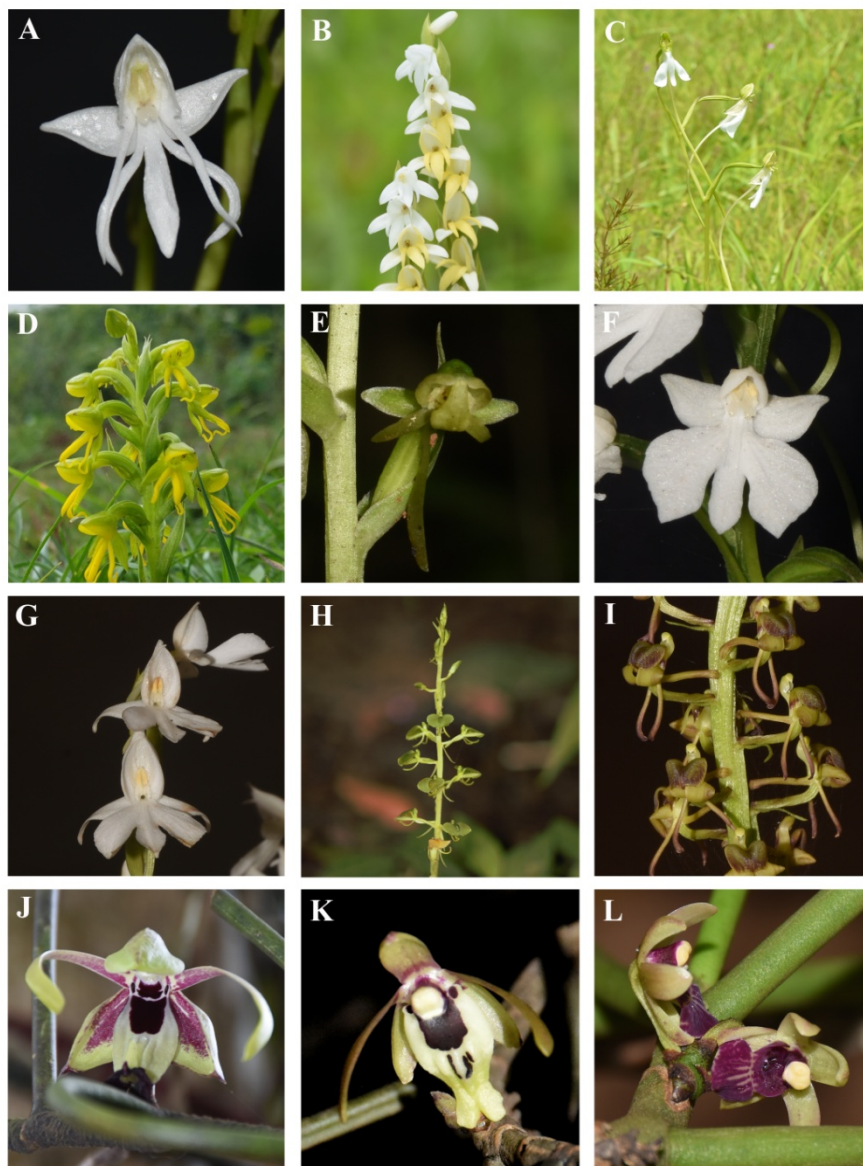


Figure 8. Orchids from Kali Tiger Reserve. A: *Habenaria grandifloriformis* – B: *Habenaria heyneana* – C: *Habenaria longicorniculata* – D: *Habenaria marginata* – E: *Habenaria ovalifolia* – F: *Habenaria plantaginea* – G: *Habenaria suaveolens* – H: *Liparis deflexa* – I: *Liparis nervosa* – J: *Luisia macrantha* – K: *Luisia tenuifolia* – L: *Luisia zeylanica*.

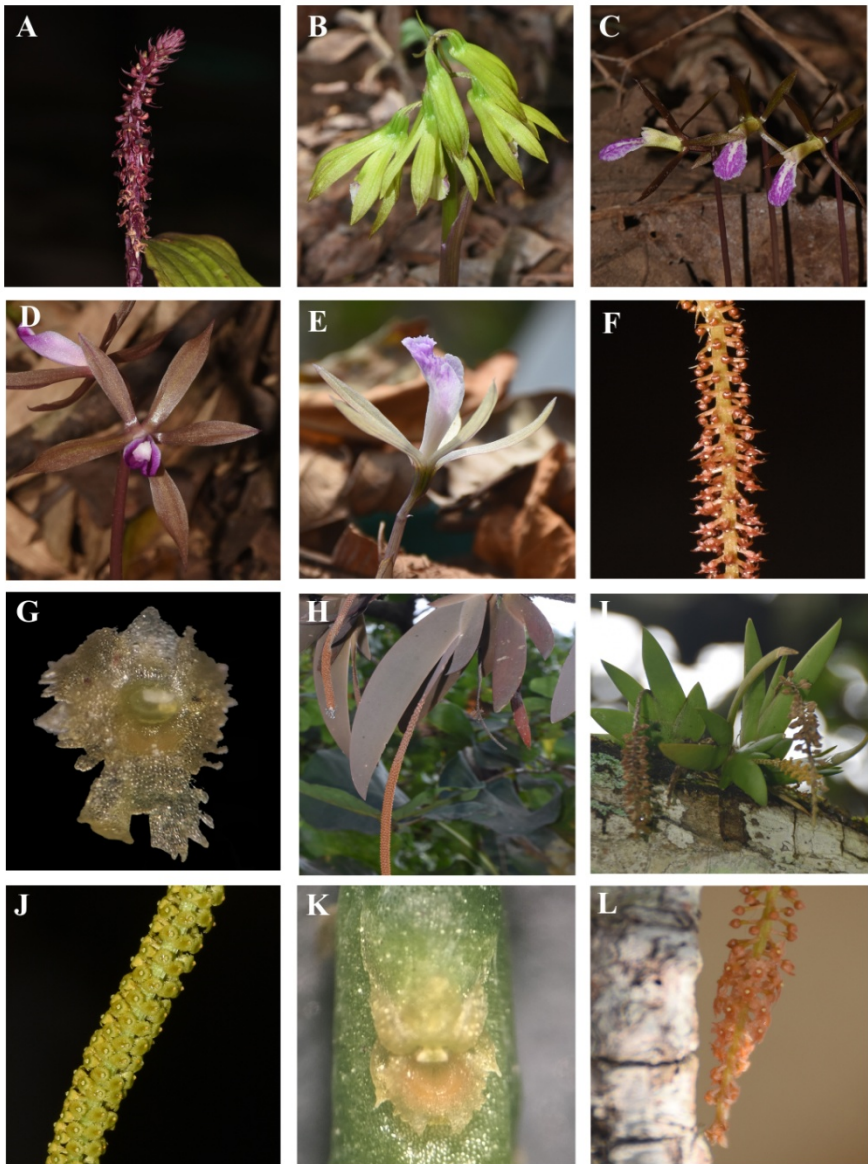


Figure 9. Orchids from Kali Tiger Reserve. A: *Malaxis densiflora* – B: *Nervilia concolor* – C: *Nervilia infundibulifolia* – D: *Nervilia plicata* – E: *Nervilia simplex* – F: *Oberonia bicornis* – G: *Oberonia brachyphylla* – H: *Oberonia brunoniana* – I: *Oberonia falconeria* – J: *Oberonia mucronata* – K: *Oberonia proudolockii* – L: *Oberonia recurva*.

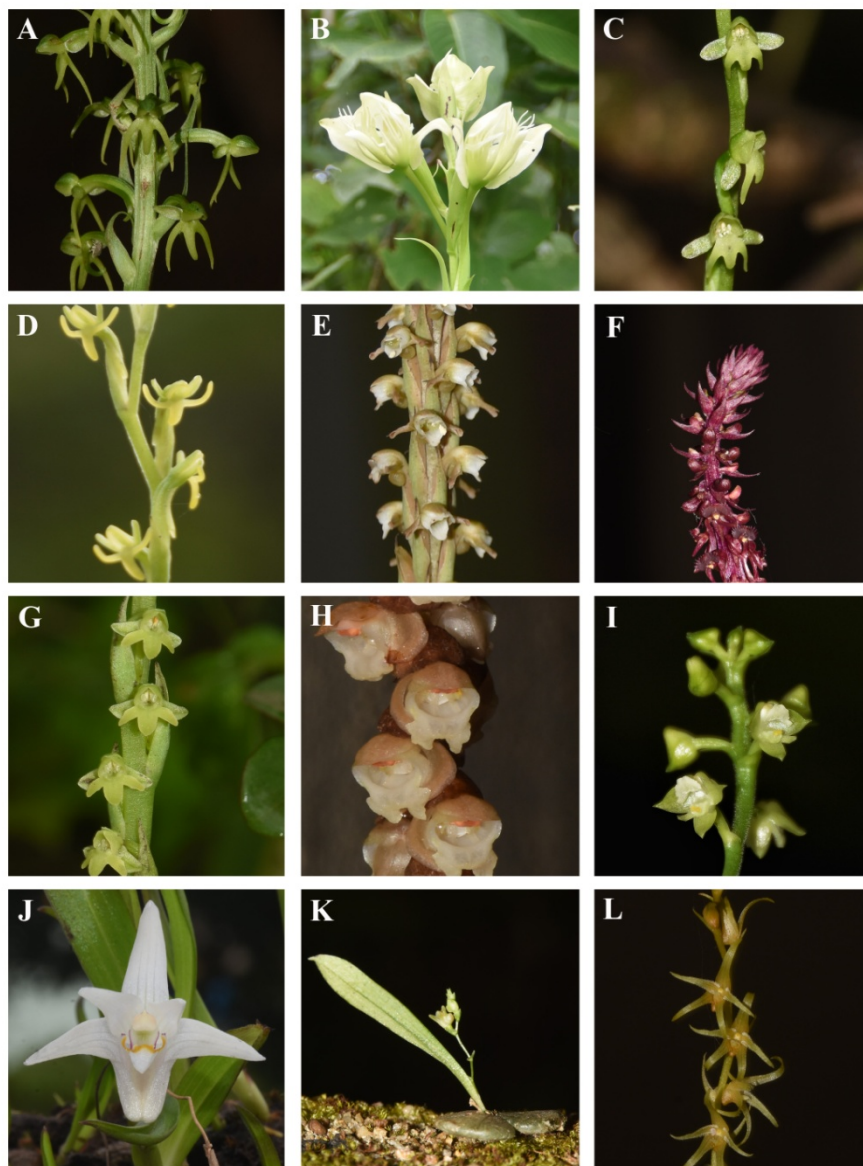


Figure 10. Orchids from Kali Tiger Reserve. A: *Oberonia verticillata* – B: *Pecteilis furcifera* – C: *Pecteilis gigantean* – D: *Peristylus aristatus* – E: *Peristylus densus* – F: *Persitylus lawii* – G: *Peristylus plantagineus* – H: *Peristylus stocksii* – I: *Polystachya concreta* – J: *Porpax braccata* – K: *Porpax exilis* – L: *Porpax filiformis*.

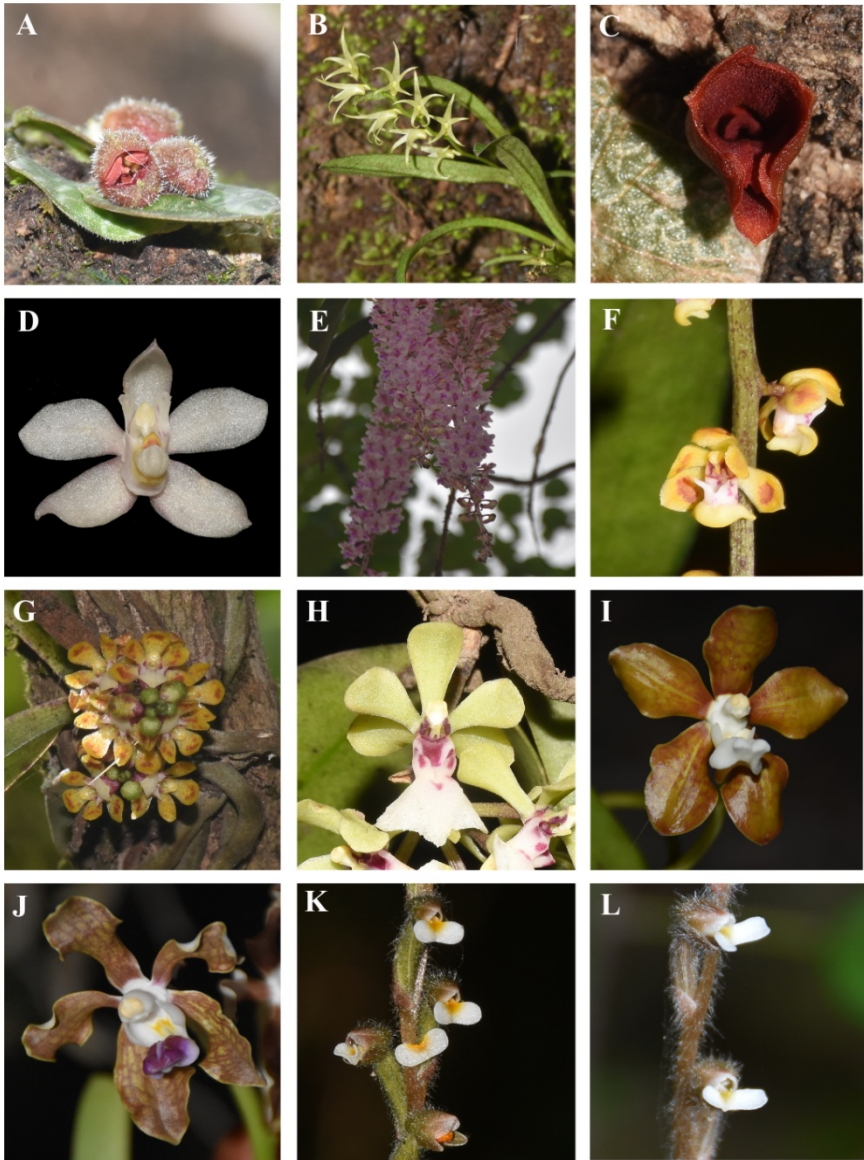


Figure 11. Orchids from Kali Tiger Reserve. A: *Porpax jerdoniana* – B: *Porpax microchilos* – C: *Porpax reticulata* – D: *Pteroceras monsooniae* – E: *Rhynchosstylis retusa* – F: *Smithsonia maculata* – G: *Smithsonia straminea* – H: *Smithsonia viridiflora* – I: *Vanda wightii* – J: *Vanda tessellate* – K: *Zeuxine gracilis* – L: *Zeuxine reflexa*.

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