



GENERA  
ORCHIDACEARUM

Volume 6

Epidendroideae (Part three)

*Edited by*

Alec M. Pridgeon, Phillip J. Cribb,

Mark W. Chase, and Finn N. Rasmussen

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*Royal Botanic Gardens, Kew*

and

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# PREFACE

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What began as the germ of an idea by Phillip Cribb in the late 1990s blossomed into a 15-year orchid project that was produced chiefly at the Royal Botanic Gardens, Kew, but involved more than 200 experts throughout the world when everyone is taken into account – systematists, anatomists, palynologists, cytogeneticists, ecologists, artists, photographers, growers, and hybridizers.

For all taxa in this final volume, 28 contributors provided up-to-date information on nomenclature, derivation of name, description, distribution (with maps), anatomy, palynology, cytogenetics, phytochemistry, phylogenetics, ecology, pollination, uses, and cultivation. Line drawings illustrating all genera appear here either for the first time or are reproduced with permission as noted in figure captions and acknowledgements.

Numbers assigned to genera, continuous with the last volume, are based solely on the alphabetic order of their appearance in the text and bear no connection to phylogenetic position or level of evolutionary advancement. On the endpapers of this and other volumes is an alphabetic/numeric list of genera covered to date as an aid to finding generic treatments within and among volumes. Authorities for binomials are provided at the first occurrence in the text or in tabular form. Finn N. Rasmussen has provided a comprehensive glossary of terms covering all volumes in the end matter.

This series was never intended to serve as the final classification of Orchidaceae, for that would be the antithesis of scientific integrity. Indeed, as long as there is even one orchid systematist working, as long as developing technologies improve our understanding of genetic relationships, as long as orchid species exist, their classification is forever destined to be a work in progress. Rather than a final monograph, then, the editors hope that *Genera Orchidacearum* becomes a benchmark for future scientists and identifies those gaps in our knowledge where further explanation and research are needed.

ALEC M. PRIDGEON  
PHILLIP J. CRIBB  
MARK W. CHASE  
FINN N. RASMUSSEN



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We thank Professor Stephen Hopper and Richard Deverell (past and present Director of the Royal Botanic Gardens, Kew, respectively) and Board of Trustees of the Royal Botanic Gardens, Kew, for continuing to support this international effort and also for providing laboratories and computer support. Professor David Mabberley (past Keeper of the Herbarium), Dr David Simpson (Acting Keeper of the Herbarium), and Professor Mark W. Chase (Keeper of the Jodrell Laboratory) offered facilities as well as encouragement. We and the other contributors must also acknowledge those who donated plant materials for study and/or DNA sequencing. *The World Checklist of Selected Plant Families*, compiled by Rafaël Govaerts and others, has been an invaluable resource for accepted plant names and standardization of author abbreviations, following the style established in *Authors of Plant Names* edited by Dick Brummitt and C. E. Powell. Directly or indirectly, every section and unit at the Royal Botanic Gardens, Kew, contributed to this project, and all warrant grateful recognition here. Diego Bogarín and Cassio van den Berg were kind enough to help prepare the distribution map for *Campylocentrum*, and Mario Blanco brought errors in previous volumes to our attention. Special thanks are reserved for André Schuiteman, who helped to secure artwork and resolved a multitude of problems, large and small, as they arose.

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ALEC M. PRIDGEON  
PHILLIP J. CRIBB  
MARK W. CHASE  
FINN N. RASMUSSEN

# CONTENTS

---

List of contributors xiii

List of colour plates xv

## I EPIDENDROIDEAE (Part Three) 1

### A DENDROBIEAE 3

621. *Bulbophyllum* 4

622. *Dendrobium* 51

### B VANDEAE 101

#### Adrorhizinae 104

623. *Adrorhizon* 104

624. *Brombeadia* 106

625. *Sirbookeera* 109

#### Aeridinae 111

626. *Acampe* 129

627. *Adenoccos* 132

628. *Aerides* 133

629. *Amesiella* 137

630. *Arachnis* 139

631. *Biermannia* 142

632. *Bogoria* 142

633. *Brachypeza* 144

634. *Calymmanthera* 146

635. *Ceratocentron* 148

636. *Chamaeanthus* 150

637. *Chiloschista* 152

638. *Chroniobilus* 156

639. *Cleisocentron* 158

640. *Cleisomeria* 161

641. *Cleisostoma* 161

642. *Cleisostomopsis* 166

643. *Cottonia* 168

644. *Cryptopylos* 168

645. *Deceptor* 170

646. *Dimorphorchis* 172

647. *Diplocentrum* 175

648. *Diploprora* 177

649. *Dryadorchis* 180

650. *Drymoanthus* 182

651. *Dyakia* 183

652. *Eclecticus* 186

653. *Gastrochilus* 188

654. *Grosourhya* 191

655. *Gunnarella* 194

656. *Holcoglossum* 195

657. <i>Hymenorchis</i>	201
658. <i>Jejewoodia</i>	203
659. <i>Luisia</i>	205
660. <i>Macropodanthus</i>	208
661. <i>Micropera</i>	210
662. <i>Microsaccus</i>	212
663. <i>Mobilabium</i>	212
664. <i>Omoea</i>	214
665. <i>Ophioglossella</i>	216
666. <i>Papilionanthe</i>	218
667. <i>Papillilabium</i>	220
668. <i>Paraphalaenopsis</i>	224
669. <i>Pelatantheria</i>	226
670. <i>Pennilabium</i>	229
671. <i>Peristeranthus</i>	231
672. <i>Phalaenopsis</i>	233
673. <i>Phragmorchis</i>	241
674. <i>Plectorrhiza</i>	242
675. <i>Pomatocalpa</i>	245
676. <i>Porrorrhachis</i>	247
677. <i>Pteroceras</i>	249
678. <i>Renanthera</i>	252
679. <i>Rhinerrhiza</i>	253
680. <i>Rhinerrhizopsis</i>	256
681. <i>Rhynchogyna</i>	258
682. <i>Rhynchostylis</i>	260
683. <i>Robiquetia</i>	263
684. <i>Saccolabiopsis</i>	264
685. <i>Saccolabium</i>	266
686. <i>Santotomasia</i>	269
687. <i>Sarcantopsis</i>	271
688. <i>Sarcobilus</i>	274
689. <i>Sarcoglyphis</i>	278
690. <i>Sarcophyton</i>	278
691. <i>Schistotylus</i>	280
692. <i>Schoenorchis</i>	282
693. <i>Seidenfadenia</i>	286
694. <i>Seidenfadeniella</i>	288
695. <i>Singchia</i>	290
696. <i>Smithsonia</i>	292
697. <i>Smitinandia</i>	295
698. <i>Spongiola</i>	295
699. <i>Stereochilus</i>	297
700. <i>Taeniophyllum</i>	299
701. <i>Taprobanea</i>	304
702. <i>Thrixspermum</i>	305
703. <i>Trachoma</i>	309
704. <i>Trichoglottis</i>	311
705. <i>Tuberolabium</i>	315
706. <i>Uncifera</i>	315
707. <i>Vanda</i>	317
708. <i>Vandopsis</i>	327
709. <i>Xenikophyton</i>	328
Agrostophyllinae	331
710. <i>Agrostophyllum</i>	331
711. <i>Earina</i>	335

## Angraecinae 338

- 712. *Aerangis* 344
- 713. *Aeranthes* 349
- 714. *Ambrella* 351
- 715. *Ancistrorhynchus* 353
- 716. *Angraecopsis* 355
- 717. *Angraecum* 358
- 718. *Beclardia* 363
- 719. *Bolusiella* 365
- 720. *Calyptrochilum* 367
- 721. *Campylocentrum* 370
- 722. *Cardiochilos* 372
- 723. *Chauliodon* 373
- 724. *Cribbia* 374
- 725. *Cryptopus* 376
- 726. *Cyrtorchis* 379
- 727. *Dendrophylax* 383
- 728. *Diaphananthe* 385
- 729. *Dinklageella* 389
- 730. *Distylodon* 390
- 731. *Eggelingia* 391
- 732. *Erasanthe* 393
- 733. *Eurychone* 395
- 734. *Jumellea* 397
- 735. *Lemurella* 399
- 736. *Lemurochis* 402
- 737. *Listrostachys* 404
- 738. *Margelliantha* 405
- 739. *Microcoelia* 407
- 740. *Mystacidium* 411
- 741. *Neobathiea* 413
- 742. *Nephrangis* 415
- 743. *Oeonia* 417
- 744. *Oeoniella* 419
- 745. *Ossiculum* 421
- 746. *Plectrelminthus* 423
- 747. *Podangis* 424
- 748. *Rangaeris* 427
- 749. *Rhaesteria* 429
- 750. *Rhipidoglossum* 431
- 751. *Sobennikoffia* 433
- 752. *Solenangis* 435
- 753. *Sphyrarhynchus* 438
- 754. *Summerhayesia* 440
- 755. *Taeniorrhiza* 442
- 756. *Triceratorhynchus* 444
- 757. *Tridactyle* 445
- 758. *Ypsilopus* 448

## Polystachyinae 450

- 759. *Hederorkis* 451
- 760. *Polystachya* 453

## Addendum 463

## Additional genera 463

- 761. *Galeoglossum* 463
- 762. *Hemipiliopsis* 466

763. <i>Neolindleya</i>	469
764. <i>Pseuderia</i>	471
765. <i>Psychopsiella</i>	473
Revised genera	476
122A. <i>Nothosteles</i>	476
14A. <i>Disa</i>	479
458A. <i>Cyanaeorchis</i>	479
498A. <i>Brassia</i>	480
513A. <i>Fernandezia</i>	482
527A. <i>Notyliopsis</i>	483
569A. <i>Gongora</i>	485
References	487
Cumulative glossary	501
Corrigenda	513
Effective dates of publication	515
Generic synonyms	517
Series contributors	523
Index to scientific names	525
Subject index	535

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## COLOUR PLATES

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- Plate 1.** *Bulbophyllum amplebracteatum* Teijsm. & Binn. subsp. *orthoglossum* (H.Wendl. & Kränzl.) J.J. Verm. & P.O'Byrne, cult. (*B.* sect. *Lepidorhiza*) (Photo: Rogier van Vugt)
- Plate 2.** *Bulbophyllum bicolor* Lindl. (*B.* sect. *Cirrhopetaloides*), cult. (Photo: Rogier van Vugt)
- Plate 3.** *Bulbophyllum cochleatum* Lindl. var. *bequaertii* (De Wild.) J.J.Verm. (*B.* sect. *Taurostaliæ*), cult. (Photo: Rogier van Vugt)
- Plate 4.** *Bulbophyllum coloratum* J.J.Sm. (*B.* sect. *Codonosiphon*), cult. (Photo: André Schuiteman)
- Plate 5.** *Bulbophyllum dayanum* Rchb.f. (*B.* sect. *Acrochaene*), cult. (Photo: Jaap Vermeulen)
- Plate 6.** *Bulbophyllum delitescens* Hance (*B.* sect. *Macrostehydia*), cult. (Photo: Rogier van Vugt)
- Plate 7.** *Bulbophyllum eberhardtii* (Gagnep.) Seidenf. (*B.* sect. *Cirrhopetalum*), cult. (Photo: Rogier van Vugt)
- Plate 8.** *Bulbophyllum erythrosema* J.J.Verm. (*B.* sect. *Epibulbon*), cult. (Photo: André Schuiteman)
- Plate 9.** *Bulbophyllum guttulatum* (Hook.f.) N.P.Balakr. (*B.* sect. *Brachyantha*), cult. (Photo: André Schuiteman)
- Plate 10.** *Bulbophyllum incisilabrum* J.J.Verm. & P.O'Byrne (*B.* sect. *Beccariana*), cult. (Photo: André Schuiteman)
- Plate 11.** *Bulbophyllum lindleyanum* Griff. (*B.* sect. *Hirtula*), cult. (Photo: Rogier van Vugt)
- Plate 12.** *Bulbophyllum longiscapum* Rolfe (*B.* sect. *Intervallatae*), cult. (Photo: Rogier van Vugt)
- Plate 13.** *Bulbophyllum molossus* Rchb.f. (*B.* sect. *Pachyblamys*), cult. (Photo: Malcolm Perry)
- Plate 14.** *Bulbophyllum monomeria* J.J.Verm. (*B.* sect. *Monomeria*), cult. (Photo: Rogier van Vugt)
- Plate 15.** *Bulbophyllum nummularia* (H.Wendl. & Kränzl.) Rolfe (*B.* sect. *Trias*), cult. (Photo: Piotr Markiewicz)
- Plate 16.** *Bulbophyllum nummularioides* Schltr. (*B.* sect. *Monanthes*), cult. (Photo: Rogier van Vugt)
- Plate 17.** *Bulbophyllum patens* King ex Hook.f. (*B.* sect. *Stenochilus*), cult. (Photo: Ed de Vogel)
- Plate 18.** *Bulbophyllum pedilochilus* (Schltr.) J.J. Verm. (*B.* sect. *Pedilochilus*), cult. (Photo: Rogier van Vugt)
- Plate 19.** *Bulbophyllum piestobulbon* Schltr. (*B.* sect. *Piestobulbon*), cult. (Photo: Dian Rabardja)
- Plate 20.** *Bulbophyllum plumatum* Ames (*B.* sect. *Plumata*), cult. (Photo: André Schuiteman)
- Plate 21.** *Bulbophyllum psittacoglossum* Rchb.f. (*B.* sect. *Leopardinae*), cult. (Photo: Piotr Markiewicz)
- Plate 22.** *Bulbophyllum saurocephalum* Rchb.f. (*B.* sect. *Saurocephalum*), cult. (Photo: Jaap Vermeulen)
- Plate 23.** *Dendrobium angustipetalum* J.J.Sm. (*D.* sect. *Brevisaccata*), cult. (Photo: André Schuiteman)
- Plate 24.** *Dendrobium archipelagense* Howcroft & W.N.Takeuchi (*D.* sect. *Spatulata*), cult. (Photo: André Schuiteman)
- Plate 25.** *Dendrobium bigibbum* Lindl. (*D.* sect. *Phalaenanthe*), Australia (Photo: Peter Adams)



- Plate 26.** *Dendrobium* aff. *bilobum* Lindl. (*D.* sect. *Biloba*), cult. (Photo: André Schuiteman)
- Plate 27.** *Dendrobium bulbophylloides* Schltr. (*D.* sect. *Microphytanthe*), cult. (Photo: Ed de Vogel)
- Plate 28.** *Dendrobium cacuminis* Gagnep. (*D.* sect. *Sarcopodium*), cult. (Photo: André Schuiteman)
- Plate 29.** *Dendrobium caudiculatum* (M.A.Clem. & D.L.Jones) Schuit. & de Vogel (*D.* sect. *Rhizobium*), cult. (Photo: André Schuiteman)
- Plate 30.** *Dendrobium densiflorum* Wall. ex Lindl. (*D.* sect. *Dendrobium*), cult. (Photo: André Schuiteman)
- Plate 31.** *Dendrobium djamuense* Schltr. (*D.* sect. *Grastidium*), cult. (Photo: André Schuiteman)
- Plate 32.** *Dendrobium ellipsophyllum* Tang & F.T.Wang (*D.* sect. *Distichophyllae*), cult. (Photo: André Schuiteman)
- Plate 33.** *Dendrobium formosum* Roxb. ex Lindl. (*D.* sect. *Formosae*), cult. (Photo: André Schuiteman)
- Plate 34.** *Dendrobium fytchianum* Bateman (*D.* sect. *Fytchianthe*), cult. (Photo: André Schuiteman)
- Plate 35.** *Dendrobium gracilicanle* F.Muell. (*D.* sect. *Dendrocoryne*), cult. (Photo: Peter Adams)
- Plate 36.** *Dendrobium hasseltii* (Blume) Lindl. (*D.* sect. *Pedilonum*), cult. (Photo: André Schuiteman)
- Plate 37.** *Dendrobium lichenastrum* (F.Muell.) Nicholls (*D.* sect. *Lichenastrum*), cult. (Photo: Peter Adams)
- Plate 38.** *Dendrobium lindleyi* Steud. (*D.* sect. *Dendrobium*), cult. (Photo: Alec Pridgeon)
- Plate 39.** *Dendrobium minjemense* Schltr. (*D.* sect. *Diplocaulobium*), cult. (Photo: André Schuiteman)
- Plate 40.** *Dendrobium* aff. *monticola* P.F.Hunt & Summerh. (*D.* sect. *Stachyobium*), cult. (Photo: André Schuiteman)
- Plate 41.** *Dendrobium moschatum* (Buch.-Ham.) Sw. (*D.* sect. *Dendrobium*), cult. (Photo: André Schuiteman)
- Plate 42.** *Dendrobium pinifolium* Ridl. (*D.* sect. *Conostaliæ*), cult. (Photo: André Schuiteman)
- Plate 43.** *Dendrobium pleianthum* Schltr. (*D.* sect. *Pleianthe*), cult. (Photo: Royal Botanic Garden, Edinburgh)
- Plate 44.** *Dendrobium polysema* Schltr. (*D.* sect. *Latouria*), cult. (Photo: Alec Pridgeon)
- Plate 45.** *Dendrobium pseudoglomeratum* T.M.Reeve & J.J.Wood (*D.* sect. *Calyptrochilus*), cult. (Photo: André Schuiteman)
- Plate 46.** *Dendrobium rumphiae* Rchb.f. (*D.* sect. *Cadetia*), cult. (Photo: André Schuiteman)
- Plate 47.** *Dendrobium schneiderae* F.M.Bailey (*D.* sect. *Monophyllaea*), cult. (Photo: Peter Adams)
- Plate 48.** *Dendrobium spatella* Rchb.f. (*D.* sect. *Aporum*), cult. (Photo: André Schuiteman)
- Plate 49.** *Dendrobium spurium* (Blume) J.J.Sm. (*D.* sect. *Fugacia*), cult. (Photo: André Schuiteman)
- Plate 50.** *Dendrobium squamiferum* J.J.Sm. (*D.* sect. *Amblyanthus*), cult. (Photo: André Schuiteman)
- Plate 51.** *Dendrobium verruciferum* Rchb.f. (*D.* sect. *Macrocladium*), cult. (Photo: Mark Clements)
- Plate 52.** *Dendrobium vonroemeri* J.J.Sm. (*D.* sect. *Herpetobophytum*), cult. (Photo: André Schuiteman)
- Plate 53.** *Dendrobium xantholeucum* Rchb.f. (*D.* sect. *Crinifera*), cult. (Photo: André Schuiteman)
- Plate 54.** *Adrorhizon purpurascens* (Thwaites) Hook.f., Sri Lanka (Photo: Suranjan Fernando)
- Plate 55.** *Brombeadia grandiflora* Kruij. & de Vogel, cult. (Photo: André Schuiteman)
- Plate 56.** *Sirbookera lanceolata* (Wight) Kuntze, Sri Lanka (Photo: Suranjan Fernando)
- Plate 57.** *Acampe rigida* (Buch.-Ham. ex Sm.) P.F.Hunt, cult. (Photo: André Schuiteman)
- Plate 58.** *Adenoncos sumatrana* J.J.Sm., cult. (Photo: André Schuiteman)

- Plate 59.** *Aerides quinquevulnera* Lindl., cult. (Photo: André Schuiteman)
- Plate 60.** *Amesiella philippinensis* (Ames) Garay, cult. (Photo: Lubbert Westra)
- Plate 61.** *Arachnis grandispala* J.J.Wood, Sabah (Photo: Anthony Lamb)
- Plate 62.** *Brachypezza indusiata* (Rchb.f.) Garay, cult. (Photo: André Schuiteman)
- Plate 63.** *Chiloschista exuperei* (Guillaumin) Garay, cult. (Photo: Lubbert Westra)
- Plate 64.** *Cleisocentron merrillianum* (Ames) Christenson, cult. (Photo: André Schuiteman)
- Plate 65.** *Cleisomeria pilosulum* (Gagnep.) Seidenf. & Garay, cult. (Photo: Alexander Kocyan)
- Plate 66.** *Cleisostoma duplicilobum* (J.J.Sm.) Garay, cult. (Photo: André Schuiteman)
- Plate 67.** *Cleisostoma simondii* (Gagnep.) Seidenf., cult. (Photo: André Schuiteman)
- Plate 68.** *Cleisostomopsis eberhardtii* (Finet) Seidenf., cult. (Photo: Nguyen Thien Tich)
- Plate 69.** *Cryptopylos clausus* (J.J.Sm.) Garay, cult. (Photo: André Schuiteman)
- Plate 70.** *Dimorphorchis lowii* (Lindl.) Rolfe, cult. (Photo: André Schuiteman)
- Plate 71.** *Diplocentrum recurvum* Lindl., cult. (Photo: Alexander Kocyan)
- Plate 72.** *Diploprora championii* (Lindl.) Hook.f., Sri Lanka (Photo: Imaduwa Priyadarshana)
- Plate 73.** *Dryadorchis dasystele* Schuit. & de Vogel, cult. (Photo: André Schuiteman)
- Plate 74.** *Drymoanthus minutus* Nicholls, cult. (Photo: Alexander Kocyan)
- Plate 75.** *Dyakia hendersoniana* (Rchb.f.) Christenson, cult. (Photo © Greg Allikas, www.orchidworks.com)
- Plate 76.** *Gastrochilus retrocallus* (Hayata) Hayata, cult. (Photo: André Schuiteman)
- Plate 77.** *Gastrochilus sororius* Schltr., cult. (Photo: André Schuiteman)
- Plate 78.** *Grosourhya muscosa* (Rolfe) Garay, cult. (Photo: André Schuiteman)
- Plate 79.** *Holcoglossum flavescens* (Schltr.) Z.H.Tsi, cult. (Photo: André Schuiteman)
- Plate 80.** *Hymenorchis tani* Schuit. & de Vogel, cult. (Photo: André Schuiteman)
- Plate 81.** *Luisia morsei* Rolfe, cult. (Photo: André Schuiteman)
- Plate 82.** *Luisia tristis* (G.Forst.) Hook.f., Sri Lanka (Photo: Suranjan Fernando)
- Plate 83.** *Macropodanthus sababensis* J.J.Wood & A.L.Lamb, Malaysia (Photo: Alexander Kocyan)
- Plate 84.** *Micropera pallida* (Roxb.) Lindl., cult. (Photo: André Schuiteman)
- Plate 85.** *Microsaccus truncatus* Carr, cult. (Photo: André Schuiteman)
- Plate 86.** *Ophioglossella chrysostoma* Schuit. & Ormerod, cult. (Photo: Johan van Valkenburg)
- Plate 87.** *Papilionanthe teres* (Roxb.) Schltr., cult. (Photo: Lubbert Westra)
- Plate 88.** *Paraphalaenopsis labukensis* Shim, A.L.Lamb & C.L.Chan, cult. (Photo: André Schuiteman)
- Plate 89.** *Pelatantheria rivesii* (Guillaumin) Tang & F.T.Wang, cult. (Photo: André Schuiteman)
- Plate 90.** *Pennilabium struthio* Carr, cult. (Photo: André Schuiteman)
- Plate 91.** *Phalaenopsis amabilis* (L.) Blume, cult. (Photo © Greg Allikas, www.orchidworks.com)
- Plate 92.** *Phalaenopsis amboinensis* J.J.Sm. 'July Copper', cult. (Photo © Greg Allikas, www.orchidworks.com)
- Plate 93.** *Phalaenopsis appendiculata* Carr, cult. (Photo: André Schuiteman)
- Plate 94.** *Phalaenopsis bellina* (Rchb.f.) Christenson 'Krull's Perfection' FCC/AOS, cult. (Photo © Greg Allikas, www.orchidworks.com)

- Plate 95.** *Phalaenopsis floresensis* Fowlie, cult. (Photo: André Schuiteman)
- Plate 96.** *Phalaenopsis pulcherrima* (Lindl.) J.J.Sm., cult. (Photo: André Schuiteman)
- Plate 97.** *Plectorrhiza tridentata* (Lindl.) Dockrill, cult. (Photo: Peter Adams)
- Plate 98.** *Pomatocalpa maculosum* (Lindl.) J.J.Sm., Sri Lanka (Photo: Suranjan Fernando)
- Plate 99.** *Pomatocalpa marsupiale* (Kränzl.) J.J.Sm., cult. (Photo: André Schuiteman)
- Plate 100.** *Porrorhachis galbina* (J.J.Sm.) Garay, cult. (Photo: André Schuiteman)
- Plate 101.** *Pteroceras teres* (Blume) Holttum, cult. (Photo: André Schuiteman)
- Plate 102.** *Renanthera bella* J.J.Wood, cult. (Photo: André Schuiteman)
- Plate 103.** *Rhinerrhiza divitiflora* (F.Muell. ex Benth.) Rupp, cult. (Photo: Peter Adams)
- Plate 104.** *Rhinerrhizopsis moorei* (Rchb.f.) Ormerod, cult. (Photo: André Schuiteman)
- Plate 105.** *Rhynchostylis coelestis* (Rchb.f.) A.H.Kent 'Frاندys Delight' AM/AOS, cult. (Photo © Greg Allikas, www.orchidworks.com)
- Plate 106.** *Robiquetia angustifolia* Schltr., cult. (Photo: André Schuiteman)
- Plate 107.** *Robiquetia rosea* (Lindl.) Garay, Sri Lanka (Photo: Suranjan Fernando)
- Plate 108.** *Robiquetia witteana* (Rchb.f.) Kocyan & Schuit., cult. (Photo: André Schuiteman)
- Plate 109.** *Sarcobilus dilatatus* F.Muell., cult. (Photo: Peter Adams)
- Plate 110.** *Sarcoglyphis smithianus* (Kerr) Seidenf., cult. (Photo: André Schuiteman)
- Plate 111.** *Sarcophyton pachyphyllum* (Ames) Garay, cult. (Photo: Lubbert Westra)
- Plate 112.** *Schoenorchis gemmata* (Lindl.) J.J.Sm., cult. (Photo: Lubbert Westra)
- Plate 113.** *Seidenfadenia mitrata* (Rchb.f.) Garay, Laos (Photo: Pierre Bonnet)
- Plate 114.** *Smithsonia saldanbae* C.S.Kumar & Theuerkauf, cult. (Photo: C. Sathish Kumar)
- Plate 115.** *Smitinandia micrantha* (Lindl.) Holttum, cult. (Photo: André Schuiteman)
- Plate 116.** *Stereochilus dalatensis* (Guillaumin) Garay, cult. (Photo: Lubbert Westra)
- Plate 117.** *Taeniophyllum alwisii* Lindl., Sri Lanka (Photo: Suranjan Fernando)
- Plate 118.** *Taeniophyllum montanum* Carr, cult. (Photo: André Schuiteman)
- Plate 119.** *Thrixspermum pinocchio* P.O'Byrne & J.J.Verm., cult. (Photo: André Schuiteman)
- Plate 120.** *Trachoma speciosum* D.L.Jones, B.Gray, M.A.Clem. & J.J.Wood. cult. (Photo: André Schuiteman)
- Plate 121.** *Trichoglottis kinabaluensis* Rolfe, cult. (Photo: André Schuiteman)
- Plate 122.** *Trichoglottis smithii* Carr, cult. (Photo: André Schuiteman)
- Plate 123.** *Trichoglottis tenera* (Lindl.) Rchb.f., Sri Lanka (Photo: Suranjan Fernando)
- Plate 124.** *Taberolabium odoratissimum* (J.J.Sm.) Garay, cult. (Photo: André Schuiteman)
- Plate 125.** *Uncifera thailandica* Seidenf. & Smitinand, cult. (Photo: André Schuiteman)
- Plate 126.** *Vanda dives* (Rchb.f.) L.M.Gardiner, cult. (Photo: André Schuiteman)
- Plate 127.** *Vanda falcata* (Thunb.) Beer, cult. (Photo © Greg Allikas, www.orchidworks.com)
- Plate 128.** *Vanda garayi* (Christenson) L.M.Gardiner, cult. (Photo: André Schuiteman)
- Plate 129.** *Vanda tessellata* (Roxb.) Hook.f. ex G.Don, Sri Lanka (Photo: Imaduwa Priyadarshana)
- Plate 130.** *Vanda testacea* (Lindl.) Rchb.f., Sri Lanka (Photo: Suranjan Fernando)
- Plate 131.** *Vandopsis gigantea* (Lindl.) Pfitzer, cult. (Photo © Greg Allikas, www.orchidworks.com)

- Plate 132.** *Agrostophyllum majus* Hook.f., cult. (Photo: André Schuiteman)
- Plate 133.** *Earina valida* Rchb.f., cult. (Photo: André Schuiteman)
- Plate 134.** *Aerangis articulata* (Rchb.f.) Schltr., cult. (Photo: Johan Hermans)
- Plate 135.** *Aerangis bariotiana* (Kränzl.) P.J.Cribb & Carlswald, cult. (Photo: Johan Hermans)
- Plate 136.** *Aerangis monantha* Schltr., cult. (Photo: Johan Hermans)
- Plate 137.** *Aeranthes filipes* Schltr., cult. (Photo: Johan Hermans)
- Plate 138.** *Aeranthes schlechteri* Bosser, cult. (Photo: Johan Hermans)
- Plate 139.** *Ambrella longituba* H.Perrier, cult. (Photo: H. Vorster)
- Plate 140.** *Ancistrorhynchus cephalotes* (Rchb.f.) Summerh., cult. (Photo: André Schuiteman)
- Plate 141.** *Angraecopsis parviflora* (Thouars) Schltr., cult. (Photo: Johan Hermans)
- Plate 142.** *Angraecum eburneum* Bory, cult. (Photo: Johan Hermans)
- Plate 143.** *Angraecum magdalenae* Schltr. & H.Perrier, cult. (Photo: Johan Hermans)
- Plate 144.** *Angraecum sesquipedale* Thouars, cult. (Photo: Johan Hermans)
- Plate 145.** *Angraecum vignieri* Schltr., cult. (Photo: Johan Hermans)
- Plate 146.** *Beclardia macrostachya* (Thouars) A.Rich., cult. (Photo: Johan Hermans)
- Plate 147.** *Bolusiella maudiae* (Bolus) Schltr., Rwanda (Photo: Eberhard Fischer)
- Plate 148.** *Calypstrochilum christyanum* (Rchb.f.) Summerh., cult. (Photo: Johan Hermans)
- Plate 149.** *Campylocentrum brenesii* Schltr., cult. (Photo: Rudolf Jenny)
- Plate 150.** *Cribbia confusa* P.J.Cribb, cult. (Photo: André Schuiteman)
- Plate 151.** *Cryptopus paniculatus* H.Perrier, cult. (Photo: Johan Hermans)
- Plate 152.** *Cyrtorchis arcuata* (Lindl.) Schltr., cult. (Photo: Johan Hermans)
- Plate 153.** *Cyrtorchis ringens* (Rchb.f.) Summerh., cult. (Photo: Johan Hermans)
- Plate 154.** *Dendrophylax funalis* (Sw.) Benth. ex Rolfe, cult. (Photo: Mark Whitten)
- Plate 155.** *Dendrophylax lindeni* (Lindl.) Benth. ex Rolfe, USA (Photo: Roger Hammer)
- Plate 156.** *Diaphananthe pellucida* (Lindl.) Schltr., cult. (Photo: Johan Hermans)
- Plate 157.** *Eggelingia ligulifolia* Summerh., cult. (Photo: Eberhard Fischer)
- Plate 158.** *Erasanthe henrici* (Schltr.) P.J.Cribb, Hermans & D.L.Roberts, cult. (Photo: Johan Hermans)
- Plate 159.** *Eurychone rothschildiana* (O'Brien) Schltr., cult. (Photo: Johan Hermans)
- Plate 160.** *Jumellea rossii* Senghas, cult. (Photo: Johan Hermans)
- Plate 161.** *Lemurella culicifera* (Rchb.f.) H.Perrier, cult. (Photo: Johan Hermans)
- Plate 162.** *Lemurochis madagascariensis* Kränzl., cult. (Photo: Johan Hermans)
- Plate 163.** *Listrostachys pertusa* (Lindl.) Rchb.f., cult. (Photo: Rudolf Jenny)
- Plate 164.** *Margelliantha leedalii* P.J.Cribb, Tanzania (Photo: Phillip Cribb)
- Plate 165.** *Microcoelia koehlerii* (Schltr.) Summerh., cult. (Photo: Johan Hermans)
- Plate 166.** *Microcoelia perrieri* (Finet) Summerh., cult. (Photo: Johan Hermans)
- Plate 167.** *Mystacidium venosum* Harv. ex Rolfe, cult. (Photo: Johan Hermans)
- Plate 168.** *Neobathiea grandidieriana* (Rchb.f.) Garay, cult. (Photo: Johan Hermans)
- Plate 169.** *Nephrangis filiformis* (Kränzl.) Summerh., cult. (Photo: Eberhard Fischer)

- Plate 170.** *Oeonia rosea* Ridl., cult. (Photo: Johan Hermans)
- Plate 171.** *Oeoniella polystachys* (Thouars) Schltr., cult. (Photo: Johan Hermans)
- Plate 172.** *Plectrelminthus caudatus* (Lindl.) Summerh., cult. (Photo: Johan Hermans)
- Plate 173.** *Podangis dactyloceras* (Rchb.f.) Schltr., cult. (Photo: Johan Hermans)
- Plate 174.** *Podangis rhipsalisocia* (Rchb.f.) P.J.Cribb & Carlswald, cult. (Photo: Johan Hermans)
- Plate 175.** *Rhaesteria eggelingii* Summerh., Rwanda (Photo: Eberhard Fischer)
- Plate 176.** *Rhipidoglossum stolzii* (Schltr.) Garay, cult. (Photo: J. Tanner)
- Plate 177.** *Sobennikoffia humbertiana* H.Perrier, cult. (Photo: Johan Hermans)
- Plate 178.** *Solenangis wakefieldii* (Rolfe) P.J.Cribb & J.Stewart, cult. (Photo: Joyce Stewart)
- Plate 179.** *Sphyrarrhynchus schliebenii* Mansf., Tanzania (Photo: J. Tanner)
- Plate 180.** *Summerbayesia laurentii* (De Wild.) P.J.Cribb, cult. (Photo: Coen Arends)
- Plate 181.** *Triceratorhynchus viridiflorus* Summerh., Rwanda (Photo: Eberhard Fischer)
- Plate 182.** *Tridactyle bicandata* (Lindl.) Schltr., cult. (Photo: Johan Hermans)
- Plate 183.** *Tridactyle tanneri* P.J.Cribb, Tanzania (Photo: Phillip Cribb)
- Plate 184.** *Ypsilopus longifolius* (Kränzl.) Summerh., cult. (Photo: W. Bachmann)
- Plate 185.** *Polystachya clareae* Hermans, cult. (Photo: Johan Hermans)
- Plate 186.** *Polystachya concreta* (Jacq.) Garay & H.R.Sweet, Sri Lanka (Photo: Suranjan Fernando)
- Plate 187.** *Polystachya concreta* (Jacq.) Garay & H.R.Sweet, Florida (USA) (Photo: Chuck McCartney)
- Plate 188.** *Polystachya goetzeana* Kränzl., cult. (Photo: Milan Svanderlik)
- Plate 189.** *Polystachya porphyrochila* J.Stewart, cult. (Photo: Joyce Stewart)
- Plate 190.** *Polystachya tsaratananae* H.Perrier, cult. (Photo: Johan Hermans)
- Plate 191.** *Galeoglossum tubulosum* (A.Rich. & Galeotti) Salazar & Soto Arenas, cult. (Photo: Gerardo Salazar)
- Plate 192.** *Nothostele acianthiformis* (Rchb.f. & Warm.) Garay, cult. (Photo: João Batista)
- Plate 193.** *Hemipiliopsis purpureopunctata* (K.Y.Lang) Y.B.Luo & S.C.Chen, China (Photo: Chen Li-jun)
- Plate 194.** *Hemipiliopsis purpureopunctata* (K.Y.Lang) Y.B.Luo & S.C.Chen (close-up), China (Photo: Chen Li-jun)
- Plate 195.** *Neolindleya camtschatica* (Cham.) Nevski, Russia (Photo: Petr Efimov)
- Plate 196.** *Neolindleya camtschatica* (Cham.) Nevski, (close-up) Russia (Photo: Petr Efimov)
- Plate 197.** *Pseuderia floribunda* Schltr., Papua New Guinea (Photo: Peter O'Byrne)

# I EPIDENDROIDEAE (Part Three)

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## A. TRIBE DENDROBIEAE

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**Dendrobieae** Endl., *Gen. Pl.*, 190 (1837). Type: *Dendrobium* Sw.  
Bulbophylleae Pfitzer, *Entw. Nat. Anordn. Orchid.*, 104 (1887), as  
‘Bulbophyllinae’. Type: *Bulbophyllum* Thouars  
Sunipiace Szlach., *Folia Geobot. Phytotax.*, **26**, 323 (1991). Type:  
*Sunipia* Buch.-Ham. ex Sm., **syn. nov.**

Taxa at the rank of subtribe referable to Dendrobieae:  
Dendrobiinae Lindl., *Gen. Sp. Orch. Pl.*, 45 (1830), as ‘sect.  
Dendrobieae’. Type: *Dendrobium* Sw.  
Bulbophyllinae Schltr., *Orchideen*, ed. 1, 319 (1914). Type:  
*Bulbophyllum* Thouars  
Genyorchidinae Schltr., *Orchideen*, ed. 1, 336 (1914). Type:  
*Genyorchis* Schltr.  
Sunipiinae Dressler, *Selbyana*, **5**, 205 (1979). Type: *Sunipia* Buch.-  
Ham. ex Sm.  
Epigeneiinae M.A.Clem., *Telopea*, **10**, 278 (2003). Type:  
*Epigeneium* Gagnep.  
Grastidiinae M.A.Clem., *Telopea*, **10**, 278 (2003). Type:  
*Grastidium* Blume

### Description

Epiphytic, lithophytic, or rarely terrestrial, sympodial *herbs* with one- to many-leaved, heteroblastic or homoblastic pseudobulbs or with few- to many-leaved, cane-like stems. *Leaves* distichous, conduplicate, with or without sheathing base, glabrous or rarely pubescent or papillose. *Inflorescence* basal, lateral or terminal, one-flowered or racemose, rarely branching. *Flowers* resupinate or not, minute to large, ephemeral to long-lasting; distichous, secund or helically arranged; fragrant or non-fragrant. *Sepals* entire, free or variously connate; the lateral sepals often forming a mentum together with the column foot. *Petals* entire or variously divided, free. *Labellum* free or adnate to the column foot, rigidly attached or hinged through a ligament and then highly mobile; entire or lobed, with or without keels and/or callosities, not spurred. *Column* usually straight, with or without lateral wings or apical steldia; column foot usually present and well-developed, rarely reduced to almost absent; anther helmet-shaped, rarely horn-like and elongate, two-locular; pollinia usually four, sometimes two, usually oblong and laterally flattened, hard-waxy, if four then cohering in two pairs, those of a pair subequal to strongly unequal in size, without caudicles, rarely with a hamular stipe in some *Bulbophyllum* species; stigma a ventral concavity, rarely with a raised lower margin; rostellum simple, usually short, but sometimes beak-like and elongate; a well-defined, detachable viscidium usually absent, when present semiliquid or rarely solid. *Ovary*

and pedicel terete or winged. *Capsule* ellipsoid, oblong, obovoid to subglobose, unilocular, sometimes winged or triangular in cross-section, without endocarpic elaters. **(AS)**

### Distribution (Fig. A.1)

Dendrobieae are a pantropical tribe of two genera, *Bulbophyllum* and *Dendrobium*, with about 3650 species. *Dendrobium* is absent from Africa and America. Both genera are most diverse in Southeast Asia and Australasia, especially in New Guinea, where, for both genera, almost 30% of all species occur. **(AS)**

### Phylogenetics

Endlicher (1837) was the first to apply the rank of tribe to a group of genera for which Lindley (1830) had already used the name Dendrobieae, but as a ‘section’ of the tribe Malaxideae. If we disregard some misplaced genera, such as *Diglyphosa* and *Microcoelia*, then Lindley’s concept essentially covers the genera *Bulbophyllum*, *Dendrobium*, *Polystachya*, and *Eria* and their allies. Until the advent of molecular methods, *Dendrobium* was most often considered to be closely related to *Eria*, for example by Schlechter (1927) in his influential work *Die Orchideen*. DNA studies (e.g. Clements 2006) have shown, however, that *Dendrobium* is the sister group of *Bulbophyllum*, and that *Eria* and *Polystachya* are more distantly related. Van den Berg *et al.* (2005) performed a Bayesian analysis of four combined DNA regions of species in subfamily Epidendroideae and found that Dendrobieae are sister to a strongly supported clade that they called the vandoid orchids (in their analysis including Agrostophyllinae, Polystachyinae, Aeridinae, and other subtribes). However, the clade Dendrobieae + vandoid orchids has a low support, which renders this result inconclusive. More recently, Górnjak *et al.* (2010), using the low-copy nuclear gene *Xdb*, confirmed the sister group relationship of *Dendrobium* (including *Epigeneium*) and *Bulbophyllum* but found Dendrobieae to be sister to Malaxideae with strong bootstrap support. However, the combined clade Dendrobieae + Malaxideae had no strongly supported sister group relationship with any other, much like all other major clades thus far identified in Epidendroideae.

The morphological differences between *Bulbophyllum* and *Dendrobium* are few, as indicated in the key below. However, the two genera differ largely in their pollination biology: *Bulbophyllum* is mainly, with few known exceptions, fly-pollinated (but not syrphid flies, apparently), whereas *Dendrobium* is mainly bee- and (to





Fig. A.1. Distribution map of Dendrobieae.

a lesser extent) bird-, wasp-, and syrphid fly-pollinated. Owing to the different pollination syndromes, *Dendrobium* species tend to have showier, more brightly coloured flowers than *Bulbophyllum* species, and it is usually easy to assign the species to the proper genus using either vegetative or floral characters. (AS)

## Taxonomic literature

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## Artificial key to the genera of Dendrobieae (AS)

- Plants with pseudobulbs (sometimes reduced) consisting of a single internode; pseudobulbs with one or two non-

sheathing leaves, rarely with a tuft of several needle-shaped leaves. Inflorescence arising from the base of the pseudobulb or the rhizome. Pollinia four, often distinctly unequal in size, sometimes two . . . . . **621. *Bulbophyllum***

- Plants with cane-like stems or with pseudobulbs (sometimes reduced) consisting of one to many internodes; stems or pseudobulbs one- to many-leaved, the leaves sheathing or not. Inflorescence arising above the base of the pseudobulb or stem, laterally or apically. Pollinia four, subequal . . . . . **622. *Dendrobium***

## 621. BULBOPHYLLUM

**Bulbophyllum** Thouars, *Hist. Orchid.*, t. 3 (1822), nom. cons.

Type species: *Bulbophyllum nutans* (Thouars) Thouars, typus cons. (basonym: *Phyllorkis nutans* Thouars), **cons. pending**.

*Phyllorkis* Thouars, *Nouv. Bull. Sci. Soc. Philom. Paris*, **1**, 319

(1809). Type species: *Phyllorkis nutans* Thouars

*Sunipia* Buch.-Ham. ex Sm. in A.Rees, *Cycl.* 34, Art. *Stelis*, nos. 11 & 13 (1816). Lectotype (designated by Senghas 1991): *Sunipia racemosa* (Sm.) Tang & F.T.Wang (= *Bulbophyllum reptans* (Lindl.) Lindl. ex Wall.), **syn. nov.**

*Tribrachia* Lindl., *Bot. Reg.*, **10**, t. 832 (1823) Type species: *Tribrachia reptans* Lindl. (= *Bulbophyllum reptans* (Lindl.) Lindl. ex Wall.)

*Osyricera* Blume, *Bijdr. Fl. Ned. Ind.*, 307 (1825). Type species: *Osyricera crassifolia* Blume (= *Bulbophyllum osyricera* J.J.Sm.)

*Epicranthes* Blume, *Bijdr. Fl. Ned. Ind.*, 306 (1825). (*Epicranthes*). Type species: *Epicranthes javanica* Blume (= *Bulbophyllum epicranthes* (Blume) Hook.f.)

- Ephippium* Blume, *Bijdr. Fl. Ned. Ind.*, 308 (1825). Lectotype (designated by Vermeulen 2008): *Ephippium lepidum* Blume (= *Bulbophyllum lepidum* (Blume) J.J.Sm.)
- Diphyes* Blume, *Bijdr. Fl. Ned. Ind.*, 310 (1825). Lectotype (designated by Szlachetko & Rutkowski 2008): *Diphyes tortuosa* Blume (= *Bulbophyllum tortuosum* (Blume) Lindl.)
- Cochlia* Blume, *Bijdr. Fl. Ned. Ind.*, 320 (1825). Type species: *Cochlia violacea* Blume (= *Bulbophyllum salaccense* Rchb.f.)
- Anisopetalon* Hook., *Exot. Fl.*, 2, t. 149 (1825). Type species: *Anisopetalon careyanum* Hook. (= *Bulbophyllum careyanum* (Hook.) Spreng.)
- Zygoglossum* Reinw., *Syll. Pl. Nov.*, 2, 5 (1825). Type species: *Zygoglossum umbellatum* Reinw. (= *Bulbophyllum longiflorum* Thouars)
- Megaclinium* Lindl., *Bot. Reg.*, 12, t. 989 (1826). Type species: *Megaclinium falcatum* Lindl. (= *Bulbophyllum falcatum* (Lindl.) Rchb.f. var. *falcatum*)
- Odontostylis* Breda, *Gen. Sp. Orchid. Asclep.*, t. 4 (1827), nom. illeg. Lectotype: *Odontostylis triflora* (Blume) Breda (= *Bulbophyllum triflorum* (Blume) Blume)
- Sestochilos* Breda, *Gen. Sp. Orchid. Asclep.*, 1, t. 3 (1827). Type species: *Sestochilos uniflorum* Breda (= *Bulbophyllum lobbii* Lindl.)
- Hippoglossum* Breda, *Gen. Sp. Orchid. Asclep.*, 3, t. 14 (1829). Type species: *Hippoglossum umbellatum* Breda (= *Bulbophyllum lepidum* (Blume) Lindl.)
- Cirrhopetalum* Lindl., *Gen. Sp. Orchid. Pl.*, 45 (1830), nom. cons. Type species: *Cirrhopetalum thouarsii* Lindl. (= *Bulbophyllum longiflorum* Thouars)
- Lyraea* Lindl., *Gen. Sp. Orchid. Pl.*, 46 (1830). Type species: *Lyraea prismatica* Lindl.
- Monomeria* Lindl., *Gen. Sp. Orchid. Pl.*, 61 (1830). Type species: *Monomeria barbata* Lindl. Lectotype (designated by Averyanov 1994): *Sunipia scariosa* Lindl., **syn. nov.**
- Trias* Lindl., *Gen. Sp. Orchid. Pl.*, 60 (1830). Lectotype (designated by Averyanov 1994): *Trias oblonga* Lindl., **syn. nov.**
- Macrolepis* A.Rich. in J.S.C.Domont d'Urville, *Voy. Astrolabe*, 2, 25 (1833). Type species: *Macrolepis longiscapa* A.Rich. (= *Bulbophyllum longiscapum* (A.Rich.) Rolfe)
- Drymoda* Lindl., *Sert. Orchid.*, t. 8 C (1838). Type species: *Drymoda picta* Lindl., **syn. nov.**
- Malachadenia* Lindl., *Edwards's Bot. Reg.*, 25 (Misc.), 67 (1839). Type species: *Malachadenia clavata* Lindl. (= *Bulbophyllum malachadenia* Cogn.)
- Oxysepala* Wight, *Icon. Pl. Ind. Orient.*, 5, 17 (1851). Type species: *Oxysepala ovalifolium* Wight (= *Bulbophyllum clandestinum* Lindl.)
- Bolbophyllaria* Rchb.f., *Bot. Zeitung (Berlin)*, 10, 934 (1852). Type species: *Bolbophyllaria bracteolata* Rchb.f. (= *Bulbophyllum bracteolatum* Lindl.)
- Bolbophyllopsis* Rchb.f., *Bot. Zeitung (Berlin)*, 10, 933 (1852). Type species: *Bolbophyllopsis morphologorum* Rchb.f. (= *Bulbophyllum umbellatum* Lindl.)
- Didactyle* Lindl., *Fol. Orchid.*, 1, 1 (1852). Type species: *Didactyle exaltata* Lindl. (= *Bulbophyllum exaltatum* Lindl.)
- Taurostalix* Rchb.f., *Bot. Zeitung (Berlin)*, 10, 933 (1852). Type species: *Taurostalix berminiostachys* Rchb.f. (= *Bulbophyllum pumilum* (Sw.) Lindl.)
- Xiphizusa* Rchb.f., *Bot. Zeitung (Berlin)*, 10, 919 (1852). Type species: *Xiphizusa chloroptera* Rchb.f. (= *Bulbophyllum chloropterum* Rchb.f.)
- Acrochaene* Lindl., *Fol. Orchid.*, 2, 1 (1853). Type species: *Acrochaene punctata* Lindl. (= *Bulbophyllum kingii* Hook.f.), **syn. nov.**
- Ione* Lindl., *Fol. Orchid.*, 2, 1 (1853). Lectotype (**here designated**): *Ione paleacea* Lindl., **syn. nov.**
- Henosis* Hook.f., *Fl. Brit. India*, 5, 771 (1890). Type species: *Henosis longipes* Rchb.f.
- Adelopetalum* Fitzg., *J. Bot.*, 29, 152 (1891). Type species: *Adelopetalum bracteatum* (F.M.Bailey) Fitzg.
- Genyorchis* Schltr., Westafr. Kautschuk-Exped., 280 (1900). Type species: *Genyorchis pumila* Schltr.
- Pedilochilus* Schltr. in K.M.Schumann & C.A.G.Lauterbach, *Fl. Schutzgeb. Südsee, Nachtr.*, 218 (1905). Type species: *Pedilochilus papuanum* Schltr., **syn. nov.**
- Pelma* Finet, *Notul. Syst. (Paris)*, 1, 112 (1909). Syntype: *Pelma absconditum* J.J.Sm., *Pelma neocaledonicum* Schltr. (= *B. absconditum* J.J.Sm.)
- Saccoglossum* Schltr., *Repert. Spec. Nov. Regni Veg. Beib.*, 1, 683 (1912). Lectotype: *Saccoglossum papuanum* Schltr., **syn. nov.**
- Codonosiphon* Schltr., *Repert. Spec. Nov. Regni Veg. Beib.*, 1, 893 (1913). Type species: *Codonosiphon codonanthum* (Schltr.) Schltr. (basionym: *Bulbophyllum codonanthum* Schltr.)
- Dactylorhynchus* Schltr., *Repert. Spec. Nov. Regni Veg. Beib.*, 1, 890 (1913). Type species: *Dactylorhynchus flavescens* Schltr. (= *Bulbophyllum latipes* J.J.Sm.)
- Monosepalum* Schltr., *Repert. Spec. Nov. Regni Veg. Beib.*, 1, 682 (1913). Lectotype (designated by Van Royen 1979): *Monosepalum muricatum* (J.J.Sm.) Schltr. (basionym: *Bulbophyllum muricatum* J.J.Sm.)
- Tapeinoglossum* Schltr., *Repert. Spec. Nov. Regni Veg. Beib.*, 1, 892 (1913). Lectotype: *Bulbophyllum centrosemiflorum* Schltr.
- Hyalosema* (Schltr.) Rolfe, *Orchid Rev.*, 27, 130 (1919). Type species: *Hyalosema grandiflorum* (Blume) Rolfe (basionym: *Bulbophyllum grandiflorum* Blume)
- Chaseella* Summerh., *Kirkia*, 1, 88 (1961). Type species: *Chaseella pseudohydra* Summerh., **syn. nov.**
- Canacorchis* Guillaumin, *Bull. Mus. Natl. Hist. Nat.*, II, 35, 653 (1964). Type species: *Canacorchis lophoglottis* Guillaumin (= *Bulbophyllum lophoglottis* (Guillaumin) Hallé)
- Hapalochilus* (Schltr.) Senghas, *Orchidee (Hamburg)*, 29, 248 (1978). Lectotype (designated by Senghas 1978): *Hapalochilus nitidus* (Schltr.) Senghas. (= *Bulbophyllum nitidum* Schltr.)
- Jejosephia* A.N.Rao & Mani, *J. Econ. Taxon. Bot.*, 7, 217 (1985). Type species: *Jejosephia pusilla* (Joseph & H.Deka) A.N.Rao & K.J.Mani, **syn. nov.**
- Ferruminaria* Garay, Hamer & Siegerist, *Nordic J. Bot.*, 14, 635 (1994). Type species: *Ferruminaria brastagiensis* (Carr) Garay, Hamer & Siegerist
- Mastigion* Garay, Hamer & Siegerist, *Nordic J. Bot.*, 14, 635 (1994). Type species: *Mastigion appendiculatum* (Rolfe) Garay (= *Bulbophyllum appendiculatum* (Rolfe) J.J.Sm.)
- Rhytionanthos* Garay, Hamer & Siegerist, *Nordic J. Bot.*, 14, 637 (1994). Type species: *Rhytionanthos cornutum* (Lindl.) Garay,

- Hamer & Siegerist (basionym: *Cirrhopetalum cornutum* Lindl. (= *Bulbophyllum belenae* (Kuntze) J.J.Sm.))
- Synarmosepalum* Garay, Hamer & Siegerist, *Nordic J. Bot.*, **14**, 639 (1994). Type species: *Synarmosepalum kittredgei* Garay, Hamer & Siegerist (= *Bulbophyllum kittredgei* (Garay, Hamer & Siegerist) J.J.Verm.)
- Vesicisepalum* Garay, Hamer & Siegerist, *Nordic J. Bot.*, **14**, 641 (1994). Type species: *Vesicisepalum folliculiferum* (J.J.Sm.) Garay, Hamer & Siegerist (basionym: *Bulbophyllum folliculiferum* J.J.Sm.)
- Oncophyllum* D.L.Jones & M.A.Clem., *Orchadian*, **13**, 420 (2001). Type species: *Oncophyllum minutissimum* (F.Muell.) D.L.Jones & M.A.Clem. (basionym: *Bulbophyllum minutissimum* F.Muell.)
- Peltopus* (Schltr.) Szlach. & Marg., *Polish Bot. J.*, **46**, 114 (2001). Type species: *Peltopus greuterianus* Szlach. & Marg. (= *Bulbophyllum peltopus* Schltr.)
- Blepharochilum* M.A.Clem. & D.L.Jones, *Orchadian*, **13**, 499 (2002). Type species: *Bulbophyllum purpurascens* F.M.Bailey (= *Bulbophyllum macphersonii* Rupp)
- Carparomorchis* M.A.Clem. & D.L.Jones, *Orchadian*, **13**, 499 (2002). Lectotype (designated by Seidenfaden 1979): *Carparomorchis macrantha* (Lindl.) M.A.Clem. & D.L.Jones: *Bulbophyllum macranthum* (Lindl.)
- Kaurorchis* D.L.Jones & M.A.Clem., *Orchadian*, **13**, 499 (2002). Type species: *Kaurorchis evasa* (T.E.Hunt & Rupp) D.L.Jones & M.A.Clem. (basionym: *Bulbophyllum evasum* T.E.Hunt & Rupp)
- Ichthyostomum* D.L.Jones, M.A.Clem. & Molloy, *Orchadian*, **13**, 499 (2002). Type species: *Ichthyostomum pygmaeum* (Sm.) D.L.Jones, M.A.Clem. & Molloy (basionym: *Bulbophyllum pygmaeum* (Sm.) Lindl.)
- Fruticicola* (Schltr.) M.A.Clem. & D.L.Jones, *Orchadian*, **13**, 499 (2002). Type species: *Fruticicola albopunctata* M.A.Clem. & D.L.Jones (= *Bulbophyllum fruticicola* Schltr.)
- Papulipetalum* (Schltr.) M.A.Clem. & D.L.Jones, *Orchadian*, **13**, 500 (2002). Type species: *Papulipetalum angustifolium* M.A.Clem. & D.L.Jones (= *Bulbophyllum papulipetalum* Schltr.)
- Serpenticaulis* M.A.Clem. & D.L.Jones, *Orchadian*, **13**, 500 (2002). Type species: *Serpenticaulis bowkettiae* (F.M.Bailey) M.A.Clem. & D.L.Jones (basionym: *Bulbophyllum bowkettiae* F.M.Bailey)
- Spilorchis* D.L.Jones & M.A.Clem., *Orchadian*, **15**, 37 (2005). Type species: *Spilorchis weinthalii* (R.S.Rogers) D.L.Jones & M.A.Clem. (basionym: *Bulbophyllum weinthalii* R.S.Rogers)
- Hamularia* Aver. & Averyanova, *Komarovia*, **4**, 18 (2006). Type species: *Hamularia puluogensis* Aver. & Averyanova (= *Bulbophyllum griffithii* Rchb.f.), **syn. nov.**
- Lepanthanthe* (Schltr.) Szlach., *Richardiana*, **7**, 82 (2007). Type species: *Lepanthanthe lepanthiflora* (Schltr.) Szlach., **syn. nov.** (basionym: *Bulbophyllum lepanthiflorum* Schltr.)
- Trachyrhachis* (Schltr.) Szlach., *Richardiana*, **7**, 85 (2007). Lectotype (designated by Vermeulen 1993): *Bulbophyllum barbilabium* Schltr. (= *Bulbophyllum bulliferum* J.J. Sm.), **syn. nov.**

*Hordeanthos* Szlach., *Richardiana*, **7**, 88 (2007). Type species: *Hordeanthos lemniscatus* (C.S.P.Parish ex Hook.f.) Szlach. (basionym: *Bulbophyllum lemniscatum* C.S.P.Parish ex Hook.f.)

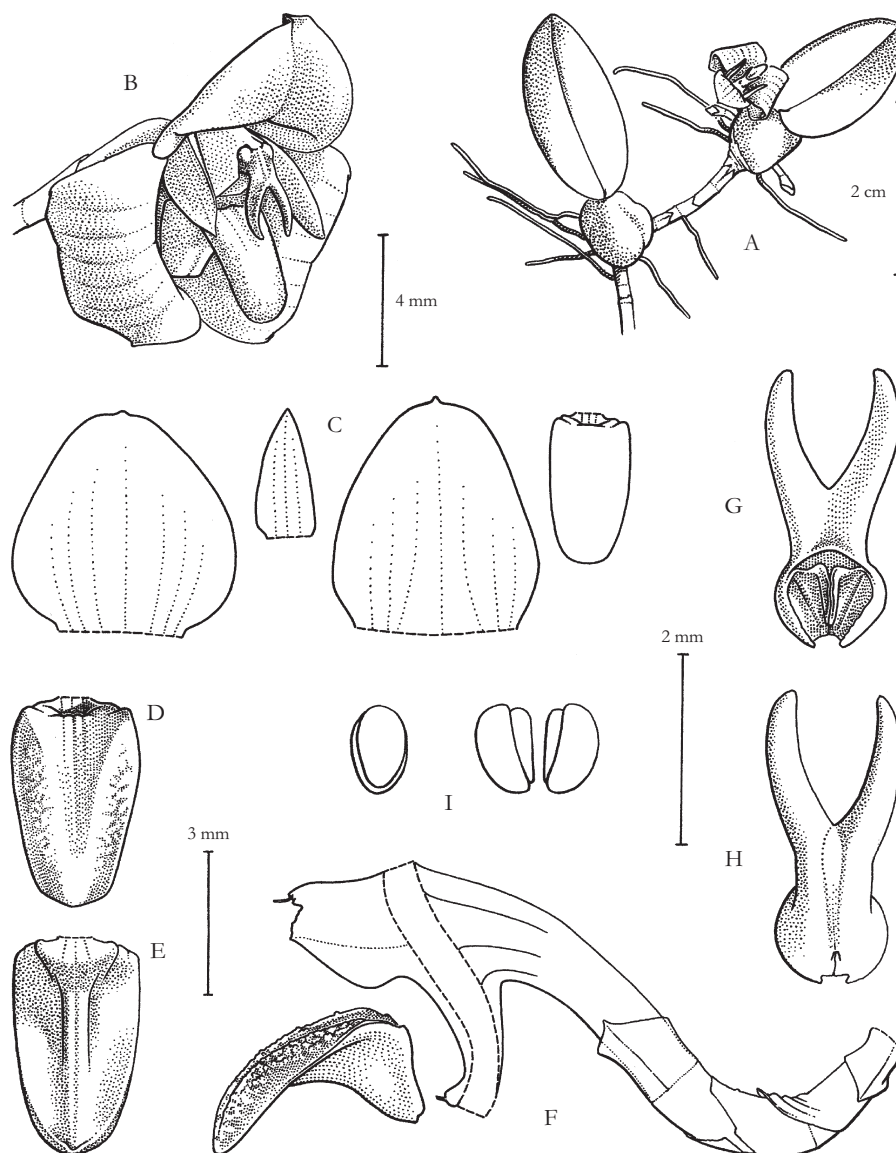
*Tripudiantbes* (Seidenf.) Szlach. & Kras, *Richardiana*, **7**, 94 (2007). Type species: *Tripudiantbes tripudians* (C.S.P.Parish & Rchb.f.) Szlach. & Kras. (basionym: *Bulbophyllum tripudians* C.S.P.Parish & Rchb.f.)

## Derivation of name

From the Greek *bolbos*, bulb, and *phyllon*, leaf, referring to the leaf-bearing pseudobulbs. **(BG)**

## Description (Plates 1–22; Fig. 621.1–621.7)

Epiphytic, occasionally lithophytic, or rarely terrestrial *herbs*. *Sympodia* arising from or (well) above one subterminal nodes from a previous sympodium. Basal part of each sympodium with three to many nodes forming a creeping or patent *rhizome* enveloped in cataphylls when young. Last node of each sympodium usually swollen into a *pseudobulb* (rarely with lower nodes swollen as well), sometimes not or hardly swollen, apex 1–3-leaved (6–12-leaved in *B. sect. Chaseella*). *Leaves* usually persistent, sometimes deciduous, duplicate, inarticulate, usually petiolate, thinly herbaceous to coriaceous, usually glabrous. *Inflorescences* usually heteranthous, consisting of modified sympodia sprouting from or (well) above nodes along rhizome, often close to pseudobulbs, each with several bract-bearing nodes, one- to many-flowered, apical or along distal part of rhizome. *Rachis* usually a peduncle, but sometimes swollen into a spindle-shaped body, or widened and bilaterally flattened with flowers either inserted on flat side, or along the edges; usually glabrous, or papillose, rarely pubescent; floral bracts appressed to reflexed, caducous or persistent. *Flowers* either distichous or spirally arranged, (partly) resupinate or not, opening either simultaneously or in succession, (almost) closed to widely open. *Sepals* free to adherent to connate (the dorsal to laterals, the laterals along their upper or lower margins, or all three), margins entire to erose to fimbriate, glabrous to papillose to ciliate, surface glabrous to papillose or hirsute; lateral sepals equal to dorsal sepal or distinctly different in length, shape, and surface ornamentation, and fused to column foot along basal part of their lower margins. *Petals* free, similar to sepals or not. *Labellum* usually with the base hinged to column foot by a flat strip of tissue allowing free movement of labellum parallel to bilateral plane of symmetry of flower, sometimes (partly) immobile because the strip of tissue is too short or too thick to allow movement, or because the labellum and column foot are fused; undivided to trilobed, margins entire to denticulate to fimbriate, glabrous to papillose to ciliate to vesiculose, adaxially with or without longitudinal ridges, more rarely with transverse ridges. *Column* usually ending in two stelia; often winged along lower margins, column foot present; anther connected to apex of column by a thin strip of tissue, bilocular, pollinia two or four, the inner pair as large as the outer or (much) smaller, usually waxy, hard to soft, sometimes with stalks: caudicles, hamular or regular



**Fig. 621.1.** *Bulbophyllum antbeae* (J.J.Verm. & A.L.Lamb) J.J.Verm. (*B. sect. Trias*). A. Habit; B. Flower; C. Flower analysis, from left to right: dorsal sepal, petal, lateral sepal, labellum; D. Labellum, upper surface; E. Labellum, lower surface; F. Column and labellum, side view; G. Anther, ventral view; H. Anther, dorsal view; I. Pollinia, one pair (left), two pairs (right). Drawn by J. J. Vermeulen from *Tenom Orchid Centre TOC cult. 2600* (L).

stipes; stigma concave, transversely elliptic to a longitudinal slit, separated from anther by seam-like, thin or fleshy rostellum; viscidium usually inconspicuous, semi-liquid. *Ovary* and pedicel glabrous or covered in hairs; node at the base of pedicel level with attachment of subtending bract or (well) above it. *Capsule* obovoid to ellipsoid to subglobose, stalked or not, sometimes winged or triangular in cross-section. (BG, JJV)

### Distribution (Fig. 621.8)

*Bulbophyllum* comprises about 2200 species and is widely distributed from continental tropical Africa, the Comoros, Madagascar, the Seychelles, Reunion and Mauritius (about 200 species), India, Nepal, Bhutan, China, Taiwan, Thailand, Malaysia, Indonesia, the Philippines, New Guinea, Australia, New Zealand and the tropical Pacific islands as far east as Tahiti (about 1700 species)

to the Neotropics (about 100 species). The main centres of diversity are Madagascar (200 species) and New Guinea (600 species). (BG)

### Infrageneric treatments

AFRICAN SECTIONS:

### Artificial key to the continental African sections of *Bulbophyllum* (BG, JJV)

1. • Pseudobulbs 6–12-leaved at apex . . . . **B. sect. Chaseella**
  - Pseudobulbs 1–2-leaved at apex . . . . .2
2. • Labellum attached to column foot by a thick strip of tissue and hence immobile . . . . .7. **B. sect. Genyorchis**

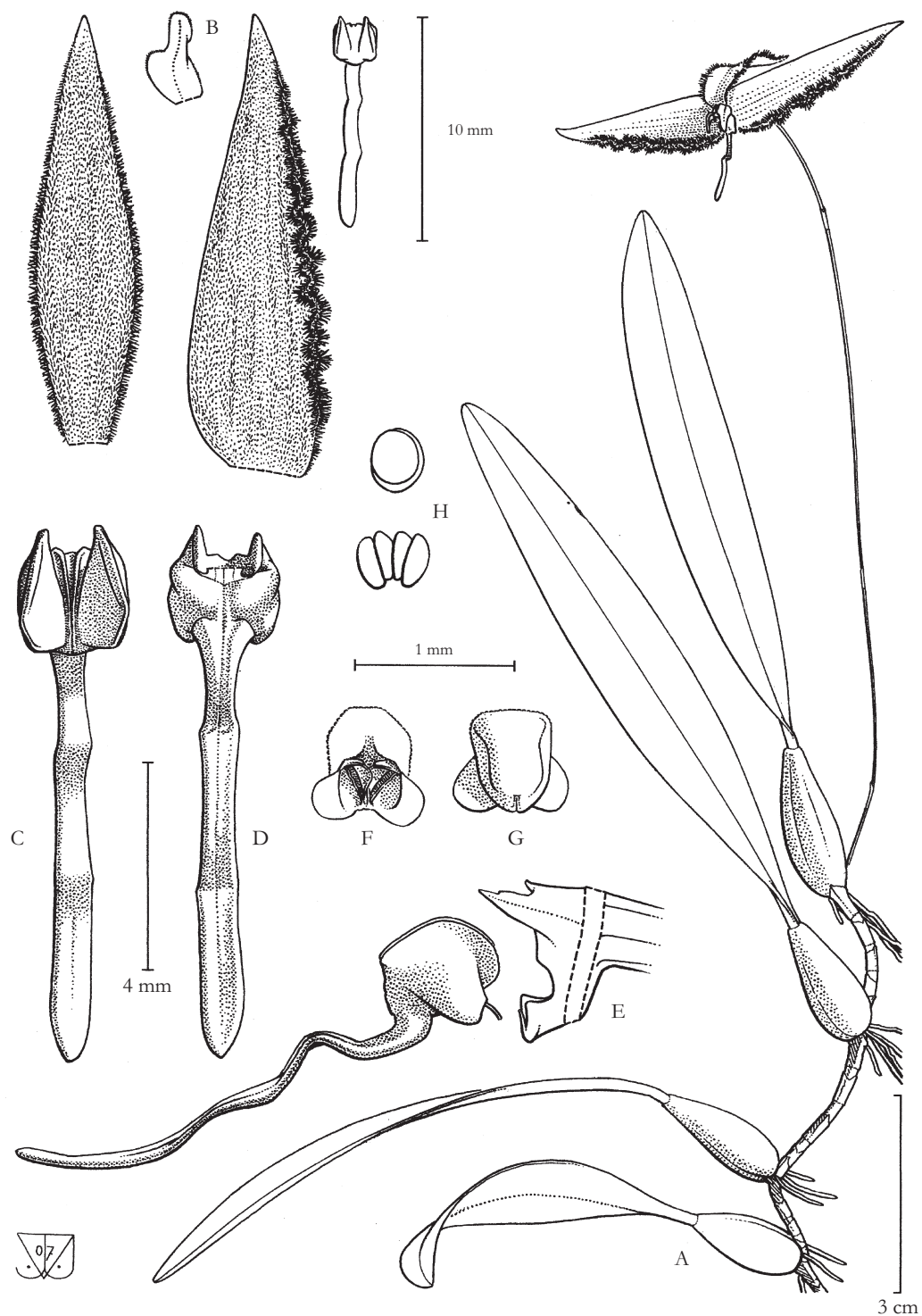


**Fig. 621.2.** *Bulbophyllum calyptratum* Kränzl. var. *calyptratum*. (B. sect. *Megacelinium*). A, B. Habit; C. Flower; D. Flower analysis, from left to right: dorsal sepal, petal, lateral sepal, labellum; E. Labellum, upper surface (left), lower surface (right); F. Column and labellum, side view; G. Column; H. Anther, ventral view (left), dorsal view (right); I. Pollinia, one pair (left), two pairs (right). Drawn by J. J. Vermeulen from *FHI 42079* (K), *Deighton 5026* (K), and *Segeberbaeck 1182* (K). Reproduced with permission from *Orchid Monographs*, 2 (1987).



**Fig. 621.3.** *Bulbophyllum osyricera* Schltr. (*B.* sect. *Brachystachyae*). A. Habit; B. Flower; C. Flower analysis, from left to right: dorsal sepal, petal, lateral sepal, labellum; D. Labellum, upper surface; E. Labellum, lower surface; F. Column and labellum, side view; G. Anther, ventral view (above) dorsal view (below); H. Pollinia. Drawn by J. J. Vermeulen from *Lamb 2008/1295* (SAN).

- Labellum attached to a thin, flexible strip of tissue, hence mobile, if not kept (partly) in position by other flower parts .....3
- 3. • Inflorescence a subumbellate raceme; pedicel plus ovary twice as long as rachis or longer. .... **B. sect. *Cirrhopetalum***
- Inflorescence an elongated raceme; pedicel plus ovary of the lowermost flower equal to length of the rachis or shorter .....4
- 4. • Raceme with distichous flowers or all inflorescences with 1–3 flowers. ....9
- Raceme with spirally arranged flowers; inflorescence with 4 flowers or more .....5
- 5. • Rachis slightly to distinctly swollen compared to peduncle, spindle-shaped, cylindrical or obovoid .....6
- Rachis about as thick as peduncle .....7
- 6. • Labellum adaxially hirsute; petals obovate to spatulate, adaxially papillose toward apex ..... **B. sect. *Comata***
- Labellum adaxially glabrous; petals ovate-oblong to narrowly triangular to linear, adaxially glabrous ..... **B. sect. *Lupulina***
- 7. • Pseudobulbs 1-leaved at apex. ....8



**Fig. 621.4.** *Bulbophyllum sannio* J.J.Verm. (*B.* sect. *Polymeres*). A. Habit; B. Flower analysis, from left to right: dorsal sepal, petal, lateral sepal, labellum; C. Labellum, upper surface; D. Labellum, lower surface; E. Column and labellum, side view; F. Anther, ventral view; G. Anther, dorsal view; H. Pollinia, one pair (above), two pairs (below). Drawn by J. J. Vermeulen from *Jongejan 1028* (L). Reproduced with permission from *Nordic Journal of Botany*, **26** (2008).

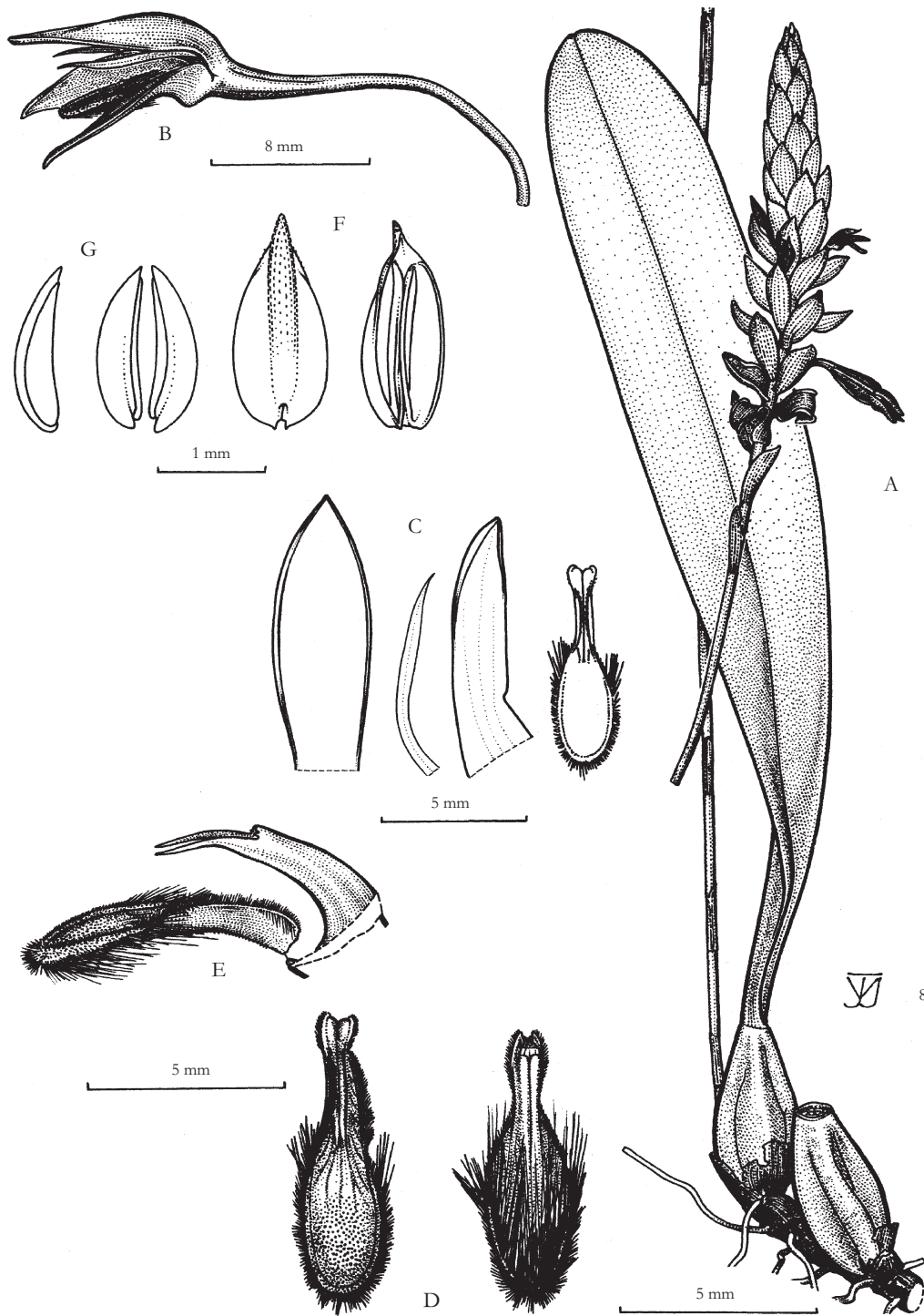
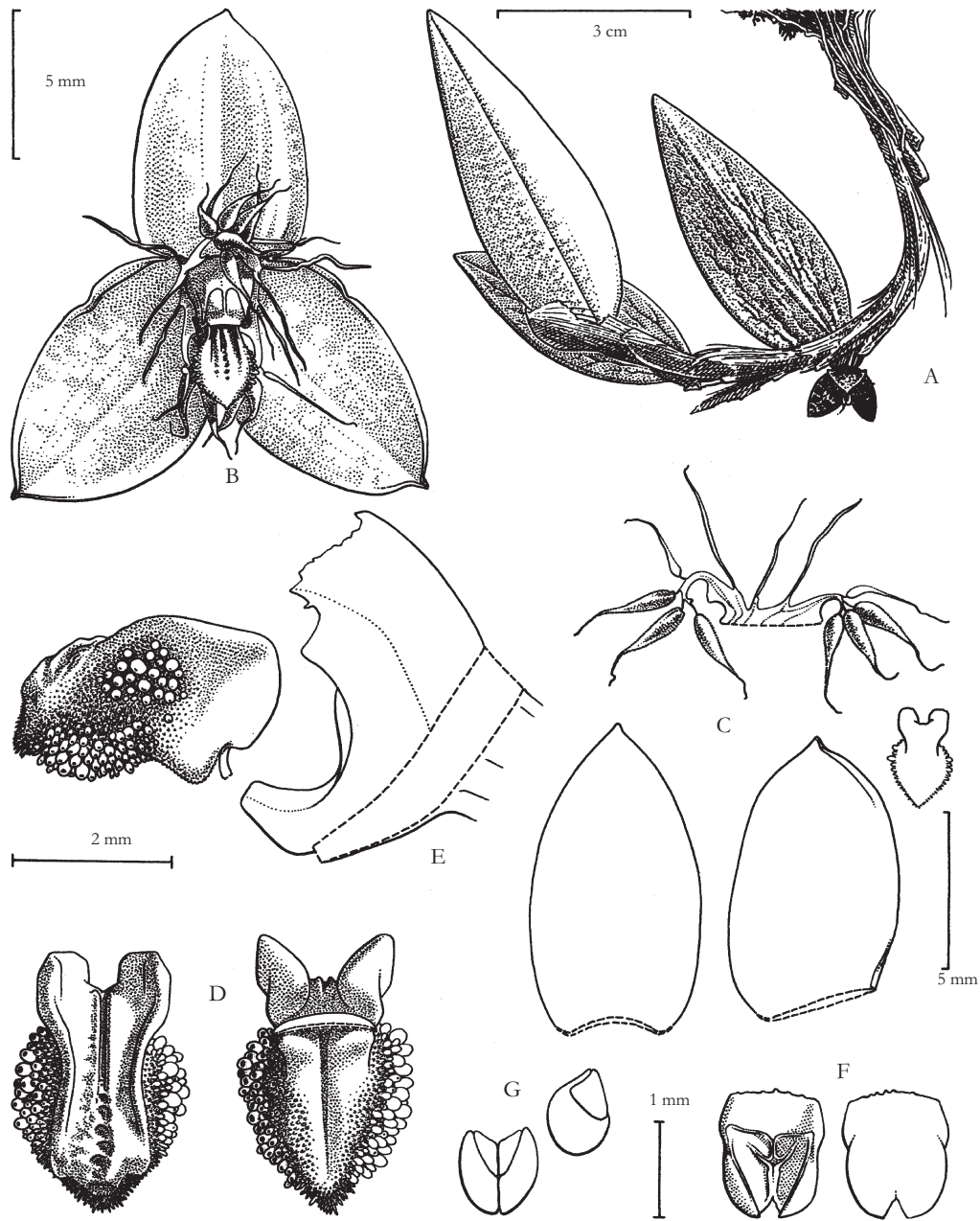


Fig. 621.5. *Bulbophyllum schinzianum* Kränzl. var. *phaeopogon* (Schltr.) J.J.Verm. (*B. sect. Ptiloglossum*). A. Habit; B. Flower; C. Flower analysis, from left to right: dorsal sepal, petal, lateral sepal, labellum; D. Labellum, upper surface (left), lower surface (right); E. Column and labellum, side view; F. Anther, dorsal view (left), ventral view (right); G. Pollinia, one pair (left), two pairs (right). Drawn by J. J. Vermeulen from *Le Testu 5178* (K). Reproduced with permission from *Orchid Monographs*, 2 (1987).

- Pseudobulbs 2-leaved at apex. . . . . **B. sect. Denticulata**
- 8. • Dorsal sepal distinctly wider than lateral sepals . . . . .  
 . . . . . **B. sect. Lupulina**
- Dorsal sepal about as wide as lateral sepals or narrower  
 . . . . . **B. sect. Ptiloglossum**
- 9. • Pseudobulbs 2-leaved at apex. . . . .10
- Pseudobulbs 1-leaved at apex. . . . .14
- 10. • Lateral sepals reflexed at base and appressed against  
 rachis. . . . . **B. sect. Bifaria**





**Fig. 621.6.** *Bulbophyllum tindemansianum* J.J.Verm., de Vogel & A.Vogel. (*B.* sect. *Epicranthes*). A. Habit; B. Flower; C. Flower analysis, petal (above); from left to right (below): dorsal sepal, lateral sepal, labellum; D. Labellum, upper surface (left), lower surface (right); E. Column and labellum, side view; F. Anther, ventral view (left), dorsal view (right); G. Pollinia, two pairs (left), one pair (right). Drawn by J. J. Vermeulen from *Leiden cult.* 20081503 (L). Reproduced with permission from *Blumea*, 55 (2010).

- Lateral sepals porrect to spreading, or lateral sepals reflexed well above base and not appressed against rachis .....11
- 11. • Anther abaxially with a dorsiventrally flattened, rounded, truncate to bifid protrusion anteriorly, with flat sides or with one (deeply) concave side that distinctly overtops anterior margin .....12
- Anther abaxially without a protrusion, or with a protrusion that does not overtop anterior margin, or with a protrusion that overtops anterior margin but is not dorsiventrally flattened .....13
- 12. • Rachis 2- or 3-flowered; dorsal sepal 8.2–10.0 mm long ..... ***B.* sect. *Gilgiana***
- Rachis 5–64-flowered; dorsal sepal 2.0–6.2 mm long ..... ***B.* sect. *Oreonastes***
- 13. • Labellum margins ciliate or ciliate, or glabrous and labellum thick and firm; rachis not thickened. .... ***B.* sect. *Ptiloglossum***
- Labellum margins glabrous; labellum usually thick, but soft and easy to compress, thin when dry; rachis often thickened and flattened, with the flowers inserted along midvein. .... ***B.* sect. *Megaclinium***



**Fig. 621.7.** *Bulbophyllum vaginatum* (Lindl.) Rchbf. (*B.* sect. *Recurva*). A. Plant; B. Flower; C. Flower analysis, from left to right: dorsal sepal, petal, lateral sepal, labellum; D. Labellum, upper surface (left), lower surface (right); E. Column and labellum, side view; F. Anther, ventral view (above), dorsal view (below); G. Pollinia, one pair (above), two pairs (below). Drawn by J. J. Vermeulen from from *Vermeulen 658* (L).

- 14. • Rachis not or slightly thickened, orbicular in section, without edges, or rachis widened and flattened, with rounded edges; flowers arising from midvein of rachis . . . . .15
- Rachis widened and flattened, sharply four-edged in section with two narrow, concave sides; flowers arising from narrow, concave sides of rachis . . . . .16
- 15. • Rachis widened and flattened with rounded edges or not or slightly thickened, orbicular in section, without edges; labellum usually thick, but soft and easy to compress, thin when dry. . . . . **B. sect. *Megaclinium***

- Rachis not thickened, orbicular in section, without edges; labellum thick and firm. . . . . **B. sect. *Ptiloglossum***
- 16. • Stelidia 1.0–1.2 mm long, acuminate . . . . .
- Stelidia 0.5 mm long or shorter, rounded to acute . . . . . **B. sect. *Carnosisepala***
- Stelidia 0.5 mm long or shorter, rounded to acute . . . . . **B. sect. *Oreonastes***

***Bulbophyllum* sect. *Bifaria*** G.A.Fischer & J.J.Verm., in prep.  
 Type species (proposed): *Bulbophyllum bifarium* Hook.

Epiphytes or lithophytes with creeping rhizomes. Pseudobulbs 2-leaved. Inflorescence a 6–30-flowered, elongate raceme with distichous flowers; rachis not or hardly thickened, sharply four-edged in section with two concave sides from which the flowers arise. Floral bracts as long as or longer than flowers. Flowers non-resupinate. Sepals free, glabrous abaxially, the lateral sepals reflexed at the base and appressed against the rachis. Labellum mobile, undivided, margins glabrous; thick and solid. Anther abaxially with a conical protrusion overtopping anterior margin; pollinia 4. Three species in montane forests up to 2050 m in Cameroon, Guinea, Kenya, and Liberia. **(JJV)**

***Bulbophyllum* sect. *Carnosisepala*** G.A.Fischer & J.J.Verm., in prep. Type species (proposed): *Bulbophyllum carnosisepalum* J.J.Verm.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Inflorescence a 3–12-flowered, elongate raceme with distichous flowers; rachis thickened, sharply four-edged in section with two concave sides from which flowers arise. Floral bracts shorter than flowers. Flowers non-resupinate. Sepals free, glabrous abaxially. Labellum mobile, undivided, margins glabrous; thick and solid. Stelidia 1.0–1.2 mm long, acuminate. Anther with an abaxial, dorsiventrally flattened protrusion overtopping the anterior margin; pollinia 4. One species in lowland and montane forests in Cameroon, Gabon, Ivory Coast, Uganda, and Zaire. **(JJV)**

***Bulbophyllum* sect. *Chaseella*** (Summerh.) G.A.Fischer & J.J.Verm., in prep. Type species (proposed): *Bulbophyllum pseudohydra* (Summerh.) G.A.Fischer & J.J.Verm.

Epiphytes with creeping rhizomes. Pseudobulbs 6–12-leaved, needle-shaped. Inflorescence 1(–2)-flowered; rachis, if present, not thickened, round in section. Floral bracts shorter than the flowers. Flowers resupinate. Sepals free, glabrous abaxially. Labellum mobile, undivided, margins glabrous; thick and solid. Anther with an abaxial, rounded protrusion slightly overtopping the anterior margin; pollinia 2. A single species in montane forests up to 2000 m in Kenya, Zambia, and Zimbabwe. **(JJV)**

***Bulbophyllum* sect. *Cirrhopetalum*** (Lindl.) Rchb.f., *Walpers Ann. Bot. Syst.*, **6**, 259 (1861). Type species: *Bulbophyllum longiflorum* Thouars

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Inflorescence a many-flowered, subumbellate raceme with flowers spirally arranged; rachis thickened, round in section. Floral bracts shorter than the flowers. Flowers resupinate. Dorsal sepal free; lateral sepals twice to 5.5 times as long as the dorsal, twisted near the base so that the upper margins turn inwards, adnate along their upper margins. Labellum mobile, undivided, margins glabrous; thick and solid. Anther abaxially with a small protrusion not overtopping the anterior margin; pollinia 4. One species in montane forests up to 1800 m in Zaire, Tanzania, Malawi, Zimbabwe, Madagascar and surrounding islands and Asia eastward to the Pacific. **(JJV)**

***Bulbophyllum* sect. *Comata*** G.A.Fischer & J.J.Verm., in prep.

Type species (proposed): *Bulbophyllum comatum* Lindl.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Inflorescence a many-flowered, elongate raceme with spirally arranged flowers; rachis swollen, spindle-shaped, cylindrical or obovoid. Floral bracts about as long as the flowers. Flowers resupinate. Sepals free, with long hairs abaxially. Labellum mobile, auriculate near base, thick, solid, margins and adaxial surface hirsute. Anther abaxially without a protrusion; pollinia 4. A single species in forests up to 1300 m in Equatorial Guinea, Gabon, Ivory Coast, Liberia, Nigeria, Sierra Leone, and Rwanda. **(JJV)**

***Bulbophyllum* sect. *Denticulata*** G.A.Fischer & J.J.Verm., in prep. Type species (proposed): *Bulbophyllum denticulatum* Rolfe

Epiphytes with creeping rhizomes. Pseudobulbs 2-leaved. Inflorescence a many-flowered, elongate raceme with spirally arranged flowers; rachis not thickened, round in section. Floral bracts shorter than flowers. Flowers resupinate. Sepals free, finely papillose abaxially. Labellum mobile, undivided, margins glabrous; thick, solid. Anther abaxially with a rounded protrusion overtopping the anterior margin; pollinia 4. A single species in montane forests up to 900 m in Ivory Coast, Liberia, and Sierra Leone. **(JJV)**

***Bulbophyllum* sect. *Genyorchis*** (Lindl.) G.A.Fischer & J.J.Verm., in prep. Type species (proposed): *Bulbophyllum apetalum* Lindl.

Epiphytes with creeping rhizomes. Pseudobulbs 1- or 2-leaved. Inflorescence a 5–15-flowered, elongate raceme with distichous flowers; rachis not thickened, round in section. Floral bracts shorter than the flowers. Flowers non-resupinate. Sepals free, glabrous abaxially. Labellum firmly attached to the column foot, undivided or distally auriculate, margins glabrous; thick, solid. Anther abaxially with a protrusion not overtopping the anterior margin; pollinia 4, stipitate. Seven species in mangrove and tropical dry forests up to 1400 m in Cameroon, Congo, Gabon, Ghana, Guinea Islands, Nigeria, Ivory Coast, Sierra Leone, and Zaire. **(JJV)**

***Bulbophyllum* sect. *Gilgiana*** G.A.Fischer & J.J.Verm., in prep. Type species (proposed): *Bulbophyllum gilgianum* Kränzl.

Epiphytes with creeping rhizomes. Pseudobulbs 2-leaved. Inflorescence a 1–3-flowered, elongate raceme with spirally arranged flowers; rachis slightly swollen, spindle-shaped. Floral bracts shorter than flowers. Flowers non-resupinate. Sepals free, sparsely hirsute abaxially. Labellum mobile, undivided, margins ciliate; thick and solid. Anther abaxially with a dorsiventrally flattened protrusion overtopping the anterior margin; pollinia 4. One species in montane forests up to 1900 m in Tanzania. **(JJV)**

***Bulbophyllum* sect. *Lupulina*** G.A.Fischer, in prep. Type species (proposed): *Bulbophyllum occultum* Thouars

Epiphytes with creeping rhizomes. Pseudobulbs 1- or 2-leaved. Inflorescence a 4- to many-flowered, elongate raceme with spirally arranged flowers; rachis not thickened, round in section to spindle-shaped. Floral bracts shorter than or about as long as the flowers. Flowers non-resupinate. Sepals free, glabrous abaxially. Labellum mobile, undivided, margins entire to fimbriate; thick and solid. Anther with an abaxial, rounded protrusion that does not overtop the margin, to a dorsiventrally flattened and bifid one overtopping the anterior margin; pollinia 4. Three species in savanna woodlands and montane forests up to 1800 m in Burundi, Tanzania, Malawi, South Africa, Zaire, Zambia, Zimbabwe, and Madagascar. Note that *B. lupulinum* is not included here but rather in *B.* sect. *Oreonastes*. (JJV)

***Bulbophyllum* sect. *Megaclinium*** G.A.Fischer & J.J.Verm., in prep. Type species (proposed): *Bulbophyllum falcatum* (Lindl.) Rchb.f.

Epiphytes or lithophytes with usually creeping rhizomes (patent in *B. fayi* J.J.Verm.). Pseudobulbs 1- or 2(-3)-leaved. Inflorescence a 2- to many-flowered, elongate raceme with distichous flowers; rachis usually thickened and flattened, with the flowers arranged along the midvein, sometimes not thickened, round in section. Floral bracts (slightly) shorter than flowers. Flowers resupinate or non-resupinate. Sepals free, glabrous to hirsute abaxially. Labellum mobile, undivided, margins entire to denticulate to lacerate, usually thick, soft and easy to compress. Anther without an abaxial protrusion or with a rounded protrusion that may overtop the anterior margin; pollinia 4. Nineteen species in mangrove forests, savanna woodland, plantations, lowland and montane forests up to 2300 m in Angola, Cameroon, Congo, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Malawi, Mozambique, Nigeria, Sierra Leone, South Africa, Tanzania, Togo, Uganda, Zaire, Zambia, and Zimbabwe. (JJV)

***Bulbophyllum* sect. *Oreonastes*** G.A.Fischer & J.J.Verm., in prep. Type species (proposed): *Bulbophyllum oreonastes* Rchb.f.

Epiphytes or lithophytes with creeping rhizomes (patent in *B. teretifolium* Schltr.). Pseudobulbs 1- or 2-leaved. Inflorescence a many-flowered, elongate raceme with flowers arranged distichously; rachis thickened, sharply four-edged in section with 2 narrow, concave sides from which the flowers arise. Floral bracts shorter or longer than the flowers. Flowers resupinate or not. Sepals free, glabrous to papillose to sparsely hirsute abaxially. Labellum mobile, undivided or trilobed, margins entire to erose to denticulate; thick and solid. Stelidia 1.0–1.2 mm long, acuminate. Anther abaxially with a dorsiventrally flattened protrusion overtopping the anterior margin; pollinia 4. Ten species in lowland rain forests, plantations, semideciduous and montane forests up to 2300 m in Angola, Burundi, Cameroon, Ethiopia, Equatorial Guinea, Gabon, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Malawi, Mozambique, Nigeria, Rwanda, Sierra Leone, South Africa, Tanzania, Uganda, Zaire, Zambia, and Zimbabwe. (JJV)

***Bulbophyllum* sect. *Ptiloglossum*** Lindl., *J. Linn. Soc. Bot.*, 6, 125 (1862). Type species: *Bulbophyllum barbigerum* Lindl.

Epiphytes, occasionally lithophytes or terrestrials, with creeping rhizomes. Pseudobulbs 1- or 2-leaved. Inflorescence 1-flowered or a 2- to many-flowered, elongate to contracted raceme with spirally or distichously arranged flowers; rachis not or hardly thickened, usually round in section, sometimes slightly angular. Floral bracts usually shorter than or as long as the flowers (longer than the flowers in *B. pandanetorum* Summerh.). Flowers resupinate or not. Sepals free, glabrous abaxially. Labellum mobile, undivided (trilobed in *B. nigritianum* Rendle); margins glabrous to long-ciliate; thick and solid at least near the base. Anther without an abaxial protrusion or with a rounded protrusion that may overtop the anterior margin; pollinia 2 or 4. Thirty species in savanna woodlands, mangrove, lowland and montane forests up to 2400 m in Angola, Burundi, Cameroon, Central African Republic, Congo, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Malawi, Mozambique, Nigeria, Rwanda, Sierra Leone, Tanzania, Uganda, Zaire, Zambia, and Zimbabwe. (JJV)

#### MALAGASY SECTIONS:

### Artificial key to the Malagasy sections of *Bulbophyllum* (GF, JJV):

1. • Pseudobulbs 1-leaved at apex.....2
  - Pseudobulbs 2-leaved at apex.....11
2. • Labellum margin partly or entirely ciliate, fimbriate or with mobile appendages.....3
  - Labellum margin entire, glabrous to papillose.....5
3. • Labellum margin ciliate.....**B. sect. *Pantoblepharon***
  - Labellum margin fimbriate or with mobile appendages.....4
4. • Flowers with labellum turned away from rachis.....
  - Flowers with labellum facing rachis.....**B. sect. *Kinethrix***
  - Flowers with labellum facing rachis.....**B. sect. *Lupulina***
5. • Lateral sepals connivent to connate along their lower margins.....6
  - Lateral sepals free, lower margins approximately diverging.....7
6. • Lateral sepals connivent to connate along their lower margins; raceme elongate.....
  - Lateral sepals connivent to connate along their upper margins; raceme subumbellate.....**B. sect. *Ploiarium***
  - Lateral sepals connivent to connate along their upper margins; raceme subumbellate.....**B. sect. *Cirrhopetalum*** (see African species)
7. • Pseudobulbs bilaterally flattened...**B. sect. *Polyradices***
  - Pseudobulbs globose, ellipsoid, ovoid or dorsiventrally flattened.....8
8. • Apical part of labellum incurved, adaxial side deeply concave.....**B. sect. *Elasmatopus***
  - Apical part of labellum porrect, or recurved, adaxial side flat or convex.....9
9. • Inflorescence 6–12-flowered; raceme contracted, globose.....**B. sect. *Lyperoccephalum***
  - Inflorescence 1–3-flowered; raceme elongate.....10

10. • Inflorescence 3- to many-flowered; or inflorescence 1- or 2-flowered and labellum glabrous adaxially. . . . . **B. sect. *Bulbophyllum***  
 • Inflorescence 1- or 2-flowered; labellum papillose adaxially. . . . . **B. sect. *Pantoblepharon* (*B. muscicola*)**
11. • Lateral sepals connivent to connate along their lower margins . . . . . 12  
 • Lateral sepals free, lower margins approximately diverging . . . . . 13
12. • Labellum oblong, elliptic, (ob-)ovate to spatulate with a widened base . . . . . **B. sect. *Ploiarium***  
 • Labellum spatulate, gradually narrowing towards base . . . . . **B. sect. *Bulbophyllum* (*B. brachystachyum*)**
13. • Inflorescence 1-flowered; vegetative shoots usually developing from basal node of pseudobulb, then fused to it for more than half the length of the latter . . . . . **B. sect. *Lichenophylax***  
 • Inflorescence 1- to many-flowered; if 1-flowered then vegetative shoots not fused to the pseudobulb above the node from which they arise . . . . . 14
14. • Pseudobulbs distinctly laterally flattened, with two distinct edges (other edges inconspicuous only if present); or inflorescence developing simultaneously with the young shoot from which it arises; or both characters present . . . . . 15  
 • Pseudobulbs not or only slightly laterally flattened, with three or more distinct ridges; inflorescence developing from (almost) mature shoots . . . . . 18
15. • Inflorescence developing simultaneously with the young shoot from which it arises . . . . . 16  
 • Inflorescence developing from (almost) mature shoots . . . . . 17
16. • Rachis with lowermost bracts 12 mm or longer . . . . . **B. sect. *Alcistachys***  
 • Rachis with lowermost bracts 7 mm or shorter . . . . . **B. sect. *Pachychlamys***
17. • Flowers with labellum turned away from rachis . . . . . **B. sect. *Inversiflora***  
 • Flowers with labellum facing rachis. . . . . **B. sect. *Lupulina***
18. • Labellum margins fimbriate . . . . . 19  
 • Labellum margins entire to erose (glabrous to papillose or ciliate) . . . . . 20
19. • Flowers with labellum turned away from rachis. . . . . **B. sect. *Kinethrix***  
 • Flowers with labellum facing rachis. . . . . **B. sect. *Lupulina***
20. • Labellum adaxially with two distinct ridges with an erose edge. . . . . **B. sect. *Moratii***  
 • Labellum adaxially without ridges, or with ridges with an entire edge . . . . . 21
21. • Inflorescence many-flowered; rachis distinctly thickened as compared to peduncle and spindle-shaped, with flowers inserted in three longitudinal rows . . . . . **B. sect. *Lupulina* (*B. senghasi*)**
- Inflorescence 1-flowered; rachis not thickened or rachis thickened and with flowers distichously or spirally arranged . . . . . 22
22. • Base of labellum with two acicular teeth (inflorescence with one or two flowers, or flowers distichous) . . . . . **B. sect. *Bifalcula***  
 • Base of labellum without acicular teeth (inflorescence with one or two flowers, or flowers spirally arranged) . . . . . 23
23. • Adaxial side of labellum with a cavity near apex or apical part of labellum curved upwards, or both characters combined present . . . . . 24  
 • Adaxial side of labellum flat or convex near the apex; apical part of the labellum porrect or curved downwards . . . . . 25
24. • Rostellum protruding beyond steldia apices . . . . . **B. sect. *Ikongoense***  
 • Rostellum receding in between steldia apices . . . . . **B. sect. *Elasmatopus***
25. • Rhizome scales thick, fibrous, the apices patent when pseudobulb reaches maturity . . . . . **B. sect. *Pachychlamys***  
 • Rhizome scales thin, membranous, the remnants weathering to woolly hairs or clinging to pseudobulb at maturity . . . . . **B. sect. *Bulbophyllum***

***Bulbophyllum* sect. *Alcistachys*** Schltr., *Feddes Repert. Spec. Nov. Regni Veg. Beih.*, **33**, 224–6 (1925). Type species: *Bulbophyllum oclusum* Ridl.

Epiphytes or lithophytes with creeping rhizomes. Pseudobulbs close together, distinctly laterally flattened or not, two-leaved. Inflorescences synanthous, a many-flowered, elongate raceme with spirally arranged flowers; rachis not thickened, round in section. Lower floral bracts 12 mm long or longer. Flowers resupinate. Sepals free, glabrous abaxially. Petal margins entire to distally erose, glabrous to distally papillose. Labellum mobile, undivided, thick, margins entire, glabrous or (partially) papillose to ciliate. Column with triangular, acute steldia (obtuse in *B. oclusum*), without a tooth along the lower margin. Anther with a rounded to high, conical protrusion that overtops the anterior margin. Six species in lowland to high-elevation moist forests in Madagascar, the Mascarenes, and the Comoros. The flowers smell of rotting meat, faeces, or decaying fish. (GF, JJV)

***Bulbophyllum* sect. *Bifalcula*** Schltr. *Feddes Repert. Spec. Nov. Regni Veg. Beih.*, **33**, 215–16 (1925). Type species (proposed): *Bulbophyllum implexum* Jum. & H.Perrier

Epiphytes or lithophytes with creeping rhizomes. Pseudobulbs clustered to distant, not laterally flattened, 2-leaved. Inflorescence heteranthous, 1-flowered or a 2- to many-flowered, elongate raceme with distichously arranged flowers; rachis not thickened, round in section. Flowers resupinate. Sepals free, glabrous abaxially. Petal margins entire, glabrous. Labellum mobile, with aciculate auricles near the base, thick, margins entire, glabrous, adaxial side without ridges, or with ridges with an entire edge. Column

with triangular, acute stelidia, without a tooth along the lower margin. Anther with a rounded protrusion that (slightly) overtops the anterior margin. Four species, with several undescribed, in dwarf forests on poor soils along the humid coast of north-western and eastern Madagascar. (GF, JJV)

***Bulbophyllum* sect. *Bulbophyllum*** G.A.Fischer & J.J.Verm., in prep. Type species (proposed): *Bulbophyllum nutans* (Thouars) Thouars

Epiphytes or lithophytes with creeping rhizomes. Pseudobulbs 1- or 2-leaved, green, red or yellow, often surrounded by cottony white fibres, densely clustered or well spaced on rhizome. Leaves thin, coriaceous, sometimes succulent, oblong or lanceolate. Inflorescence many-flowered, erect, terete but never thickened in some species, setaceous. Flowers resupinate, glabrous, often white or yellowish-brownish, rarely red. Sepals and petals never fimbriate, often transparent. Labellum glabrous, mostly white but also red or yellow in a few species, curved-geniculate, never fimbriate. Column foot short or free, part of column foot elongate. Stelidia rarely as long as the anther. Pollinia 4. At least 32 species, in humid forests at all elevations in Madagascar, the Mascarenes, and the Comoros.

***Bulbophyllum* sect. *Elasmotopus*** Schltr., *Feddes Repert. Spec. Nov. Regni Veg. Beib.*, **33**, 211–15 (1925). Type species (proposed): *Bulbophyllum oxycalyx* Schltr.

Epiphytes or lithophytes with creeping rhizomes. Pseudobulbs distant, not laterally flattened, 1- or 2-leaved. Inflorescence heteranthous, 1- to many-flowered, elongate raceme with spirally arranged flowers; rachis not thickened, round in section. Flowers resupinate. Sepals free, glabrous abaxially. Petal margins entire, glabrous to distally minutely papillose. Labellum mobile, undivided, thick, or with a thick basal part and a thin apical part, apical part with an adaxial cavity near the apex or apical part of the labellum curved upwards or with both characters combined; margins entire, glabrous or partly ciliate, adaxial side without ridges, or with inconspicuous ridges with an entire edge. Column with deltoid to triangular, acute stelidia, with or without a tooth along the lower margin. Anther with a rounded protrusion that overtops the anterior margin. Ten species in humid forests at all elevations in Madagascar. Most (not all) species have 3-veined petals; *B.* sect. *Pachyclamys* always has 1-veined petals. (GF, JJV)

***Bulbophyllum* sect. *Ikongoense*** G.A.Fischer, in prep. Type species (proposed): *Bulbophyllum ikongoense* H.Perrier

Epiphytes with creeping rhizomes. Pseudobulbs distant, not or only slightly laterally flattened, 2-leaved. Inflorescence heteranthous, a many-flowered, elongate raceme with spirally arranged flowers; rachis thickened, spindle-shaped. Flowers resupinate. Sepals free, glabrous abaxially. Petal margins entire, glabrous. Labellum mobile, undivided, thin, or apical part of the labellum curved upwards, concave; margins entire, glabrous, adaxial side without ridges. Column with stelidia, with the rostellum protruding in between, deltoid, obtuse, without a tooth along the lower

margin. Anther without an abaxial protrusion. A single species in montane forests (1000–1400 m) on the eastern edge of the central plateau of Madagascar. (GF, JJV)

***Bulbophyllum* sect. *Inversiflora*** G.A.Fischer & P.J.Cribb, in prep. Type species (proposed): *B. cardiobulbum* Bosser

Epiphytes with creeping rhizomes. Pseudobulbs close together, distinctly laterally flattened, 2-leaved. Inflorescences heteranthous, a many-flowered, elongate raceme with spirally arranged flowers; rachis thickened, spindle-shaped. Flowers non-resupinate, reflexed, with the labellum turned away from the rachis. Sepals free, glabrous abaxially. Petal margins entire, glabrous. Labellum mobile, undivided, thick, margins entire, glabrous or partly ciliate. Column with triangular, acute stelidia, without a tooth along the lower margin. Anther with a rounded to conical protrusion that overtops the anterior margin. Two species in open or dwarf montane forests on poor soils (800–1400 m) in eastern Madagascar. Ants often live underneath the pseudobulbs, which are appressed to the substrate, not unlike the leaves of many *Dischidia* species (Apocynaceae). (GF, JJV)

***Bulbophyllum* sect. *Kinethrix*** Schltr., *Feddes Repert. Spec. Nov. Regni Veg. Beib.*, **15**, 329 (1910). Type species (proposed): *Bulbophyllum mirificum* Schltr.

Epiphytes with creeping rhizomes. Pseudobulbs distant, not or hardly laterally flattened, 1- or 2-leaved. Inflorescences heteranthous, a many-flowered, elongate raceme with spirally arranged flowers; rachis thickened or not, round in section. Flowers resupinate, reflexed, with the labellum turned away from the rachis. Sepals free, glabrous abaxially. Petal margins entire, glabrous or slightly papillose distally. Labellum mobile, undivided, thick, margins fimbriate or with mobile appendages. Column with triangular to ligulate, acute stelidia, with a distinct tooth along the lower margin, close to the base. Anther with a rounded to conical protrusion that overtops the anterior margin. Eleven species in humid mid- to high elevation, moist montane forests in Madagascar and the Mascarenes. The petals are 1/3 as long as the dorsal sepal or shorter. All species are self-incompatible (Fischer, unpublished data). (GF, JJV)

***Bulbophyllum* sect. *Lichenophylax*** Schltr., *Feddes Repert. Spec. Nov. Regni Veg. Beib.*, **33**, 193–7 (1925). Type species: *Bulbophyllum lichenophylax* Schltr.

Epiphytes or lithophytes, resembling a moss in size. Rhizome ramified and creeping, nodes slightly swollen; sheaths tubular, membranous, covering new growth and pseudobulb bases, disintegrating when old. Pseudobulbs green, 2-leaved, often laterally flattened. Leaves green, elliptic, acute, thin and soft. Inflorescence 1-flowered; peduncle erect, not swollen, setaceous, with sheaths, the flower terminal. Flowers resupinate, with sepals acute to longly caudate, free, 3-veined, margins entire to finely fimbriate. Petals margins entire or fimbriate, one-veined, surface occasionally finely papillose. Labellum fleshy, often swollen,

glabrous or papillose, margins entire or fimbriate. Column often with a tooth in its dorsal margin. Stelidia truncate, triangular or hook-shaped. Pollinia 4. At least 17 species in low- to high-elevation, moist forests in Madagascar. (GF, JJV)

***Bulbophyllum* sect. *Lupulina*** G.A.Fischer, in prep. Type species (proposed): *Bulbophyllum occultum* Thouars

Epiphytes with pseudobulbs 1- or 2-leaved, densely clustered or well spaced, often laterally flattened. Leaves succulent, oblong or lanceolate. Inflorescence erect or pendent, racemose, terete; rachis as thick as the peduncle or swollen with flowers inserted into dimples. Flowers resupinate, in rows or alternately arranged. Sepals free, margins glabrous or fimbriate, surface glabrous or papillate. Petals oblong, falcate, hastate or narrowly triangular, margins entire, fimbriate or lacerate. Labellum thick, recurved in the middle, margins glabrous, lacerate or fimbriate, surface glabrous, papillate or papillose. Column fleshy. Stelidia narrowly triangular, falcate or acicular. Anther with a protrusion often as long or longer as the stelidia; pollinia 4. Eighteen species in Madagascar, the Mascarenes, and the Comoros. *Bulbophyllum humblotii* Rolfe and *B. pusillum* Thouars also occur in Africa. *Bulbophyllum malawiense* B.Morris occurs only in Africa. The species occur in dry forests, savanna woodlands, deciduous and semi-deciduous forests as well as in humid coastal and montane rain forests. (GF)

***Bulbophyllum* sect. *Lyperocephalum*** Schltr. *Feddes Repert. Spec. Nov. Regni Veg. Beib.*, **33**, 182 (1925). Type species: *Bulbophyllum lyperocephalum* Schltr.

Epiphytes with creeping rhizomes. Pseudobulbs distant, not flattened, 1-leaved. Inflorescence heteranthous, a many-flowered, congested, capitate raceme with spirally arranged flowers; rachis not thickened, round in section. Flowers resupinate. Sepals free, glabrous abaxially. Petal margins entire, glabrous. Labellum mobile, undivided, thick, margins entire, glabrous to slightly papillose. Column with triangular, acute stelidia, with a tooth along the lower margin. Anther abaxially with a protrusion that does not overtop the anterior margin. A single species in humid lowland and montane forests in Madagascar. (GF, JJV)

***Bulbophyllum* sect. *Moratii*** G.A.Fischer, in prep. Type species (proposed): *Bulbophyllum moratii* Bosser

Epiphytes with creeping rhizomes. Pseudobulbs distant, not laterally flattened, 2-leaved. Inflorescence heteranthous, a many-flowered, elongate raceme with spirally arranged flowers; rachis not thickened, round in section. Flowers resupinate. Sepals free, glabrous abaxially. Petals with entire margins, slightly erose towards the base, glabrous. Labellum mobile, undivided, thick, margins entire, glabrous to slightly papillose; adaxial side with two distinct ridges with an erose edge. Column with triangular, acute stelidia, without a tooth along the lower margin. Anther with an abaxial protrusion that overtops the anterior margin. A single species in wet lower montane forests (600–1000 m) in northeastern Madagascar. (GF, JJV)

***Bulbophyllum* sect. *Pachychlamyx*** Schltr., *Feddes Repert. Spec. Nov. Regni Veg. Beib.*, **33**, 207–9 (1925). Type species: *Bulbophyllum pachypus* Schltr.

Epiphytes with creeping rhizomes, rhizome scales thick and fibrous, the apices patent when the pseudobulb reaches maturity. Pseudobulbs clustered to distant, not laterally flattened, 2-leaved. Inflorescence synanthous or heteranthous, a many-flowered, elongate raceme with spirally arranged flowers; rachis not or hardly thickened, round in section. Lower floral bracts 7 mm long or shorter. Flowers resupinate. Sepals free, glabrous abaxially. Petal margins entire to distally minutely erose, glabrous. Labellum mobile, undivided, thick, apical part porrect or recurved, adaxially flat or convex, margins glabrous, adaxial side without ridges, or with ridges with an entire edge. Column with triangular, acute stelidia, without a tooth along the lower margin (with a tooth in *B. multivaginatam* Jum. & H.Perrier). Anther with a rounded protrusion that slightly overtops the anterior margin. Ten species in humid lowland and montane forests in Madagascar and the Mascarenes. (GF, JJV)

***Bulbophyllum* sect. *Pantoblepharon*** Schltr., *Feddes Repert. Spec. Nov. Regni Veg. Beib.*, **33**, 179–81;184–7 (1925). Type species: *Bulbophyllum pantoblepharon* Schltr.

Epiphytes or lithophytes with creeping rhizomes. Pseudobulbs clustered to distant, flattened or not, 1-leaved. Inflorescence heteranthous, 1- to many-flowered, on an elongate raceme with spirally arranged flowers; rachis not thickened, round in section. Flowers resupinate. Sepals free, glabrous abaxially. Petals with entire to distally erose margins, papillose to ciliate. Labellum mobile, undivided, margins entire, ciliate (papillose in *B. muscicola* Rchb.f.). Column with triangular, acute stelidia, with or without a tooth along the lower margin. Anther with or without a rounded protrusion that does not overtop the anterior margin. Fifteen species in humid montane forests in Madagascar and the Mascarenes. (GF, JJV)

***Bulbophyllum* sect. *Ploiarium*** Schltr., *Feddes Repert. Spec. Nov. Regni Veg. Beib.*, **33**, 226–48 (1925). Type species: *Bulbophyllum coriophorum* Ridl.

Epiphytes or lithophytes with creeping rhizomes. Pseudobulbs clustered to distant, laterally flattened or not, 1- or 2-leaved. Inflorescence heteranthous, 1- to many-flowered, elongate or congested with spirally arranged flowers; rachis not thickened, or slightly to distinctly thickened, spindle-shaped. Flowers resupinate. Sepals glabrous abaxially; the dorsal sepal free, the lateral sepals connivent to connate along their lower margins. Petals with entire, glabrous to ciliate margins. Labellum mobile, undivided, thick, margins glabrous to papillose. Column with triangular, rounded to acute stelidia, with a tooth along the lower margin. Anther with a rounded protrusion that does not overtop the anterior margin. About 75 species (number uncertain because of several unresolved species complexes) in humid lowland and montane forests in Madagascar, the Mascarenes, and the Comoros. (GF, JJV)

*Bulbophyllum* sect. *Polyradices* G.A.Fischer, Sieder & P.J.Cribb, *Adansonia*, 29, 19–25 (2007). Type species: *Bulbophyllum petrae* G.A.Fischer, Sieder & P.J.Cribb

Epiphytes with membranous, persistent rhizome scales. Pseudobulbs 1-leaved, densely clustered and bilaterally flattened. Leaves coriaceous. Inflorescence synanthous, few-flowered, scattered; peduncle pendent; floral bracts shorter than flowers. Flowers resupinate. Petals finely papillose on margins. Labellum finely papillose beneath. Anther with a protrusion overtopping the anterior margin. A single species in wet lower montane forests up to 1400 m in east-central Madagascar. (GF)

ASIAN SECTIONS:

### Artificial key to the Asian sections of *Bulbophyllum* (JJV)

1. • Some or all inflorescences racemose (inflorescence with two or more flowers, the raceme elongate, congested or subumbellate) . . . . . 2
  - All inflorescences 1-flowered (1-flowered inflorescences may develop in clusters sometimes resembling a raceme) . . . . . 3
2. • Basal node of pedicel well above (1/3 the diameter of the pedicel or more) the floral bract attachment in at least some flowers of the inflorescence; raceme congested or elongate, pedicellate ovary of lowermost flower shorter than twice as long as rachis. . . . . **Group A**
  - Basal node of pedicel approximately level with floral bract attachment in all flowers; or raceme subumbellate, pedicellate ovary of lowermost flower twice as long as rachis or longer, and several to all flowers per inflorescence opening simultaneously; or both characters present. . . . . **Group B**
3. • Basal node of pedicel well above (1/3 the diameter of the pedicel or more) floral bract attachment. . . . . **Group C**
  - Basal node of pedicel approximately level with floral bract attachment . . . . . **Group D**

### Group A

1. • Petal margins ciliate or ciliate . . . . . 2
  - Petal margins glabrous, erose(-papillose) or denticulate . . . . . 6
2. • Apex median sepal thickened, globular to ellipsoid . . . . . **B. sect. Lepanthanthe**
  - Apex median sepal obtuse to caudate . . . . . 3
3. • Floral bracts not amplexicaul . . . . . 4
  - Floral bracts amplexicaul and usually tubular proximally . . . . . 5
4. • Pseudobulbs wrinkling irregularly with age . . . . . **B. sect. Hirtula**
  - Pseudobulbs wrinkling with longitudinal furrows with age. . . . . **B. sect. Eublepharon**
5. • Margins of labellum ciliate . . . . . **B. sect. Monanthaparva**
  - Margins of labellum entire or erose to dentate . . . . . **B. sect. Intervallatae**

6. • Inflorescences 1- or 2-flowered (without more flowers present as developing buds) . . . . . 7
  - Inflorescences 3- to many-flowered (2-flowered inflorescences may also be present) . . . . . 17
7. • Labellum 8.0–17.0 mm long (without stretching or spreading) . . . . . 8
  - Labellum 0.8–6.0 mm long. . . . . 11
8. • Labellum trilobed with antrorse lateral lobes attached to basal 1/3 of its length. . . . . **B. sect. Balaenoidea**
  - Labellum undivided, or labellum inconspicuously trilobed with lobes attached close to its base . . . . . 9
9. • Roots densely and coarsely papillose to rugulose to verrucate . . . . . **B. sect. Lepidorhiza**
  - Roots glabrous, finely hirsute locally . . . . . 10
10. • Petals more than half as long as dorsal sepal . . . . . **B. sect. Leopardinae**
  - Petals half as long as dorsal sepal or shorter . . . . . **B. sect. Intervallatae**
11. • Stelidia distally along lower margin with a distinct, downwardly directed, generally rounded tooth (the tooth protruding well below level of rostellum). . . . . **B. sect. Uncifera**
  - Stelidia distally along lower margin without a tooth (sometimes with an antrorse tooth lower down, or teeth may be present between which rostellum is attached) . . . . . 12
12. • Column in lateral view with proximal edge of stigma protruding . . . . . 13
  - Column in lateral view with proximal edge of stigma not protruding (a slight swelling may be present lower down on column foot). . . . . 14
13. • Pollinia 2. . . . . **B. sect. Macrouris**
  - Pollinia 4. . . . . **B. sect. Pelma**
14. • Sepals 5–7-veined . . . . . 15
  - Sepals 3-veined . . . . . 16
15. • Dorsal sepal 9–14 mm long; lateral sepals abaxially without keel. . . . . **B. sect. Sestochilus (B. anceps)**
  - Dorsal sepal c. 5 mm long; lateral sepals abaxially with keel . . . . . **B. sect. Biseta**
16. • Pseudobulbs minute compared to size of plant or seemingly absent . . . . . **B. sect. Aeschynanthoides**
  - Pseudobulbs distinctly present. . . . . **B. sect. Adelopetalum**
17. • Raceme with 3 or more distichous flowers (although only 1 per raceme may be open, with more visible as buds or developing flower bracts) . . . . . 18
  - Raceme with spirally arranged flowers, or tristichous . . 21
18. • Apex of dorsal sepal thickened, globular to ellipsoid . . . . . **B. sect. Lepanthanthe**
  - Apex of dorsal sepal obtuse to caudate . . . . . 19
19. • Rhizome erect, patent to pendulous, with roots growing over or alongside rhizome towards substrate . . . . . **B. sect. Pelma**
  - Rhizome creeping or straggling, with roots spreading. . 20
20. • Roots glabrous or locally and finely hirsute . . . . . **B. sect. Intervallatae**



- Roots densely and coarsely papillose to rugulose to verrucate . . . . . **B. sect. *Lepidorhiza***
- 21. • Rhizome erect, patent to pendulous, with roots growing over or alongside rhizome towards substrate . . . . . 22
  - Rhizome creeping or straggling, with roots spreading. . . . . 25
- 22. • Stelidia distally along lower margin with a distinct, downwardly directed, generally rounded tooth (the tooth protruding well below level of rostellum). . . . .
  - . . . . . **B. sect. *Uncifera***
  - Stelidia distally along lower margin without a tooth (sometimes with an antrorse tooth lower down, or teeth may be present between which rostellum is attached) . . . . . 23
- 23. • Pollinia 4. . . . . **B. sect. *Imitatores***
  - Pollinia 2. . . . . 24
- 24. • Racemes eventually two to many, fasciculate on a short sympodium; labellum with distinct, antrorse lateral lobes . . . . .
  - . . . . . **B. sect. *Lepanthanthe*** (species with hanging rhizome)
  - Racemes solitary, or sometimes two together; labellum without lateral lobes . . . . . **B. sect. *Macrouris***
- 25. • Lateral sepals attached to apex of column foot only, leaving a gap between lower margin of petals and upper margins of lateral sepals . . . . . 26
  - Lateral sepals attached along most of length of column foot, with no gap between petals and lateral sepals . . . . . 27
- 26. • Labellum hirsute; petals less than half as long as dorsal sepal . . . . . **B. sect. *Henosis***
  - Labellum glabrous; petals more than half as long as dorsal sepal . . . . . **B. sect. *Altisceptrum*** (***B. gymnopus***)
- 27. • Lateral sepals either with a distinct, entire to deeply dentate keel abaxially, or apices of lateral sepals thickened, globular to ellipsoid to almost cylindrical (sometimes incurved and difficult to see), or both characters present . . . . . 28
  - Lateral sepals without keel abaxially; apices of lateral sepals obtuse to caudate, not thickened . . . . . 29
- 28. • Pseudobulbs distinctly present. . . . . **B. sect. *Biseta***
  - Pseudobulbs minute and inconspicuous compared to size of plant. . . . . **B. sect. *Lepanthanthe*** (species with creeping rhizome)
- 29. • Stelidia distally along lower margin with a distinct, downwardly directed, generally rounded tooth (the tooth protruding well below level of rostellum). . . . .
  - . . . . . **B. sect. *Uncifera***
  - Stelidia distally along lower margin without a tooth (sometimes with an antrorse tooth lower down, or teeth may be present between which rostellum is attached) . . . . . 30
- 30. • Either petals 1-veined; or petals 3-veined and dorsal sepal 3-veined . . . . . 31
  - Petals 3–5-veined; dorsal sepal 5–7-veined. . . . . 35
- 31. • Pollinia 2, or pollinia 4 and inner pair less than half as long as outer pair . . . . . 32
  - Pollinia 4, inner pair more than half as long as outer pair . . . . . 33
- 32. • Column in lateral view with proximal edge of stigma protruding, or with a distinct tooth; roots densely and coarsely papillose to rugulose to verrucate. . . . .
  - . . . . . **B. sect. *Macrouris***
  - Column in lateral view with proximal edge of stigma not protruding; roots glabrous, locally finely hirsute . . . . . **B. sect. *Adelopetalum***
- 33. • Petals minutely erose-papillose. . . . .
  - . . . . . **B. sect. *Eublepharon*** (***B. levinei***)
  - Petals entire . . . . . 34
- 34. • Petals 1-veined; labellum margins glabrous. . . . .
  - . . . . . **B. sect. *Rhinanthera***
  - Either petals 3-veined, or petals 1- or 2-veined; labellum margins partly papillose–ciliate . . . . . **B. sect. *Adelopetalum***
- 35. • Dorsal sepal 2.5–3.6 mm wide; l/w 3.6–5.0 . . . . .
  - . . . . . **B. sect. *Macrouris*** (***B. dekokkii***)
  - Dorsal sepal 5–9 mm wide; l/w 1.5–2.6 . . . . . 36
- 36. • Labellum adaxially glabrous; labellum not auriculate. . . . .
  - . . . . . **B. sect. *Sestochilus*** (***B. anceps***)
  - Labellum adaxially irregularly and coarsely verrucate, or labellum proximally auriculate with antrorse auricles, or both characters present. . . . .
    - . . . . . **B. sect. *Leopardinae***

## Group B

- 1. • Pseudobulb of flowering shoots 2-leaved. . . . . 2
  - Pseudobulb of flowering shoots 1-leaved. . . . . 3
- 2. • Leaves persistent, thick. . . . . **B. sect. *Blepharistes***
  - Leaves deciduous, thin . . . . . **B. sect. *Lemniscata***
- 3. • Rhizome erect to patent to pendulous . . . . . 4
  - Rhizome creeping . . . . . 10
- 4. • Pseudobulbs minute compared to size of plant, entirely hidden in rhizome bracts . . . . . 5
  - Pseudobulbs distinctly present. . . . . 7
- 5. • Pollinia 4; raceme c. 15-flowered, dense and globose . . . . .
  - . . . . . **B. sect. *Brachystachyae*** (***B. salaccense***)
  - Pollinia 2; raceme 2- to many-flowered, lax and elongate . . . . . 6
- 6. • Basal node of pedicel well above (1/3 the diameter of pedicel or more) floral bract attachment. . . . .
  - . . . . . **B. sect. *Imitatores*** (***B. dichotomum***)
  - Basal node of pedicel approximately level with floral bract attachment . . . . . **B. sect. *Stachysanthes***
- 7. • Lateral sepals distinctly twisted proximally, so that upper margins turned inwards, towards each other; petal margins (partly) finely ciliolate or finely papillose. . . . .
  - . . . . . **B. sect. *Emarginatae***
  - Lateral sepals not twisted proximally, or only slightly so distally; petal margins entire or erose. . . . . 8
- 8. • Basal node of pedicel approximately level with floral bract attachment . . . . . **B. sect. *Desmosanthes***
  - Basal node of pedicel well above (1/3 the diameter of pedicel or more) floral bract attachment. . . . . 9

9. • Column in lateral view with proximal edge of stigma protruding, or with a distinct tooth; roots densely and coarsely papillose to rugulose. . . . . **B. sect. *Macrouris***  
 • Column in lateral view with proximal edge of stigma not protruding; roots glabrous, locally finely hirsute . . . . . **B. sect. *Imitatores (B. dichotomum)***
10. • Raceme subumbellate (pedicellate ovary of lowermost flower twice as long as rachis or longer) . . . . . 11  
 • Raceme elongate or congested (pedicellate ovary of lowermost flower shorter than twice as long as rachis) . . . . . 35
11. • Petals (partly) ciliolate, ciliate, fimbriate or paleate. . . . . 12  
 • Petals entire, erose(–papillose) or irregularly denticulate . . . . . 20
12. • Stelidia with an antrorse tooth on adaxial surface . . . . . **B. sect. *Cirrhopetalum***  
 • Stelidia without a tooth on adaxial surface (teeth may be present along upper and lower margins) . . . . . 13
13. • Labellum 5 mm or shorter . . . . . 14  
 • Labellum longer than 5 mm . . . . . 18
14. • Petals paleate . . . . . **B. sect. *Plumata***  
 • Petals ciliolate, ciliate or fimbriate . . . . . 15
15. • Lateral sepals distinctly twisted proximally, so that upper margins are turned inwards, towards each other . . . . . **B. sect. *Recurvae***  
 • Lateral sepals not twisted proximally, or only slightly so distally. . . . . 16
16. • Pseudobulbs wrinkling in an irregular pattern with age . . . . . **B. sect. *Hirtula***  
 • Pseudobulbs wrinkling with longitudinal furrows with age. . . . . 17
17. • Labellum distinctly auriculate proximally; auricles antrorse with minutely denticulate margin. . . . . **B. sect. *Acrochaene***  
 • Labellum undivided. . . . . **B. sect. *Eublepharon***
18. • Labellum distinctly auriculate proximally; auricles antrorse with minutely denticulate margin. . . . . **B. sect. *Acrochaene***  
 • Labellum undivided (labellum may be widened proximally) . . . . . 19
19. • Lateral sepals 6.3–10.0 mm long . . . . . **B. sect. *Hirtula***  
 • Lateral sepals 20.0–300.0 mm long . . . . . **B. sect. *Cirrhopetaloides***
20. • Either margins of sepals, or margins of petals, or both, denticulate, (erose–)papillose; or margins of dorsal sepal ciliolate, ciliate, fimbriate or paleate. . . . . 21  
 • Margins of sepals and petals entire and glabrous (petals may be truncate and caudate at apex) . . . . . 24
21. • Lateral sepals distinctly twisted proximally, so that upper margins are turned inwards, towards each other . . . . . 22  
 • Lateral sepals not twisted proximally, or only slightly so distally. . . . . 23
22. • Labellum 5.0–15.0 mm long. . . . . **B. sect. *Cirrhopetaloides***  
 • Labellum 1.9–3.5 mm long. . . . . **B. sect. *Rhytionanthos***
23. • Labellum 5.5–16.0 mm long. . . . . **B. sect. *Leopardinae***  
 • Labellum 1.8–3.6 mm long. . . . . **B. sect. *Eublepharon***
24. • Lateral sepals distinctly twisted proximally, so that upper margins are turned inwards, towards each other . . . . . 25  
 • Lateral sepals not twisted proximally, or only slightly so distally. . . . . 29
25. • Labellum trilobed with lateral lobes attached to basal 1/3 of its length . . . . . **B. sect. *Balaenoidea***  
 • Labellum undivided. . . . . 26
26. • Inflorescence 2-flowered; stem sections between floral bract attachment and basal node of pedicel of both flowers fused . . . . . **B. sect. *Biflorae***  
 • Inflorescence 2- to many-flowered; stem sections between floral bract attachment and basal node of pedicel of both flowers free. . . . . 27
27. • Stelidia widened distally, apex rounded to truncate to bifid to erose, or stelidia semi-elliptic and rounded . . . . . **B. sect. *Macrostelydia***  
 • Stelidia tapering towards an acute apex (apart from the wing sometimes present along lower margin, lower down) . . . . . 28
28. • Either lateral sepals coherent to connate along upper margins, or lateral sepals free and leaves thick, without visible venation when alive. . . . . **B. sect. *Brachyantha***  
 • Lateral sepals free; leaves thin, with a dense, reticulate venation visible when alive . . . . . **B. sect. *Beccariana***
29. • Dorsal sepal 3-veined . . . . . 30  
 • Dorsal sepal 5–19-veined . . . . . 31
30. • Shoots with rhizome fused to pseudobulb from which they arise over most of length of the pseudobulb. . . . . **B. sect. *Planibulbus***  
 • Shoots growing away from pseudobulb from which they arise, not fused to pseudobulb. . . . . **B. sect. *Desmosanthes***
31. • Petals 5–7-veined. . . . . 32  
 • Petals 1–3-veined. . . . . 33
32. • Pedicel with basal node 0.5–1.0 x diameter of pedicel above floral bract attachment. . . . . **B. sect. *Leopardinae***  
 • Pedicel with the basal node level with floral bract attachment . . . . . **B. sect. *Beccariana***
33. • Lateral sepals distinctly keeled abaxially . . . . . **B. sect. *Biseta (B. bisetoides)***  
 • Lateral sepals not or hardly keeled abaxially . . . . . 34
34. • Labellum length/width 1.5–2.0 . . . . . **B. sect. *Desmosanthes***  
 • Labellum length/width approximately 1. . . . . **B. sect. *Brachyantha (B. violaceolabellum)***
35. • Labellum not mobile, attached to column foot by a thick strip of tissue. . . . . **B. sect. *Sunipia***  
 • Labellum mobile, attached to column foot by a thin strip of tissue . . . . . 36
36. • Stelidia distally along lower margin with a patent and downwardly directed, semi-elliptic tooth . . . . . 37

- Stelidia without a tooth along the lower margin, or stelidia with a tooth along the lower margin in a more proximal position. . . . . 38
- 37. • Petals triangular . . . . . **B. sect. Beccariana** (*B. anaclastum*)
- Petals ovate to elliptic . . . . . **B. sect. Uncifera**
- 38. • Stelidia distally abruptly bent downwards but with an antrorse tip. . . . . **B. sect. Saurocephalum**
- Stelidia porrect or gradually upwards or downwards falcate . . . . . 39
- 39. • Either labellum proximally auriculate, with antrorse auricles along margins; or margins of petals denticulate, papillose, ciliate or ciliolate; or both characters (on labellum and petals) present. . . . . 40
- Labellum undivided, or labellum trilobed with semicircular or semi-elliptic, patent or retrorse lateral lobes; margins of petals entire, glabrous . . . . . 61
- 40. • Labellum proximally auriculate . . . . . 41
- Labellum undivided. . . . . 48
- 41. • Petal margins ciliate or ciliolate . . . . . 42
- Petal margins glabrous, denticulate or papillose. . . . . 44
- 42. • Pseudobulbs wrinkling in a random pattern with age . . . . .
- Pseudobulbs wrinkling with longitudinal furrows with age. . . . . **B. sect. Hirtula** . . . . . 43
- 43. • Petals 1-veined, less than half as long as dorsal sepal . . . . . **B. sect. Monomeria**
- Petals 3-veined, half as long as dorsal sepal or longer . . . . . **B. sect. Acrochaene**
- 44. • Stelidia with a distinct tooth or wing along lower margin . . . . . 45
- Stelidia without a tooth or wing along lower margin (lower down, proximal edge of stigma may be protruding in lateral view) . . . . . 46
- 45. • Sepals abaxially distinctly hirsute . . . . . **B. sect. Beccariana** (*B. taeter*)
- Sepals abaxially glabrous. . . . . **B. sect. Phreatiopsis** (*B. viridescens*)
- 46. • Pedicel distinctly longer than ovary . . . . . 47
- Pedicel approximately as long as the ovary or shorter . . . . . **B. sect. Racemosae**
- 47. • Petals caudate, caudae with thickened apices . . . . . **B. sect. Antennata**
- Petals acute to acuminate, apices not thickened. . . . . **B. sect. Beccariana** (*B. striatum*)
- 48. • Adaxial side of labellum with a median ridge near base, this ridge proximally widening into a triangular callus that forms a roof over furrows bordering the ridge . . . . . **B. sect. Phreatiopsis**
- Adaxial side of the labellum without ridge that proximally widens into a callus . . . . . 49
- 49. • Petal margins entire to denticulate, glabrous to papillose . . . . . 50
- Petal margins ciliate or ciliolate . . . . . 58
- 50. • Pseudobulbs minute, inconspicuous compared to size of plant . . . . . 51
- Pseudobulbs distinctly present. . . . . 54
- 51. • Pollinia 2. . . . . **B. sect. Stachysanthes**
- Pollinia 4. . . . . 52
- 52. • Petals widest at or near base and gradually tapering into an approximately strap-shaped top part. . . . . **B. sect. Altisceptrum**
- Petals elliptic to (ob-)ovate to triangular . . . . . 53
- 53. • Flowers in a dense raceme, arranged in a regular pattern, or flowers in a lax raceme, with lateral sepals held appressed or parallel to rachis . . . . . **B. sect. Brachystachyae**
- Flowers in a lax raceme, not arranged in a regular pattern, nor with lateral sepals held appressed or parallel to rachis . . . . . **B. sect. Stachysanthes**
- 54. • Petals widest at base or in proximal half, and gradually tapering into an approximately linear top part . . . . . **B. sect. Altisceptrum**
- Petals elliptic to oblong to (ob-)ovate . . . . . 55
- 55. • Petals entire . . . . . 56
- Petals finely erose-denticulate . . . . . 57
- 56. • Stelidia downwards sigmoid towards apex, with a large wing along upper margin that widely overtops stelidia themselves (check the vein!) . . . . . **B. sect. Saurocephalum**
- Stelidia approximately straight, with or without a tooth along lower margin . . . . . **B. sect. Brachystachyae**
- 57. • Lateral sepals 27–37 mm long . . . . . **B. sect. Gongorodes**
- Lateral sepals  $\approx$  5 mm long. . . . . **B. sect. Eublepharon** (*B. vietnamense*)
- 58. • Labellum margins ciliate . . . . . **B. sect. Hirtula**
- Labellum margins glabrous to papillose . . . . . 59
- 59. • Petals widest near base and gradually tapering into an approximately linear top part. . . . . **B. sect. Altisceptrum** (*B. farinulentum*)
- Petals elliptic to (ob-)ovate . . . . . 60
- 60. • Stelidia with a rounded wing or a deltoid tooth along lower margin . . . . . **B. sect. Brachystachyae**
- Stelidia without a tooth or wing along lower margin . . . . . **B. sect. Eublepharon**
- 61. • Dorsal sepal 5–19-veined, free from lateral sepals . . . . . 62
- Dorsal sepal 3-veined, or dorsal sepal 5-veined and fused to lateral sepals. . . . . 63
- 62. • Proximal edge of stigma with a protruding, triangular tooth. . . . . **B. sect. Pseudopelma**
- Proximal edge of stigma rounded to truncate . . . . . **B. sect. Beccariana**
- 63. • Pseudobulbs minute, inconspicuous compared to size of plant . . . . . 64
- Pseudobulbs distinctly present. . . . . 67
- 64. • Pollinia 2. . . . . **B. sect. Stachysanthes**
- Pollinia 4. . . . . 65

65. • Petals widest at or near the base and gradually tapering into an approximately strap-shaped top part ..... *B. sect. Altisceptrum*  
• Petals elliptic to (ob-)ovate to triangular ..... 66
66. • Flowers in a dense raceme, arranged into a regular pattern, or flowers in a lax raceme, with lateral sepals held appressed or parallel to rachis ..... *B. sect. Brachystachyae*  
• Flowers in a lax raceme, not arranged into a regular pattern, nor with lateral sepals held appressed or parallel to rachis. .... *B. sect. Stachysanthes*
67. • Lateral sepals with lower margins running approximately parallel (at least in proximal half of sepals or adherent (but flowers not cleistogamous)..... 68  
• Lateral sepals with lower margins spreading, or flowers cleistogamous ..... 69
68. • Pseudobulbs cylindrical, at most slightly widened proximally ..... *B. sect. Beccariana*  
• Pseudobulbs ovoid to ellipsoid ..... *B. sect. Brachystachyae*
69. • Leaves deciduous. .... *B. sect. Lemniscata*  
• Leaves persistent ..... 70
70. • Shoots with rhizome fused to pseudobulb from which they arise over most of length of pseudobulb ..... *B. sect. Planibulbus*  
• Shoots growing away from pseudobulb from which they arise, not fused to pseudobulb ..... 71
71. • Petals more than half as long as dorsal sepal ..... 72  
• Petals half as long as dorsal sepal or shorter ..... 75
72. • Petals widest at or near base and gradually tapering into an approximately linear top part, or widest in proximal half, then abruptly narrowed into a drawn-out distal half, or petals strap-shaped ..... 73  
• Petals elliptic to (ob-)ovate ..... 74
73. • Pseudobulbs obovoid ..... *B. sect. Desmosanthes (B. compressum)*  
• Pseudobulbs ovoid or ellipsoid ..... *B. sect. Altisceptrum*
74. • Pseudobulbs cylindrical, at most slightly widened proximally ..... *B. sect. Beccariana*  
• Pseudobulbs ovoid to globose ..... *B. sect. Adelopetalum (B. bracteatum)*
75. • Inflorescences sprouting from basal nodes of a new shoot while the latter develops ..... *B. sect. Reptantia*  
• Inflorescences sprouting from fully mature shoots, either below pseudobulbs, or elsewhere along rhizome ..... 76
76. • Pollinia 2. .... *B. sect. Adelopetalum (B. bracteatum)*  
• Pollinia 4. .... 77
77. • Rhizome bracts densely and finely papillose; roots densely and coarsely papillose ..... *B. sect. Pseudopelma*  
• Rhizome bracts glabrous to colliculate; roots glabrous, finely hirsute locally. .... *B. sect. Desmosanthes*

## Group C

1. • Labellum deeply saccate with a thickened, recurved apical part overhanging anterior margin of saccate part ..... *B. sect. Pedilochilus*  
• Labellum convex, partly concave, or labellum saccate without a thickened, recurved apical part overhanging anterior margin of saccate part. .... 2
2. • Petal margins with 1–24 appendages differing from petal itself in thickness and/or surface ornamentation ..... 3  
• Petal margins entire to denticulate, glabrous to papillose or ciliate, or with appendages similar to petals in thickness and/or surface ornamentation ..... 5
3. • Dorsal sepal connate to lateral sepals for half of its length or more; lateral sepals free along their lower margins ..... *B. sect. Monosepalum*  
• Sepals free, or all connate proximally for a short distance, or the lateral sepals connate along their lower margins ..... 4
4. • Sepals approximately equal in shape and size; dorsal sepal 5.0–18.5 mm long ..... *B. sect. Epicrianthes*  
• Lateral sepals dissimilar from the median; dorsal sepal 25.0–145.0 mm long ..... *B. sect. Hyalosema*
5. • Adaxial side of labellum proximally with a transverse ridge without a notch halfway; proximal surface of this ridge touches column foot (column foot and base of labellum often fused together) ..... *B. sect. Codonosiphon*  
• Adaxial side of the labellum proximally without a transverse ridge, or with a transverse ridge notched halfway and not touching column foot. .... 6
6. • Pseudobulbs conspicuous compared to size of plant; rhizomes creeping, with shoots developing at basal node of pseudobulb and fused to the latter along 1/3–4/5 of its length, or with shoots developing a similar distance above its basal node, perforating the pseudobulb over the distance between its basal node and the point of emergence (rhizome will break off in front of the fused part) ..... 7  
• Pseudobulbs minute compared to size of plant; or rhizomes patent; or rhizomes creeping with shoots developing from nodes below pseudobulbs and not fused to the latter ..... 8
7. • Either pollinia 2, or pollinia 4 with the inner half as long as the outer or less ..... *B. sect. Macrocaulia*  
• Pollinia 4, inner approximately as long as the outer ..... *B. sect. Leopardinae*
8. • Stelidia distally along lower margin with a distinct, downwardly directed, rounded to obtuse tooth (the tooth protruding well below level of rostellum) ..... 9  
• Stelidia distally along lower margin without a tooth (sometimes with an antrorse tooth lower down, or teeth may be present between which rostellum is attached) ..... 10
9. • Anther with a deeply lacerated anterior margin ..... *B. sect. Monanthaparva (B. tothastes)*  
• Anther with an entire anterior margin ..... *B. sect. Uncifera*

10. • Pollinia 4 (the inner pair may be minute and may be best visible if the outer pair is split) . . . . . 11  
 • Pollinia 2 . . . . . 36
11. • Petals 5–12-veined . . . . . 12  
 • Petals 1–3(–4)-veined . . . . . 16
12. • Dorsal sepal 4.0–4.2 mm long . . . . .  
 . . . . . **B. sect. *Monanthaparva* (*B. tothastes*)**  
 • Dorsal sepal 7.0–95.0 mm long . . . . . 13
13. • Basal node of pedicel larger than diameter of pedicel above floral bract attachment; labellum adaxially glabrous to (partly) hirsute or minutely papillose . . . . . 14  
 • Basal node of pedicel approximately equal to diameter of pedicel above floral bract attachment or less, or labellum adaxially (partly) coarsely papillose . . . . . 15
14. • Flowers resupinate . . . . . **B. sect. *Sestochilus***  
 • Flowers non-resupinate . . . . . **B. sect. *Stenochilus***
15. • Lateral sepals more than three times as long as dorsal sepal . . . . . **B. sect. *Cirrhopetaloides* (*B. fascinator*)**  
 • Lateral sepals approximately as long as dorsal sepal . . . . .  
 . . . . . **B. sect. *Leopardinae***
16. • Rhizome patent; roots developing along basal part of rhizome only or growing backwards along rhizome towards substrate . . . . . 17  
 • Rhizome creeping or straggling; roots developing along most of length of rhizome or below most pseudobulbs, spreading in all directions . . . . . 22
17. • Column foot distinctly widening towards apex, usually with two lateral teeth at tip . . . . . 18  
 • Column foot not or hardly widening towards apex . . . . . 19
18. • Pseudobulbs well protruding from rhizome scales; shoots proximally fused to pseudobulbs, arising from the latter at or above halfway its length . . . . . **B. sect. *Epibulbon***  
 • Pseudobulbs largely covered by rhizome scales or well protruding from rhizome scales; shoots proximally not fused to pseudobulbs . . . . . **B. sect. *Polymeres***
19. • Petals shorter than 1/10 of length of dorsal sepal . . . . .  
 . . . . . **B. sect. *Peltopus* (*B. subapetalum*)**  
 • Petals longer than 1/10 of the length of dorsal sepal . . . . . 20
20. • Pedicel and ovary together 35 mm or longer . . . . .  
 . . . . . **B. sect. *Papulipetalum* (*B. ellipticifolium*)**  
 • Pedicel and ovary together 10 mm or less . . . . . 21
21. • Pedicel longer than ovary; petal margins finely but distinctly erose–denticulate or entire and ciliate . . . . .  
 . . . . . **B. sect. *Piestobulbon***  
 • Pedicel shorter than ovary; petal margins entire or erose distally, glabrous . . . . . **B. sect. *Pelma***
22. • Stelidia vestigial, (partly) included in distinctly projecting rostellum, sometimes only visible as thickenings on its side . . . . . 23  
 • Stelidia distinct although sometimes short; rostellum anterior surface receding in between stelidia apices or level with these, or only slightly projecting . . . . . 25
23. • Petals shorter than 1/4 the length of dorsal sepal; or column foot distinctly swollen distally above labellum attachment, this callus fitting in a cavity on adaxial surface of labellum, near the base; or both characters present . . . . .  
 . . . . . **B. sect. *Peltopus***  
 • Petals 1/4 the length of dorsal sepal or longer; column foot not swollen distally; labellum without a cavity on adaxial surface near base . . . . . 24
24. • Labellum margin coarsely papillose proximally . . . . .  
 . . . . . **B. sect. *Monanthaparva* (*B. hemiprionotum*)**  
 • Labellum margin glabrous . . . . .  
 . . . . . **B. sect. *Minutissima***
25. • Column foot distinctly widening towards apex and usually with two lateral teeth at apex . . . . . 26  
 • Column foot tapering towards apex or only slightly widening towards apex . . . . . 27
26. • Petals proximally (partly) fused to column or stelidia narrowly oblong and obtuse, or both characters present . . . . .  
 . . . . . **B. sect. *Brachypus***  
 • Petals not fused to column; stelidia deltoid to triangular to subulate, approximately acute . . . . . **B. sect. *Polymeres***
27. • Petals proximally fused to column . . . . .  
 . . . . . **B. sect. *Brachypus***  
 • Petals entirely free . . . . . 28
28. • Dorsal sepal 35.0–145.0 mm long . . . . .  
 . . . . . **B. sect. *Hyalosema***  
 • Dorsal sepal 1.5–20.0 mm long . . . . . 29
29. • Pseudobulbs seemingly absent or minute, not or hardly thicker than rhizome . . . . . **B. sect. *Aeschynanthoides***  
 • Pseudobulbs distinct when compared to size of plant, distinctly thicker than rhizome . . . . . 30
30. • Stelidia apex approximately level with rostellum anterior surface or nearly so . . . . . **B. sect. *Minutissima***  
 • Stelidia apex projecting well beyond rostellum anterior surface . . . . . 31
31. • Pseudobulbs distant, at least some rhizome sections between pseudobulbs longer than adjacent pseudobulbs . . . . . 32  
 • Pseudobulbs in clusters, rhizome sections between pseudobulbs shorter than adjacent pseudobulbs . . . . . 34
32. • Dorsal sepal margins glabrous to minutely papillose . . . . .  
 . . . . . **B. sect. *Monanthaparva***  
 • Dorsal sepal margins ciliate . . . . . 33
33. • Dorsal sepal acute to acuminate . . . . .  
 . . . . . **B. sect. *Papulipetalum***  
 • Dorsal sepal rounded to obtuse . . . . .  
 . . . . . **B. sect. *Hirtula* (*B. rariflorum*)**
34. • Petal margins papillose, glandular or distinctly, deeply and finely erose; or stelidia distally glandulose; or both characters present . . . . . **B. sect. *Papulipetalum***  
 • Petal margins approximately entire or slightly, shallowly and coarsely erose; stelidia not glandular . . . . . 35
35. • Sepals 3-veined . . . . . **B. sect. *Monanthaparva***  
 • Sepals 5–11-veined . . . . . 36

36. • Lateral sepals approximately only as long as dorsal sepal . . . . . **B. sect. *Leopardinae* (*B. griffithii*)**  
 • Lateral sepals approximately twice as long as dorsal sepal . . . . . **B. sect. *Balaenoidea***
37. • Column foot distinctly widening towards apex, usually with two lateral teeth at apex . . . . . 38  
 • Column foot not or hardly widening towards apex (sometimes widened more proximally and tapering towards apex) without teeth . . . . . 40
38. • Column foot deeply concave distally . . . . . **B. sect. *Tapeinoglossum***  
 • Column foot flat or convex distally . . . . . 39
39. • Pseudobulbs protruding from rhizome scales; shoots proximally fused to pseudobulbs, arising from the latter at or above half its length . . . . . **B. sect. *Epibulbon***  
 • Pseudobulbs largely covered or not by rhizome scales; shoots not proximally fused to pseudobulbs . . . . . **B. sect. *Polymeres***
40. • Dorsal sepal distinctly and often sharply conduplicate towards apex . . . . . **B. sect. *Hoplandra***  
 • Dorsal sepal not or hardly conduplicate towards apex . . . . . 41
41. • Pseudobulbs seemingly absent or minute, not or hardly thicker than rhizome . . . . . 42  
 • Pseudobulbs distinct when compared to size of plant, distinctly thicker than rhizome . . . . . 44
42. • Rhizomes creeping or straggling . . . . . **B. sect. *Aeschynanthoides***  
 • Rhizomes limply pendulous . . . . . 43
43. • Column in lateral view with proximal edge of stigma protruding, or with a distinct tooth; roots densely and coarsely papillose to rugulose to verrucate . . . . . **B. sect. *Macrouris***  
 • Column in lateral view with proximal edge of stigma not protruding, roots glabrous, locally finely hirsute . . . . . **B. sect. *Imitatores* (*B. glaucum*)**
44. • Stelidia apices approximately level with rostellum anterior surface, or slightly longer, or slightly shorter . . . . . 45  
 • Stelidia apices projecting well beyond rostellum anterior surface . . . . . 46
45. • Rhizomes creeping or straggling; roots spreading . . . . . **B. sect. *Minutissima***  
 • Rhizomes patent to pendulous; roots growing backwards along rhizome towards substrate . . . . . **B. sect. *Schistopetalum* (*B. barbasapiensis*)**
46. • Petal margins approximately entire or slightly, shallowly and coarsely erose, glabrous or with 3–9 caudate appendages . . . . . 47  
 • Petal margins papillose, glandular or distinctly, deeply and finely erose; petals without appendages . . . . . 48
47. • Petals with 3–9 caudate appendages, or triangular and labellum adaxially with ridges proximally . . . . . **B. sect. *Schistopetalum***
- Petals without caudate appendages, (ob-)ovate to elliptic to spatulate to wedge-shaped, or petals triangular and labellum adaxially without ridges proximally . . . . . **B. sect. *Monanthaparva***
48. • Labellum margins glabrous . . . . . **B. sect. *Papulipetalum***  
 • Labellum margins papillose–ciliate . . . . . **B. sect. *Monanthaparva* (*B. lipense*)**

## Group D

1. • Floral bract distinctly tubular proximally . . . . . 2  
 • Floral bract not tubular (but sometimes amplexicaul, with the side just connected at base) . . . . . 5
2. • Leaves deciduous; column foot elongate so that a wide gap exists between lower margins of petals and upper margins of lateral sepals . . . . . **B. sect. *Drymoda***  
 • Leaves persistent; column foot not elongate with no gap between petals and lateral sepals . . . . . 3
3. • Lateral sepals 5–11-veined, free . . . . . **B. sect. *Trias***  
 • Lateral sepals (1–3-veined) or 5–7-veined and connate along their lower margins . . . . . 4
4. • Roots glabrous . . . . . **B. sect. *Monanthes***  
 • Roots densely and coarsely papillose . . . . . **B. sect. *Pseudopelma* (*B. fossatum*)**
5. • Labellum not mobile, attached to column foot by a thick strip of tissue . . . . . **B. sect. *Sunipia***  
 • Labellum mobile, attached to column foot by a thin strip of tissue . . . . . 6
6. • Sepals 3- or 5-veined; dorsal sepal connate to lateral sepals . . . . . **B. sect. *Stachysanthes***  
 • Sepals 5–19-veined; dorsal sepal not connate to lateral sepals . . . . . 7
7. • Petals entire, glabrous . . . . . **B. sect. *Beccariana***  
 • Petals (sparsely) ciliolate, ciliate or fimbriate . . . . . 8
8. • Labellum 2.5–2.7 mm long . . . . . **B. sect. *Recurvae* (*B. subbullatum*)**  
 • Labellum 8.0–15.0 mm long . . . . . **B. sect. *Cirrhopetaloides***

***Bulbophyllum* sect. *Acrochaene*** (Lindl.) J.J.Verm., in prep.

Type species (proposed): *Bulbophyllum kingii* Hook.f.

Epiphytes with creeping rhizomes. Pseudobulbs wrinkling with age along longitudinal lines, 1-leaved. Leaves persistent. Inflorescences a subumbellate to elongate raceme with flowers spirally arranged. Pedicel with the basal node above the attachment of the floral bract. Flowers resupinate. Sepals free, approximately equal; margins glabrous to ciliate or fimbriate, c. 7-veined. Petal margins ciliate to fimbriate, surface glabrous; 3-veined. Labellum mobile on a thin ligament, auriculate. Column with stigma proximally not protruding. Stelidia shorter than ½ the length of the column. Anther anterior surface not

concave, anterior margin somewhat drawn out or not; pollinia 4, with bifid stipe. Three species in semideciduous forests up to 1300 m from India to Vietnam, southwards to Thailand. (JJV)

***Bulbophyllum* sect. *Adelopetalum*** (Fitzg.) J.J.Verm., *Orch.*

*Monog.*, 7, 66 (1993). Type species: *Bulbophyllum bracteatum* (Fitzg.) F.M.Bailey

Epiphytes or lithophytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescences usually an elongate raceme with flowers spirally arranged. Floral bracts amplexicaul or not; pedicel with the basal node above the attachment of the floral bract. Flowers resupinate. Sepals free, usually 3-veined. Petals 1–3-veined. Labellum mobile on a thin ligament, undivided or auriculate. Column with stigma proximally not protruding, column foot distally widened. Stelidia  $\frac{1}{2}$  the length of the column or shorter, with or without a tooth along the upper and/or lower margin. Anther anterior surface concave, anterior margin drawn out or not; pollinia 2 or 4. Eight species in lower montane forests up to 1800 m in Australia, New Zealand, and New Caledonia. (JJV)

***Bulbophyllum* sect. *Aeschynanthoides*** Carr, *Gard. Bull, Straits Settle.*, 5, 137 (1930). Type species: *Bulbophyllum dryas* Carr

Epiphytes with creeping or straggling rhizomes. Pseudobulbs seemingly absent or minute compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescences 1- or 2-flowered. Floral bract amplexicaul, usually tubular; pedicel with the basal node above the attachment of the floral bract. Flowers resupinate. Sepals free, approximately equal, 3-veined. Petals 1-veined, margins entire or sometimes slightly erose. Labellum mobile on a thin ligament, undivided. Column with the rostellum anterior surface approximately level with the stelidia apices, stigma proximally not protruding. Stelidia distinctly shorter than  $\frac{1}{2}$  the length of the column, almost absent or inconspicuous, with a tooth along the lower margin. Anther anterior surface concave or not, anterior margin not drawn out; pollinia 2 or 4; with or without a stipe. Probably 4 species in montane forests up to 1600 m in Japan, Taiwan, China, Peninsular Malaysia, Sumatra, and Borneo. (JJV)

***Bulbophyllum* sect. *Altisceptrum*** J.J.Sm., *Bull. Jard. Bot.*

*Buitenzorg*, ser. 2, 13, 34 (1914). Type species: *Bulbophyllum elongatum* (Blume) Hassk.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence a contracted to elongate raceme with flowers spirally arranged. Flowers resupinate, pedicel usually with the basal node level with the attachment of the floral bract. Sepals free, approximately equal, 3-veined. Petals usually 1-veined with margins entire to erose, glabrous to papillose or ciliolate. Labellum mobile on a thin ligament, usually undivided. Column with stigma proximally not protruding, column foot with lateral teeth near the apex. Stelidia shorter than  $\frac{1}{2}$  the length of the column, with or without tooth along the upper and/or the

lower margin. Anther anterior surface concave or not, anterior margin not drawn out; pollinia 4. Nine species in dry kerangas forests, limestone forests and montane forests up to 3000 m in India, Bhutan, China, Laos, Thailand, Malaysia, Sumatra, Java, Borneo, the Philippines, Sulawesi, and Papua New Guinea. (JJV)

***Bulbophyllum* sect. *Antennata*** Pfitz. in Engler & Prantl, *Die Natürlichen Pflanzenfamilien*, 2, 6, 179 (1888). Type species: *Bulbophyllum fuscopurpureum* Wight

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence an elongate raceme with flowers spirally arranged. Pedicel with the basal node level with attachment of the floral bract. Flowers resupinate. Sepals free, ca. 5-veined, the lateral sepals c. 1.2 times as long as the dorsal sepal. Petals 1-veined. Labellum mobile on a thin ligament, distinctly auriculate. Column with stigma proximally not protruding. Stelidia shorter than  $\frac{1}{2}$  the length of the column. Anther anterior surface not concave, anterior margin not drawn out; pollinia 4. A single species in montane forests up to 2260 m in India. (JJV)

***Bulbophyllum* sect. *Balaenoidea*** Pfitz. in Engler & Prantl, *Die Natürlichen Pflanzenfamilien*, 2, 6, 179 (1888). Type species: *Bulbophyllum balaeniceps* Rchb.f.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1- or 2-flowered. Pedicel with the basal node above the attachment of the floral bract. Flowers resupinate. Dorsal sepal free, 9-veined; lateral sepals as the dorsal but adherent along their lower margin, c. 2 times as long as the dorsal sepal. Petals 3-veined, margins entire or erose. Labellum mobile on a thin ligament, trilobed. Column with stigma proximally not protruding. Stelidia shorter than  $\frac{1}{2}$  the length of the column, denticulate along the upper margin or not. Anther anterior surface concave, anterior margin drawn out into a beak; pollinia 4. A single, poorly known species from India and Sri Lanka. (JJV)

***Bulbophyllum* sect. *Beccariana*** Pfitz. in Engler & Prantl, *Die Natürlichen Pflanzenfamilien*, 2, 6, 179 (1888). Type species: *Bulbophyllum beccarii* Rchb.f.

Epiphytes with creeping rhizomes with shoots usually not fused to the pseudobulbs. Pseudobulbs small to distinct compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescence a 2- to many-flowered, subumbellate, congested or elongate raceme, or one-flowered with an abortive second flower present; peduncle bracts 3–10; rachis, if present, not or hardly thickened. Floral bracts amplexicaul or not; pedicel with the basal node level with the attachment of the floral bract or above it. Flowers resupinate or non-resupinate. Dorsal sepal free, (3-)5–19-veined; lateral sepals as the dorsal but 1.0–1.4 times as long, usually free. Petals (1–3-)9-veined. Labellum mobile on a thin ligament, usually undivided. Column with stigma usually proximally not protruding, usually without lateral lobes near the apex. Stelidia approximately  $\frac{1}{2}$  the length of the column or shorter, entire to erose along the upper margin, with a tooth or wing along the

lower margin. Anther anterior surface not concave, anterior margin drawn out or not; pollinia 4, with or without a single stipe. Approximately 65 species in peat swamp forests up to 800 m in Bhutan, Borneo, Sulawesi, and Papua New Guinea. (JJV)

***Bulbophyllum* sect. *Biflorae*** Garay, Hamer & Siegerist, *Nordic J. Bot.*, **14**, 626 (1994). Type species: *Bulbophyllum biflorum* Teijsm. & Binn.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence a 2-flowered, subumbellate raceme. Flowers resupinate; pedicel with the basal node above the floral bract attachment, the stem portions between pedicel node and floral bract attachment fused. Dorsal sepal free, 5-veined; lateral sepals as for the dorsal but 2.2–8.0 times as long, twisted near the base so that the upper margins turn inward, adherent along their upper margins. Petals 3-veined. Labellum mobile on a thin ligament, undivided. Column with stigma proximally not protruding and (slight) lateral lobes near the apex. Stelidia shorter than  $\frac{1}{2}$  the length of the column, with or without a wing along the lower margin. Anther anterior surface concave, anterior margin drawn out into a rounded beak; pollinia 4. Five species in montane forests up to 1200 m in Thailand, Peninsular Malaysia, Sumatra, Java, Lesser Sunda Islands, Borneo, and the Philippines. (JJV)

***Bulbophyllum* sect. *Biseta*** J.J.Verm. *Edinburgh J. Bot.*, **58**, 120 (2001). Type species: *Bulbophyllum bisetum* Lindl.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence a 2- to many-flowered, contracted or elongate raceme with the rachis (distinctly) thickened or not. Flowers resupinate or not; pedicel with the basal node above the attachment of the floral bract; ovary with the jugae usually extending between the sepals as teeth. Dorsal sepal free, 3-veined; lateral sepals as for the dorsal sepal but 1.0–1.6 times as long, adherent along the lower margin, 5-veined, midvein abaxially keeled. Petals usually 1-veined. Labellum mobile on a thin ligament, undivided. Column with stigma proximally usually protruding and/or with a tooth, column foot often with lateral wings near the apex. Stelidia approximately  $\frac{1}{2}$  the length of the column, upper margin with or without tooth, lower margin with a tooth. Anther anterior surface concave, anterior margin drawn out into a beak; pollinia 4. Probably four species in montane forests up to 1900 m in India, Peninsular Malaysia, Sumatra, and Borneo. (JJV)

***Bulbophyllum* sect. *Blepharistes*** J.J.Verm., in prep. Type species (proposed): *Bulbophyllum blepharistes* Rchb.f.

Epiphytes with creeping or straggling rhizomes. Pseudobulbs 2-leaved. Leaves persistent. Inflorescence a many-flowered, subumbellate raceme. Flowers resupinate; pedicel with the basal node slightly above the attachment of the floral bract. Dorsal sepal free, 7–9-veined; lateral sepals as for the dorsal sepal but 1.1–1.2 times as long, connate along their lower margins. Petals 5-veined, the distal margin fimbriate. Labellum mobile on a thin

ligament, undivided. Column with stigma proximally not protruding. Stelidia shorter than  $\frac{1}{2}$  the length of the column, lower margin with an inconspicuous wing. Anther anterior surface hardly concave, anterior margin not drawn out; pollinia 4. A single species in temperate forests up to 800 m in India, Burma, Thailand, Laos, Vietnam, and Peninsular Malaysia. (JJV)

***Bulbophyllum* sect. *Brachyantha*** Rchb.f., *Ann. Bot. Syst.*, **6**, 264 (1861). Type species: *Bulbophyllum umbellatum* Lindl.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence usually a 2- to many-flowered, subumbellate raceme. Flowers resupinate; pedicel with the basal node above the floral bract attachment. Dorsal sepal free, usually 3–5-veined; lateral sepals as for the dorsal sepal but usually 2–6 times as long, usually twisted near the base so that the upper margins turn inward, free or adherent or adnate along their upper margins. Petals 3–5-veined. Labellum mobile on a thin ligament, undivided. Column with stigma proximally not protruding, column foot with or without lateral lobes near the apex. Stelidia approximately  $\frac{1}{2}$  the length of the column or shorter, with or without a tooth along the upper and/or lower margin. Anther anterior surface concave, anterior margin drawn out into a rounded beak or not; pollinia 4. Approximately 26 species in montane forests up to 2200 m from India to Japan, and to the Philippines, with 1 species in New Guinea. (JJV)

***Bulbophyllum* sect. *Brachypus*** Schltr., *Repert. Spec. Nov. Regni Veg. Beib.* **1**: 700–765 (1911). Type species: *Bulbophyllum maxillarioides* Schltr.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescences 1-flowered. Flowers resupinate. Floral bract tubular with basal node of above attachment of the floral bract. Sepals usually free; usually subequal, 3–9-veined. Petals 1-veined, usually proximally fused to the column over a short distance. Labellum mobile on a thin ligament, undivided. Column with stigma usually not protruding. Stelidia shorter to distinctly longer than  $\frac{1}{2}$  the length of the column; with or without a tooth along the upper margin, usually without one along the lower. Anther anterior surface not concave, anterior margin not drawn out; pollinia 4. Approximately 21 species in montane forests up to 1100 m in New Guinea and the western Pacific islands. (JJV)

***Bulbophyllum* sect. *Brachystachyae*** Benth. & Hook.f., *Gen. Pl.*, **3**, 504 (1880). Type species: *Bulbophyllum repens* Wall.

Epiphytes with creeping rhizomes. Pseudobulbs minute compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescence a many-flowered, contracted or elongated, lax to dense raceme. Flowers resupinate, pedicel with the basal node level with the floral bract attachment. Dorsal sepal free or fused to the laterals, 3-veined, margins glabrous to papillose to ciliate; lateral sepals 3-(–5)-veined, otherwise as for the dorsal sepal but usually adherent along their lower margins, 0.9–1.5 times as long as the dorsal sepal. Petals 1–3-veined, margins



entire to erose, glabrous to ciliate. Labellum mobile on a thin ligament, undivided. Column with stigma proximally not or only slightly protruding. Stelidia shorter to longer than  $\frac{1}{2}$  the length of the column, upper and lower margin usually with a tooth. Anther anterior surface usually concave, anterior margin usually drawn out into a beak; pollinia usually 4. Approximately 43 species in montane forests up to 2200 m in India and Sri Lanka to China, southwards to Java, eastwards to the western Pacific. In Sulawesi and eastwards represented by a few species only. (JJV)

***Bulbophyllum* sect. *Cirrhopetaloides*** Garay, Hamer & Siegerist, *Nordic J. Bot.*, **14**, 625 (1994). Type species: *Bulbophyllum longissimum* (Ridl.) Ridl.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1- to many-flowered, subumbellate raceme. Flowers resupinate; pedicel with the basal node not to slightly above the floral bract attachment. Dorsal sepal free, 5–9-veined, margins entire to erose–dentate, fimbriate with or without paleate fimbriae; lateral sepals as for the dorsal sepal but 1.3–15.0 times as long, twisted near the base so that upper margins turn inward, free or adherent or adnate along their upper margins, margins entire, glabrous. Petals 3–(–5)-veined, margins denticulate and fimbriate with or without paleate fimbriae. Labellum mobile on a thin ligament, undivided. Column with stigma proximally not protruding. Stelidia usually shorter than  $\frac{1}{2}$  the length of the column, usually with a tooth or wing along the upper and lower margin. Anther anterior surface slightly concave or not, anterior margin not or hardly drawn out; pollinia 4, usually without stipes. Approximately 19 species in montane forests up to 1500 m in India, Sri Lanka, China, Taiwan, Japan, Burma, Thailand, Laos, Vietnam, Peninsular Malaysia, Sumatra, Borneo, and the Philippines. (JJV)

***Bulbophyllum* sect. *Cirrhopetalum*** (Lindl.) Rchb.f., *Ann. Bot. Syst.*, **6**, 259 (1861). Type species: *Bulbophyllum longiflorum* Thouars

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence a many-flowered, subumbellate raceme. Flowers resupinate; pedicel with the basal node above the floral bract attachment. Dorsal sepal free, (3–)5-veined, margins entire or distally erose; lateral sepals as for the dorsal sepal, 3–5-veined, but 2.0–5.5 times as long, twisted near the base so that the upper margins turn inward, connate along their upper margins margins, entire, glabrous. Petals 3-veined, margins fimbriate. Labellum mobile on a thin ligament, undivided or auriculate. Column with stigma proximally not protruding. Stelidia  $\frac{1}{2}$  the length of the column or shorter, with a tooth on the adaxial surface, with or without a tooth along the upper and/or lower margin. Anther anterior surface slightly concave, anterior margin drawn out; pollinia 4. Approximately nine species in montane forests up to 1800 m in Africa, Madagascar and surrounding islands, India, Burma, Thailand, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, the Philippines, and eastward in the Pacific. (JJV)

***Bulbophyllum* sect. *Codonosiphon*** Schltr., *Repert. Spec. Nov. Regni Veg.*, **10**, 178 (1911). Type species: *Bulbophyllum codonanthum* Schltr.

Epiphytes with creeping to patent rhizomes, shoots fused to the pseudobulbs or not. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flowers resupinate; floral bracts tubular; pedicel with the basal node above the attachment of the floral bract. Sepals usually free, usually equal, 3-veined. Petals 1-veined, margins entire to erose, glabrous to papillose. Labellum usually immobile, fused to or firmly appressed to the column foot over a smaller or larger area, this area in front bordered by a transverse, straight ridge; often auriculate. Column with stigma proximally not protruding, column foot widening and thickening towards its apex. Stelidia usually shorter than  $\frac{1}{2}$  the length of the column, margins often erose or dentate. Anther anterior surface not concave, anterior margin drawn out or not; pollinia 4. Seventy-seven species in montane forests up to 2200 m in Borneo, Sulawesi, Maluku, New Guinea, and the Pacific. (JJV)

***Bulbophyllum* sect. *Desmosanthes*** (Blume) J.J.Sm., *Bijdr. Flora Ned. Indië*, **7**, 315 (1825). Type species: *Bulbophyllum croceum* (Blume) Lindl.

Epiphytes with creeping to patent rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence a 2- to many-flowered, elongate to subumbellate raceme. Flowers resupinate; pedicel with the basal node hardly above the floral bract attachment. Sepals free, 3–7-veined, the laterals 1–3 times as long as the dorsal, 3–7-veined. Petals 1–3-veined. Labellum mobile on a thin ligament, undivided. Column with stigma proximally usually not protruding. Stelidia shorter to longer than  $\frac{1}{2}$  the length of the column, lower margin often with a tooth. Anther anterior surface concave or not, anterior margin drawn out into a beak or not; pollinia 4, with or without stipes. Approximately 70 species in montane forests up to 2000 m in India, China, Taiwan, eastwards to the Philippines, Sulawesi, and the Lesser Sunda Islands. (JJV)

***Bulbophyllum* sect. *Drymoda*** (Lindl.) J.J.Verm., in prep. Type species (proposed): *Bulbophyllum drymoda* J.J.Verm., ined.

Epiphytes with creeping rhizomes. Pseudobulbs 2-leaved. Leaves deciduous. Inflorescence 1-flowered. Flowers resupinate. Floral bract tubular; pedicel with the basal node level with the attachment of the floral bract. Sepals free, 3–5-veined, the lateral sepals 1.2–3.3 times as long as the dorsal sepal. Petals 1-veined, margins entire to irregularly denticulate. Labellum mobile but attached to the column foot by a thick strip of tissue, undivided or sub-trilobed. Column with the proximal margin of stigma protruding, column foot with the lateral sepals attached near the apex so that a gap exists between the lower margins of the petals and the upper margins of the lateral sepals. Stelidia approximately  $\frac{1}{2}$  the length of the column or shorter, lower margin with or without a tooth. Anther anterior surface not concave, anterior margin slightly drawn out; pollinia 4. Two species in montane forests up to 900 m in Burma, Laos, and Thailand. (JJV)

***Bulbophyllum* sect. *Emarginatae*** Garay, Hamer & Siegerist, *Nordic J. Bot.*, **14**, 625. Type species: *Bulbophyllum emarginatum* (Finet) J.J.Sm.

Epiphytes with patent rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence a 1-flowered, or a 2- to many-flowered, subumbellate raceme. Flowers resupinate; pedicel with the basal node above the floral bract attachment. Dorsal sepal free, 5–7-veined, margins glabrous to ciliate; lateral sepals 2–3 times as long as the dorsal, twisted near the base so that the upper margins turn inward, adherent or connate along their upper and lower margins. Petals 3-veined, ciliate or papillose distally. Labellum mobile on a thin ligament, undivided. Column with stigma proximally not protruding, column foot with or without lateral lobes near the apex. Stelidia approximately  $\frac{1}{2}$  the length of the column or shorter, with a wing along the lower margin. Anther anterior surface not concave, anterior margin not drawn out; pollinia 4. Three species in montane forests up to 2600 m in India, Nepal, Bhutan, China, Burma, Thailand, and Vietnam. (JJV)

***Bulbophyllum* sect. *Epibulbon*** Schltr., *Repert. Spec. Nov. Regni Veg. Beib.*, **1**, 703 (1912). Type species: *Bulbophyllum epibulbon* Schltr.

Epiphytes with patent rhizomes, with roots sprouting near the base of the rhizome, growing backwards along it until reaching the substrate, shoots fused proximally to the pseudobulbs. Pseudobulbs distinct to small compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flowers resupinate; floral bracts tubular; pedicel with the basal node above the attachment of the floral bract. Sepals usually free, 3-(4–9)-veined, usually approximately equal, margins glabrous to papillose or ciliate. Petals usually 1-veined, with margins entire to approximately fimbriate, glabrous to ciliate. Labellum mobile on a thin ligament, undivided or auriculate. Column with stigma often proximally protruding, column foot widened and often thickened and usually with two lateral teeth towards its apex. Stelidia with upper margin sometimes with a tooth. Anther anterior surface concave or not, anterior margin not drawn out; pollinia 2 or 4. Seven species in montane forests up to 1300 m in Papua New Guinea. (JJV)

***Bulbophyllum* sect. *Epicrianthes*** (Blume) Hook.f., *Flora Brit. India*, **5**, 753 (1890). Type species: *Bulbophyllum epicrianthes* (Blume) Hook.f.

Epiphytes with patent rhizomes. Shoots proximally fused to pseudobulbs. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flowers resupinate; floral bracts tubular, pedicel with the basal node above the attachment of the floral bract. Sepals free, approximately equal, 3–9-veined. Petals 3–5-veined, distally with 3–24 appendages, appendages usually differing in texture from the petal itself. Labellum mobile on a thin ligament, auriculate or undivided. Column with stigma proximally not protruding, column foot with or without small, antrorse lobes near the apex. Stelidia shorter than  $\frac{1}{2}$  the length of the column, upper margin with or without a tooth, lower margin with 1–2 teeth. Anther anterior surface concave or not, anterior margin usually drawn out, emarginate; pollinia 2 or 4, sometimes with a

stipe. Forty species in montane forests up to 1300 m in China, Burma to Java and Borneo, eastward to New Guinea and New Caledonia. (JJV)

***Bulbophyllum* sect. *Eublepharon*** J.J.Verm., in prep. Type species (proposed): *Bulbophyllum eublepharon* Lindl.

Epiphytes with creeping rhizomes. Pseudobulbs distinct, wrinkling with age along longitudinal lines, 1-leaved. Leaves persistent. Inflorescence a 2- to many-flowered, elongate to subumbellate raceme. Flowers resupinate; pedicel with the basal node not or slightly above the attachment of the floral bract. Dorsal sepal free, usually 3-veined, margins entire to denticulate; lateral sepals 1–2 times as long as the dorsal, usually free, 3–5-veined. Petals 1–3-veined, margins erose to fimbriate. Labellum mobile on a thin ligament, undivided. Column with stigma proximally not protruding, column foot with teeth near the apex. Stelidia  $\frac{1}{2}$  the length of the column or shorter; with or without teeth along the upper and lower margin. Anther anterior surface not concave, anterior margin drawn out or not; pollinia 4. Approximately 10 species in montane forests up to 3300 m in Sri Lanka, India, Nepal, Bhutan, China, Taiwan, Japan, Laos, and Vietnam. (JJV)

***Bulbophyllum* sect. *Gongorodes*** J.J.Sm., *Bull. Jard. Bot. Buitenzorg*, ser. 2, **13**, 35. Type species: *Bulbophyllum digitatum* J.J.Sm.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence a many-flowered raceme. Flowers resupinate; pedicel with the basal node level with the attachment of the floral bract. Sepals free; the dorsal sepal 3–7-veined, lateral sepals 1.6–1.9 times as long as the dorsal sepal. Petals 1–3-veined, apices either widened and tridentate, or sharply folded twice, margins erose. Labellum mobile on a thin ligament, undivided. Column with stigma proximally not protruding, column foot with the lateral sepals attached halfway along its length so that a gap exists between the lower margins of the petals and the upper margins of the lateral sepals, with 2 teeth at the apex. Stelidia shorter than  $\frac{1}{2}$  the length of the column, triangular, subacute, with or without a slight tooth along the upper margin, with 1–2 teeth along the lower. Anther anterior surface concave, anterior margin drawn out or not; pollinia 4. Two species in montane forests up to 1500 m in New Guinea. (JJV)

***Bulbophyllum* sect. *Hemisterrantha*** J.J.Verm., in prep. Type species (proposed): *Bulbophyllum hemisterranthum* J.J.Verm. & P.O'Byrne

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flower resupinate; floral bract tubular; pedicel with the basal node above the attachment of the floral bract. Sepals usually free, approximately equal, usually 3-veined. Petals usually 1-veined, margins entire to erose, glabrous to papillose. Labellum mobile on a thin ligament, undivided, fleshy. Column with stigma proximally often protruding, column foot with or without a dorsal tooth near the apex. Stelidia with upper and/or lower margin often with a tooth. Anther anterior surface concave or not, anterior margin drawn out into a

beak or not; pollinia 2 or 4. Only two species in montane forests up to 1200 m in Sulawesi. (JJV)

***Bulbophyllum* sect. *Henosis*** (Hook.f.) Ormerod, *Edinburgh J. Bot.*, **58**, 120. Type species: *Bulbophyllum longipes* Rchb.f.

Epiphytes with creeping rhizomes. Pseudobulbs distinct, 1-leaved. Leaves persistent. Inflorescence a many-flowered, elongate raceme. Flowers resupinate; pedicel with the basal node above the attachment of the floral bract. Sepals free, five-veined; lateral sepals 1.6–1.8 times as long as the dorsal sepal. Petals 1-veined. Labellum mobile on a thin ligament, undivided. Column distinctly widened, stigma proximally not protruding, column foot with the lateral sepals attached halfway along its length so that a gap exists between the lower margins of the petals and the upper margins of the lateral sepals, at the apex with lateral wings. Stelidia approximately  $\frac{1}{2}$  the length of the column, with or without a tooth along the upper margin, lower margin much widened. Anther anterior surface not concave, anterior margin drawn out; pollinia 4. A single species in lowland forests up to 1500 m in Burma and Thailand. (JJV)

***Bulbophyllum* sect. *Hirtula*** Ridl., *Mat. Flora Malay. Peninsula*, **1**, 68 (1908). Type species: *Bulbophyllum hirtulum* Ridl.

Epiphytes with creeping rhizomes. Pseudobulbs distinct to minute compared to the size of the plant, wrinkling with age in a random pattern, 1-leaved. Leaves persistent. Inflorescence usually a many-flowered, subumbellate to elongate raceme. Flowers resupinate; pedicel with the basal node level with or above the attachment of the floral bract. Sepals free, 4.5–32.0 mm long, equal in length, usually 3–5-veined, glabrous to ciliate; usually 3–5-veined. Petals 1-veined, margins ciliate. Labellum mobile on a thin ligament, auriculate. Column with stigma proximally protruding or not. Stelidia approximately  $\frac{1}{2}$  the length of the column or shorter, with or without a tooth along the upper and lower margin. Anther anterior surface concave or not, anterior margin drawn out or not; pollinia 4. Forty species in montane forests up to 2500 m from India to China, southward to Java, eastward to the Philippines and Sulawesi. (JJV)

***Bulbophyllum* sect. *Hoplandra*** J.J.Verm., *Nordic J. Bot.*, **26**, 147 (2008). Type species: *Bulbophyllum restrepia* Ridl.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flowers resupinate; floral bracts tubular; pedicel with the basal node above the attachment of the floral bract. Dorsal sepal free, 3–5-veined, distally distinctly and often sharply conduplicate; lateral sepals free or connate along the lower margin and/or with the caudate apices entwined, 5–8-veined, 1.6–6.5 times as long as the dorsal sepal. Petals 1–3-veined. Labellum mobile on a thin ligament, undivided. Column with stigma proximally not protruding. Stelidia approximately  $\frac{1}{2}$  the length of the column or shorter, often with a tooth along the upper or lower margin. Anther anterior surface curved backward, inflated and deeply concave, anterior margin not drawn out; pollinia 2. Approximately 10 species in forests up

to 1200 m from Peninsular Malaysia and Sumatra eastward to the Pacific islands. (JJV)

***Bulbophyllum* sect. *Hyalosema*** Schltr., *Repert. Spec. Nov. Regni Veg.*, **10**, 92 (1911). Type species: *Bulbophyllum grandiflorum* Blume

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flower resupinate; floral bract tubular; pedicel with the basal node well above the attachment of the floral bract. Dorsal sepal free, 5–9-veined, margins glabrous to papillose or hirsute; lateral sepals free or connate along the lower margins, 5–7-veined, as long as or shorter than the dorsal sepal. Petals 1–3-veined, apices often with a thickened appendage. Labellum mobile on a thin ligament, usually undivided. Column with stigma proximally not protruding, column foot slightly widened toward the apex or not. Stelidia less than  $\frac{1}{2}$  the length of the column, with or without a tooth along the upper and lower margin. Anther anterior surface inflated and deeply concave, anterior margin not drawn out; pollinia 4. Approximately 19 species in montane forests up to 1500 m from Thailand and Java eastward to Pacific islands. (JJV)

***Bulbophyllum* sect. *Hymenobractea*** Schltr., *Repert. Spec. Nov. Regni Veg. Beib.*, **1**, 699–752 (1913). Type species: *Bulbophyllum infundibuliforme* J.J.Sm.

Epiphytes with creeping rhizomes. Pseudobulbs minute compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescence a 1–10-flowered, patent to erect raceme with distichously arranged flowers. Flowers non-resupinate; floral bracts amplexicaul, often proximally tubular; pedicel with the basal node above the attachment of the floral bract. Sepals 5–9-veined with broadly attached base, the lateral sepals 1.0–1.4 times as long as the dorsal sepal; lateral sepals united at base to column foot forming a mentum. Petals 3–5-veined with broadly attached base, margins entire. Labellum mobile on a thin ligament, distinctly recurved at  $\frac{1}{3}$  to  $\frac{1}{2}$  of its length, entire. Column with stigma proximally often protruding, or with two protruding teeth; column foot present. Stelidia  $\frac{1}{2}$  the length of the column or shorter, with or without a tooth along the upper and lower margin. Anther anterior surface not concave, anterior margin not or slightly drawn out; pollinia 4. Two species in forests up to 1500 m in Papua New Guinea. (JJV)

***Bulbophyllum* sect. *Imitatores*** J.J.Verm., in prep. Type species (proposed): *Bulbophyllum imitator* J.J.Verm.

Epiphytes with patent rhizomes. Pseudobulbs distinct to minute compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescences 1- to many-flowered, subumbellate to elongated raceme. Flowers resupinate; floral bracts usually not amplexicaul, pedicel with the basal node above the floral bract attachment. Sepals free, approximately equal, usually 3-veined. Petals 1–3-veined. Labellum mobile on a thin ligament, undivided. Column with the rostellum anterior surface approximately level with the stelidia apices or receding in between these; stigma

proximally not protruding. Stelidia shorter than the length of the column. Anther anterior surface not concave, anterior margin not drawn out (with a small, triangular beak in *B. glaucum* Schltr.); pollinia 2 or 4. Four species in montane forests up to 2100 m in New Guinea and the western Pacific islands. (JJV)

***Bulbophyllum* sect. *Intervallatae*** Ridl., *J. Linn. Soc., Bot.*, **31**,

276. Type species: *Bulbophyllum attenuatum* Rolfe

Epiphytes with creeping rhizomes. Pseudobulbs distinct to minute compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescence a 2- to many-flowered, dense to elongate raceme with distichously arranged flowers. Flowers resupinate, usually one open at a time per inflorescence; floral bracts amplexicaul, often proximally tubular; pedicel with the basal node above the attachment of the floral bract. Sepals free, 5–11-veined, the lateral sepals 1.0–1.4 times as long as the dorsal sepal. Petals 1–5-veined, margins entire to distally denticulate. Labellum mobile on a thin ligament, undivided or auriculate. Column with stigma proximally often protruding, or with two protruding teeth. Stelidia  $\frac{1}{2}$  the length of the column or less, with or without a tooth along the upper and lower margin. Anther anterior surface not concave, anterior margin not or hardly drawn out; pollinia 4, with or without stipes. Approximately 44 species in forests up to 1400 m in Peninsular Malaysia, Sumatra, Borneo, Sulawesi, the Philippines, New Guinea, and the western Pacific islands. (JJV)

***Bulbophyllum* sect. *Lemniscata*** Pfitz. in Engler & Prantl, *Die Natürlichen Pflanzenfamilien*, **2**, **6**, 179 (1888-1889). Type species: *Bulbophyllum lemniscatum* C.S.P. Parish ex Hook.f.

Epiphytes with creeping rhizomes. Pseudobulbs usually 2-leaved. Leaves deciduous. Inflorescence a 2- to many-flowered, subumbellate to elongate raceme. Flowers resupinate; pedicel with the basal node approximately level with the attachment of the floral bract. Dorsal sepal free, 1–5-veined, margins entire to erose to irregularly fimbriate or paleate; lateral sepals free to adnate, usually along the lower margin, 3–5-veined, 1.0–6.9 times as long as the dorsal. Petals usually 1-veined, margins entire to fimbriate or paleate. Labellum mobile on a thin ligament, undivided. Column with stigma proximally not protruding. Stelidia approximately  $\frac{1}{2}$  the length of the column or less, often with a wing along the lower margin. Anther anterior surface not concave, anterior margin drawn out into a beak or not; pollinia 4. Approximately 32 species in forests up to 400 m in India, Nepal, Bhutan, China, Burma, Laos, Vietnam, Thailand, Peninsular Malaysia, Sumatra, Java, and Borneo. (JJV)

***Bulbophyllum* sect. *Leopardinae*** Benth. & Hook.f., *Gen. Pl.*, **3**, 502 (1880-1883). Type species: *Bulbophyllum leopardinum* (Wall.) Lindl.

Epiphytes with creeping rhizomes, shoots proximally fused to the pseudobulbs. Pseudobulbs one-leaved. Leaves persistent. Inflorescence a 1–4-flowered, congested to elongate raceme with the flowers spirally arranged. Flowers resupinate; floral bracts

tubular; pedicel with the basal node above the attachment of the floral bract. Sepals free, approximately equal, 5–11-veined. Petals 3–7-veined, margins entire to erose. Labellum mobile on a thin ligament, undivided or auriculate. Column with stigma proximally not protruding. Stelidia shorter than  $\frac{1}{2}$  the length of the column, deltoid to triangular to subulate, with or without the upper and lower margin. Anther anterior surface not concave, anterior margin usually not drawn out; pollinia 4, with or without stipes. Seven species in forests up to 3300 m in India, Nepal, China, Taiwan, Indochina, Burma, Thailand, and the Philippines. (JJV)

***Bulbophyllum* sect. *Lepanthanthe*** Schltr., *Repert. Spec.*

*Nov. Regni Veg. Beib.*, **1**, 704-875 (1911). Type species:

*Bulbophyllum lepanthiflorum* Schltr.

Epiphytes with creeping or pendent rhizomes. Shoots proximally fused to the pseudobulb. Roots verrucate. Pseudobulbs minute compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescence a many-flowered raceme with flowers usually spirally arranged. Flowers resupinate; pedicel with the basal node above the attachment of the floral bract. Sepals equal, free, apex a fleshy, subulate projection, margins glabrous to papillose to ciliate; usually 3-veined, abaxially keeled or not, dorsal sepal free; lateral sepals sometimes connate along their lower margins. Petals 1-veined, margins entire to erose, glabrous to ciliate. Labellum mobile on a thin ligament, undivided or trilobed. Column with the rostellum anterior surface approximately level with the stelidia apices or receding in between these, stigma proximally usually protruding. Stelidia  $\frac{1}{2}$  or less the length of the column, often with a distinct tooth along the lower margin. Anther anterior surface not concave, anterior margin drawn out into a beak or not; pollinia 2. Seventeen species in forests up to 3300 m in New Guinea and the western Pacific islands. (JJV)

***Bulbophyllum* sect. *Lepidorhiza*** Schltr., *Repert. Spec. Nov.*

*Regni Veg.*, **10**, 93 (1911). Type species: *Bulbophyllum*

*amplebracteatum* Teijsm. & Binn.

Epiphytes with creeping rhizomes. Roots verrucate. Pseudobulbs usually distinct, 1-leaved. Leaves persistent. Inflorescence 2- to many-flowered, usually elongate raceme with distichously arranged flowers. Flowers often open one at a time, resupinate; floral bracts usually tubular proximally; pedicel with the basal node usually above the attachment of the floral bract. Sepals 5–13-veined; dorsal sepal free, lateral sepals 1.0–1.7 times as long as the dorsal sepal, often twisted near the base so that the upper margins turn inward, free or adherent along their upper margins. Petals usually 3–12-veined. Labellum mobile on a thin ligament, undivided, auriculate or sub-trilobed. Column with stigma proximally often protruding. Stelidia often with a tooth along the upper and/or lower margin. Anther anterior surface not concave, anterior margin not or hardly drawn out; pollinia 4. Approximately 28 species in forests up to 1900 m in Borneo, Sulawesi, the Philippines, Maluku, New Guinea, and the western Pacific islands. (JJV)

***Bulbophyllum* sect. *Macrocaulia*** (Blume) Aver., *Ident.*

*Guide Viet. Orch.*, 279 (1994). Type species: *Bulbophyllum ovalifolium* (Blume) Lindl.

Epiphytes with creeping rhizomes. Shoots proximally fused to the pseudobulbs. Pseudobulbs 1-leaved. Leaves usually persistent. Inflorescence 1-flowered. Flowers resupinate; floral bracts tubular; pedicel with the basal node above the attachment of the floral bract. Dorsal sepal usually free, 3–5-veined, margins entire to erose, glabrous to papillose; lateral sepals 1–5 times as long as the dorsal sepal. Petals 1–3-veined, margins entire to erose. Labellum mobile on a thin ligament, usually undivided. Column with stigma proximally protruding or not. Stelidia with or without a slight tooth along the upper and lower margin. Anther anterior surface slightly concave or not, anterior margin drawn out or not; pollinia 2 or 4, stipes absent or present. Approximately 68 species in forests up to 2500 m in India, China, Burma, Laos, Vietnam, Thailand, Peninsular Malaysia, Sumatra, Java, Bali, Borneo, Sulawesi, and the Philippines. (JJV)

***Bulbophyllum* sect. *Macrostelydia*** Garay, Hamer & Siegerist,

*Nordic J. Bot.*, 14, 626 (1994). Type species: *Bulbophyllum macraei* (Lindl.) Rchb.f.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1-flowered, or a 2- to many-flowered, subumbellate raceme. Flowers resupinate; pedicel with the basal node above the floral bract attachment. Sepals 5-veined, dorsal sepal free; lateral sepals 1.3–4.5 times as long as the dorsal sepal, (slightly) twisted near the base so that the upper margins turn inwards, free to connate along their upper margins. Petals 3-veined. Labellum mobile on a thin ligament, undivided. Stelidia widened distally, apex rounded to truncate to bifid or erose, with a wing low down along the lower margin. Anther anterior surface not concave, anterior margin not or hardly drawn out; pollinia 4. Four species in forests up to 2000 m in India, Sri Lanka, China, Taiwan, Japan, and Vietnam. (JJV)

***Bulbophyllum* sect. *Macrouris*** Schltr., *Repert. Spec. Nov. Regni*

*Veg. Beib.*, 1, 703–865 (1913). Type species: *Bulbophyllum macrourum* Schltr.

Epiphytes with creeping, straggling or patent rhizomes. Roots usually verrucate. Pseudobulbs distinct to minute compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescence 1- to many-flowered, contracted or elongate raceme. Flowers resupinate; floral bracts sometimes amplexicaul; pedicel with the basal node above the attachment of the floral bract. Sepals usually 1–3-veined, dorsal sepal free; lateral sepals sometimes connate along their lower margin, 1–3 times as long as the dorsal sepal. Petals usually 1-veined, margins entire to erose. Labellum mobile on a thin ligament, undivided. Column with stigma proximally protruding. Stelidia with upper and/or lower margins sometimes with a tooth. Anther anterior surface not concave, anterior margin drawn out into a beak or not; pollinia usually 2. Twenty-eight species in forests up to 3000 m in New Guinea, Maluku, and the western Pacific islands. (JJV)

***Bulbophyllum* sect. *Minutissima*** Pfitz. in Engler & Prantl, *Die*

*Natürlichen Pflanzenfamilien*, 2, 6, 180 (1889). Type species: *Bulbophyllum minutissimum* (F.Muell.) F.Muell.

Epiphytes with creeping or straggling rhizomes. Pseudobulbs distinct to minute compared to the size of the plant, 1-leaved. Leaves usually persistent. Inflorescence 1-flowered. Flower resupinate; floral bracts usually tubular; pedicel with the basal node above the attachment of the floral bract. Sepals free, approximately equal, 1–3-veined. Petals usually 1-veined. Labellum mobile on a thin ligament, usually undivided. Column with the rostellum anterior surface projecting beyond the stelidia apices to slightly receding in between, stigma proximally protruding or not. Stelidia with upper and/or lower margin sometimes with a tooth. Anther anterior surface concave or not, anterior margin drawn out into a beak or not; pollinia 2 or 4, with or without stipes. Approximately 23 species in forests up to 2400 m in Thailand, Sumatra, and Java to Australia (*B. minutissimum* (F.Muell.) F.Muell., *B. globuliforme* Nicholls), New Zealand (*B. pygmaeum* (Sm.) Lindl.), New Caledonia (*B. keekee* N.Hallé), and Pacific islands. Most species are from New Guinea. (JJV)

***Bulbophyllum* sect. *Monanthaparva*** Ridl., *J. Linn. Soc., Bot.*,

32, 269. Type species *Bulbophyllum striatellum* Ridl.

Epiphytes with creeping or straggling rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence usually 1-flowered. Flower resupinate; floral bracts tubular; pedicel with the basal node above the attachment of the floral bract. Sepals usually free, approximately equal, usually 3-veined. Petals usually 1-veined, margins entire to erose, glabrous to papillose. Labellum mobile on a thin ligament, undivided or auriculate. Column with stigma proximally often protruding, column foot with or without a dorsal tooth near the apex. Stelidia with upper and/or lower margin often with a tooth. Anther anterior surface concave or not, anterior margin drawn out into a beak or not; pollinia 2 or 4. Approximately 36 species in forests up to 2500 m in China and Vietnam, Thailand, Sumatra, and Java to the Philippines and Sulawesi, with only *B. membranaceum* Teijsm. & Binn. in New Guinea and Pacific islands. (JJV)

***Bulbophyllum* sect. *Monanthes*** (Blume) Aver., *Ident. Guide*

*Viet. Orch.*, 279 (1994). *Bulbophyllum tortuosum* (Blume) Lindl.

Epiphytes with creeping, straggling or patent rhizomes, shoots either fused proximally to the pseudobulbs or not. Pseudobulbs distinct to minute compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flower resupinate; floral bracts tubular; pedicel with the basal node level with the attachment of the floral bract. Sepals usually approximately equal, usually 3-veined, margins glabrous to ciliate; the dorsal sepal free; the lateral sepals free or connate along their lower margins. Petals usually 1-veined, margins entire to erose, glabrous to ciliate. Labellum mobile on a thin ligament, undivided, auriculate or trilobed. Column with stigma proximally protruding or not, column foot with or without a dorsal callus at the apex. Stelidia upper and

lower margin with or without tooth. Anther anterior surface not concave, anterior margin usually drawn out into a small beak; pollinia 2 or 4. Approximately 150 species in forests up to 3000 m in India (Darjeeling), China, Indochina to Australia and the Pacific. Most species are from New Guinea. Range extension largely determined by *B. clandestinum* Lindl., Australia excepted. Endemic species in Maluku, New Guinea, and Australia. (JJV)

***Bulbophyllum* sect. *Monomeria*** (Lindl.) J.J.Verm., in prep. Type species (proposed): *Bulbophyllum monomeria* J.J.Verm., ined.

Epiphytes with creeping rhizomes. Pseudobulbs wrinkling with age along longitudinal lines, one-leaved. Leaves persistent. Inflorescence a many-flowered, elongate raceme. Flowers resupinate; pedicel with the basal node above the floral bract attachment. Sepals free, dorsal sepal 5–7-veined; lateral sepals 1.5–1.8 times as long as the dorsal sepal, upper margins distally converging or adherent, adaxially puberulous to hispid. Petals 1(–2)-veined, margins entire to fimbriate, glabrous to ciliate. Labellum mobile on a thin ligament, distinctly auriculate. Column foot with the lateral sepals attached approximately halfway along its length so that a gap exists between the lower margins of the petals and the upper margins of the lateral sepals. Stelidia with upper margin winged. Anther anterior surface concave, anterior margin drawn out; pollinia 4, stipe present. Three species in forests up to 1200 m in India, Nepal, Bhutan, China, Vietnam, Thailand, and Peninsular Malaysia. (JJV)

***Bulbophyllum* sect. *Monosepalum*** (Schltr.) J.J.Sm., *Nova Guinea*, **12**, 3–4, 374 (1916). Type species: *Bulbophyllum muricatum* J.J.Sm.

Epiphytes or terrestrials with creeping rhizomes. Pseudobulbs distinct to small compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flower resupinate, pendent; floral bract tubular; pedicel with the basal node above the attachment of the floral bract. Dorsal sepal connate to the lateral sepals, the lateral sepals free along their lower margins, all approximately equal; 5-veined. Petals 3-veined, margins entire or lobed, with three appendages; appendages differing in texture from the petal itself. Labellum mobile on a thin ligament, undivided. Column with stigma proximally protruding or not, column foot widening and thickening toward the apex, with a dorsal tooth near the apex. Anther anterior surface curved backward, inflated and concave, anterior margin distinctly drawn out; pollinia 4. Three species in forests up to 2500 m in New Guinea. (JJV)

***Bulbophyllum* sect. *Papulipetalum*** Schltr., *Repert. Spec. Nov. Regni Veg. Beib.*, **1**, 700–769 (1913). Type species: *Bulbophyllum papulipetalum* Schltr.

Epiphytes with creeping rhizomes. Pseudobulbs distinct to small compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flowers resupinate; floral bract tubular; pedicel with the basal node above the attachment of the floral bract. Sepal usually free, 3–5-veined; the lateral sepals 1.0–1.6

times as long as the dorsal sepal. Petals 1-veined, margins entire to finely erose, glabrous to ciliate. Labellum mobile on a thin ligament, undivided. Column with stigma proximally protruding or not. Stelidia distally often glandular, upper margin with or without a tooth. Anther anterior surface not concave, anterior margin not drawn out; pollinia 2 or 4. Approximately 22 species in forests up to 2250 m in New Guinea, western Pacific islands, and Australia. (JJV)

***Bulbophyllum* sect. *Pedilochilus*** (Schltr.) J.J.Verm. & P.O'Byrne, *Bulbophyllum Sulawesi*, 199 (2011). Type species: *Bulbophyllum papuanum* Schltr.

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flowers resupinate; floral bract tubular; pedicel with the basal node above the attachment of the floral bract. Sepals free, equal, 3–5-veined, margins glabrous to ciliate. Petals 1-veined, midvein abaxially keeled, margins entire to lacerate, glabrous to ciliate. Labellum immobile, fused to the column foot by a thick strip of tissue, auriculate, saccate with a small, apical part overhanging the anterior margin. Column with foot thickened toward the apex, ending in one or two calli around which the labellum is attached. Stelidia with upper margin with or without a small tooth. Anther anterior surface concave, anterior margin drawn out; pollinia 2 or 4. Approximately 33 species in forests up to 3550 m in Sulawesi, New Guinea, and the Pacific islands, but most species in New Guinea. (JJV)

***Bulbophyllum* sect. *Pelma*** (Finet) Schltr., *Repert. Spec. Nov. Regni Veg. Beib.*, **1**, 703–855 (1913). Type species: *Bulbophyllum absconditum* J.J.Sm.

Epiphytes with patent rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1- to many-flowered, an elongate raceme with distichously arranged flowers. Flowers resupinate; floral bracts tubular; pedicel with the basal node above the attachment of the floral bract. Sepals free, 1–7-veined, lateral sepals 0.9–1.5 times as long as the dorsal sepal. Petals 1–3-veined, margins entire to erose, glabrous to papillose. Labellum on a thin ligament, but usually not mobile, usually undivided. Column with rostellum anterior surface slightly receding in between stelidia apices to distinctly projecting beyond them, stigma proximally usually protruding, column foot usually with a dorsal tooth near the apex that fits into a basal cavity of the labellum. Stelidia often vestigial. Anther anterior surface concave or not, anterior margin not drawn out; pollinia 4, sometimes with a stipe. Twenty-six species in forests up to 2800 m in Sumatra, Java, Borneo, Sulawesi, the Philippines, the Moluccas, and New Guinea, eastward to New Caledonia. Most species endemic to New Guinea and the western Pacific islands, the range extension largely determined by that of *B. absconditum* J.J.Sm. (JJV)

***Bulbophyllum* sect. *Peltopus*** Schltr., *Repert. Spec. Nov. Regni Veg. Beib.*, **1**, 700–760 (1913). Type species: *Bulbophyllum peltopus* Schltr.

Epiphytes with creeping or straggling rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flowers resupinate; floral bract tubular; pedicel with the basal node above the attachment of the floral bract. Sepals free, approximately equal, 3–(5)-veined, margins usually entire, glabrous to ciliate. Petals usually vestigial or minute compared to the size of the flower, usually 1-veined, margins entire to erose, glabrous to ciliate. Labellum on a thin ligament but usually not mobile, undivided. Column with the rostellum anterior surface drawn out into a beak-like projection, stigma proximally protruding or not, column foot usually with a dorsal tooth near the apex that fits into a basal cavity of the labellum. Stelidia vestigial. Anther anterior surface concave or not, anterior margin usually not drawn out; pollinia 4, with stipe (easily lost). Thirty-three species in forests up to 2900 m in New Guinea, western Pacific islands, and New Caledonia. (JJV)

***Bulbophyllum* sect. *Phreatiopsis*** J.J.Verm. & P.O'Byrne,

*Bulbophyllum Sulawesii*, 61 (2011). Type species: *B. phreatiops* J.J.Verm.

Epiphytes with creeping rhizomes. Pseudobulbs minute to small compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescence a many-flowered, elongate raceme. Flowers resupinate; pedicel with the basal node level with attachment of the floral bract. Sepals free, equal, 3-veined, margins glabrous to papillose distally. Petals 1-veined, margins glabrous to papillose. Labellum mobile on a thin ligament, undivided or auriculate; adaxially near the base with a triangular callus. Column foot with or without small lateral teeth near the apex. Stelidia with upper margin with or without a tooth, lower with a wing. Anther anterior surface not concave, anterior margin not drawn out; pollinia 4. Two species in forests up to 1000 m in Peninsular Malaysia, Borneo, Sulawesi, and New Guinea. (JJV)

***Bulbophyllum* sect. *Piestobulbon*** Schltr., *Bot. Jahrb. Syst.*, **58**, 139 (1923). Type species: *Bulbophyllum piestobulbon* Schltr.

Epiphytes with ascending to patent rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flowers resupinate; floral bract tubular; pedicel with the basal node above the attachment of the floral bract. Sepals free, approximately equal, 3-veined, margins glabrous to ciliate. Petals 1-veined, margins entire to denticulate, glabrous to ciliate. Labellum mobile on a thin ligament, undivided; adaxially concave at the base, this cavity in front bordered by a transverse ridge notched halfway or with a concave crest line. Column with stigma proximally protruding or not, column foot with a dorsal tooth at the apex. Stelidia with upper margin often with a tooth, lower margin with a tooth. Anther anterior surface not concave, margin drawn out; pollinia 4. Five species in forests of unknown elevation in New Guinea and also the Pacific islands. (JJV)

***Bulbophyllum* sect. *Planibulbus*** J.J.Verm., in prep. Type species (proposed): *Bulbophyllum planibulbe* Ridl.

Epiphytes with creeping rhizomes. Shoots proximally fused to the pseudobulb. Pseudobulbs 1-leaved. Leaves persistent, thick. Inflorescence a 2- to many-flowered, congested or subumbellate raceme. Flowers resupinate; floral bracts amplexicaul or not, pedicel with the basal node level with the attachment of the floral bract. Sepals free, 3-veined; lateral sepals 1.5–2.2 times as long as the dorsal sepal. Petals 1–3-veined, margins entire or erose. Labellum mobile on a thin ligament, undivided. Stelidia with lower margin with a slight tooth. Anther anterior surface not concave, anterior margin not drawn out; pollinia 4. Two species in forests of unknown elevation in Thailand, Peninsular Malaysia, Sumatra, and Borneo. (JJV)

***Bulbophyllum* sect. *Plumata*** J.J.Verm., in prep. Type species (proposed): *Bulbophyllum plumatum* Ames

Epiphytes with creeping rhizomes. Pseudobulbs 1-leaved. Leaves persistent. Inflorescence 1-flowered or a 2–4-flowered, subumbellate raceme. Flowers resupinate; pedicel with the basal node above the attachment of the floral bract. Dorsal sepal 3–17-veined, margins glabrous to minutely ciliate; lateral sepals 3–16 times as long as the dorsal sepal, connate along upper and usually the lower margin; 5–11-veined. Petals 1–3-veined, apical margin with 12–32 appendages, appendages differing in texture from the petal itself. Labellum mobile on a thin ligament, undivided. Column face furrowed longitudinally. Stelidia with upper and lower margin usually with a tooth. Anther anterior surface deeply concave, anterior margin not drawn out; pollinia 4. Four species in forests up to 1460 m in Thailand, Peninsular Malaysia, Sumatra, Java, Borneo, and the Philippines. (JJV)

***Bulbophyllum* sect. *Polymeres*** (Blume) J.J.Verm. & P.O'Byrne, *Gard. Bull. Singapore*, **60**, 126 (2008). Type species: *Bulbophyllum tenuifolium* (Blume) Lindl.

Epiphytes with creeping to patent rhizomes; shoots free or fused proximally to the pseudobulbs. Pseudobulbs distinct to small compared to the size of the plant, 1-leaved. Leaves persistent. Inflorescence 1-flowered. Flower resupinate; floral bracts tubular; pedicel with the basal node above the attachment of the floral bract. Sepals usually free, usually approximately equal, 3–(4–9)-veined, margins glabrous to papillose or ciliate. Petals usually 1-veined, margins entire to fimbriate, glabrous to ciliate. Labellum mobile on a thin ligament, undivided or auriculate. Column with stigma often proximally protruding, column foot widened and often thickened and usually with 2 lateral teeth toward its apex. Stelidia with upper margin sometimes with a tooth. Anther anterior surface concave or not, anterior margin not drawn out; pollinia usually 4. Approximately 164 species in forests up to 3400 m in India (Andaman Islands), Thailand, Sumatra, Java, eastward to the western Pacific islands.

Morphologically, *B.* sect. *Polymeres* grades into *B.* sect. *Brachypus* and *B.* sect. *Papulipetalum*. Uniting all three would leave a group without a distinguishing character (the latter two do not have a widened and winged column foot typical for *B.* sect. *Polymeres*), and keeping all three apart yields sectional boundaries that are partly arbitrary. The boundaries also divide a few species groups

that otherwise are similar. Here, the three groups are kept separate, with the note that further investigation is needed, which should include the use of characters now ignored, such as rostellum shape. (JJV)

***Bulbophyllum* sect. *Pseudopelma*** J.J.Verm. & P.O'Byrne. *Gard. Bull. Singapore*, **55**, 130 (2003). Type species: *Bulbophyllum pseudopelma* J.J.Verm.

Epiphytes with creeping or straggling rhizomes; shoots developing from nodes below the pseudobulbs, not fused to them; bracts finely and densely papillose, spiral vessels apparent when decaying. Roots spreading, densely and coarsely papillose. Pseudobulbs 1-leaved. Leaves persistent, thin, veins inconspicuous. Inflorescences developing from nodes below the pseudobulbs, or from nodes scattered along the rhizome, solitary or few-fasciculate, 1–5-flowered, elongate racemes; peduncle bracts 2 or 3; rachis not thickened. Flowers resupinate, open simultaneously if racemose; floral bracts tubular; pedicel with the basal node level with the floral bract attachment, approximately as long as or longer than the ovary. Sepals free, approximately equal, 7–9 mm long, elliptic to triangular, acute to acuminate, glabrous, margins entire. The dorsal sepal 3–5-veined, the lateral sepals 3-veined. Petals 3.2–3.6 mm long, elliptic(–ovate), rounded to obtuse, 3-veined, margins entire, glabrous. Labellum mobile on a thin ligament, undivided, 1.3–2.0 mm long, elliptic to ovate or sub-orbicular, margins entire, glabrous, adaxially with two distinct ridges. Column with the rostellum anterior surface level with (or receding in between) the steldia apices, stigma with the proximal edge truncated by a transverse ridge or a triangular tooth; column foot not widened toward its apex, with or without two deltoid, rounded lobes near the apex. Steldia approximately  $\frac{1}{2}$  the length of the column or less, triangular, with a patent to antrorse, deltoid, rounded to obtuse wing along the lower margin. Anther abaxially with or without a crest, anterior surface not concave, anterior margin not drawn out; pollinia 4, the inner ones more than half as long as the outer ones. Two species in lowland forests in Sulawesi. (JJV)

***Bulbophyllum* sect. *Racemosae*** Benth. & Hook.f., *Gen. Pl.*, **3**, 502 (1883). Type species: *Bulbophyllum careyanum* (Hook.) Spreng.

Epiphytes with creeping to occasionally straggling rhizomes; shoots developing from nodes below the pseudobulbs, not fused to them; bracts approximately glabrous, spiral vessels unknown. Roots spreading, approximately glabrous to finely hirsute locally. Pseudobulbs 1-leaved. Leaves persistent, thick, veins inconspicuous. Inflorescences developing from nodes below pseudobulbs, solitary, many-flowered, contracted to elongate racemes with flowers spirally arranged, opening simultaneously; peduncle bracts 3–7; rachis thickened or not. Flowers resupinate; floral bracts not amplexicaul; pedicel with the basal node level with the attachment of the floral bracts, or less than the diameter of the pedicel above it, approximately as long as the ovary or less. Dorsal sepal free, 3–8 mm long, (ob-)ovate to elliptic, rounded to acuminate, 3–7-veined, margins entire,

glabrous, surface glabrous, abaxially sometimes verrucate; lateral sepals like the dorsal sepal but 1.2–2.3 times longer, (loosely) adhering along the lower margin, 5.5–12.0 mm long, ovate, subacute to acuminate. Petals 1.5–4.5 mm long, ovate to triangular, approximately acute to caudate, glabrous, 1-veined (3-veined in *B. allenkerrii* Seidenf., *B. bittnerianum* Schltr.), margins entire to erose or denticulate. Labellum mobile on a thin ligament, auriculate, 2–5 mm long, oblong to ovate to triangular, margins entire, glabrous to papillose to ciliolate; adaxially with two ridges, sometimes also with a dorsal ridge, surface glabrous to papillose or hirsute, abaxial surface glabrous, auricles attached along the basal  $\frac{1}{4}$ – $\frac{2}{5}$  of the labellum, antrorse, margins approximately entire or erose to denticulate, glabrous. Column with the rostellum anterior surface receding in between the steldia apices, stigma proximally not protruding (with a tooth in *B. tricorne* Seidenf. & Smitinand, *B. tricornoides* Seidenf.), column foot not widened toward the apex. Steldia approximately  $\frac{1}{2}$  the length of the column or less, distinct, triangular, sometimes with a small tooth along the upper margin. Anther abaxially with a (low) rounded crest, anterior surface concave or not, anterior margin drawn out or not; pollinia 4, the inner ones more than half as long as the outer ones. Approximately 38 species in forests up to 1200 m in India, Nepal, Bhutan, Burma, China, Vietnam, Laos, Thailand, and Peninsular Malaysia. (JJV)

***Bulbophyllum* sect. *Recurvae*** (Garay, Hamer & Siegerist)

J.J.Verm., in prep. Type species (proposed): *Bulbophyllum corolliferum* J.J.Sm.

Epiphytes with creeping rhizomes; shoots developing from nodes below the pseudobulbs, not fused to them. Roots spreading and glabrous to hirsute. Pseudobulbs small compared to the size of the plant in *B. nanobulbon* Seidenf., 1-leaved. Leaves persistent, veins inconspicuous. Inflorescences developing from nodes below the pseudobulbs, 2- to many-flowered, subumbellate racemes, with flowers spirally arranged (1-flowered in *B. lineatum* (Teijsm. & Binn.) J.J.Sm., *B. subbullatum* J.J.Verm.); peduncle bracts 4–6; rachis, if present, thickened or not. Flowers per inflorescence all open simultaneously if racemose, resupinate; floral bracts not amplexicaul; pedicel with the basal node equal to its diameter above the floral bract attachment or less, approximately as long as the ovary or shorter. Dorsal sepal free, 3.0–7.5 mm long, elliptic to ovate, rounded to caudate, 3–5-veined, margins entire to erose, fimbriate, glabrous or adaxially papillose to hirsute distally; lateral sepals as for dorsal but 2–10 times as long (approximately equal in length in *B. subbullatum*), twisted near the base so that the upper margins turn inward (not so in *B. subbullatum*), free or adherent or connate along their upper margins, sometimes also along the lower margins, 10–50 mm long, margins entire to (minutely) erose, upper margin slightly fimbriate to glabrous; surface glabrous to papillose or hirsute abaxially. Petals 1.5–7.5 mm long, obovate, elliptic to rhombiform to triangular, obtuse to caudate, 3-veined, margins entire to erose, fimbriate, adaxial surface glabrous to papillose to hirsute distally. Labellum mobile on a thin ligament, undivided or auriculate, 2.2–4.2 mm long, oblong (with a slightly widened apical part) to ovate with a widened base, margins entire, usually glabrous;



adaxially without ridges, or with two inconspicuous to distinct ridges (starting near the base of the labellum as conical knobs), often with one more inconspicuous to distinct ridge in between, adaxial surface glabrous to partly verrucose, rugose or hirsute, abaxial surface glabrous, auricles if present attached near the base, patent, margins entire, glabrous. Column with the rostellum anterior surface receding in between the stelia apices, stigma proximally not protruding, column foot tapering toward its apex or not, with or without slight lateral lobes at the apex. Stelidia approximately  $\frac{1}{2}$  the length of the column or (much) shorter, porrect to downward-falcate, truncate to rounded, acute or long-subulate, with or without an (antrorse) tooth along the upper margin, with or without a patent, deltoid, rounded wing along the lower (with a triangular, obtuse wing with an erose anterior margin in *B. serratotruncatum* Seidenf.). Anther abaxially with rounded crest, anterior surface concave, anterior margin drawn out into a rounded beak; pollinia 4, the inner ones more than half as long as the outer ones. Approximately 36 species in forests up to 1700 m in India (Andaman Islands), Bangladesh, China, Taiwan, Burma, Thailand, Laos, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, the Philippines, Sulawesi, and Maluku. (JJV)

***Bulbophyllum* sect. *Reptantia*** J.J.Verm., *Edinburgh J. Bot.*, **58**, 121 (2001). Type species: *Bulbophyllum reptans* Lindl.

Epiphytes with creeping or straggling rhizomes; shoots developing from nodes below the pseudobulbs, not fused to them; bracts glabrous to colliculate, distally sometimes papillose, spiral vessels unknown. Roots spreading, glabrous to verrucate, hirsute locally. Pseudobulbs distinct, 1-leaved. Leaves persistent, thin, veins inconspicuous. Inflorescences developing at the base of developing shoots, solitary, two- to many-flowered, elongate racemes with flowers spirally arranged or imperfectly distichous; peduncle bracts 3–7; rachis not thickened. Flowers resupinate, opening simultaneously; floral bracts not amplexicaul; pedicel with the basal node level with the floral bract attachment or less than half the diameter of the pedicel above this, longer than the ovary. Sepals free, the dorsal sepal 4–11 mm long, elliptic to ovate, acute, 3–5-veined, margins entire, glabrous; lateral sepals as for the dorsal but approximately 1.0–1.5 times as long; 4–16 mm long, elliptic to triangular. Petals 2.0–3.5 mm long, elliptic to oblong, obovate to spatulate, rounded to obtuse, 1–3-veined, margins entire, glabrous. Labellum mobile on a thin ligament, undivided, 2–5 mm long, elliptic to oblong, margins entire, glabrous, adaxially without ridges or with two ridges, adaxial surface glabrous (papillose along the dorsal line in *B. triviale* Seidenf.), abaxial surface glabrous. Column with the rostellum anterior surface receding in between the stelia apices, stigma proximally not protruding (a callus lower down on the column foot in *B. reptans* (Lindl.) Lindl. ex Wall.), column foot slightly widening toward its apex or not. Stelidia approximately  $\frac{1}{2}$  the length of the column or shorter, triangular to almost subulate, upper margin with or without a small, deltoid, obtuse tooth, lower margin with or without a deltoid, obtuse wing. Anther abaxially with a low rounded crest, anterior surface concave, anterior margin not drawn out; pollinia 4, the inner ones more than half as long as

the outer ones. Six species in montane forests up to 2800 m in India, Nepal, Bhutan, and China, southward to Thailand. (JJV)

***Bulbophyllum* sect. *Rhinanthera***, J.J.Verm., in prep. Type species (proposed): *Bulbophyllum turpe* J.J.Verm. & P.O'Byrne

Epiphytes with creeping rhizomes. Shoots developing from nodes below pseudobulbs, not fused to them; bracts minutely papillose. Roots spreading, glabrous to minutely hirsute locally. Pseudobulbs distinct, 1-leaved. Leaves persistent, thin to thick, veins inconspicuous. Inflorescences developing from nodes below the pseudobulb, solitary, elongate racemes with flowers spirally arranged; peduncle bracts 4–10; rachis not thickened. Flowers resupinate, opening simultaneously; floral bracts not amplexicaul; pedicel with the basal node 0.5–1.5 times its diameter above the floral bract attachment, distinctly longer than the ovary. Sepals free, the dorsal sepal 6–10 mm long, obovate to ovate-triangular, rounded to acuminate, 3-veined, margins entire, glabrous; lateral sepals equally long or shorter, 4.5–9.0 mm long, obliquely ovate to triangular. Petals 2.5–5.5 mm long, (sub-)spatulate to elliptic to oblong to triangular, rounded to subacute, 1-veined, margins entire, glabrous. Labellum mobile on a thin ligament, undivided or sub-trilobed, 1.8–3.0 mm long, oblong to ovate, or divided in a wide, ovate basal part and a drawn-out, narrow, oblong to ovate apical part, margins entire, glabrous, adaxially with two short, knob-like ridges close to the base or with two distinct ridges more distally positioned. Column with the rostellum anterior surface almost level with the stelia apices or receding in between, stigma proximally with a protruding tooth, column foot not widened toward the apex but with a dorsal tooth at the apex. Stelidia approximately  $\frac{1}{2}$  the length of the column (slightly longer in *B. wrayi* Hook.f.), triangular to subulate, with or without a rounded to triangular wing along the upper margin, with or without a deltoid to triangular, obtuse wing along the lower margin. Anther abaxially with a low, rounded crest, anterior surface concave, anterior margin distinctly drawn out into an elliptic to triangular beak (curved backward in *B. tabanense* Carr); pollinia 4, the inner ones slightly shorter than the outer ones. Four species in montane forests up to 2100 m in Peninsular Malaysia, Sumatra, and Java. (JJV)

***Bulbophyllum* sect. *Rhytionanthos*** (Garay, Hamer & Siegerist) J.J.Verm., in prep. Type species (proposed): *Bulbophyllum belenae* (Kuntze) J.J.Sm.

Epiphytes with creeping rhizomes. Shoots developing from nodes below the pseudobulbs, not fused to them; bracts glabrous to papillose. Roots spreading, glabrous to hirsute or papillose. Pseudobulbs distinct, 1-leaved. Leaves persistent, thick, veins inconspicuous. Inflorescences developing from nodes below the pseudobulb, solitary, 2- to many-flowered, subumbellate racemes, with flowers spirally arranged (also 1-flowered in *B. paramarginatum* Aver., *B. rheedei* Manilal & C.S.Kumar); peduncle bracts 3–5; rachis thickened or not. Flowers resupinate, opening simultaneously if racemose; floral bracts not amplexicaul; pedicel with the basal node less than diameter of the pedicel above floral bract attachment, as long as or longer than ovary. Dorsal