



Studies on *Oberonia* 5 (Orchidaceae: Malaxideae). Twenty-four new synonyms, and a corrected spelling

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Key words

conservation
extinction
nomenclature
synonymy
types
variability

Abstract The following 24 new synonyms in the orchid genus *Oberonia* are proposed, correct name (+ synonym(s)): *O. bicornis* (+ *O. tenuis*); *O. brunoniana* [lectotype here designated] (+ *O. santapau* lectotype and epitype here designated); *O. caulescens* (+ *O. katakiana*); *O. complanata* (+ *O. flavescens*); *O. costeriana* (+ *O. elmeri*, + *O. obesa*, + *O. gigantea*); *O. insectifera* (+ *O. toppingii*, + *O. basilanensis*, + *O. attenuata*); *O. langbianensis* (+ *O. sulcata*); *O. merapiensis* (+ *O. salakana*); *O. mucronata* (+ *O. manipurensis*); *O. obcordata* (+ *O. delicata*); *O. padangensis* (+ *O. fungum-olens* [lectotype here designated], + *O. patentifolia*); *O. punctata* (+ *O. subanajamensis*, + *O. caprina*); *O. rufilabris* (+ *O. thisbe*, + *O. nepalensis*); *O. subligaculifera* (+ *O. evrardii*, + *O. kanburiensis*); *O. titania* (+ *O. crateriformis*, + *O. rimachila*). The flowers of several species are illustrated with scanning electron micrographs. The spellings of the species epithets of *Dendrobium odoardi*, *Oberonia odoardi*, *Aphyllorchis odoardi*, *Bulbophyllum odoardi*, *Trichotosia odoardi*, *Pandanus odoardi* and *Coelogyne odoardi* are corrected to *odoardo*. Problems with the illustrations in the protologue of *O. nayarii* and *O. balakrishnanii* are highlighted. Several inadvertent lectotypifications are documented.

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INTRODUCTION

Oberonia Lindl. is an orchid genus in subtribe *Malaxidinae* with some 470 species-level names. In order to make progress on a global assessment of its true species richness and to better understand the distributional patterns, existing names need to be carefully evaluated for overlooked synonyms (Geiger 2016). Here a number of new synonymies are proposed. Some have been alluded to in the literature, while others are truly novel proposals. This contribution does not claim to remove all duplicate names in the genus, but exposes some of the most obvious cases. It is incremental progress towards a more in-depth assessment of this genus at a global level.

It is worth noting that despite studies in several herbaria in recent years, no clearly new species of *Oberonia* were encountered. Apparently, *Oberonia* is a rare case of a significantly over-described genus. It appears that because the flowers are small and no comprehensive treatment is available, that every new plant from a given location is considered new. A complicating factor also is that scale bars in published illustrations are frequently demonstrably in error, which makes comparisons of flower size based partly on literature data suspect. One further gets the impression that orchids are presumed to be micro-endemics (e.g., Averyanov 2013). However, a preliminary molecular phylogeny (Hedderich, Kocyan & Geiger unpubl. data) shows no geographic patterning at any level, which clearly indicates wide dispersal ability of the species in this genus. Given that *Oberonia* has the smallest seeds of any orchid (Barthlott et al. 2014, Geiger 2014, unpubl. data), significant wind dispersal is to be expected.

As the purpose of this contribution is not a full revision of the names treated here, the information provided is limited to what is needed to discuss those synonymies.

The type concepts used are used in strict accordance with ICN (McNeill 2014, 2015). Isotypes are duplicate specimens of the same gathering as the holotype explicitly specified in the original description. If no holotype was specified, then all specimens are referred to as syntypes, even if from a single gathering. Inadvertent lectotypifications (Prado et al. 2015) are indicated.

MATERIALS AND METHODS

Scanning Electron Microscopy (SEM): Flowers preserved in Copenhagen solution (Anonymous 2018) were brought to 100 % ethanol and then critical point dried in a Tousimis 815A using default parameters. Dry flowers were mounted on double sticky carbon tabs onto SEM stubs, sputter coated on a rotary-planetary stage with gold (Cressington 108Auto), and imaged in a Zeiss EVO40 XVP SEM in variable pressure (30 Pa), at 20 kV accelerating voltage and probe currents of 50–500 pA depending upon magnification and necessary working distance due to tilt, using the variable pressure secondary electron detector.

Details on macro- and micro-photography have been given elsewhere (Geiger 2013, 2017). Image files were processed in Affinity Photo.

DLG: Daniel L. Geiger, living collection, Santa Barbara. HOAG: Herbarium Oberoniarum Aliorumque Geigeri, Santa Barbara.

Material in B, CANB, E, K, NSW, SING, US and W was examined personally. Other type specimens were examined by various on-line portals. PE specimens were examined in Lin & Yang (2015). Other type material could not be examined and is listed for sake of completeness (COGCEHR: Center for Orchid Gene Conservation of Eastern Himalaya Region, herbarium, Hengbung, Manipur, India. OHT: Orchide Herbarium, Tipi, Arunachal Pradesh, India). Type localities have been clarified in some instances with modern equivalents or higher geographic terms in square brackets. Those may have been obvious from the title of the original contribution, such as Ames' publication on Philippine orchids, and benefit from explicit clarification in the context of this global treatment.

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AMES: http://kiki.huh.harvard.edu/databases/specimen_index.html
 BRI: <https://avh.chah.org.au>
 L: <http://biportal.naturalis.nl/>
 P: <https://science.mnhn.fr/institution/mnhn/collection/p/item/search>

SYSTEMATICS

Oberonia bicornis Lindl. — Fig. 1

Oberonia bicornis Lindl. (1830) 16. — Type: *Wallich 1949* (syn E 00394097, K 001114799), [Eastern India, today Bangladesh,] Sillet [= Sylhet].
Oberonia tenuis Lindl. (1859) 3. — Type: *Thwaites 2654* (syn K 000974229), Ceylon [= Sri Lanka], Hittàwaka, on trees, *syn. nov.*

Notes — *Oberonia tenuis* is here synonymised under *O. bicornis*, a synonymy already suspected by Ansari & Balakrishnan (1990). Santapau & Kapadia (1966) distinguished *O. bicornis* by the shape of the petals, the lateral lobes of lip linear-lanceolate, erect, not filiform and incurved, mid-lobe of lip fleshy cuneate truncate, not broadly three-lobed with long ends. However, Lindley (1859: 4) described *O. bicornis* as having a crescent, i.e., curved lateral lobes of the lip, disabling Santapau & Kapadia's (1966) argument. The examined Lindley specimens (K) as well as drawings of the Lindley specimens of both names available in the W Reichenbach collection and from Seidenfaden (1968) show identical flowers (Fig. 1), including some variability in the orientation of the auricles.

Other names in the section *Scylla* need to be carefully evaluated. All have very limited material associated with them and there is little information on intraspecific variability. The size indications of the flowers need to be viewed with much caution because of demonstrable inaccuracies and errors with scale bars in the literature (see below). Some characters used to describe those species are known to be highly variable, including size of the plant, length of the inflorescence, and colour of the peduncle-rachis. The last can be demonstrated from species in cultivation, because peduncle-rachis colour varies on the same plant among different flowering periods. The same plant of *O. rufilabris* can either have bright green to dull orange peduncles and rachis (DLG395: HOAG85 green, HOAG193 yellow-green, HOAG138 yellowish. DLG515: HOAG95 bright green, HOAG156, HOAG197 yellowish green, HOAG151 orange. DLG476: HOAG136 bright green, HOAG133, HOAG179, HOAG201 yellowish green). A character that is variable on the same plant is unsuitable in taxonomy. This example highlights

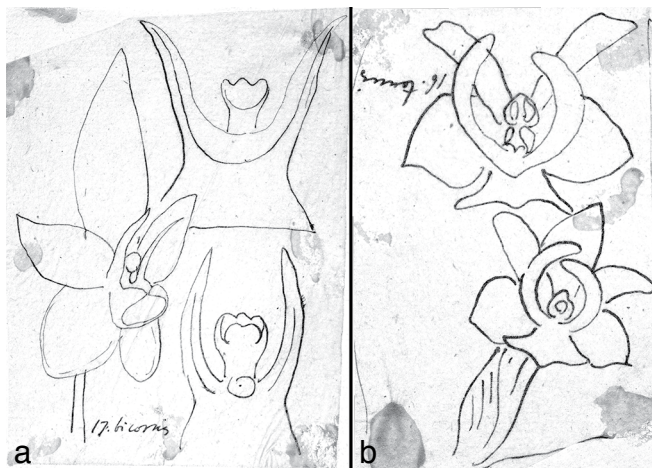


Fig. 1 a–b. *Oberonia bicornis* Lindl. drawing of Type: a. Reichenbach herbarium 9857; b. *Oberonia tenuis* drawing of type in Reichenbach herbarium 35460. Figure rotated 180° to show flowers in same orientation.

the complementary nature of herbarium records from cultivated plants (Geiger 2018) in the context of taxonomic assessments.

Two examples illustrate the above. *Oberonia dolabrata* Jayaw. is only distinguished by the hairs along the margin of the petals. Specimens of *O. tenuis* (without hairy petals) have been reported from India and Sri Lanka (Ansari & Balakrishnan 1990). It is an omission that Jayaweera (1981) only compared *O. dolabrata* to *O. bicornis* with type locality in Bangladesh, but not to *O. tenuis* with a Sri Lankan type locality.

As a second example, *O. meegaskumburæ* Priyad., Wijew. & Kumar in Priyadarshana et al. (2017: t. 1) was distinguished from *O. weragamaensis* Jayaw. (1963) by the size of the plant and the inflorescence (variable), and the colour of the peduncle (variable), and on the size of the flower. Based on the demonstrable intraspecific variability of flower size in general (see *O. complanata*), I consider such indications as unreliable and of questionable taxonomic value. The cited difference in size of the pedicelled ovary (0.8 × 0.3 mm vs 3.5 × 1.6 mm) is clearly a comparison of an unfertilised pedicelled ovary with a developed seed capsule (Priyadarshana et al. 2017: f. 1E, 2K). Morphological comparisons always have to be made on organs in the same stage of development. While the alleged differentiating characters are demonstrably unreliable in other species, the limited material for *O. meegaskumburæ* and *O. weragamaensis* precludes a firm conclusion in this instance at this time.

Oberonia brunoniana Wight — Fig. 2

Oberonia brunoniana Wight (1851) 3, pl. 1622. — Type: *Wight s.n.* (lecto, here designated K 000387708), India, Coimbatore, Iyamally Hills, Mount Agamullu (type sheet). *Wight 2914* (paralecto K 000387707), Mt Paulghautcherry.
Oberonia lindleyana Wight (non Brongn.), [*Oberonia santapau* Kapadia in Santapau & Kapadia (1960) 265]. — Type: *Wight s.n.* (syn repository unknown, India, Coimbatore, Iyamally Hills. Wight (1851: pl. 1624) (lecto, here designated), *Wight s.n.* (epi here designated K 000387708), *syn. nov.*

Notes — *Oberonia santapau* is here considered a synonym of *O. brunoniana*. Joseph (1982) contended that *santapau* and *brunoniana* are indistinguishable based on flowers but have a distinct ecotype: The statement is here rather interpreted as a single species with consistent morphology of the reproductive structures being found in a variety of habitats. In fact, the habitat types (epiphyte on trees in shola forests) and elevation for the two names are if not identical, then heavily overlapping, and certainly not statistically different.

The types of the two names are confused. The Kew database identifies three sheets of *O. brunoniana* as types. The here designated lectotype was collected 08/1848, prior to the description in 1851 and is from the type locality. The sheet includes a drawing of the flower. Because the drawing is partially covered by plant material, the drawing was most likely made before the plants were affixed to the sheet, and may be in Wight's hand. This additional information is decisive in the selection of the lectotype: The second gathering collected prior to the description was collected from Mount Paulghautcherry. I was unable to determine the specific locality of those two collecting sites, though they seem to be in the vicinity of Coimbatore based on various travelogues consulted (e.g., Scott 1853, Bradshaw 1864).

The third gathering considered in the Kew database an 'unspecified type' K 000387715 was collected in 04/1857 after the publication of the description, hence, cannot have been the basis of the description and has no standing as a type.

The whereabouts of type material of *O. lindleyana* Wight (non Brongn.) are unknown, it may have been lost. Because Wight (1851) did not give collecting numbers in his description, it is very difficult to ascertain other material to be either unrecognised type material, or material examined by Wight. According

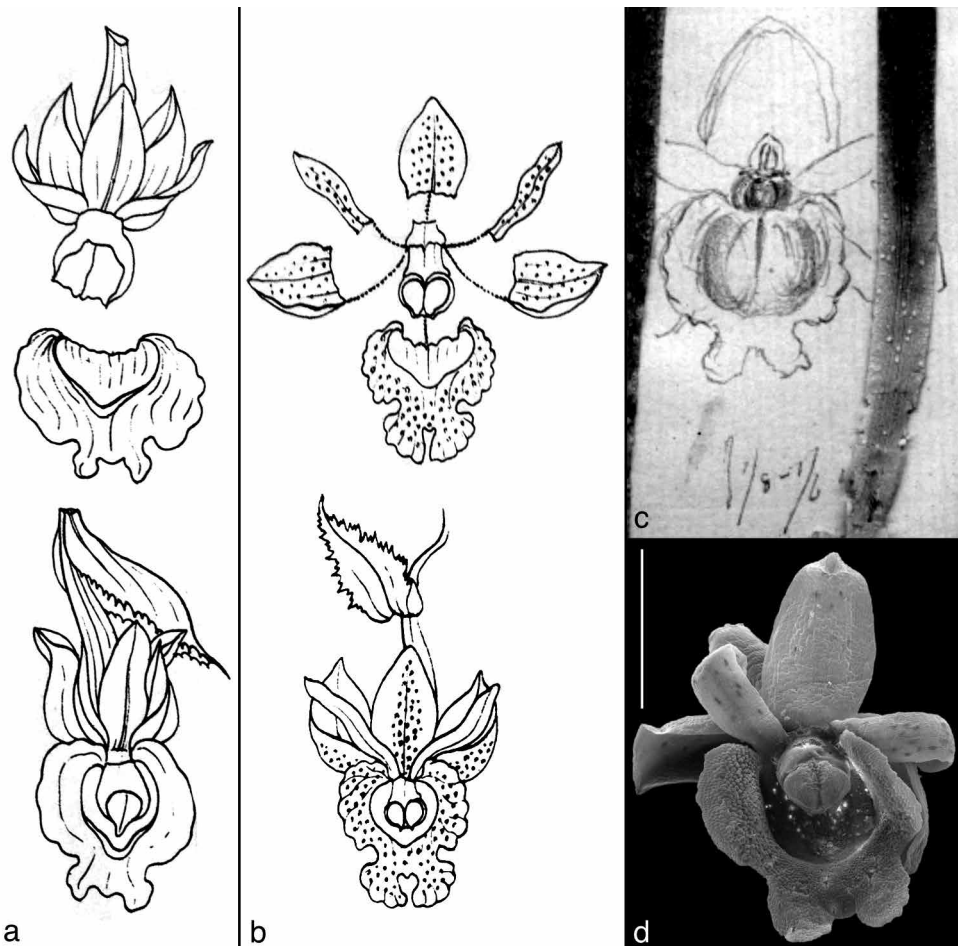


Fig. 2 *Oberonia brunoniana* Wight. a–b. Illustrations of the flowers from Wight (1851): a. *Oberonia brunoniana* Wight; b. *Oberonia lindleyana* Wight. — c. Drawing of the flower on lectotype of *O. brunoniana* = epitype of *O. lindleyana* (from <http://specimens.kew.org/herbarium/K000387708>). — d. SEM image of flower. K24122. — Scale bar = 1 mm.

to ICN Art. 9.3 illustrations of the protologue constitute original material, which makes the illustration in Wight (1851) the only candidate for typification. However, the drawing is by nature interpretative and the true characters of *O. lindleyana* and its alleged discriminating aspects from *O. brunoniana* are uncertain. To remove that uncertainty, *Wight s.n.* K 000387708 is here designated as the epitype of *O. lindleyana* Wight (non Brongn.) = *O. santapau*. This renders all three names nomenclatural synonyms.

Cooke (1907) speculated whether the record of Dalzell & Gibson (1861) under *O. lindleyana* may refer to *O. brunoniana*. As those two names are here recognised as synonyms, Cooke’s (1907) opinion is validated here. Seidenfaden (1968) noted that *O. brunoniana*, *O. santapau*, and *O. platycaulon* are often mixed up in herbaria. The first two are here considered

synonyms, while *O. platycaulon* may be recognised by the bisaccate condition of the lip. The most distinct characters are the longish pedicellate flowers of *O. platycaulon*, while these are described as sessile in *O. lindleyana*; however, the illustrations do not convey any difference in length of the pedicelled ovary. The colour was described as brown with darker centre in *O. brunoniana*, and dull orange in *O. lindleyana*; those colours are well within the range observed in other species. The textual analysis of Wight’s diagnoses shows almost perfect agreement (Table 1); the subtle differences can easily be attributed to intraspecific variability. Specifically, the margin of the lip is undulating in *O. brunoniana* illustration (Fig. 2a), more strongly crenate in the *O. lindleyana* illustration (Fig. 2b), but the drawing on the sheet of the lectotype/epitype is in between the two (Fig. 2c). Additionally, the names share the smooth surface of the disc with surrounding area of the lip with strong crenulate cell clearly seen in the SEM image (Fig. 2e).

Table 1 Comparison of the protologues of *O. brunoniana* and *O. lindleyana*, showing almost perfect agreement between the two names.

Character	<i>O. brunoniana</i>	<i>O. lindleyana/santapau</i>
Bracts	ovate, denticulate, acute	ovate, subdenticulate, somewhat obtuse
Sepals	ovate, obtuse, reflexed, a bit longer than petals	broad, ovate, obtuse, entire
Petals	narrow lanceolate	narrow linear
Lip	broad, cordate at base, entire	broad, cordate at base, crenate
Epichile	obtusely 3-lobed at apex, middle one small or obsolete	two lobed apex with minute one in between
Colour	olive brown, darker centre	dull orange

***Oberonia caulescens* Lindl.**

Oberonia caulescens Lindl. (1830) 15. — Type: *Wallich 1950* ((lecto Ansari & Balakrishnan (1990: 30: inadvertent designation) K 0011114800), Nepal. *Oberonia katakiana* A.N.Rao (1996) 711, f. 1–9. — Type: *A.N. Rao 26077-A* (holo OHT), *A.N. Rao 26077-B* (para CAL), *A.N. Rao 26077-C* (para AS-SAM), India, Arunachal Pradesh, W Kameng District, Tipi, 200 m, *syn. nov.*

Notes — *Oberonia caulescens* has a number of fairly well-established synonyms, which are not discussed here; see Ansari & Balakrishnan (1990) for the most recent summary.

Oberonia katakiana is here considered a clear synonym of *O. caulescens*. The type of *O. katakiana* was compared by Rao

(1996) with *O. auriculata* [= *O. caulescens*], it is supposed to differ in the absence of a caulescent habit, the degree of both reflexing of petals and sepals and of less pronounced erosion of the margins of the petals, and the flowers are arranged in whorls instead of scattered, and the basal auricles of the lip are less pronounced, described as absent. All character states fall within the variation of *O. caulescens*, hence *O. katakiana* is considered a synonym.

Oberonia complanata (A.Cunn.) M.A.Clem. & D.L.Jones — Fig. 3

Oberonia complanata (A.Cunn.) M.A.Clem. & D.L.Jones (in Clements 1989). Basionym: *Dendrobium complanatum* A.Cunn. (1839) 34. — Type: *A. Cunningham s.n.*, (syn not found: Clements 1989), Moreton Bay. *J.R. Clarkson & T.D. Stanley 832* (neo, designated by Clements & Jones in Clements 1989: BRI AQ0268526), Australia, Queensland, Shoalwater Bay Military Reserve, Creek below abandoned sawmill on CSIRO ISOPOD site, c. 3 km NE of Mt Parnassus.

Oberonia flavescens D.L.Jones & M.A.Clem. (2006) 10, f. 1.12, pl. 1, f. 1e–f. — Type: *D.L. Jones 19354* (in cult.) (holo CANB 751060), original collec-

tion *B. Gray 8640*, Australian National Botanic Gardens, Canberra, from plant collected from Australia, Queensland, McIlwraith Range, Pandanus Creek, *syn. nov.*

Notes — *Oberonia flavescens* is here synonymised under *O. complanata*. The shared similarities include the straw coloured lip with serrated lateral lobes and small pointed apical lobes, and the uncommon oblique orientation of the flowers along the rachis. The drawings suggest that the lip is more T-shaped in *O. flavescens* compared to the more V-shaped lip of *O. complanata*. The T-shaped lip of *O. flavescens* is not evident in the scanning electron micrographs of the protologue (pl. 1, f. e–f), nor in other material of the two names identified by the original authors of *O. flavescens* (Fig. 3). The indicated differences in the serration pattern or the length to width ratio of the lip are not holding up to scrutiny once multiple samples are examined. The only difference is the ~20 % smaller size of *O. flavescens*. Such size differences are known from other species and are here considered taxonomically insignificant; they were not mentioned in the protologue of *O. flavescens*.

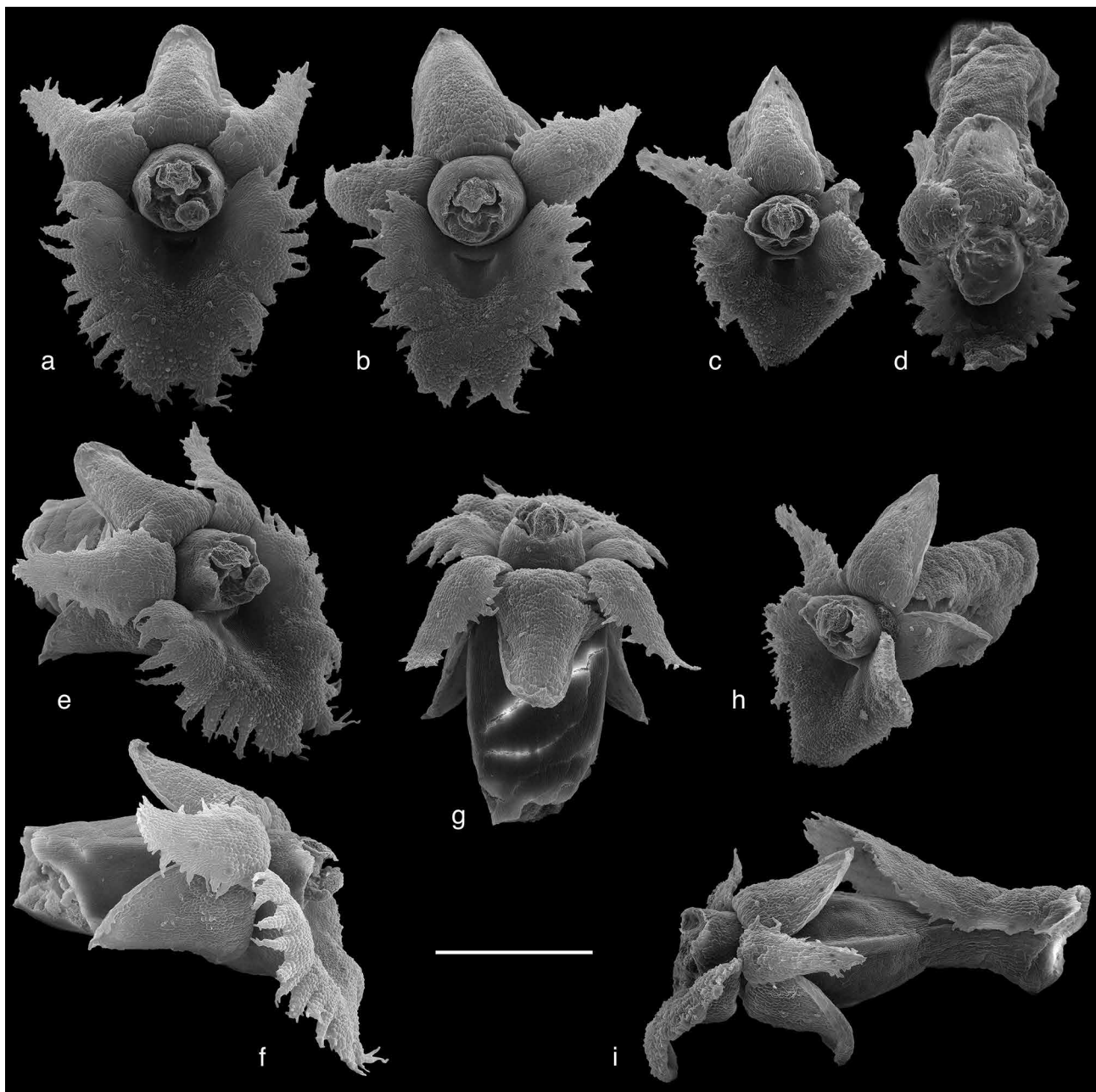


Fig. 3 *Oberonia complanata* flowers. a–b, e–g. *Oberonia complanata* (A.Cunn.) M.A.Clem. & D.L.Jones; c–d, h–i. *Oberonia flavescens* D.L.Jones & M.A.Clem.; a–d. frontal; e, h. oblique; f, i. lateral; g. top (a, e–g: CANB 9306467; b: CANB 9614282; c, h–i: CANB 891126; d: CANB 650606). — Scale bar = 1 mm.

Oberonia costeriana J.J.Sm. — Fig. 4

Oberonia costeriana J.J.Sm. (1905) 244. — Type: *Blume s.n.* (syn L 0061737), [Indonesia, Java,] Mt Gede, at the water fall, parasitic; *FW Jung-huhn s.n.* (syn L 0063834); *unknown collector s.n.* (syn), Indonesia, Java, Buitenzorg [= Bogor], Bobodjong; *De Monchy s.n.*, Krawang; *J.J. Smith s.n.* (syn), [Indonesia,] Pekalongan, Djolotigo; also [Indonesia,] Sumatra.

Oberonia elmeri Ames (1912) 1564. — Type: *ADE Elmer 8434* (syn AMES 12905/barcode 00101962), Philippines, Benguet, *syn. nov.*

Oberonia obesa Ames (1915) 76. — Type: *M. Vanoverbergh 407* (syn AMES 16637/barcode 00102011, AMES 14194/barcode 00102010), [Philippines,] Luzon, Bontoc Sub-province, *syn. nov.*

Oberonia kinabaluensis Ames & C.Schweinf. (in Ames 1920) 81, pl. 89, f. 1, 1. — Type: *Clemens J. 329* (syn AMES 16985/barcode 00101974), [Malaysia, Sabah,] Kiau.

Oberonia gigantea Fukuy. (1935) 295. — Type: *N. Fukuyama 4543* (holo KPM-NA 0105567), Formosa [= Taiwan], Haihoku Prefecture, Shooagyokusan [= Syoagyokusan], Mountain broad-leaf forest, *syn. nov.*

Notes — *Oberonia elmeri* is here synonymised under *O. costeriana*. It differs allegedly by unspecified characters of the lip, the petals, and the colour of the flower. However, the habit of the plant on the type sheet and drawings of the flowers are identical to *O. costeriana* (Fig. 4a–b).

Oberonia kinabaluensis is here recognised as a synonym of *O. costeriana*, in agreement with O’Byrne & Gokusing (2017). The main difference of *O. kinabaluensis* and *O. costeriana* is the mid-lobe of the lip and the brown vs salmon colour (Ames 1920). The difference in colour is well within the usual colour spectrum in *Oberonia*. The mid-lobe shares the diagnostic apical incisions of the lateral lobes, but appears to be narrowing towards the base. Topotypical material illustrated by Wood et al. (1993: pl. 64A) shows the shape of the lateral lobes typical of *O. costeriana* (Fig. 4a, d). It is quite possible that the draw-

ing of that minute flower is inaccurate with respect to this detail (see also *O. punctata/caprina* below). Sympatric occurrence of two almost indistinguishable species is rather unlikely and postulating the extinction of *O. kinabaluensis* and simultaneous range extension of the almost identical *O. costeriana* is equally far-fetched. The cited differences in leaf morphology can easily be explained by plants of different sizes or levels of maturity.

Oberonia obesa is here considered a synonym of *O. costeriana*. The differences in lip shape are rather small (Fig. 4a, c), and differences stated in the protologue in the leaf arrangement are due to some leaves being broken at the abscission plane and overlap the others for that reason alone. The other floral and vegetative characters all agree very well with *O. costeriana*, specifically the narrow lanceolate floral bracts. The identification of the type as *O. costeriana* has been previously noted on one of the type sheets.

Oberonia gigantea was initially suspected to be a synonym of *O. costeriana* based on matching illustrations in the secondary literature (Lin 1987, Lin & Wang 2014, Su 2000). The original description noting the lip with the serrated, triangular lateral lobes and the small bilobed epichile as well as the type sheet confirmed the initial assessment. No disconfirming details could be discerned. Even the phenology data match (Geiger unpubl. data). *Oberonia gigantea* was used as a local name for *O. costeriana* from Taiwan.

Whether *O. pygmaea* Bunpha, H.A.Pedersen & Sridith (2014) is yet a further synonym of *O. costeriana* remains to be fully evaluated. The cited difference in the shape of the petals – linear-oblong in *O. pygmaea* vs oblanceolate in *O. costeriana* – cannot be confirmed; they are identical in specimens identified

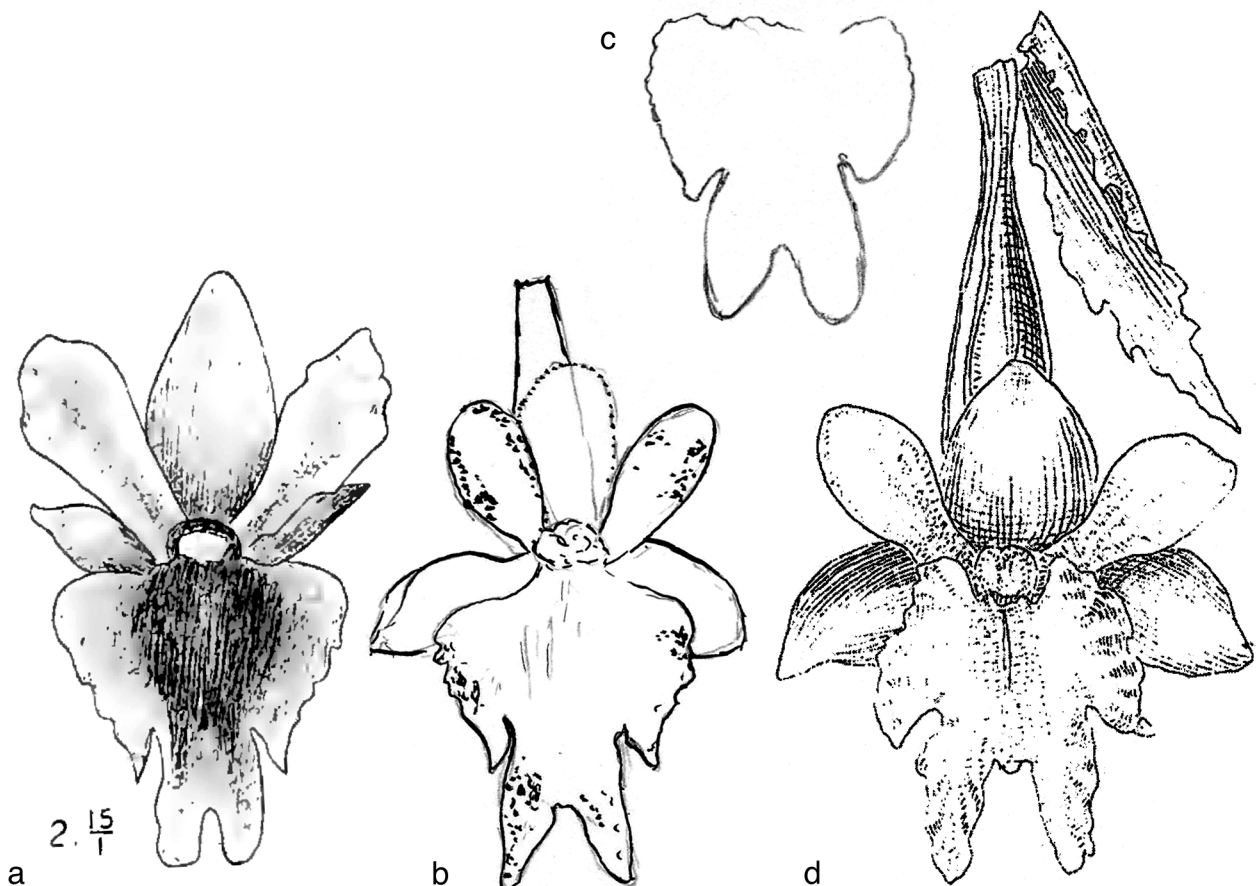


Fig. 4 a. *Oberonia costeriana* J.J.Sm.: illustration of the species by J.J. Smith, from Schuiteman & De Vogel (2006); b. drawing of *O. elmeri* from syntype AMES 12905/barcode 00101962 *ADE Elmer 8434*; c. drawing of the lip on type sheet of *O. obesa* (AMES 14194/barcode 00102010); d. drawing of *Oberonia kinabaluensis* from protologue.

with either of the two names. The presence/absence of column wings is not evident from the illustrations. The expression of column wings can be variable within well-known species such as *O. cavaleriei* Finet (1908) (Geiger pers. obs. by SEM). The indistinct apical incision of the lateral lobe on a single small specimen is a rather dubious character.

Borrowing from statistics, for differences to be significant based on small sample size, the amount of differences must be large.

Oberonia griffithiana Lindl. — Fig. 5

Oberonia griffithiana Lindl. (1838) t. 1779/t8B. *Griffith* 355 (lecto K 00097422, Ansari & Balakrishnan (1990: 43) inadvertently designated "Type: Griffith s.n. Moulmein, Burma (K)", second step designated here). Burma [= Myanmar], Moulmein [= Mawlamyine].

Oberonia toppingii Ames (1914) 413. — Type: *D. LeRoy Topping* s.n. (syn AMES 13282, HUH barcode 00102067), [Philippines,] Luzon, Rizal Province, Wawa, *syn. nov.*

Notes — *Oberonia toppingii* is here considered a synonym of *O. griffithiana*. Ames (1914) compared his species to his *O. basilanensis* (= *O. insectifera*: see below), but noted the wider petals. The multiple long digitated lateral lobes are found in only a few species including *O. griffithiana* with wider petals than *O. insectifera* with linear-lanceolate petals. The drawing of the isolated lip on the type sheet of *O. toppingii* (Fig. 5b) shows nicely the rough surface of *O. griffithiana* as can be seen both

in the photograph (Fig. 5c) and even better in the SEM images (Fig. 5d–f). This rough surface has only been seen in *O. griffithiana* out of dozens of species examined by SEM. Both in *basilanensis* – *insectifera* as well as in *toppingii* – *griffithiana*, the accepted names were described from the Malayan Peninsula (*insectifera*, *griffithiana*) and Ames introduced synonyms (*basilanensis*, *toppingii*) for specimens found on the Philippines.

Kew lists in their database additional specimens as 'unknown types' for *O. griffithiana*. However, those specimens are from Mergui, Myanmar, and Myanmar, hence, cannot possibly be considered type material (*Griffith* 772 K 00974200, Myanmar, Mergui; *s. coll.* 772 K 000387723, Myanmar [most likely duplicate of *Griffith* 772]; *Griffith* 5090 K 000387725, Myanmar, Mergui).

An additional unpublished manuscript name has been found on historical herbarium specimens. *Oberonia caespitosa* Griff., unpublished. *Griffith* s.n. W Reichenbach 37822, P00404930 from Burma, collected in 1844, has been identified as '*O. caespitosa* m.' on a Griffith label. That name has never been published. The W specimen had a further annotation of '50 Lindley', most likely an identification annotation from 1850 by Lindley as evidenced on the P specimen. The P specimen has a Griffith collecting label from 1844, but also a further identification label '*Oberonia griffithiana* - Burma - M. Lindley 1838'. That 1838 date is a publication date of the name and not a collecting date of the specimen. Accordingly, the P specimen cannot be considered an isotype of *O. griffithiana* as indicated in P database.

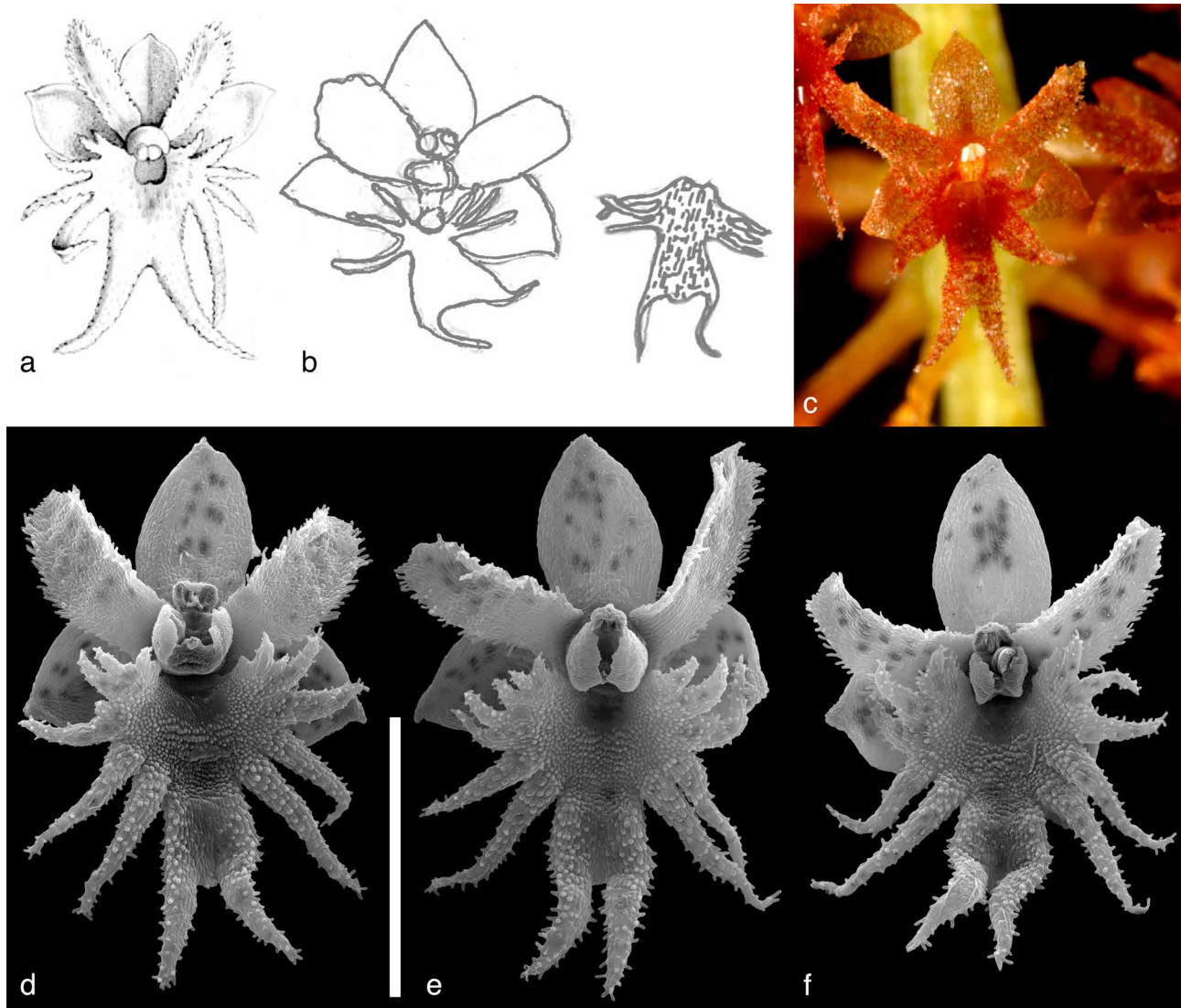


Fig. 5 a. *Oberonia griffithiana* Lindl.: Illustration from protologue; b. *O. toppingii*: drawing of flower from type sheet; c–f. HOAG148 ex Stadtgärtnerei Zürich, Switzerland; c. photograph of flower; d–f. scanning electron micrographs. — Scale bar = 1 mm.

***Oberonia insectifera* Hook.f. — Fig. 6**

Oberonia insectifera Hook.f. (1890) pl. 21, t. 2004. — Type: *King 2793* ((lecto Seidenfaden (1968: 90: inadvertent designation) K 00943005), [Malaysia, Malaya], Perak, Larut.

Oberonia basilanensis Ames (1915) 72. — Type: *J. Reillo Bur. Sci. 16247* (syn AMES 13339/barcode 00101939), [Philippines,] Basilan, 9 Sept. 1912, *syn. nov.*

Oberonia attenuata Dockrill (1960) 4, text-fig. — Type: *A.W. Dockrill s.n.* (holo BRI AQ0279632; iso NSW 826855), [Australia,] Queensland, Mossman River, *syn. nov.*

Notes — *Oberonia basilanensis* and *O. attenuata* are here considered synonyms of *O. insectifera*. All names share the same overall habit, and several attributes of the flower, including narrow lanceolate petals (arrows in Fig. 6) and the lateral lobes of the lip that are noted to have variable numbers of processes and are frequently inequilateral (Fig. 6). The names were described from Malaya (*insectifera*), the Philippines (*basilanensis*) and Queensland, Australia (*attenuata*). Specimens are known also from Borneo and Brunei (Fig. 6e–g). *Oberonia insectifera* has not been reported from New Guinea (Schlechter 1911a, Schuiteman & De Vogel 2006, Ormerod 2017), which may be considered an important distributional stepping stone for a species reaching northern Australia. However, the rather large and conspicuous species *O. heliophila* Rchb.f. (1878) was

also never listed for New Guinea but specimens are present in several herbaria (Geiger unpubl. data; A. Schuiteman pers. comm. Jan. 2018). Accordingly, smaller and less obvious species may also not have been documented from New Guinea.

The purported Australian endemic *O. attenuata* shows how important taxonomy can be for conservation assessments. After the description of *O. attenuata*, the species has not been recollected (B. Lavarack pers. comm. 02/2015), which lead others to call the species ‘extinct’ (Jones 2006). Specimens have recently been re-discovered in Queensland (Banks 2016, M. Clements pers. comm. Mar. 2017). The difference between local extinction of a wide-spread species (*O. insectifera*, including synonym *O. attenuata*) at the periphery of the range vs extinction of an entire species (*O. attenuata*) is significant.

The lack of floral differences suggests conspecificity even of seemingly disjunct populations as in the case of the Malayan *O. insectifera* and its synonym *O. attenuata* from Australia, given the wide dispersal ability indicated by our preliminary molecular phylogeny (Hedderich, Kocyan & Geiger unpubl. data).

Oberonia insectifera is distinct from *O. rufilabris* (see below), which has similarly red flowers with drawn out epichile, and undivided linear lateral lobe on each side of the lip. While *O. insectifera* flowers may occasionally have only a single lateral lobe on each side (Fig. 6c), it is an uncommon condition of an

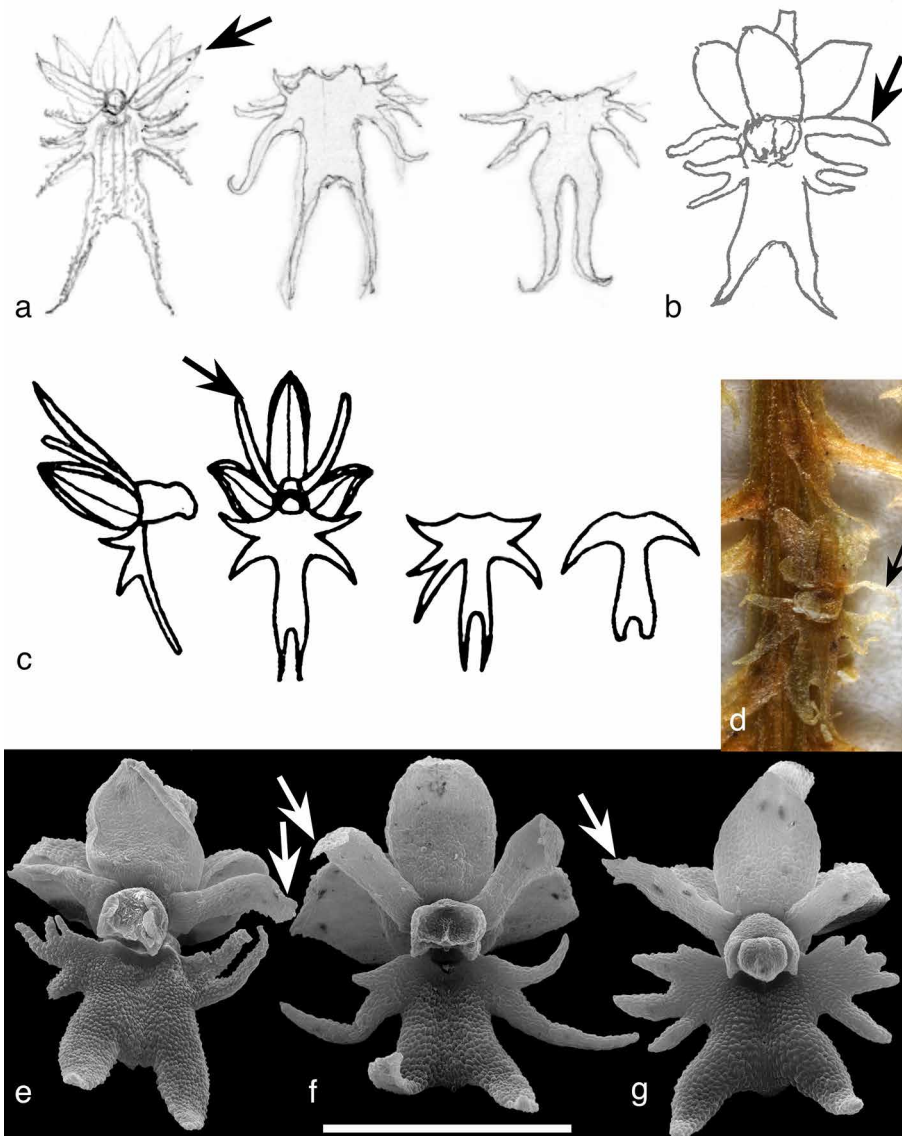


Fig. 6 a. *Oberonia insectifera* Hook.f. Arrow identifies the petal; b. *O. basilanensis*; a–b. drawings from the type sheets; c. *O. attenuata*: drawing from prologue; d. photograph of flower of *O. attenuata* isotype NSW 826855; e–g. scanning electron micrographs of flowers (e: K 21002; f: K 50185; g: K 76635). — Scale bar = 1 mm.

occasional flower in an inflorescence. In contrast, having examined thousands of *O. rufilabris* flowers, some with abnormality such as triple gynostemium and ten tepals (Geiger & Kocyan 2018), not a single flower with two lateral lobes on either side of the lip has been encountered.

***Oberonia langbianensis* Gagnep. — Fig. 7**

Oberonia langbianensis Gagnep. (1932) 168. — Type. *Evrard 1402* (lecto Seidenfaden (1968: 16: inadvertent designation) P00292892), [Vietnam,] Annam, Langbian, 'planches' near Dran.

Oberonia dalatensis Gagnep. (1932) 168. — Type. *Evrard 1160* (lecto Seidenfaden (1968: 17: inadvertent designation) P00292890), [Vietnam,] Annam, Dalat, gully behind police station.

Oberonia sulcata J. Joseph & Sud. Chowdhury (1966) 53, f. 1–4. — Type: *Joseph 40358* (holo CAL; iso ASSAM), [India, Arunachal Pradesh, Kameng,] Selari forest, NEFA [The North-East Frontier Agency], 2230 m, *syn. nov.*

Notes — *Oberonia langbianensis*, with synonyms *O. dalatensis* (see Ormerod 2007) and *O. sulcata*, is one of the four species in sect. *Myosurus*, a section diagnosed by terete leaves. The other three species are highly distinct. *Oberonia cavaleriei* has long finger-like projections from the lip, while *O. teres* Kerr (1927) has linear-lanceolate petals with entire margins, and *O. calcarea* P.O'Byrne (2017) has a four-lobed lip with warts on the front. The other names have oval-oblong petals with erose margins, a lip with erose margin, and reflexed oval sepals. The distinctness of the apical notch on the lip varies. Particularly illuminating are the illustrations of two flowers from the type of *O. langbianensis* by Seidenfaden (1968; Fig. 7c): the flower in frontal view shows no distinct notch, while the flower in ventral view has a distinct notch, intermediate between the condition of the type of *O. dalatensis* and *O. sulcata*. The illustrations from the type of *O. dalatensis* by Seidenfaden (1968; Fig. 7a) and Averyanov (2013; Fig. 7b) show differences both in the apical notch as well as the insertion below the lateral lobes. As the flowers are from the same respective plants, it is a clear indication of the variability of the species.

Oberonia sulcata is here synonymised with *O. langbianensis* as had already been suggested by Seidenfaden (1978) and Ansari & Balakrishnan (1990). Specimens identified with both names have the rather uncommon terete leaves of sect. *Myosurus*. The shared characters are the T-shaped lip with irregularly erose lateral lobes and indistinctly bilobed epichile with irregularly erose margins, the petals with erose margins that are broader than the median sepal, the acuminate floral bract with erose margin, the reflexed sepals, and the inflorescence with distinctly pedunculate flowers in loose whorls. The sizes of the whole flower and the isolated lip are incongruent (Fig. 7e). All illustrations of Fig. 7 were scaled to one common scale bar based on the scale bars in the respective publications.

***Oberonia merapiensis* Schltr. — Fig. 8**

Oberonia merapiensis Schltr. (1911a) 13. — Type: *Schlechter 15977* (syn B lost, AMES/barcode 00101995, AMES 18330/barcode 00101994, AMES 105720/barcode 00101997, AMES 11922/barcode 00101996, K 000942987, L 0061760, P00364404), [Indonesia, Sumatra], slopes of Gunung [= mount] Merapi, 1300 m.

Oberonia salakana J.J.Sm. (1927) 44, pl. 4, f. 3. — Type: *W. Docters van Leeuwen s.n.* (syn), [Indonesia,] Java, Buitenzorg [= Bogor], on the [Mount] Salak, in the forest, *syn. nov.*

Notes — *Oberonia salakana* is considered an obvious synonym of *O. merapiensis*. Smith (1933) noted the similarity of his *O. salakana* to *O. merapiensis* and distinguished the former only by the strength of constriction of the mid-lobe and the less strongly incised lateral and apical lobes of the lip. Smith's flower was an alcohol preserved specimen, and evidently the flower was not fresh when preserved, because fresh-preserved flowers are not shrivelled and long appendages are life-like if fresh and properly processed. All other attributes of the habit and details of the flower agree with *O. merapiensis*. The distribution of the species spanning from Java (*O. salakana*) to Sumatra (*O. merapiensis*) and the mountainous forest habitat of both type localities further support the synonymy.

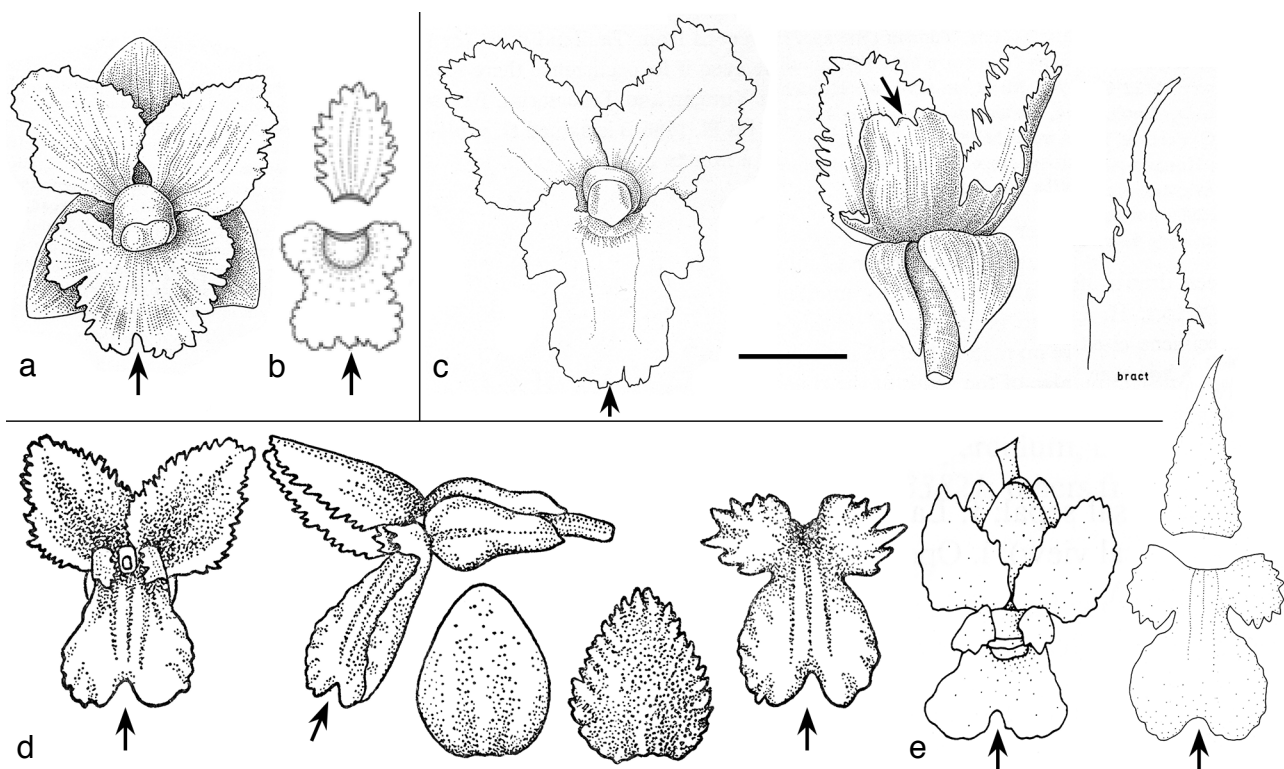


Fig. 7 Illustrations of the types of: a–b. *O. dalatensis*; c. *O. langbianensis*; d–e. *O. sulcata*. — a, c. From Seidenfaden (1968); b. lip and petal from Averyanov (2013); d. flowers, sepal with entire margin, petal with erose margin, and lip from Joseph & Cowdhury (1966); e. flower, isolated lip, and bract, from Ansari & Balakrishnan (1990). — Scale bar for all illustrations = 1 mm. Arrows highlight the variable condition of the apical notch of the epichile.

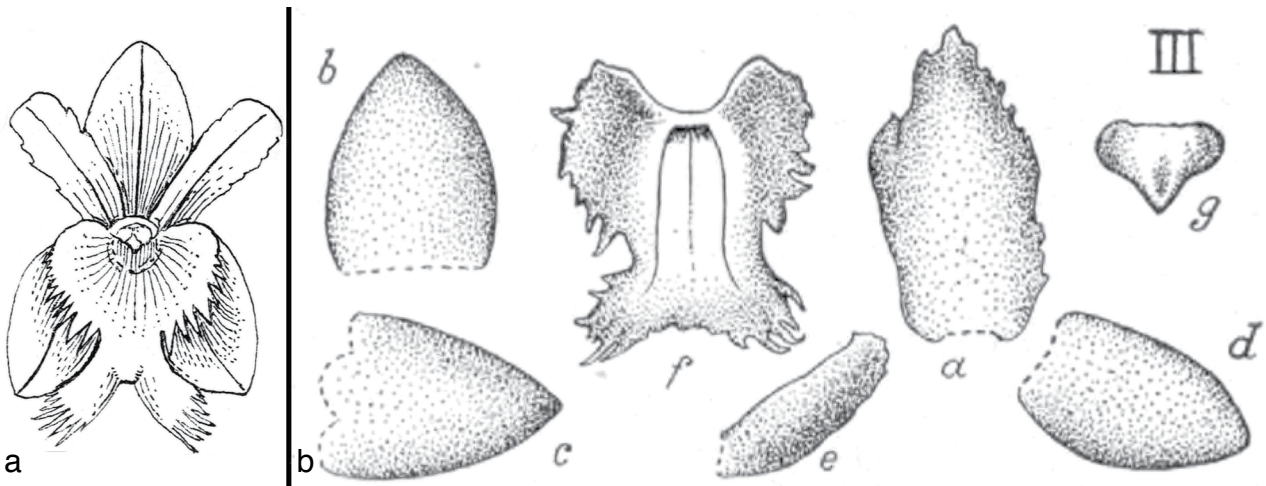


Fig. 8 *Oberonia merapiensis*. a. *Oberonia merapiensis* illustration from Schlechter (1934: f. 56); b. *Oberonia salakana* illustration from Smith (1927).

***Oberonia mucronata* (D.Don) Ormerod & Seidenf. — Fig. 9**

Oberonia mucronata (D.Don) Ormerod & Seidenf. (in Seidenfaden (1997) 20). Basionym. *Stelis mucronata* D.Don (1825) 32. — Type: *Hamilton s.n.* (questionable syn BM 000088238 1948b), Nepal.
Oberonia manipurensis Chowlu, Y.N.Devi, A.N.Rao, N.Angela, H.B.Sharma & Akimpou (2015) 42, f. 1–2. — Type: *Chowlu 00362* (holo CAL); *Chowlu 00441* (para/iso COGCEHR), India, Manipur, Tamenglong District, Tamenglong (N24°48.78' E93°32.77', 403 m a.s.l.), 7 June 2013, *syn. nov.*

Notes — *Oberonia mucronata* is used here in the currently accepted species concept (e.g., Ansari & Balakrishnan 1990, Averyanov 2013; Fig. 9a–d). The original scale bar for Ansari & Balakrishnan's (1990) figure for the entire flower (Fig. 9a) is

evidently wrong. Most likely it is a 2 mm scale bar, which agrees with the 2.5 mm dimension of the overall flower given in the description. This error has been corrected here for Fig. 9a–d. There are questions about the standing of the alleged type in BM. Misra (2004) indicated that the specimen in BM is not the type, because it is a fruiting specimen of *O. ensiformis*. Don (1825) described the flowers agreeing with the common species concept of *O. mucronata* (lip oval, acute, serrulate), and not of *O. ensiformis* with a quadrate, panduriform lip. The BM specimen has as number 1948b, which suggest a Wallich specimen. *Wallich 1948* consists of *Oberonia 'iridifolia* (Roxb.) Lindl.' specimens, an illegitimate name (see <http://wallich.rbge.info> for

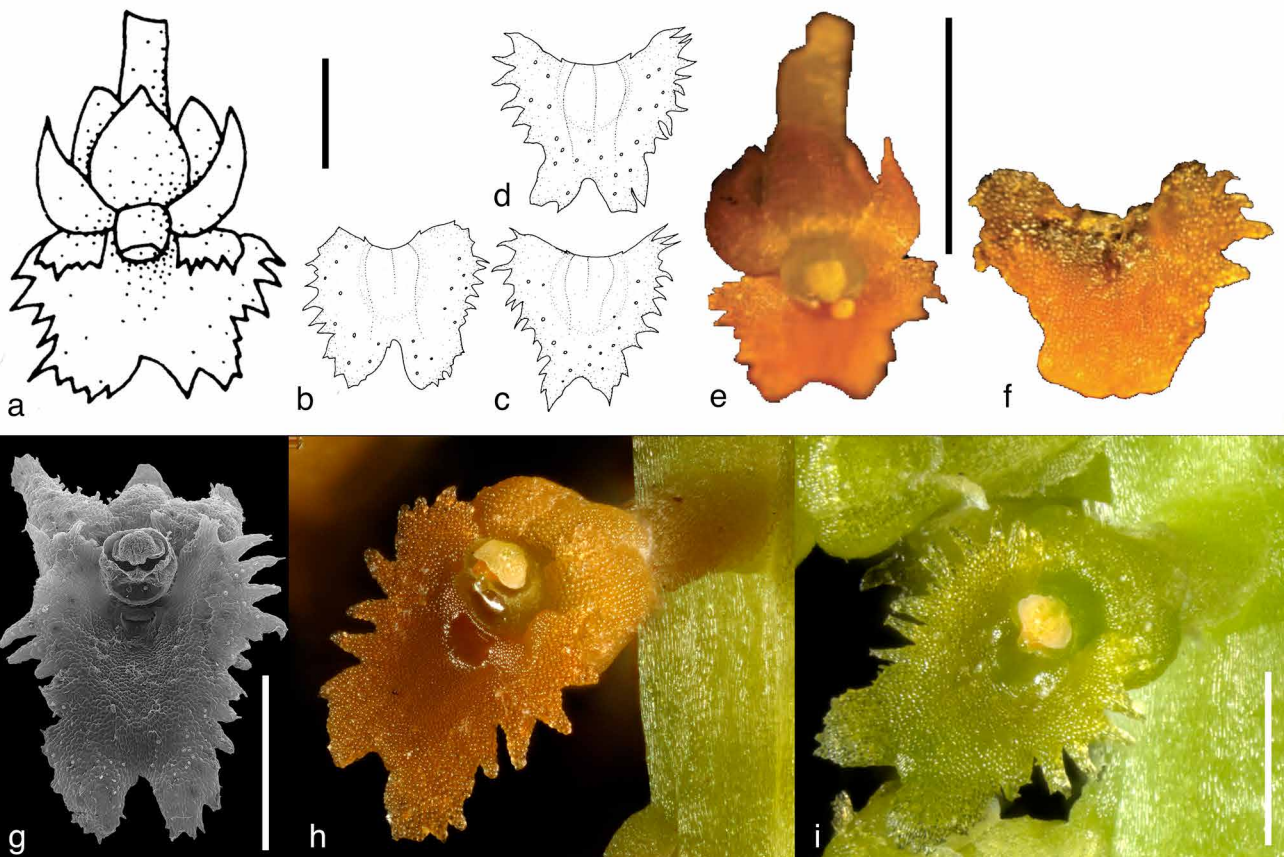


Fig. 9 *Oberonia mucronata*. a–d. Representative illustration of *O. mucronata* from Ansari & Balakrishnan (1990: f. 15). a. Entire flower; b–d. variability of the lip. — e–f. Illustrations of the type of *O. manipurensis*. e. Entire flower; f. lip. — g–h. Orange form of *O. mucronata*. DLG452, HOAG53. g. SEM of single flower; h. Z-stacked micrograph from live plant, 175 frames. — i. Yellowish green form of *O. mucronata*. DLG631, HOAG204. Z-stacked micrograph from live plant, 23 frames. — Scale bars = 1 mm.

details). Records of *O. iridifolia* often refer to what is currently labelled *O. mucronata*, but that name historically was used as a catch-all for several *Oberonia* species. In fact, *Wallich 1948* consists of multiple species. *Wallich 1948.1* is from Nepal and was collected in 1821, but there is no *Wallich 1948b*. Additionally, the collector specified by Don (1825) is Hamilton; for other species he cited Wallich, which demonstrates that Don (1825) distinguished between those two collectors. In conclusion, the BM specimen cannot be considered a type of *Stelis mucronata*, and the species concept of *O. mucronata* is not affected by the identity of the BM specimen.

The P database identifies 'isotypes' of *O. mucronata* (P00404924, P00404925), with gathering number *Wallich 1948b* (see above). The gathering was collected in 1832 according to P database, after the description of *Stelis mucronata* in 1825. Accordingly, the P specimen has no standing as any type, and casts further doubts on the standing of the BM specimen. The detailed drawing of the flower on the sheet clearly shows *O. mucronata*.

Oberonia manipurensis is here considered a synonym of *O. mucronata*. The flower (Fig. 9e–f) shows the reflexed petals and sepals, the lip has the characteristic deep serration along the triangular sides and the indentation at the tip of the epichile (Fig. 9). The orange colour form is also known from elsewhere (Fig. 9g–h) while the more typical greenish form is shown in Fig. 9i. The dense irregular arrangement of the flowers on the inflorescence, and the habit also agrees with *O. mucronata*. Chowlu et al. (2015) compared their species with *O. pachyphylla*, which, however, has a much thicker rachis with almost embedded flowers, and *O. multidentata*, which has distinct lateral lobes with strong serrations and the habit consists of short leaves that are barely as long as wide. Chowlu et al. (2015) did not compare their new species to *O. mucronata* or any of its known synonyms.

The dimensions given by Chowlu et al. (2015) need to be taken with much caution, because the scale bars for the various portions of the plants are grossly incongruent. Scaling the

scale bars to one or the other scale bar (Fig. 9e–f) show that there is an approximate 50 % difference between them. While the dimensions given in the protologue of *O. manipurensis* are smaller (1–1.2 mm) than for typical *O. mucronata* (2–2.5 mm), using the scale bar for the entire plant (Fig. 1a) reveals that the flowers are rather 2 mm in size. Given the structural identity and the demonstrable gross inaccuracies in the scale bars, the alleged size differences are here explained as a measurement error.

Chowlu et al. (2015) cited as type *Chowlu 00362, 00441* as composite holotype and isotype: In correcting the type designations, Chowlu (2016) referred to *Chowlu 00441* in the narrative as isotype, but the type section identified that second number as the paratype: The latter would be correct if the two numbers are considered two separate gatherings. Sennikov (2015) discussed this designation, and argued that the two Chowlu numbers are field numbers of a single gathering; the dual numbers suggesting two gatherings should not invalidate the description due to ICN Art. 8.3. If that view should prevail, then *Chowlu 0441* is a duplicate of the holotype, therefore, an isotype: I consider the clerical error by Chowlu et al. (2015) insufficient to make *O. manipurensis* a *nom. illeg.*, which does not affect its recognition as a synonym of *O. mucronata*.

Oberonia mucronata has multiple additional synonyms; see Seidenfaden (1997) for discussion.

Oberonia nayarii Ansari & N.P.Balacr. — Fig. 10

Oberonia nayarii Ansari & N.P.Balacr. (1990) 17, f. 11. — Type: C.A. Barber 2687 (holo MH), India, Tamil Nadu, Nilgiris, Pykara. R.S. Raghavan 85373 (para BSI), India, Karnataka, Chikmangalur. B.D. Naithani 23237 (para MH), India, Karnataka, Mysore. A.V.N. Rao 18205 (para MH), India, Karnataka, Mysore. M. Mohanan 52522 & 66057 (para MH), India, Kerala, Trivandrum [= Thiruvananthapuram]. A.N. Henry 52425 (para MH), India, Tamil Nadu, Kanniyakumari.

?*Oberonia balakrishnanii* Ansari (in Ansari & Balakrishnan (1990)) 16, f. 10. — Type: Brown 1837 (holo MH), India, Tamil Nadu, Puleneys, Church Cliff.

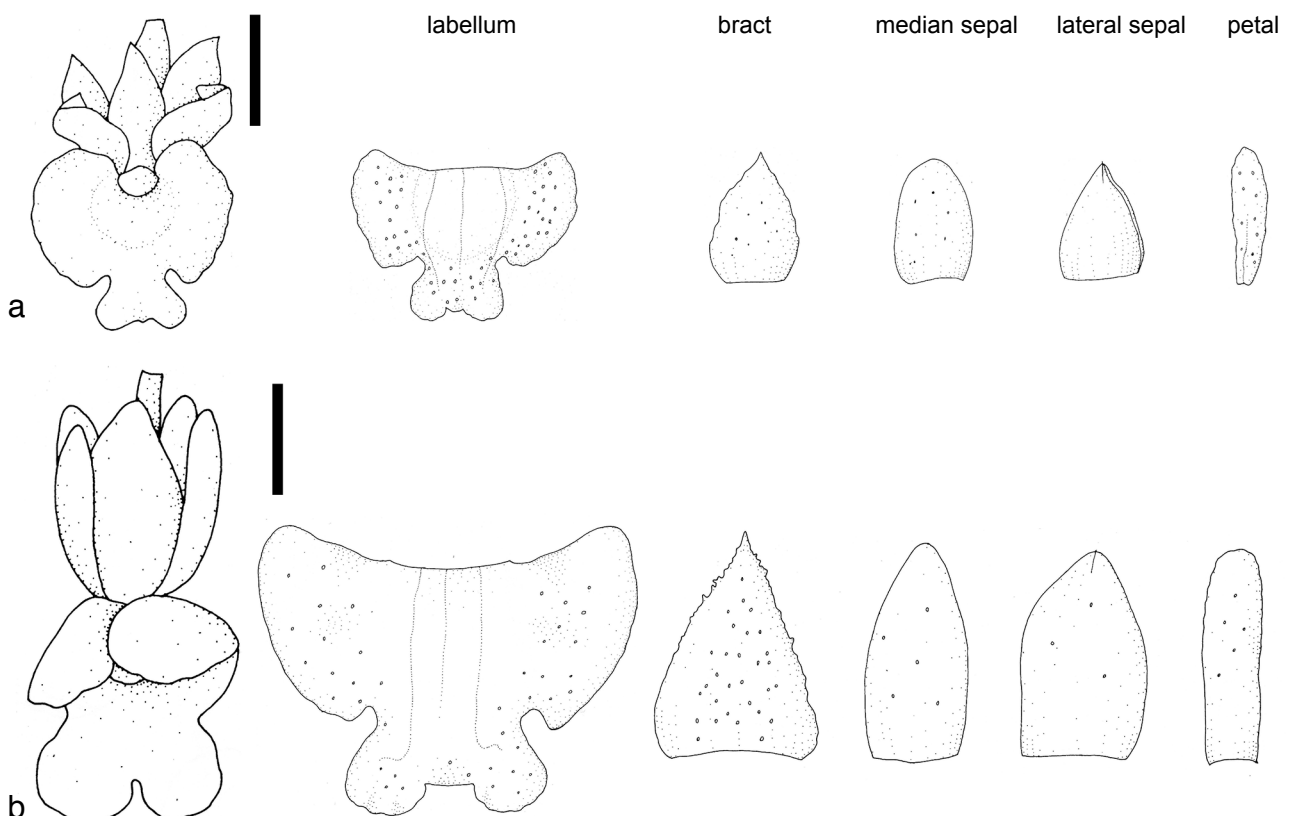


Fig. 10 Illustrations from the protologue of *O. nayarii* (a) and *O. balakrishnanii* (b), showing multiple inconsistencies between entire flower and floral parts.

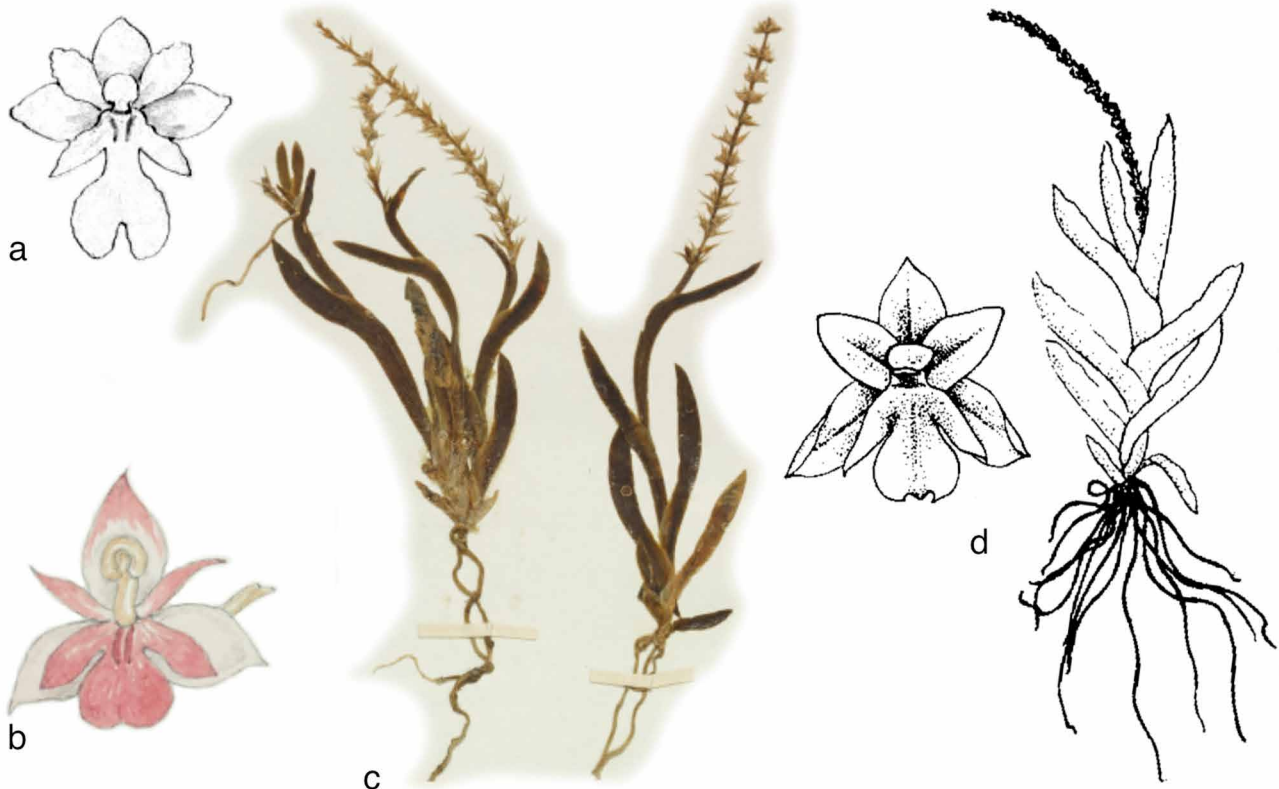


Fig. 11 a–c: *Oberonia obcordata* Lindl. a. Drawing of flower from Griffith s.n. (syn K 000974238); b. drawing of flower from Hooker f. & Thomson 112 (syn K 000974237); c. habit of Hooker f. & Thomson 112 (syn K 000974237). — d. *O. delicata*: illustration of *O. delicata* from Tsi & Chen (1994).

Notes — *Oberonia nayarii* and *O. balakrishnanii* pose some intriguing problems with respect to the illustrations in the protologue. It seems that the drawing of the entire flower and the drawings of the floral parts were derived from two different plants.

Oberonia nayarii has the following inconsistencies: auricles of labellum distinct in flower, absent in part; median sepal acuminate acute in flower, ovate obtuse in part, petals wider in flower than in part.

Oberonia balakrishnanii has the following inconsistencies: labellum about 30 % larger in part compared to flower; lateral lobes of labellum missing apical incision in flower; labellum of part with smaller and well-separated lobules of the epichile.

The floral parts of the two names are identical to one another, and seem to have been drawn from a third species, possibly *O. brunoniana*. The apparent differences in size could be a further error with the scale bars (see *O. mucronata* discussion above). Another possibility is that some of the floral parts in the whole flower are reflexed, while they are spread out flat in the illustrations of the parts. These names need to be investigated by a researcher with access to Indian herbaria.

***Oberonia obcordata* Lindl. — Fig. 11**

Oberonia obcordata Lindl. (1859) 7. — Type: Hooker f. & Thomson 112 (lecto Ansari & Balakrishnan (1990: 40: inadvertent designation) K 000974237), [India,] Sikkim, 2000'; former syntypes: Griffith s.n. (K 000974238), [India,] Darjeeling; Griffith s.n. (K 000974231), [India, Meghalaya,] Khasia Myrung. *Oberonia delicata* Z.H.Tsi & S.C.Chen (1994) 559, f. 2.11–13. — Type: Z.H. Tsi 91-356 (holo PE; iso AMES/barcode 00145074), China, Yunnan, Jinghong, 8 Aug. 1991, syn. nov.

Notes — *Oberonia obcordata* and *O. delicata* are here considered synonyms (Fig. 11). They share the unique downward sloping lateral lobes, the widened epichile with apical notch, and the identical overall habit. The length of the floral bracts is much longer at the base of the inflorescence than towards the

tip (Fig. 11c), a character well-known from *O. rufilabris* (see below) and better visible in live plants (Geiger unpubl. data). Accordingly, the difference in bract length based on illustrations from single flowers are irrelevant for the identity of the species. The width of the petals is continuously variable (Fig. 11a–b, d); discrete character states cannot be identified, which renders this character taxonomically uninformative.

The only species Tsi & Chen (1994) compared their *O. delicata* to is *O. longibracteata*, with shorter lateral lobes that are typically erose and laterally oriented, and bracts that consistently exceed the length of the flower.

***Oberonia odoardi* Schltr. [correction of spelling] — Fig. 12**

Basionym. *Oberonia odoardi* [sic] Schltr. (1911b) 431. — Type: *O. Beccari* s.n. (syn B?: lost?), [Indonesia, W Sumatra,] Gunong [= Mount] Singgalang, 1600 m.

Notes — The specific epithet is corrected from Schlechter's (1911b) original *O. odoardi* [sic] to *O. odoardi* in accordance with ICN Art. 60.1 and Rec. 60C.1(a). The species epithet *odoardi* cannot be considered a well-established form under ICN Rec. 60C.2 because two alternate spellings exist in low numbers; it has to be noted that WCSP (2016) gives spellings at variance to the protologue, particularly several *odoardi* original spellings were given as either *odoardii* (*Bulbophyllum*, *Trichotosia*) or *odoardi* (*Aphyllorchis*, *Pandanus*):

- *Dendrobium odoardi* Kraenzl.
- *Oberonia odoardi* Schltr.
- *Aphyllorchis odoardi* Rchb.f. [= *A. pallida* Blume]
- *Bulbophyllum odoardi* Rchb.f. & Pfitzer
- *Trichotosia odoardi* Kraenzl.
- *Pandanus odoardi* Martelli [= *Benstonea lauterbachii* (K.Schum. & Warb.) Callm. & Buerki]
- *Coelogyne odoardi* Schltr.
- *Syzygium odoardi* Merr. & L.M.Perry.

Schlechter's intention of using a patronym is evident from the customary capitalisation of such a species epithet named for Italian botanist Odoardo Beccari (1843–1920), the collector of the type material. The orthographic rules in botanical nomenclature were not established at that time, but spellings of names are required to be corrected under current ICN Art. 60.12. There is no justification for the spelling variant of *odoardii*, because there are no traceable signs that Beccari's first name was referred to as 'Odoard'. Accordingly, the spellings of all *odoardi* (*Aphyllorchis*, *Bulbophyllum*, *Dendrobium*, *Oberonia*, *Trichotosia*) species epithets must be corrected to *odoardoi*. The illustrations (Fig. 12) of the species are the first photographs ever published. The only other illustration is a line drawing from Comber (2001: 201, text-fig.).

***Oberonia padangensis* Schltr.** — Fig. 13

Oberonia padangensis Schltr. (1911a) 12. — Type: *Schlechter 16019* (syn B lost, AMES 11969/barcode 00102014, K 000942984, P00364414), [Indonesia,] Sumatra, on trees near Padang-Pandjang, 900 m.

Oberonia patentifolia Ames & C.Schweinf. (in Ames (1920)) 83, pl. 90, f. 1, 1. — Type: *Clemens, J. 104* (syn AMES 16989/barcode 00102051), [Malaysia, Sabah,] Mount Kinabalu, Lobang Cave, 5000 ft. *Clemens 27* (para AMES 16988/barcode 00102052), [Malaysia, Sabah, Mount Kinabalu,] Kiau, *syn. nov.*

Oberonia fungum-olens [sic] Burkill (1924) 292, text-fig. — Type: *Burkill s.n.* (lecto SING 0048298: here designated, isolecto Burkill (1924: 292, text-fig.): here designated), Malaya, Malum, Perak, Tanjong, 8 Sept., 1924, *syn. nov.*

Notes — The species belongs in sect. *Platyacron*, characterised by the small auriculate hypochile and more or less expansive, bilobed epichile, and usually with papillate back side of petals and/or sepals. The habit of the plant is highly variable between species; often it is easier to distinguish species by habit than by floral morphology. Plants under all names discussed here have identical habits.

Oberonia patentifolia is here recognised as a new synonym of *O. padangensis*. The shared attributes include the overall vegetative habit of long narrow stems with short imbricate leaves, shorter at bottom and top, longest in the upper half of each growth, the terminal inflorescence with strongly pubescent

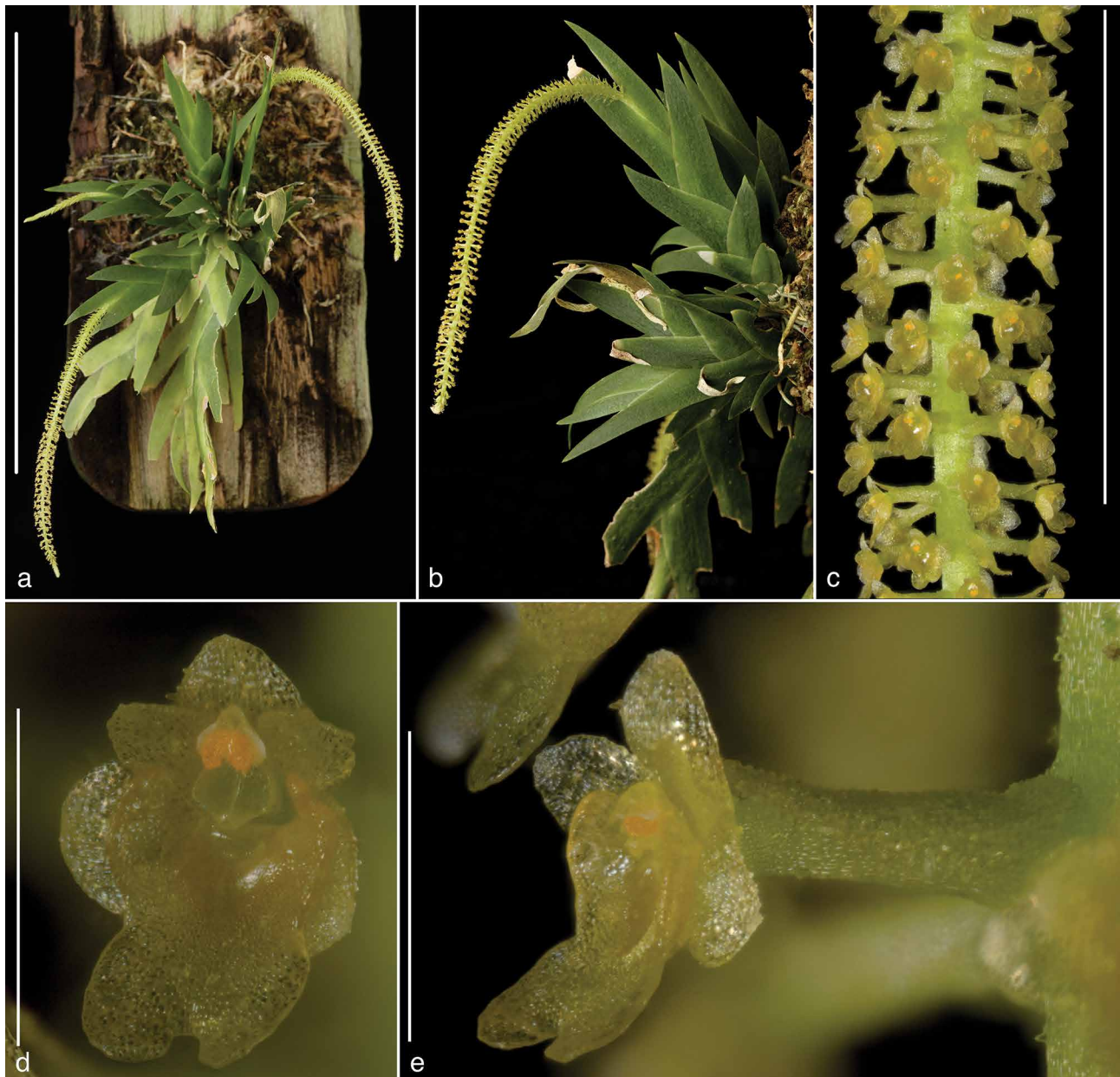


Fig. 12 *Oberonia odoardoi* DLG 687, HOAG 208. a. Habit; b. growth, Z-stack 15 frames; c. portion of inflorescence, Z-stack 16 frames; d. flower frontal, Z-stack 25 frames; e. flower lateral, Z-stack 32 frames. — Scale bars: a = 100 mm; c = 10 mm; d–e = 1 mm.

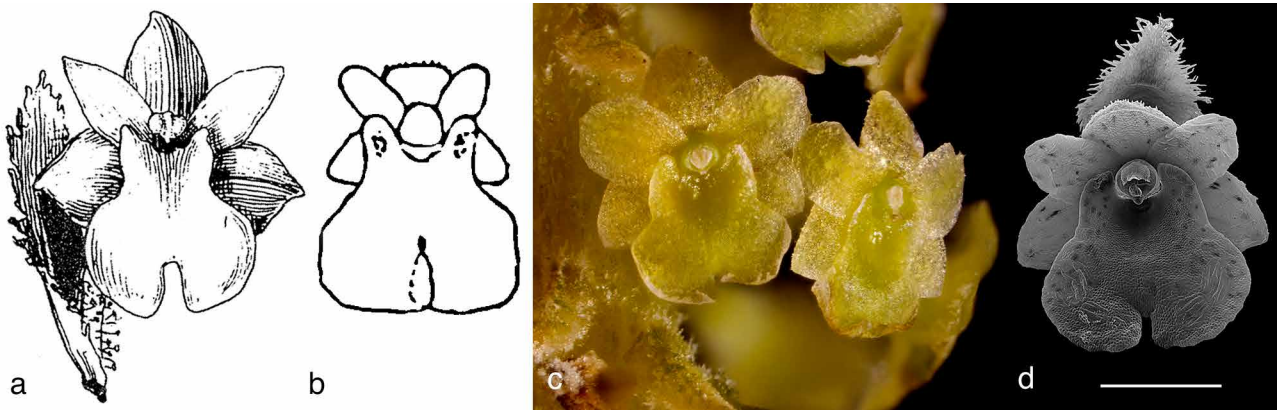


Fig. 13 *Oberonia padangensis*. a. *Oberonia patentifolia* from Ames (1920); b. *Oberonia fungumolens* from Burkill (1924); c. flowers on living plant DLG 568/HOAG68. Z-stack 16 images; d. SEM image L23982. — Scale bar = 1 mm.

rachis, the strongly pubescent pedicel-with-ovary, the triangular sepals, the somewhat to distinctly narrower petals, the lip with two small basal auricles clasping the column and much wider, rounded apical lobes (Fig. 13b).

The status of *O. patentifolia* types needs to be clarified and corrected. *Clemens 104* is a syntype because the repository was not specified in Ames (1920), not a holotype (ICN Art. 8.1), despite the fact that the sheet bears the annotation 'No dupl.'. Although Ames (1920) was published in Ames' home journal, there is no explicit indication in the work as to the repository of the specimens. *Clemens 27* is a paratype according to ICN Art. 9.6 (contra AMES). Because *Clemens 104* was designated in Ames (1920) as '(Type)', that gathering is given a higher standing as a name-bearing type, while *Clemens 27* is of a lower standing, i.e., a non-name-bearing paratype.

No type was designated for *O. fungum-olens*. A specimen collected by Burkill on 8 September 1924, is at SING (SING0048298), which can reasonably be assumed to have been available for the description published in the 7 November 1924 issue of the 'Garden's Bulletin'. Accordingly, it qualifies as original material and is here designated as the lectotype from which Burkill's (1924: 292, text-fig.) drawing was prepared. Burkill's (1924: 292) note 'ex vivo in Horto Singaporensi descripta' does not contradict the availability of a preserved specimen also examined by Burkill. That specimen was previously erroneously identified as the holotype on the herbarium label, most likely by Seidenfaden in 1978 based on the matching handwriting of his annotation label, and in the SING database.

Oberonia fungum-olens has been considered a synonym of *O. padangensis* (O'Byrne pers. comm.), which is here con-

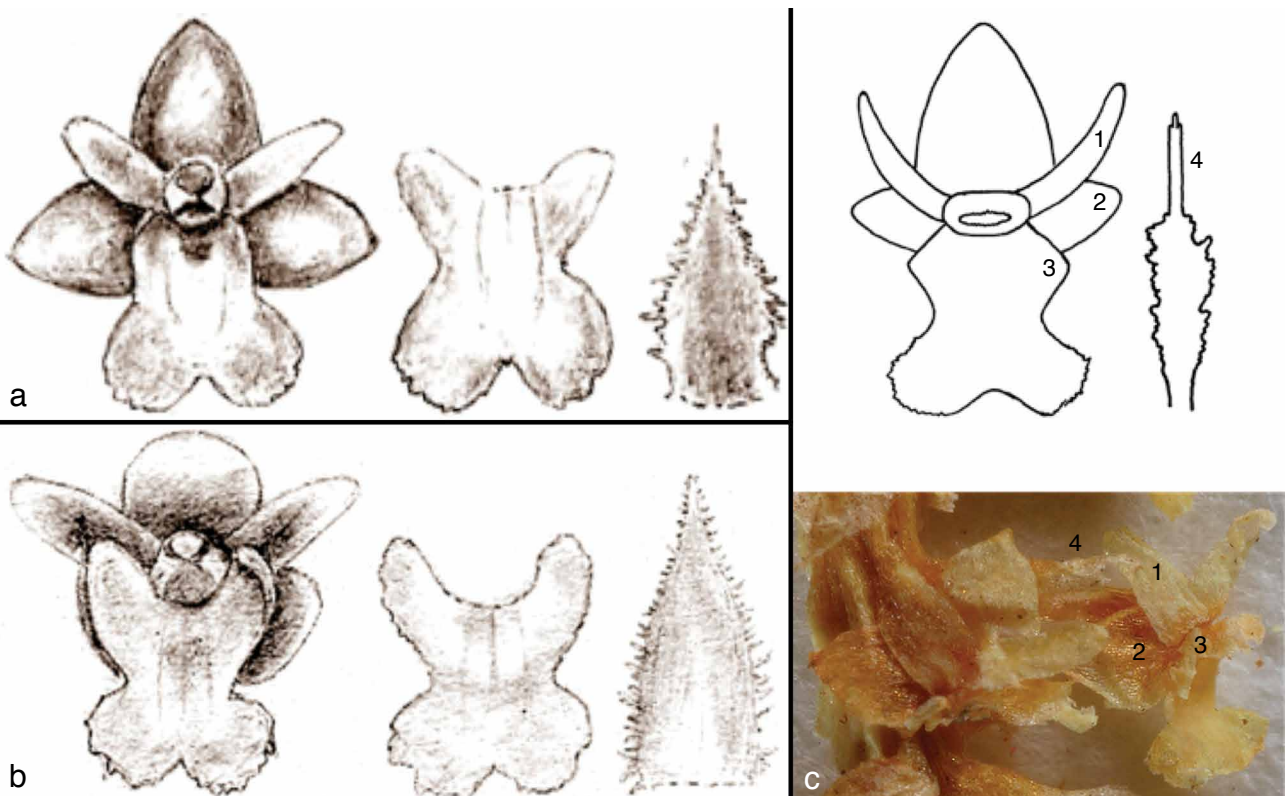


Fig. 14 a. *Oberonia punctata*; b. *O. subanajamensis*: a–b. Illustrations by J.J.Sm. from Schuiteman & De Vogel (2006): entire flower, lip separated, floral bract. — c. Original illustration of *O. caprina* from Gilli (1983: f. 29); below photograph of flower from holotype (W 16722 Gilli 164). 1, 2, 3, 4: corresponding floral elements on Gilli's drawing and on the holotype, for details see main body of text.

firmed. The illustration of the flower (Fig. 13c), as well as the comparison to *O. spathulata* (considered a synonym of *O. padangensis*) and *O. anceps* (considered a taxonomic synonym of *O. lycopodioides*, but a frequent misidentification of *O. padangensis*) and the protologue all confirm the synonymy. The habit also agrees with *O. padangensis*.

Oberonia padangensis shows a moderate amount of intra-specific variability. None of the attributes correlate with one another, for which reason, no taxonomic separation can be justified. The colour of the flowers varies from dark yellow to orange and light green.

Oberonia punctata J.J. Sm. — Fig. 14

Oberonia punctata J.J.Sm. (1927) 141. — Type: *E. Jacobson cult.* (syn), [Indonesia,] W Sumatra, Goenoeng [= Mount] Singgalang, 1900 m.

Oberonia subanajamensis J.J.Sm. (1928) 46. — Type: *Ajoeb 354* (syn L 0061794), *Ajoeb 355* (syn L 0061795), [Indonesia,] Sumatra, Bengkulu Province, Ajam [= Soeban Ajam = Suban Ayam], *syn. nov.*

Oberonia caprina Gilli (1983) 38, f. 29. — Type: *Gilli 164* (holo W 16722), [Papua New Guinea,] (Chimbu district: type sheet), Mingende, 2200 m, on a tree in forest, *syn. nov.*

Notes — *Oberonia subanajamensis* and *O. punctata* refer to the same species, with the latter having priority by one year. Smith (1928) did not compare his *O. subanajamensis* to his *O. punctata*. The description of the habit and the flower (Fig. 14a–b) are a precise match between the two species, specifically the decreasing size of the leaves along the stem, the triangular bracts with erose margin, the narrow petals, and the shape of the lip. Both were described from Sumatra. The only distinction is the dots on the leaves of *O. punctata*. Comber (2001) noted that those dots are known from other species, without giving further details. It seems that they are most likely caused by a pathogen, and have no taxonomic value.

Oberonia caprina is here considered a clear synonym of *O. punctata*. Gilli's (1983) drawing in the protologue is poor to the degree

of being positively misleading. Van Steenis (1982) was also highly critical of Gilli's work. The examination of the holotype permitted to clarify the identity of this species. The petals were shown about half as wide in the protologue as they are in the type specimen (Fig. 14c: 1). The lateral sepals are much larger than shown in Gilli's drawing (Fig. 14c: 2). The auricles at the base of the lip are not shown at all (Fig. 14c: 3). The epichile of the lip is spreading more, reminiscent of *O. aporophylla* Rchb.f. (1855). The bract is standard acuminate not the linear shape with terminal awn as in the protologue (Fig. 14c: 4).

Oberonia rufilabris Lindl. — Fig. 15

Oberonia rufilabris Lindl. (1838) t 8A. — Type: *Griffith s.n.* (lecto Ansari & Balakrishnan (1990: 40: inadvertent designation) K 000974242; isolecto L 0061775, P00044876), Burma [= Myanmar], Mergui.

Oberonia thisbe Rchb.f. (1855) 223. — Type: *Cuming 2134* (syn K s.n., W 68837, W 37745), Philippines. Bohol on K type sheet, *syn. nov.*

Oberonia nepalensis L.R.Shakya & R.P.Chaudhary (1999) 359, f. 2. — Type: *L.R. Shakya, R.L. Singh & R.P. Chaudhary 27* (holo KATH; iso TUCH), [Nepal,] Gandaki Zone, Pokhara (around Annapurna Conservation area), 1100 m, *syn. nov.*

Oberonia pantlingiana L.R.Shakya & R.P.Chaudhary (1999) 360, f. 3. — Type: *R. Pantling 430* (holo CAL; iso B000088284), [India,] Sikkim, Doars, 175 m.

Notes — *Oberonia thisbe* was based on a small specimen (Ames 1908), but lacks any discrete differentiating attributes (Fig. 15a–b). *Oberonia nepalensis* and *O. pantlingiana* were distinguished by vegetative size and size of the inflorescence. Both characters are well-known to be extensively variable within *O. rufilabris* (Seidenfaden 1995, Geiger pers. obs.), and especially vegetative size is likely linked to the age or developmental stage of the plant. Inflorescences may have as few as three to in excess of 60 whorls of flowers. Shape differences of the petals indicated by Shakya & Chaudhary (1999: t. 1) are at best subtle and well within intraspecific variability (Fig. 15). Both those names are only known from the type gathering, hence, exhibit a particularly egregious case of typological splitting.

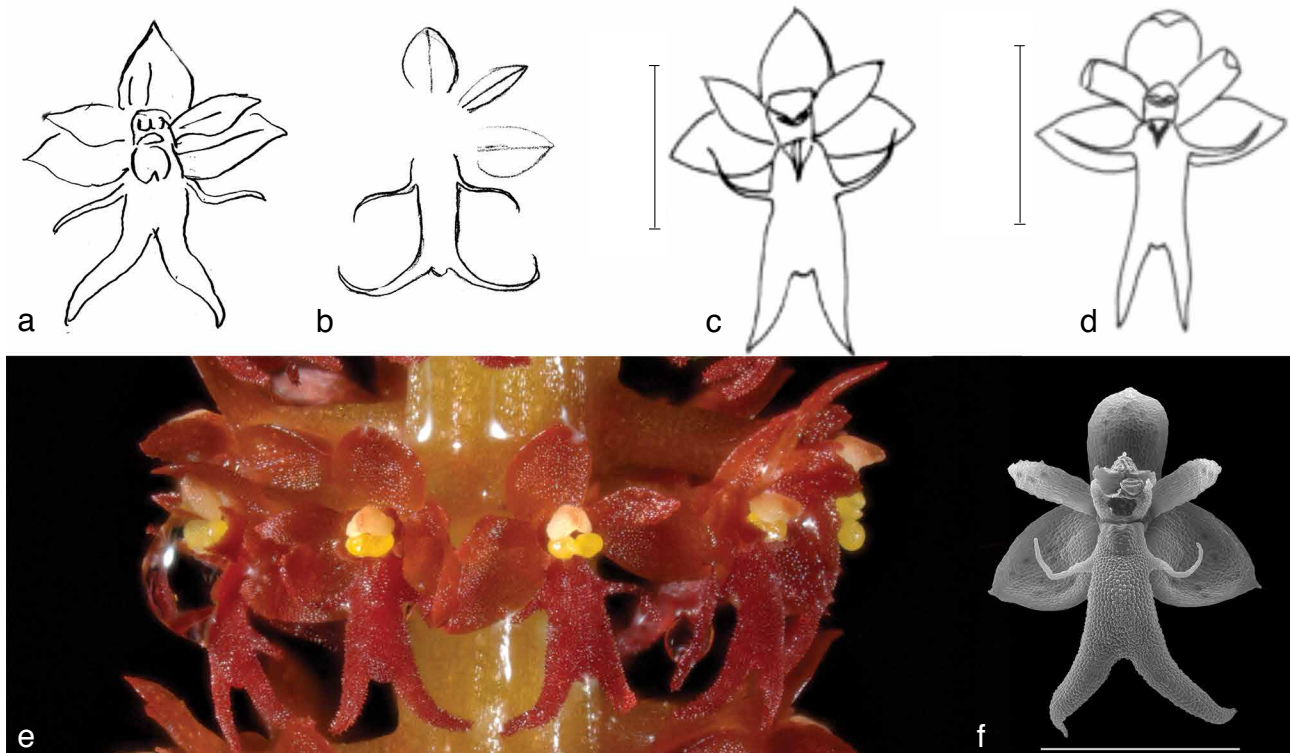


Fig. 15 a. *Oberonia rufilabris*: drawing from Lindley specimen in Reichenbach herbarium Nr. 35494 in W; b. *O. thisbe*: drawing from Reichenbach f. type specimen in W Reichenbach herbarium 37745. Drawing digitally re-arranged; c. *O. nepalensis*: original illustration of flower from Shakya & Chaudhary (1999: f. 2); d. *O. pantlingiana*: original illustration of flower from Shakya & Chaudhary (1999: f. 3); e–f. *O. rufilabris*: e. light optical z-stacked image (17 images) of inflorescence (DLG 476/HOAG 176); f. SEM image of flower (DLG 80/HOAG 93). — Scale bars = 1 mm.

Those names are here synonymised under *O. rufilabris*. Rajbhandari (2015) and Gogoi & Yonzon (2016) included *O. pantlingiana* in their synonymy of *O. rufilabris* without any further discussion, but did not include *O. nepalensis*.

***Oberonia subligaculifera* J.J.Sm. — Fig. 16**

Oberonia subligaculifera J.J.Sm. (1913) 35. — Type: J.J. Smith & Rant 201 (syn), [Indonesia, Java,] Bandoeng [= Badung], near Tirtasari, 1500 m, on fallen tree, in sunny location.

Oberonia evrardii Gagnep. (1929) 326. — Type: *Evrard 300* (lecto Seidenfaden (1968: 48: inadvertent designation) P00404954), [Vietnam,] Dalat, chalet Rimaud, *syn. nov.*

Oberonia kanburiensis Seidenf. (1973) 47, f. 12. — Type: *Beusekom et al. 3657* (holo C; iso L0061749), Thailand, Kanburi, West of Sisawat, Huay Ban Kao, *syn. nov.*

Notes — *Oberonia evrardii* is here considered a synonym of *O. subligaculifera* as shown by the illustrations on the syntype sheet in P (Fig. 16b). The shared attributes include the four-lobed lips with incised lateral lobes and broadened and incised epichile lobes, the deeply incised petals. While the lobes of the lip in *O. evrardii* are a bit more square and not as rounded as those in *O. subligaculifera*, the uncommon incision pattern on lip and the uncommon incision of the petals are clear evidence of conspecificity.

This synonymy was obscured by partial misidentifications in the secondary literature. Seidenfaden (1968: f. 27; copied in Seidenfaden 1992, Ho 1993, Hop 1998) illustrated the habit of the type, but the flower from *Sigaldi 258* is *O. langbianensis*. The epichile lobes of *Sigaldi 258* are not widening (distinctly widening in *O. subligaculifera*), and the margin around the entire lip is erose (entire in the middle portion in *O. subligaculifera*). Averyanov (2013) illustrated the flower based on the type.

The flowers of *O. kanburiensis* are identical to those of *O. subligaculifera*: identical hour-glass shape of lip with serrated margin, erose margins of petals, broad ovate shape of sepals (Fig. 16a, c). The synonymy is crystal clear. Seidenfaden's previous misidentification of *O. evrardii*/*O. langbianensis* may be the reason for the description of his *O. kanburiensis*.

***Oberonia titania* Lindl. — Fig. 17**

Oberonia titania Lindl. (1859) 8. *Nomen novum* for *Oberonia miniata* (Endl.) Lindl. (non Lindl.).

Titania miniata Endl. (1833) 31. — Type: *F. Bauer s.n.* (syn W 0046211), [Australia,] Norfolk Islands, Anson Bay.

Oberonia crateriformis D.L.Jones & M.A.Clem. (2006) 9, f. 1.9–10, pl. 1a–b. — Type: *D.L. Jones 19353* (in cult.) ex *D.L. Jones 11560* (holo CANB 751059), [Australia, ACT,] Canberra, Australian National Botanic Gardens, collected Australia, Queensland, Eungella, rendition State Forest, *syn. nov.*

Oberonia rimachila D.L.Jones & M.A.Clem. (2006) 11, f. 1.13–14, pl. 1c–d. — Type: *Brass 19394* (holo CANB 186351; iso BRI 80746), Australia, Queensland, Cook District, Tozer Range, 0.5 mile E of Mount Tozer, *syn. nov.*

Notes — *Oberonia crateriformis* and *O. rimachila* are here synonymised under *O. titania*. *Oberonia palmicola* F.Muell. (1860–1861 [1860]) has variously been considered synonymous with or distinct from *O. titania*. Material from CANB identified by the authors of the newer names were examined by SEM: *crateriformis* (CANB 9010337, CANB 8807174, CANB 679051), *rimachila* (CANB 9707705, CANB 9707703, CANB 9306461, CANB 9306455, CANB 8912846, CANB 679052, CANB 678991), *palmicola* (CANB 8806342, CANB 678974, CANB 678669), *titania* (CANB 867922, CANB 507301; additionally K 48321, K 40063). The cited differences in the callus are not visible on the SEM images on their pl. 1 and cannot be confirmed (Fig. 17). The alleged discriminating characters were cross-referenced between the two species, but were not

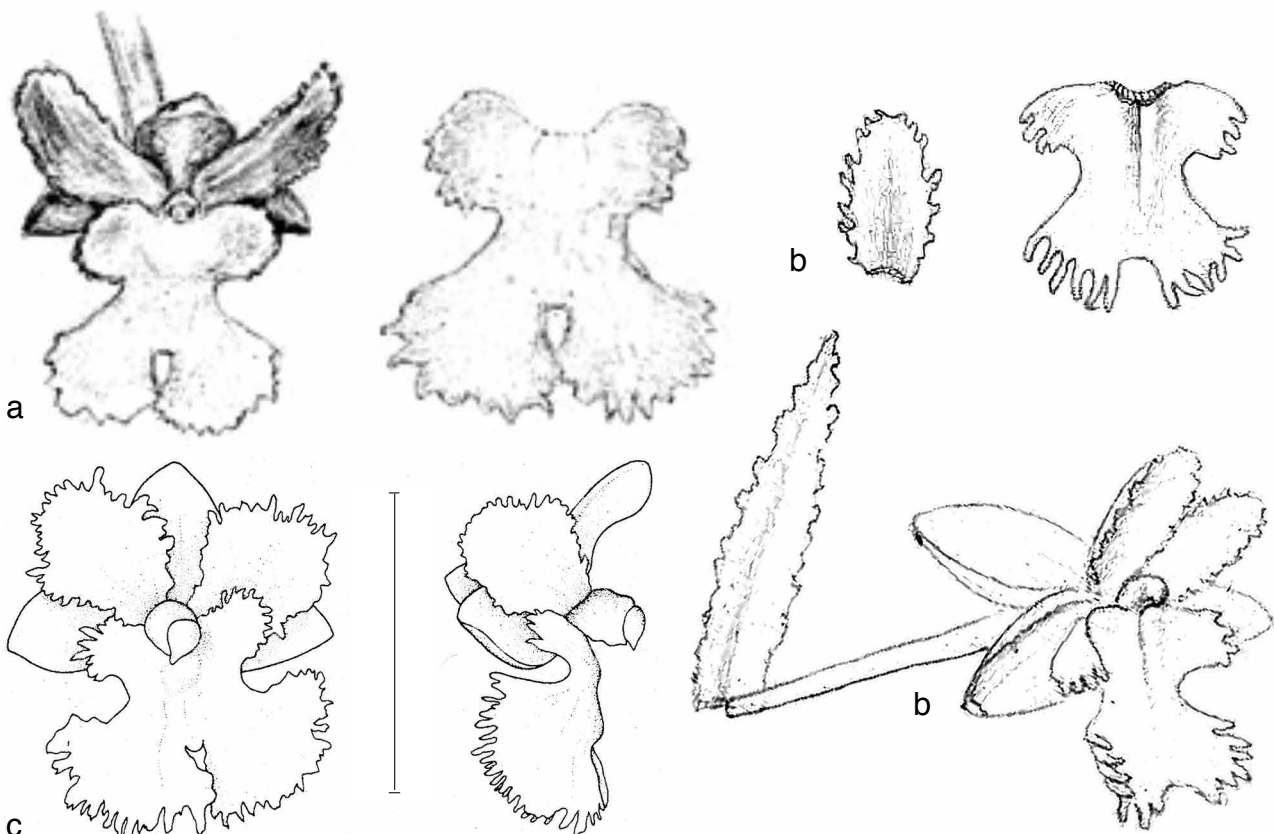


Fig. 16 Figure subligaculifera. a. *Oberonia subligaculifera*: illustrations by J.J.Sm. from Schuiteman & De Vogel (2006): entire flower, lip isolated; b. *O. evrardii*: drawing of petal, lip, entire flower from syntype P00404954; c. *O. kanburiensis*: illustration of the flower from the holotype from Seidenfaden 1978: f. 9. — Scale bar = 2 mm.

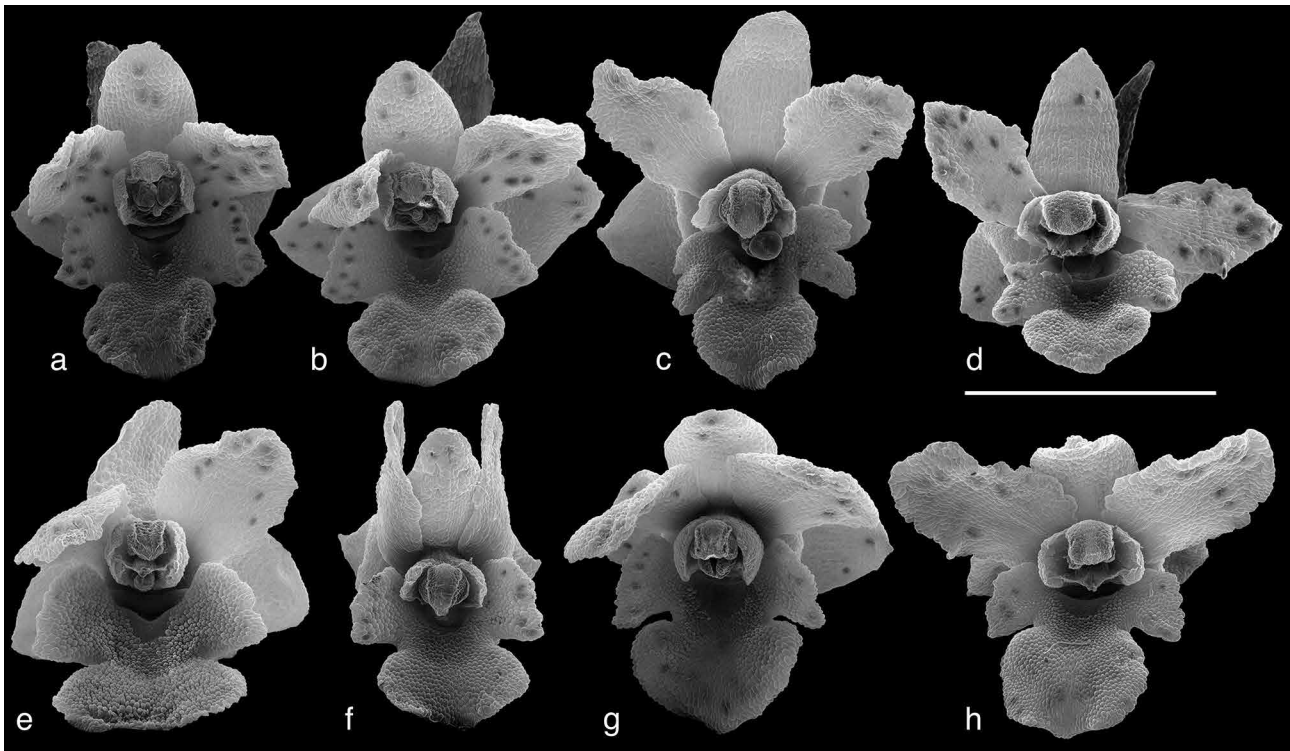


Fig. 17 *Oberonia titania* and its synonyms. a–b. *Oberonia titania*; c–d. *Oberonia palmicola*; e–f. *Oberonia crateriformis*; g–h. *Oberonia rimachila* (from: a–b CANB 507301; c. CANB 8806342; d. CANB 678974; e. CANB 679051; f. CANB 9010337; g. CANB 9707705; h. CANB 678991). — Scale bar = 1 mm.

actually given. The size differences of the flower are due to an error in the scale bars as evidenced by examination of the types, where no size differences could be detected, and by the identical size of all material examined by SEM (Fig. 17).

The shape of all floral components and the habit are identical among specimens of all four names (Fig. 17). The depth and width of the sac can easily be explained through floral ontogeny and also by the orientation of the lip to the gynostemium. There are certainly no consistent patterns discernible. The incision pattern of the lateral lobes of the lip, from irregularly erose to deeply incised, seems variable in this species. It is evident from the inequilateral expression in a single flower and the examination of multiple flowers from the same plant by SEM; the condition in Fig. 17c is unusually deep, but is considered of no further taxonomic consequence.

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REFERENCES

- Ames O. 1908. Studies in the orchid flora of the Philippines. In: Ames O (ed), *Orchidaceae, Illustration and Studies in the Family Orchidaceae* issuing from the Ames Botanical Laboratory: 17–273. Houghton, Mifflin & Company, Boston.
- Ames O. 1912. *Orchidaceae novae et criticae insularum Philippinarum*. *Leaflets of Philippine Botany* 5: 1549–1588.
- Ames O. 1914. Notes on Philippine orchids with descriptions of new species, VI. *Philippine Journal of Science. Section C, Botany* 8: 407–441, pl. 13.
- Ames O. 1915. *Genera and species of Philippine orchids. Orchidaceae: Illustrations and studies of the family Orchidaceae* issuing from the Ames Botanical Laboratory, North Easton, Massachusetts 5: xiv, 1–271, map.

- Ames O. 1920. The orchids from Mount Kinabalu. *Orchidaceae: Illustrations and studies of the family Orchidaceae* issuing from the Ames Botanical Laboratory, North Easton, Massachusetts 6: 3–271.
- Anonymous. 2018. The spirit collection. Available from <http://www.rbge.org.uk/science/herbarium/about-the-collections/spirit-collection> [acc. 4 July 2018].
- Ansari R, Balakrishnan NP. 1990. A revision of the Indian species of *Oberonia* (Orchidaceae). *Orchid Monographs* 4: i–iv, 1–82, pls. 1–3.
- Averyanov LV. 2013. The orchids of Vietnam illustrated survey. *Turczaninowia* 16: 5–163.
- Banks D. 2016. *Oberonia attenuata* rediscovered! *The Australian Orchid Review*, June–July 2016: 31–33.
- Barthlott W, Gorsse-Veldmann B, Korotkova N. 2014. Orchid seed diversity, a scanning electron microscopy survey. *Englera* 32: 1–245.
- Bradshaw G. 1864. *Bradshaw's hand-book to the Bengal Presidency, and Western Provinces of India*. [Selfpublished], London.
- Bunpha K, Pedersen H AE, Sridith K. 2014. *Oberonia pygmaea* sp. nov. (Orchidaceae) from Thailand. *Nordic Journal of Botany* 32: 143–145.
- Burkill IH. 1924. Orchid notes. *The Gardens' Bulletin; Straits Settlements*, ser. 3, 3: 292–296.
- Chowlu K. 2016. Erratum to 'Oberonia manipurensis sp. nov. (Orchidaceae) from Manipur, India'. *Nordic Journal of Botany* 34: 384.
- Chowlu K, Devi YN, Rao AN, et al. 2015. *Oberonia manipurensis* sp. nov. (Orchidaceae) from Manipur, India. *Nordic Journal of Botany* 33: 42–44.
- Clements MA. 1989. *Catalogue of Australian Orchidaceae*. *Australian Orchid Research* 1: 1–160.
- Comber JB. 2001. *Orchids of Sumatra*. The Royal Botanical Gardens, Kew.
- Cooke T. 1907. *The Flora of the Presidency of Bombay, Vol. III, part IV. Botanical Survey of India, Calcutta: 625–816* [123–326 in 1967 reprint examined].
- Cunningham A. 1839. Notes on orchideaceous epiphytes of New South Wales. *Edwards Botanical Register* 25: 33–34.
- Dalzell NA, Gibson A. 1861. *The Bombay Flora*. Education Society's Press, Bombay.
- Don D. 1825. *Prodromus florae Nepalensis: sive enumeratio vegetabilium quae in itinere per Nepaliam proprie dictam et regiones conterminas, ann. 1802–1803*. Gale, London.
- Dockrill A.W. 1960. A new species of *Oberonia* (Orchidaceae) from north Queensland. *The North Queensland Naturalist* 29(126): 4.
- Endlicher S. 1833. *Prodromus florae Norfolkicae, sive, Catalogus stirpium quae in Insula Norfolk annis 1804 et 1805 a Ferdinando Bauer collectae et depictae nunc in Museo Caesareo Palatino Rerum Naturalium Vindobonae servantur*. Fridericus Beck, Vienna.
- Finet E-A. 1908. Orchidées nouvelles ou peu connues. II. *Bulletin de la Société Botanique de France* 55: 333–343, pls. 10–11.

- Fukuyama N. 1935. Studia Orchidacearum Japonicarum IV. Orchidaceae formosanae novae atque criticae. The Botanical Magazine [Shokubutsugaku zasshi] 49: 290–297.
- Gagnepain T. 1929. Trois *Oberonia* nouveaux d'Indo-Chine. Bulletin de la Société Botanique de France, second series 5: 326–327.
- Gagnepain F. 1932. Orchidacées nouvelles d'Indo-Chine. Bulletin de la Société Botanique de France 79: 162–177.
- Geiger DL. 2013. Imaging small orchids using visible light. *Orchid Digest* 77: 112–123.
- Geiger DL. 2014. *Oberonia*: the microscopist's delight. *ORCHIDS* 83: 558–563.
- Geiger DL. 2016. Studies in *Oberonia* 1: *Oberonia maxima* and its new synonyms. *ORCHIDS/Lindleyana* 85: 390–395.
- Geiger DL. 2017. Studies on *Oberonia* 2 (Orchidaceae: Malaxideae): *Oberonia aureolabris*, a new species discovered in cultivation. *Phytotaxa* 329: 173–179.
- Geiger DL. 2018. Studies in *Oberonia* [4]. An herbarium of cultivated orchids: why and how. *Orchid Digest* 82: 92–98.
- Geiger DL, Kocyan A. 2018. Studies in *Oberonia* 3. Aberrant flowers and other floral modifications in the orchid genus *Oberonia*. *Nordic Journal of Botany* 36: 1–8. doi: <https://doi.org/10.1111/njb.01699>.
- Gilli A. 1983. Beiträge zur Flora von Papua-New Guinea. III Monocotyledones. *Annalen des Naturhistorischen Museums Wien B84*: 5–47.
- Gogoi K, Yonzon R. 2016. *Oberonia rufilabris* Lindley (Orchidaceae): a new record for the State of Assam, India. *Pleione* 10: 199–202.
- Ho P-H. 1993. An illustrated Flora of Vietnam. Vol. 3(2) Smilacaceae to Orchidaceae. Mekong Printing, Montreal.
- Hooker J.D. 1890. *Icones plantarum or figures, with brief descriptive characters and remarks, of new and rare plants*, Ser. 4, vol. 1/21, part 1: pls. 2001–2025. Dulau & Co., London.
- Hop T. 1998. *Phong Lan Việt Nam (The Orchids of Vietnam)*. Khoa học kỹ thuật, Hanoi.
- Jayaweera DMA. 1963. New orchids from Ceylon. *Botanical Museum Leaflets, Harvard University* 20: 93–116.
- Jayaweera DMA. 1981. Orchidaceae. In: MD Dassanayake (ed), *Revised handbook of the Flora of Ceylon*. Volume 2: 4–386. Amerind Publishing Co. Pvt. Ltd., New Delhi.
- Jones DL. 2006. A complete guide to the native orchids of Australia including the island territories. Reed New Holland, Sydney.
- Jones DL, Clements MA. 2006. Fourteen new taxa of Orchidaceae from northern and eastern Australia and two new combinations from New Guinea. *Australian Orchid Research* 5: 2–33.
- Joseph J. 1982. Orchids of Nilgiris. *Records of the Botanical Survey of India* 22: i–viii, 1–144, 4 pls.
- Joseph J, Chowdhury S. 1966. A new orchid from Kameng frontier district, NEFA, Assam. *Journal of the Bombay Natural History Society* 63: 54–56.
- Kerr AFG. 1927. Contributions to the Flora of Siam. *Additamentum XXII*. *Bulletin of Miscellaneous Information* 1927: 212–220.
- Lin Q, Yang Z. 2015. Type specimens in China National Herbarium (PE) Volume 5 Angiospermae(2). Henan Science and Technology Press, Zhengzhou.
- Lin T-P. 1987. *Native orchids of Taiwan*. Vol. 3. Southern Materials Center, Inc., Taipei.
- Lin W-M, Wang Y-F. 2014. *The wild orchids of Taiwan, an illustrated guide*. KBCC Press, Gaoshu.
- Lindley J. 1830. The genera and species of Orchidaceous plants part I. Malaxideae. *Ridgways*, London [reprint of 1963 examined].
- Lindley J. 1838. *Sertum orchidaceum: a wreath of the most beautiful orchidaceous flowers*. Ridgeway, London.
- Lindley J. 1859. *Oberonia*. *Folia Orchidacea*. An enumeration of the known species of Orchids 1: 1–8.
- McNeill J. 2014. Holotype specimens and type citations: general issues. *Taxon* 63: 1112–1113.
- McNeill J. 2015. Corrigendum to 'Holotype specimens and type citations: general issues' [Taxon 63: 1112–1113. 2014]. *Taxon* 64: 183.
- Misra S. 2004. *Orchids of Orissa*. Bishen Singh Mahendra Pal Singh, Dehra Dun.
- Mueller F. 1860–1861. *Fragmenta Phytographiae Australiae*, vol. 2. Auctoritate Gubern. Coloniae Victoriae, Ex Officina Joannis Ferres, 1858–82, Melbourne. [*Oberonia* in 1860].
- O'Byrne P. 2017. *Oberonia calcareae*, a new orchid species from Peninsular Malaysia. *Malayan Orchid Review* 51: 53–57.
- O'Byrne P, Gokusing L. 2017. Notes on Borneo orchids 4. New species, new records and emendatory notes. *Malesian Orchid Journal* 20: 31–61.
- Ormerod P. 2007. Orchidaceous additions to the flora of China and Vietnam (II). *Taiwania* 52: 307–314.
- Ormerod P. 2017. *Checklist of Papuanian Orchids*. Nature & Travel Books, Lismore.
- Prado J, Hirai RY, Moran RC. 2015. Proposal concerning inadvertent lectotypification (and neotypification). *Taxon* 64: 651.
- Priyadarshana TS, Wijewardhane IH, Atthanagoda AG, et al. 2017. *Oberonia meegaskuburae* (Orchidaceae: Epidendroideae: Malaxideae), a new species from Sri Lanka. *Phytotaxa* 302: 259–265.
- Rajbhandari KR. 2015. *A handbook of the orchids of Nepal*. Government of Nepal, Ministry of Forest and Soil Conservation, Department of Plant Resources, Kathmandu.
- Rao AN. 1996. *Oberonia katakana* Nageswara Rao – A new orchid species from Arunachal Pradesh. *Journal of Economic and Taxonomic Botany* 20: 711–713.
- Reichenbach Jr HG. 1855. *Symbolae Orchidaceae*. *Bonplandia* 3: 212–227.
- Reichenbach Jr HG. 1878. *Orchideae Wilensianae indescriptae*. *Otia Botanica Hamburgensia* 1: 50–56.
- Santapau H, Kapadia Z. 1966. *The orchids of Bombay*. The Government of India Press, Calcutta.
- Santapau H, Kapadia Z. 1960. Critical notes on the Orchidaceae of Bombay State. III. The genus *Oberonia* Lindl. *Journal of the Bombay Natural History Society* 57: 252–269.
- Schlechter R. 1911a. Beiträge zur Kenntnis der Orchidaceen-Flora von Sumatra. *Beiblatt zu den Botanischen Jahrbüchern* 45 (104): 1–61.
- Schlechter R. 1911b. *Orchidaceae novae et criticae*. *Decas XXIII–XXIV*. *Repertorium Speciarum Novarum, Regni Vegetalis* 9: 428–439.
- Schlechter R. 1934. Blütenanalysen neuer Orchideen IV. Indische und malaisische Orchideen. *Repertorium specierum novarum regni vegetabilis*, Beihefte 74: 1–9, pls 1–85.
- Schuiteman A, De Vogel EF. 2006. *Flora Malesiana: Orchids of New Guinea Vol. IV. Genera Kuhlhasseltia to Ophioglossella*. CD ROM. ETI, Amsterdam.
- Scott FH. 1853. *Routes in the Peninsula of India, comprising the whole of the Madras Presidency and portions of the adjacent territories of Bengal and Bombay, arranged and compiled from the latest original sources*. Athenaeum Press, Madras.
- Seidenfaden G. 1968. The genus *Oberonia* in mainland Asia. *Dansk Botanisk Arkiv* 25: 1–125.
- Seidenfaden G. 1973. *Botanisk Tidsskrift* 68: 47 [not seen].
- Seidenfaden G. 1978. *Orchid genera of Thailand VII Oberonia Lindl. & Malaxis Sol. ex Sw*. *Dansk Botanisk Arkiv* 33: 1–91.
- Seidenfaden G. 1992. The orchids of Indochina. *Opera Botanica* 114: 1–502.
- Seidenfaden G. 1995. Contributions to the orchid flora of Thailand XII. *Opera Botanica* 124: 1–90.
- Seidenfaden G. 1997. Contributions to the orchid flora of Thailand XIII. Olsen & Olsen, Fredensborg.
- Sennikov AN. 2015. (099–100) Two more proposals on the definition of specimens. *Taxon* 64: 1337–1338.
- Shakya LR, Chaudhary RP. 1999. Taxonomy of *Oberonia rufilabris* (Orchidaceae) and allied new species from the Himalaya. *Harvard Papers in Botany* 4: 357–363.
- Smith JJ. 1905. *Die Orchideen von Java*. Brill, Leiden.
- Smith JJ. 1913. *Die Orchideen von Java, dritter Nachtrag*. *Bulletin du Jardin Botanique de Buitenzorg*, ser. 2, 9: 1–130.
- Smith JJ. 1927. *Orchidaceae novae Malayenses*, XII. *Bulletin du Jardin Botanique de Buitenzorg*, ser. 3, 9: 138–193.
- Smith JJ. 1928. *Orchidaceae novae Malayenses*. XIII. *Bulletin du Jardin Botanique de Buitenzorg*, ser. 3, 10: 25–84.
- Smith JJ. 1933. Enumeration of the orchids of Sumatra and neighbouring islands. *Feddes Repertorium* 32: 129–386.
- Su HJ. 2000. *Orchidaceae. Flora of Taiwan*, second edition, volume 5: 729–1086. National Taiwan University, Taipei.
- Tsi Z-H, Chen S-C. 1994. New taxa of Orchidaceae from Xishuang-Banna of south Yunnan, China. *Acta Phytotaxonomica Sinica* 32: 553–562.
- Van Steenis CGGJ. 1982. Critical notes on New Guinea plants described by A. Gilli. *Blumea* 28: 165–169.
- WCSP. 2016. *World Checklist of Selected Plant Families*. Facilitated by the Royal Botanic Gardens, Kew. Available from: <http://apps.kew.org/wcsp/> [acc. 26 Dec. 2017].
- Wight R. 1851. *Icones Plantarum Indiae Orientalis*, Vol. 5, Part 1. Cramer & Swann, Weinheim. [Reprint of 1963 examined.]
- Wood JJ, Beaman RS, Beaman JH. 1993. *The plants of Mount Kinabalu*. 2. Orchids. Royal Botanic Gardens, Kew.