Blumea 65, 2020: 188–203
www.ingentaconnect.com/content/nhn/blumea

RESEARCH ARTICLE

https://doi.org/10.3767/blumea.2020.65.03.02

Studies in *Oberonia* 8 (*Orchidaceae*: *Malaxideae*). Additional 24 new synonyms, a corrected spelling, and other nomenclatural matters

D.L. Geiger[1,2]

Key words

nomenclature
taxonomic vandalism
typification
variability

Abstract The following 24 new synonyms in the orchid genus *Oberonia* are proposed, correct name (synonym(s)): *O. aporophylla* (*O. longirepens*); *O. bertoldii* (*O. gracillima*, *O. laeta*); *O. bifida* (*O. celebica*, *O. fissiglossa*); *O. brunoniana* (*O. wallichii*, *O. saintberchmansii*); *O. costeriana* (*O. vulcanica*); *O. ensiformis* (*O. vesiculifera*); *O. griffithiana* (*O. khuongii*); *O. heliophila* (*O. asperula*, *O. rivularis*, *O. inversiflora*, *O. hosokawai*); *O. obcordata* (*O. menghaiensis*); *O. pachyphylla* (*O. janae*); *O. pachystachya* (*O. trignonoglossa*); *O. rhizomatosa* (*O. repens*, *O. torana*, *O. ponapensis*, *O. chenii*, *Hippeophyllum microphyllum*); *O. spathipetala* (*O. odontopetala*, *O. pectinata*). *Oberonia anicpita* is not a distinct name introduced by Náves in F.M.Blanco but an orthographic variant of *O. anceps*, itself a synonym of *O. lycopodioides*. The spelling of several species epithets in honour of Takahide Hosokawa, a man, are corrected to *hosokawai*: *Carpesium hosokawae* (*Asteraceae*), *Glochidion hosokawae* (*Phyllanthaceae*), *Pandanus hosokawae* (*Pandanaceae*), *Psychotria hosokawae* (*Rubiaceae*), *Eria hosokawae*, *Microtatorchis hosokawae*, *Habenaria hosokawae*, *Moerenhoutia hosokawae* (all *Orchidaceae*).

Citation: Geiger DL. 2020. Studies in Oberonia 8 (Orchidaceae: Malaxideae). Additional 24 new synonyms, a corrected spelling, and other nomenclatural matters. Blumea 65 (3): 188–203. https://doi.org/10.3767/blumea.2020.65.03.02.
Effectively published online: 21 November 2020.

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, 2019, unpubl. data, Geiger et al. 2020). Here additional 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 further cases. It is incremental progress towards a more in-depth assessment of this genus at a global level.

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

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.

Some flowers from herbarium specimens were rehydrated during collection visits (B, BM, CANB, E, F, K, MEL, MICH, MO, NSW, P, SING, SOG, US, W, WU, Z). Individual flowers were soaked in warm to hot water with a bit of detergent (pulsed in a microwave oven, if available) for 5–10 minutes. The pedicelled ovary was trimmed from the flower with 2 mm blade length iris scissors, and the flower was unfurled with fine watchmaker's forceps and tungsten needles in a drop of water on a histology slide under a stereomicroscope. After coverslipping and flooding with water, the preparation was placed on top of a turned-off smart phone, which provided a texture-free deep black background. The specimen was photographed with a Canon 5DsR full-frame dSLR camera, the Canon MPE-65 macro lens, and a twin-head macro flash (Canon MT-24 or MT-26RT).

Stereomicroscope z-stack images were acquired on a Zeiss Discovery V20 with motorized focus, 0.63× and 1.5× planapochromatic lenses on a turret, and a Zeiss Axiocam HR3 rev3 camera, and Zeiss KL1500 LED fibre optics light source diffused with ping pong balls, using Zeiss Zen Blue software. dSLR z-stacks were acquired with a Cognisys Stackshot motorised focusing rail and X3 controller, a Canon 5dSR body, Zeiss 100 mm f/2.0 Makro or Canon MPE-65 f/2.8 lenses, and either a Canon twin head macro flash (MT24 or MT26RT) or a Paul C. Buff Einstein 640 studio strobe with softbox. Details on macro- and micro-photography have been given elsewhere (Geiger 2013, 2017). Some images from other publications are shown in

[1] Santa Barbara Museum of Natural History, 2559 Puesta del Sol, Santa Barbara, CA 93105, USA; dgeiger@sbnature2.org.
[2] Visiting Research Scholar, Huntington Library, Art Museum and Botanical Gardens - Botanical Division, San Marino, CA 91108, USA.

accordance with the fair use provision of copyright law. Image files were processed in AffinityPhoto.

DLG: Daniel L. Geiger, living collection, Santa Barbara. HOAG: Herbarium Oberoniarum Aliorumque Geigeri, Santa Barbara. The same live plant can be the source of multiple herbarium vouchers.

Material in B, BM, CANB, E, F, K, MICH, MO, NSW, P, SING, W, WU, and US was examined personally. Other type specimens were examined by various on-line portals (AMES: http://kiki.huh.harvard.edu/databases/specimen_index.html; BRI: https://avh.chah.org.au; L: http://bioportal.naturalis.nl/). PE specimens were examined through Lin & Yang (2015). 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 and benefit from explicit clarification in the context of this global treatment.

The morphological species concept is generally applied, explicitly taking into account intraspecific variability in accordance with population thinking in systematics, as opposed to typological thinking. Established statistical principles are applied to estimate the expected variability. Sample size and significant mean difference are inversely related to one another. For single observations (types), the expected variance is equal to that from well-known species with a large number of specimens, which is the rational behind a t-test of a single value with a mean (Sokal & Rohlf 1981). Extensive variability has been confirmed with molecular data by Li et al. (2016) for *O. jenkinsiana* Griff. ex Lindl. and its not yet formally recognized synonym *O. austro-yunnanensis* S.C.Chen & Z.H.Tsi and Geiger et al. (2020) for *O. equitans* (G.Forst.) Mutel.

Intraspecific variability in the entire genus was assessed by examination of over 3000 herbarium vouchers in the above listed repositories. Number of non-type specimens examined for each species treated here are *O. aporophylla* (20), *O. bertholdii* (0), *O. bifida* (42), *O. brunoniana* (58), *O. costeriana* (30), *O. ensiformis* (56), *O. griffithiana* (45), *O. heliophila* (48), *O. lycopodioides* (67), *O. obcordata* (31), *O. pachyphylla* (10), *O. pachystachya* (0), *O. rhizomatosa* (14), and *O. spathipetala* (16).

SYSTEMATICS

Oberonia aporophylla Rchb.f. — Fig. 1

Oberonia aporophylla Rchb.f. (1855) 223. — Syntypes: *Cuming 2113* (BM000088320, K s.n., K s.n. Drawing from type at Vienna Reichenbach Herbarium #37820 W68779. Additional pocket labelled *Cuming 2112* or *Cuming 2113* with flower parts and leaf sample. Agrees with drawing of *Cuming 2113* on herbarium sheet. Philippines in protologue; Bohol on K syntype.

Oberonia longirepens J.J.Wood in J.J.Wood et al. (2011) 434, f. 2.214. — Type: *Clemens 50250* (holo SING: not found in 8/2018, iso K 73164: not found 4/2018), [Malaysia, Sabah,] Tenompok Orchid Garden, 1500 m, *syn. nov*.

Notes — *Oberonia aporophylla* and *O. longirepens* are conspecific. The overall habit of erect stems with short imbricate leaves and creeping rhizomes (Fig. 1a, c) in conjunction with multiple floral attributes, such as the narrow petals, the presence of distinct auricles on the lip, the bilobed epichile of the lip with serrated edges (Fig. 1b, d) clearly show that the two names refer to the same species. One of the most striking characters is the creeping rhizome, typically associated with the genus *Hippeophyllum* Schltr. While Reichenbach (1855) did not mention this character in the protologue, it is found on historical herbarium records such as *Vanoverbergh 1919*, P00263280 from Luzon, the Philippines, collected in flower in

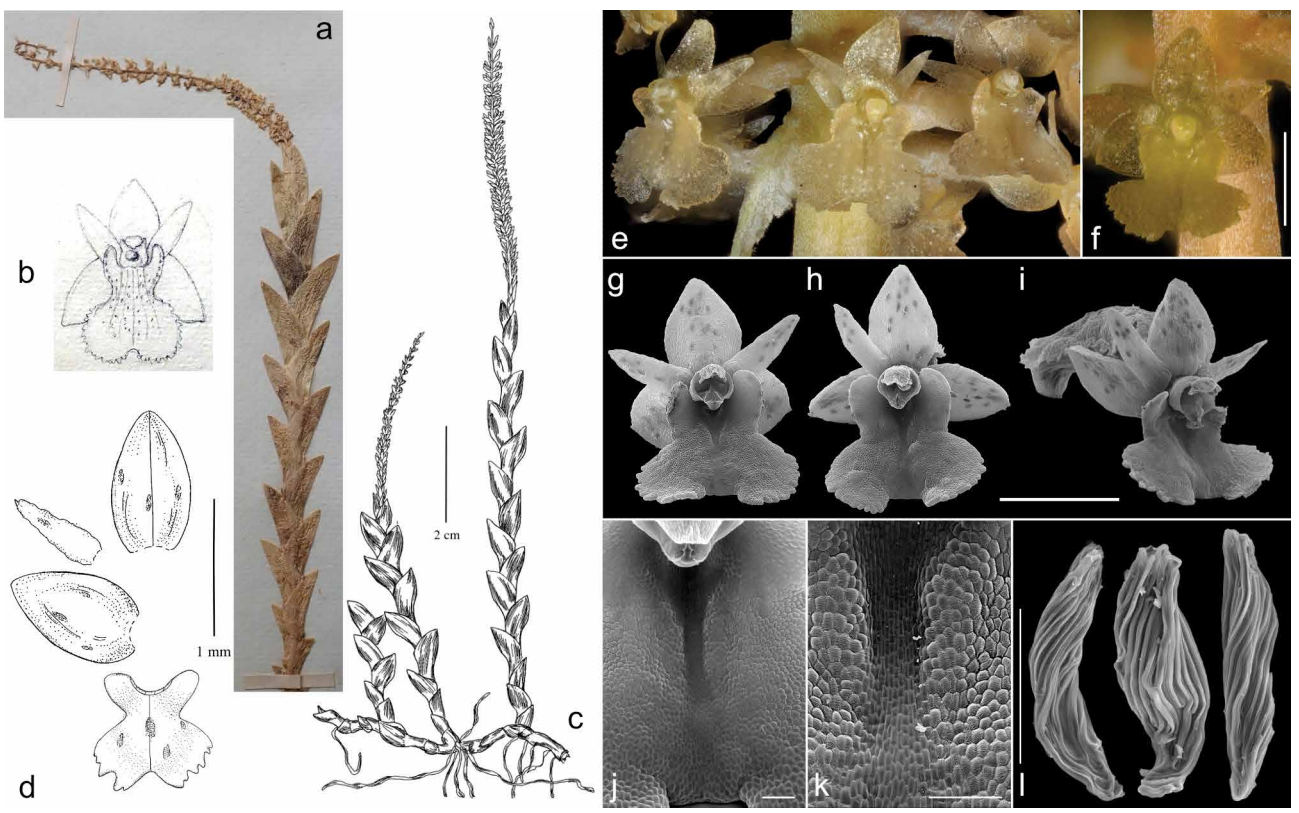

Fig. 1 *Oberonia aporophylla*. a–b. Syntype in K. a. Habit; b. flower; c–d. drawing of *O. longirepens* (a synonym of *O. aporophylla*) from Wood et al (2011): c. habit; d. sepals and petals, digitally re-arranged and scaled according to scale bars on drawings; the relative and absolute size of the floral elements are highly inaccurate, see text for details; e–f. z-stack colour photographs of *O. aporophylla*. e. Light cream form; f. yellow form with salmon rachis; g–i. SEM images of flowers; j–k. enlargement of central portion of lip showing disc; j. central portion of lip; k. details of cell surface sculptures with rugulate cells on mesochile and cross striate cells in central channel; l. seeds, from plant of Andy's Orchids nursery (e, g–h, j–k: DLG 394, HOAG 49; f: DLG 599, HOAG 248; i: DLG 599, HOAG 50). — Scale bars: f–i = 1 mm; j–l = 100 µm.

October 1912, is known from field observation in the Philippines (Ronny Boos, pers. comm.), and from horticultural specimens of Philippine provenance seen by the author (Fig. 1e–k). The probability of two species with identical vegetative growth and flowers, but with and without rhizomes, is extremely unlikely.

Wood et al. (2011) did not compare *O. longirepens* to any species occurring outside of Borneo, and only noted the distinct creeping habit and the salmon coloured flowers. The colour of the flower can vary extensively in *Oberonia* species. *Oberonia aporophylla* is known in light cream and yellow-green forms (Fig. 1e–f), with salmon rachis (Fig. 1f). The salmon colour of the flower is well within the expected range.

The illustration for the flower of O. *longirepens* might erroneously suggest different proportions of the floral elements. However, the measurements of the floral elements in Wood et al. (2011) are incongruent with the drawings, both in relative and absolute terms. The sepals as well as the petals are indicated as being 0.9 mm long, but petals are markedly smaller in the drawing compared to the sepals. Based on the 1 mm scale bar, the sepals are at least 1.0 mm long, while the petal is only 0.7 mm long. The lip is described as 0.9–1 mm long, while from top of auricles to longest projection of epichile it is 0.85 mm based on the 0.5 mm scale bar provided. From that follows, that the proportion of the sepals to lip is off by 15 % in the drawing. The implied live position of the lateral sepals is equally misleading (Fig. 1d). While the drawing shows them inclined towards the petal and median sepal, they are actually pointed away at an approximately 120° angle, as shown in the much more realistic drawing on the syntype sheet of *O. aporophylla* at K (Fig. 1b). Notice also the absence of disc and a fortiori the sac in both drawings. It is a further example that drawings are frequently highly inaccurate, even by well-respected authors in highly regarded publications.

Unfortunately, the type specimens of *O. longirepens* allegedly deposited at SING and K were not found during collection visits in 2018. The K on-line data portal does not have an image of the specimen, suggesting it was never deposited there. The fate of those type specimens is unknown. The collector is given as 'Clemens' in the protologue, while the K data portal gives J.Clemens & M.S.Clemens. As the type sheets are missing, the collector could not be verified.

A biogeographic distribution spanning from the Philippines to Borneo is well within the dispersal abilities of plants with minute seeds. The seeds of *O. aporophylla* are approximately 150 µm long (Fig. 1l), typical for *Oberonia* spp. (Barthlott et al. 2014, Geiger 2014, unpubl. data, Geiger et al. 2020).

Oberonia bertoldii King & Pantl. — Fig. 2

Oberonia bertoldii King & Pantl. (1897) 581 ('*Bertholdi*'); Holttum (1953) 222 [spelling correction, '*Bertoldii*']. — Syntypes: *Scortechini 1525* (repository unknown), [Malay Peninsula,] Perak.

Oberonia gracillima Ridl. (1905) 189. — Syntypes: *Rostados s.n.* (K 000942998, SING 0047515), Tringanu [= Terengganu, Peninsular Malaysia] at Bundi, Malaya, *syn. nov.*

Oberonia laeta J.J.Sm. (1927) 41, pl. 4, l. — Syntypes: *Backer 31514* (repository unknown), Java, Banjoemas, Kinderzee [Banyumas Regency], *syn. nov.*

Notes — The three names had been treated as synonyms already by Seidenfaden (1968) but are currently still listed as distinct by WCSP (2020), for which reason these taxa are here discussed in more detail. The oldest name, *O. bertoldii* was introduced as *O. Bertoldi* [*sic*], but requires a double -ii ending according to ICN (2018) Art. 60.8(b). That spelling was first used by Holttum (1953), though still with the customary capitalisation of the specific epithet honouring a person. Seidenfaden (1968) was the first author to use the correct and modern spelling of *bertoldii*.

Oberonia gracillima is here confirmed as a synonym of *O. bertoldii* after examination of the SING syntype. The shared characters include the habit, the broad triangular lip with short broadly bifid epichile, deeply serrated lateral petals, and broad, serrated bract. The collector is indicated as Rostado in the protologue but should be spelled Rostados according to Van Steenis-Kruseman (2017).

The habit of all three names are identical for all intents and purposes. King & Pantling (1897) noted the very short stem, and narrowly lanceolate acuminate leaves, which perfectly describes the syntype of *O. gracillima* (Fig. 2d) and illustration of *O. laeta* (Fig. 2c).

Oberonia bifida Schltr. — Fig. 3

Oberonia bifida Schltr. in K.Schum. & Lauterb. (1905) 109. — Type: *Schlechter 14081* (holo B, lost, single exemplar), on trees in the forests of the Bismarck Mountains, ~1000 m.

Oberonia celebica Schltr. (1911b) 23. — Syntype: *Schlechter 20474* (B, lost), [Sulawesi, Minahassa,] on trees in the forest of the Gunong Masrang, 1200 m, *syn. nov.*

Oberonia fissiglossa N.Hallé (1977) 274, carte 73, f. 115. — Type: *MacKee 26809* (holo P00081700; flowers originally in alcohol, dry mounted on herbarium sheet), [New Caledonia,] Ponerihouen, Mt Auoupini, 900–1000 m, *syn. nov*.

Notes — *Oberonia bifida* is a fairly common species in the Central and Western Pacific Islands. It is characterised by its caulescent habit with long falcate leaves and orange flowers,

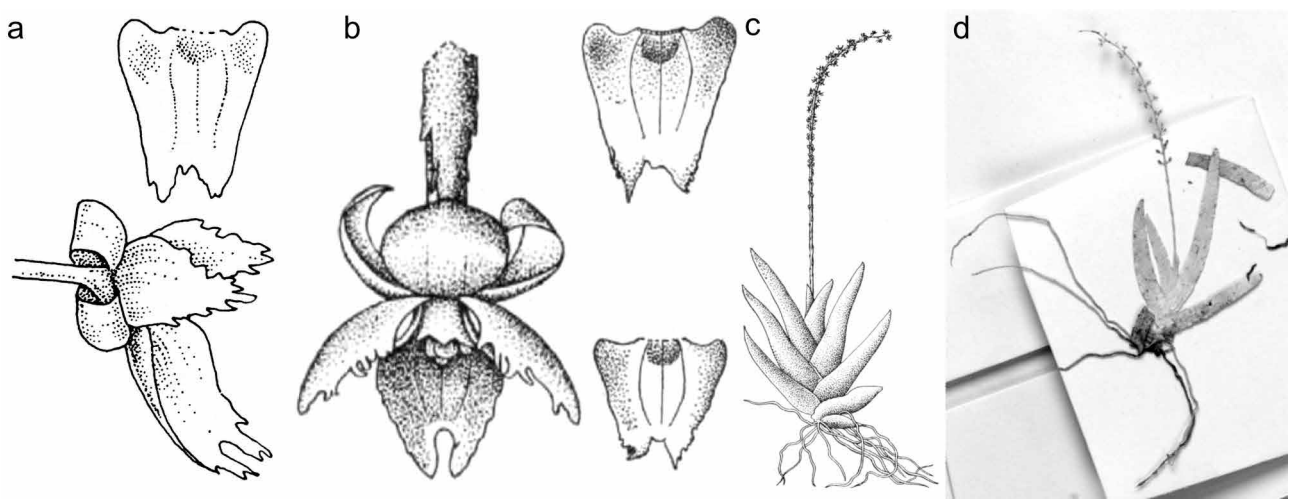

Fig. 2 a. Flower drawing of *O. bertoldii* by Scortechini from Seidenfaden (1968), with separate lip; b. drawing of flower of *O. laeta* from Smith (1927) with two lips; c. habit of *O. laeta* from Smith (1927); d. syntype of *O. gracillima* K 000942998 from K database.

acuminate bract, narrow petals, and lip with auricles, small but deep sac, darker orange disc, moderate constriction in mesochile, and bifid epichile. All those characters are shared between the correct name *O. bifida*, and two synonyms: *O. celebica* and *O. fissiglossa*. Schlechter (1911b) described his *O. celebica* with yellow-brown (= orange) flowers, and did not differentiate it from any other species. Hallé (1977) compared his *O. fissiglossa* only to *O. equitans* (G.Forst.) Mutel, and noted the brown buds. The illustrations either from the protologues or by the respective author of the three species show no differences (Fig. 3a–c).

The SEM images (Fig. 3d–i) reveal some variability in the degree of the constriction of the mesochile and the erose tips of the epichile lobes. The specimen in Fig. 3d–e is somewhat larger than the others, which may be attributable to it having been grown in cultivation. There is natural variability in size, and the less than 10 % difference seems well within natural variability.

Oberonia brunoniana Wight — Fig. 4

Oberonia brunoniana Wight (1851) 3, pl. 1622. — Lectotype (designated by Geiger 2019): *Wight s.n.* (lecto K 000387708), India, Coimbatore, Iyamally Hills, Mount Agamullu. *Wight 2914* (paralecto K 000387707), Mount Paulghautcherry.

Oberonia wallichii Hooker (1888) 681. — Syntype: *De Silva s.n.* (repository unknown), [India,] Silhet, *syn. nov*.

Oberonia saintberchmansii Kad.V.George & J.Mathew in Kad.V.George et al. (2019) 110, f. 1 (‘*saint-berchmansii*’). — Type: *K.V. George & S. Antony 0126* (holo RHK; iso MSSRF), [India,] Kerala, Idukki District, way to Nedukandam, Cardomom Hills, 3rd mile, alt. 1310 m, Jan. 2014, *syn. nov*.

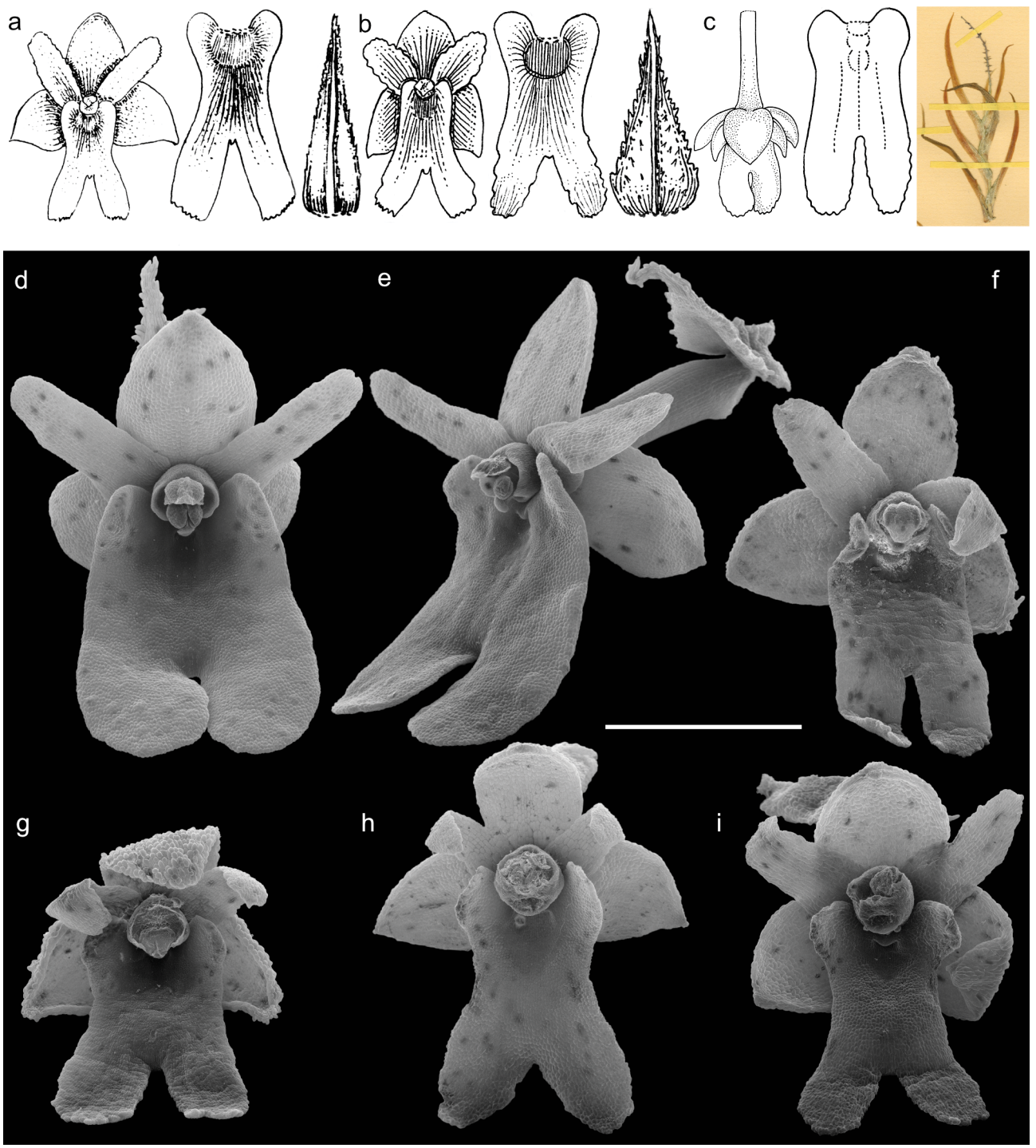

Fig. 3 *Oberonia bifida*. a. Drawing of flower, lip and floral bracts of *O. bifida* from Schlechter (1923: f. 224); b. drawing of flower, lip and floral bracts of *O. celebica* from Schlechter (1934: f. 48); c. drawing of flower (top view), lip from Hallé (1977: f. 115), and one plant from holotype of *O. fissiglossa*; d–i. SEM images of flowers of *O. bifida* (d–e. *Unknown s.n.* E00233534 from Papua New Guinea, cultivated at E; f. *Cribb S128* K44070 from Papua New Guinea; g. *Schuiteman 78* L10816 from Papua New Guinea; h. *Edwards 4163* K71390 from Irian Jaya; i. *Clements 5987* CANB 9009979 from Papua New Guinea). — Scale bar = 1 mm.

Notes — The repository of the type for *Oberonia wallichii* is unknown. Specimens in K, K 000387713 *Wallich 1948*, and K 000387690 *s. coll.* are not from the type locality nor by the indicated collector, thus they do not seem to be types. A specimen, *Lobb s.n.* K s.n., from Khasiya Hills identified by Lindley as *O. lindleyana* (= *O. brunoniana*) was identified by Hooker as *O. wallichii*, hence, constitutes an ideotype (Fernald 1939). The associated drawing of the flower on the ideotype shows a typical *O. brunoniana* morphology.

This species has been overlooked and confused. For instance, Ansari & Balakrishnan (1990) in their monograph of Indian *Oberonia*, did not mention *O. wallichii* at all. The species was distinguished by Hooker (1888) by the smaller flower of 1/20 inch = 1.25 mm, which would be on the smaller side of any known *Oberonia* species, and would be extremely small for species in Ansari & Balakrishnan's (1990) Section III. Those small-flowered specimens from Khasia in NE India were contrasted to the more typical larger-flowered 'peninsular' *O. brunoniana* s.str., i.e., those of SW India. It is interesting to note that the alleged smaller flower size has been repeated by reference to Hooker (1888), but has not been independently confirmed.

The flower size seems to vary along a north-south gradient. The dimensions for *O. saintberchmansii* from Karnataka (N9°, see below) are 3.5 mm, the flower from Myosore (N12°) shown in Fig. 4d measures 2.4 mm, while specimens from Mumbai (N19°) were indicated as < 2 mm in size (Santapau & Kapadia 1960), and Hooker's (1888) indication of 1.25 mm from Khasia (N24°). Accordingly, a latitudinal size gradient becomes evident. Without either a clear geographic break, or a distinctly bimodal size distribution, once specimens are sampled across the geographic range, no taxonomic separation seems justifiable for now. The observed differences appear to be ecophenotypical variation.

In the absence of any distinguishing characters, and the contradictory identifications of the same plant with various synonyms of *O. brunoniana*, *O. wallichii* is a further synonym of *O. brunoniana*.

Oberonia saintberchmansii is a clear synonym of *O. brunoniana*. The shared characters include the lip with broad lateral lobes, two relatively small epichile lobes, a well-defined smooth disc, narrow petals, overall fan-shaped vegetative habit of the plant. *Oberonia brunoniana* is well-known from Kerala (e.g., Ansari & Balakrishnan 1990), the type locality of *O. saintberchmansii*. There is no variant character of any kind. George et al. (2019) compared their new species only to *O. falconeri*, a species outside of Section III of Ansari & Balakrishnan (1990) to which *O. brunoniana* and allied species belong. In fact, George et al. (2019) did not even cite Ansari &

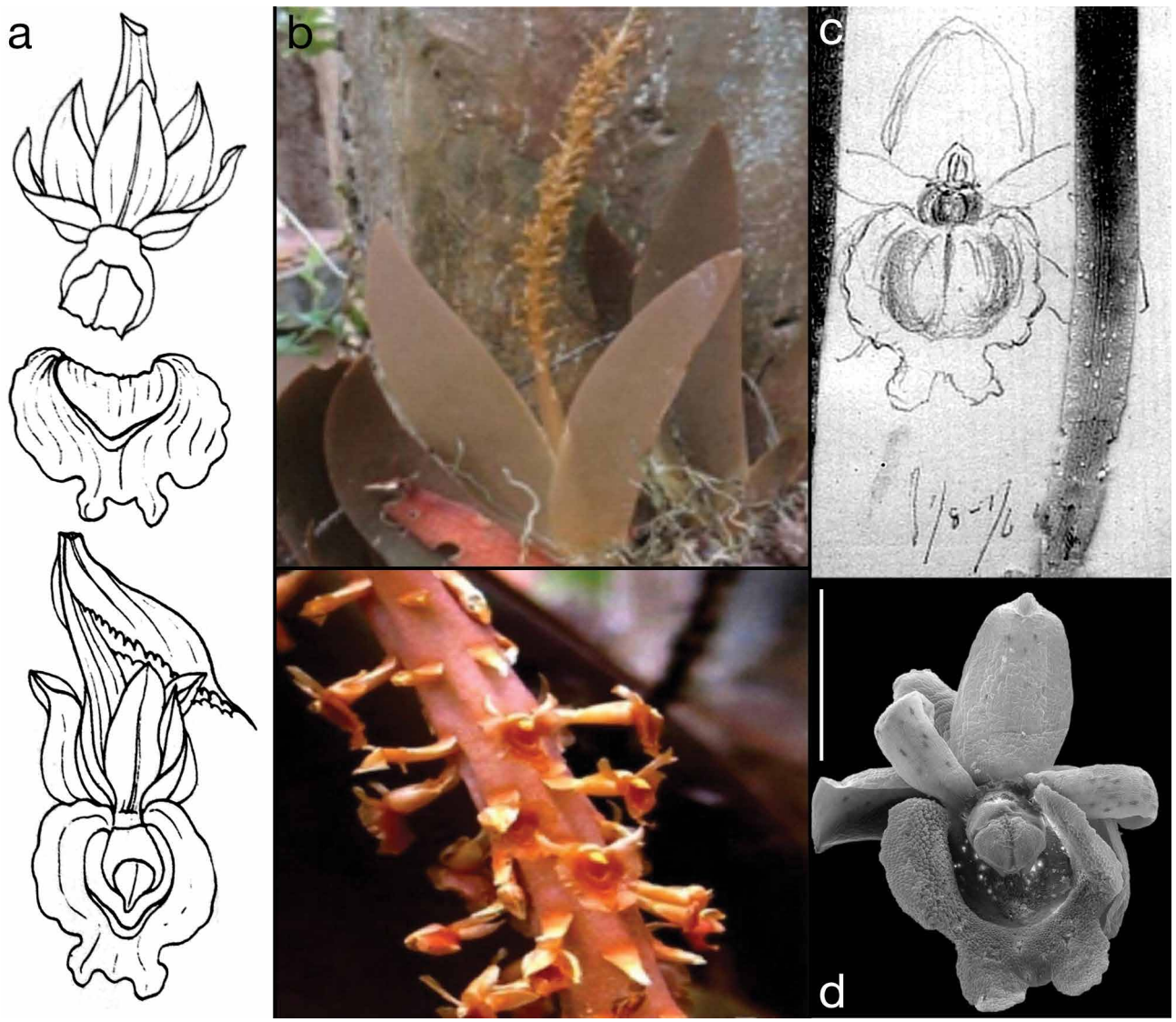

Fig. 4 *Oberonia brunoniana*. a. Illustrations of the flowers of *O. brunoniana* from Wight (1851); b. illustration of *O. saintberchmanii* from George et al. (2019); c. drawing of the flower on lectotype of *O. brunoniana* (from http://specimens.kew.org/herbarium/K000387708); d. SEM image of flower. *Barnes 2098* K24122, Mysore, India. — Scale bar = 1 mm.

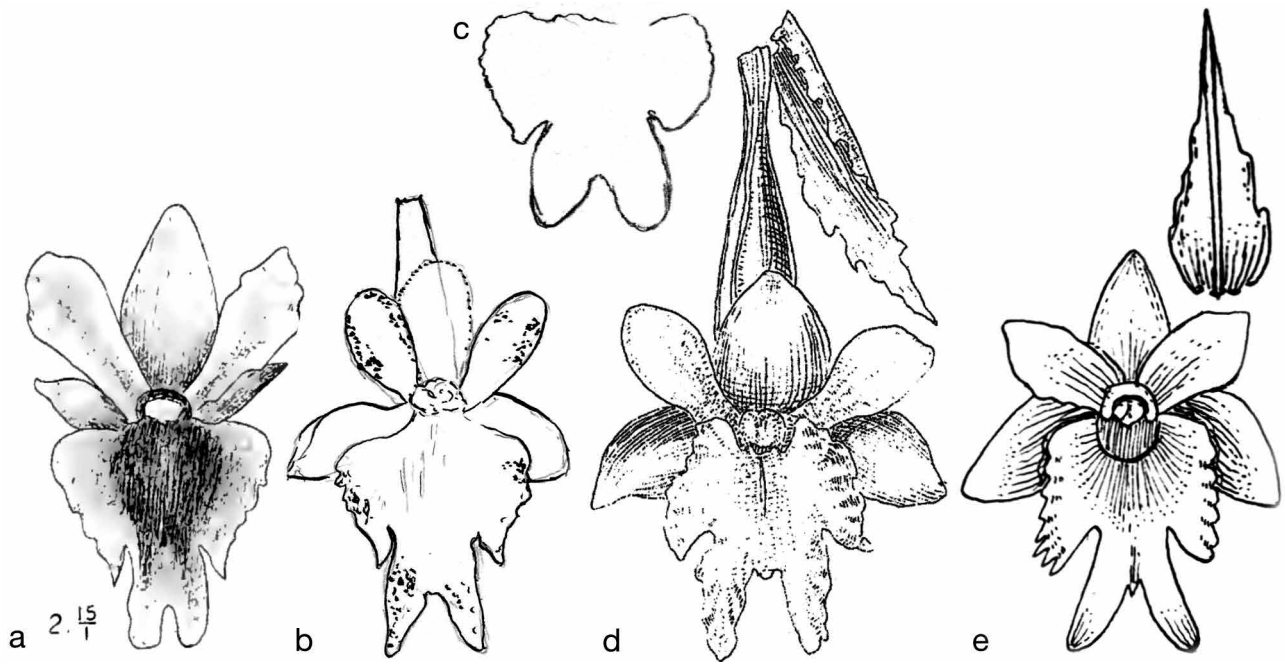

Fig. 5 *Oberonia costeriana*. a. Illustration of the species by J.J. Smith, from Schuiteman & De Vogel (2006); b. drawing of *O. elmeri* from syntype *ADE Elmer 8434* (AMES); c. drawing of the lip on type sheet of *O. obesa* (AMES 14194); d. drawing of *O. kinabaluensis* from Ames (1920); e. drawing of *O. vulcanica* flower and floral bract from Schlechter (1934: pl. 18, f. 96).

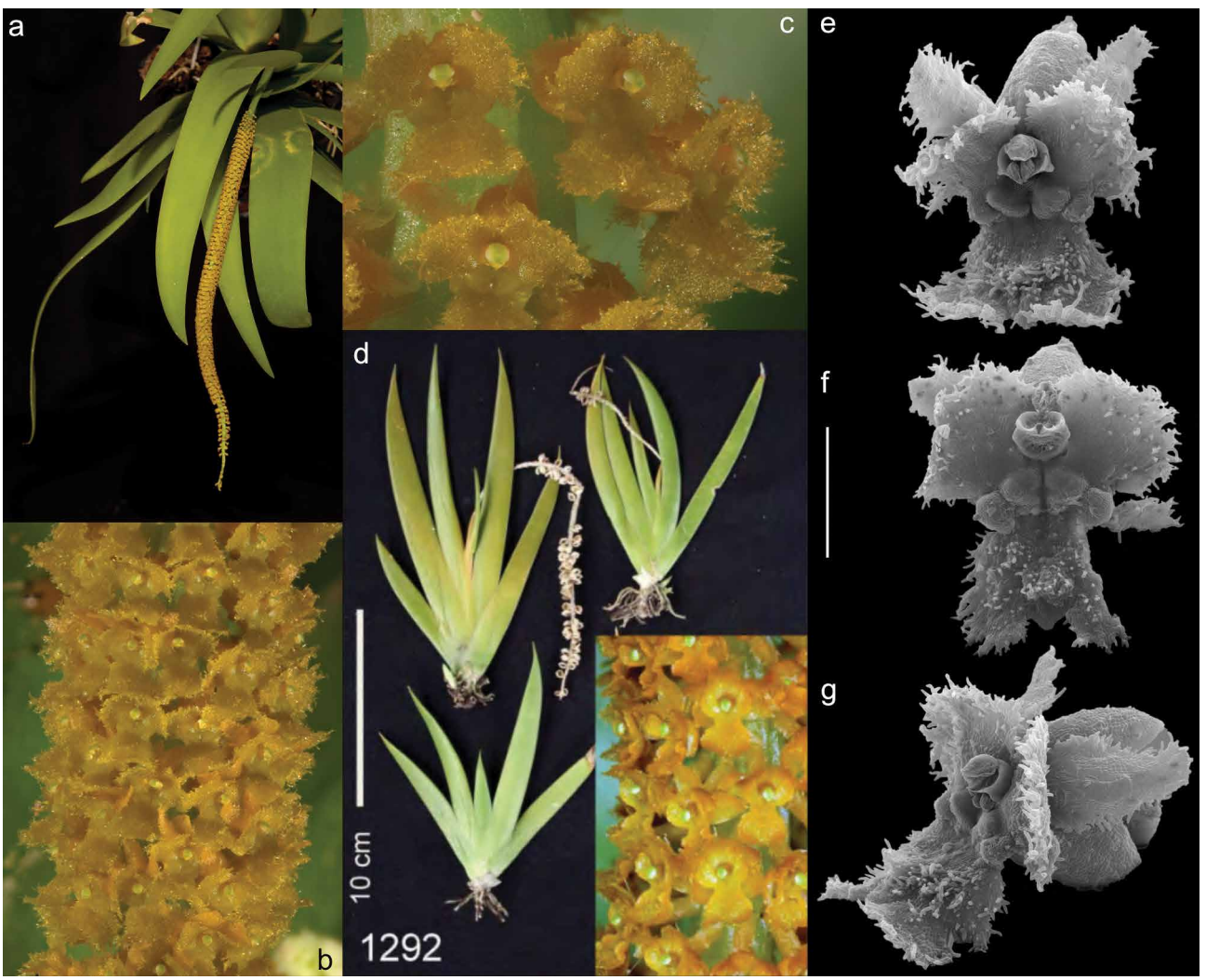

Fig. 6 *Oberonia ensiformis*. a–c. Photograph and z-stack micrographs of cultivated specimen DLG 570, HOAG 18. a. Habit; b. portion of inflorescence; c. individual flowers; d. illustrations of *O. vesiculifera* from Averyanov et al. (2019); e–g. SEM images of flowers; e, g. DLG 570, HOAG 18; f. DLG 572, HOAG 16. — Scale bar: e–g = 1 mm.

Balakrishnan (1990), a key work on *Oberonia* of India. Schuiteman (pers. comm.) has indicated the synonymy previously. Additional synonyms of *O. brunoniana* were recently discussed by Geiger (2019).

Oberonia costeriana J.J.Sm. — Fig. 5

Oberonia costeriana J.J.Sm. (1905) 244. — Syntypes: *Blume s.n.* (L 0061737), [Indonesia, Java] Mount Gede, at the water fall, parasitic; *De Monchy s.n.* (repository unknown), [Indonesia, Java,] Krawang; *Junghuhn s.n.* (L 0063834); *J.J. Smith s.n.* (repository unknown), [Indonesia,] Pekalongan, Djolotigo; *J.J. Smith s.n.* (repository unknown), [Indonesia,] Sumatra; *unknown collector s.n.* (repository unknown), Indonesia, Java, Buitenzorg [= Bogor], Bobodjong.

Oberonia vulcanica Schltr. (1911b) 24; (1934) pl. 18, f. 96. — Syntype: *Schlechter 20509* (B, lost), [Indonesia,] on trees in the forest of the Gunong Mahawo (Minahassa), Sulawesi, 1200 m, *syn. nov.*

Notes — *Oberonia costeriana* has several synonyms (Geiger 2019), such as *O. elmeri* Ames (Fig. 5b), *O. kinabaluensis* Ames & C.Schweinf. (Fig. 5d), *O. obesa* Ames (Fig. 5c), and *O. gigantea* Fukuy. Here one further taxon, *O. vulcanica*, is identified as conspecific with *O. costeriana* (Fig. 5e). The shared characters include the trapezoidal lateral lobes with downward pointed tips, the bifid epichile, the rhombic petals and the acuminate acute floral bract with erose margins, and the dirty orange colour (fox-brown in Schlechter 1911b: 24). The description of the habit also matches *O. costeriana* (acaulescent with falcate-linear leaves).

Oberonia ensiformis (Sm.) Lindl. — Fig. 6

Oberonia ensiformis (Sm.) Lindl. (1859) 4. — *Malaxis ensiformis* Sm. (1812) *Malaxis* #14, [p. 180]. — Lectotype (first step designation by Ansari & Balakrishnan (1990: 27): *Hamilton-Buchanan s.n.* (LINN-HS 1396.11.1–2), Nepal, Narainhetty. *Buchanan s.n.* (questionable isolecto BM000088250), Nepal.

Oberonia vesiculifera Aver. in Aver. et al. (2019) 151, f. 1292. — Type: *AL 965/1* (holo LE 01048682), 300–530 m, [Vietnam,] Nam No Npa [inferred from title]; *AL 920* (para LE 01048684), 400–600 m, [Vietnam,] Nam No Npa [inferred from title], *syn. nov.*

Notes — The identity of *O. ensiformis* is rather uncontroversial, despite the fact that the protologue did not contain any illustrations and that images of the type are not available. The written account of the species by Smith (1812) describing it having sword-shaped leaves with basal abscission scar and dull orange flowers with ovate sepals and petals and a four-lobed lip only matches one species occurring in India, namely what is commonly referred to *O. ensiformis* (e.g., Ansari & Balakrishnan 1990). Despite the long chresonymy for the species, there are surprisingly few herbarium specimens, with not a single fluid preserved sample in any institutional repository visited or contacted.

Ansari & Balakrishnan's (1990: 27) reference to "Type: Hammilton-Buchanan s.n. ... (LINN)" constitutes a first-step lectotypification. Averyanov (2013) cited LINN as holotype, most likely not aware of the two sheets.

Averyanov et al. (2019) distinguished *O. vesiculifera* from *O. ensiformis* solely on the basis of vesicles or calli above the constriction in the middle of the lip. The presence of those calli has been documented in *O. ensiformis*, for which reason *O. vesiculifera* is an obvious synonym of *O. ensiformis*. It is unclear what Averyanov considered '*ensiformis*'. He did not refer any of his previously illustrated *O. ensiformis* with calli (e.g., *CPC 1887* Averyanov 2013: f. 76b,c) to his new taxon.

The reporting and illustration of those calli is rather variable. They can be recognized in the photograph of Ansari & Balakrishnan (1990: pl. 2b) from India, Raskoti (2009: 191, text-fig.) from Nepal, and Averyanov (2013: f. 76c) from Vietnam. Seidenfaden & Smitinand (1959), Seidenfaden (1968, 1978), Abraham & Vatsala (1981), Pradhan (1979), Ho (1993), Chen et al. (1999), and Lucksom (2007) show them clearly on their drawings. However, usually only a single callus is evident. The otherwise exquisite colour drawing in Hooker (1858: f. 5), though misidentified as *O. acaulis*, and King & Pantling (1898: pl. 9) also alluded to them. The drawings in Ansari & Balakrishnan (1990) and Averyanov (2013: f. 77h) do not show a trace of those calli, but the written description in both referred to pairs of minute calli. Given the numerous demonstrated inaccuracies in drawings of *Oberonia* flowers (Geiger 2019) I consider those inconsistencies are problems with drawings rather than representing additional species. SEM images always show the dual calli. The claim that the species with dual calli is microendemic to the type locality in Vietnam is demonstrably false.

Misra (2004) considered the specimens from Orissa to be distinct at the species level because of slightly different distribution of the calli on the lip. Such a statement cannot be found in the subsequent edition (Misra 2014), which suggests that he reconsidered his earlier statement and regarded the observed differences to lie within intraspecific variability. Given the rather slight nature of differences, the details of callus morphology are taxonomically insignificant.

Oberonia griffithiana Lindl. — Fig. 7

Oberonia griffithiana Lindl. (1838) t. 1779/t8B. — Syntypes: *Griffith s.n.* (*Griffith 355* K 00097422), Burma [= Myanmar], Moulmein [= Mawlamyine].

Oberonia khuongii Aver. & V.C.Nguyen in Aver. et al. (2019) 185, 188, f. 8. — Type: *Van Canh Nguyen AL 437* (holo LE01042183), [Vietnam,] Dak Nong province, Dak Song district, ~700 m, *syn. nov.*

Notes — Averyanov et al. (2019: 185) referred to their figure 8 as a 'digital epitype'. As the figure is part of the protologue and original material, it cannot be an epitype per ICN (2018) Art. 9.9 and glossary.

Oberonia khuongii is identical to *O. griffithiana*. Shared characters include the caulescent habit, the narrow petals with irregular edges, the lip with multiply incised lateral lobes, the bifid epichile, and the granular surface of the lip. The species was mainly compared to *O. cavaleriei* Finet with terete leaves. *Oberonia griffithiana* was mentioned in the remarks, but no discriminating characters were given. Averyanov et al. (2019: f. 8) illustrated some interesting colour morphs. The red dots on the leaves are taxonomically not meaningful. A similar case is found in *O. punctata* J.J.Sm. (with dots) and *O. subanajamensis* J.J.Sm. and *O. caprina* Gilli without (Geiger 2019).

It is interesting to note that the authors of *O. khuongii* were well aware of the identity of the specimen as *O. griffithiana* through personal communication by the present author, but introduced the new name anyway without further discussion or justification.

Oberonia heliophila Rchb.f. — Fig. 8, 9

Oberonia heliophila Rchb.f. (1878) 56. — Lectotype (designated by Kores 1989): *U.S. Exploring Expedition s.n.* (lecto W37726), Fiji, Vanua Levu, Mountains of Mathuata Province. Paralectotypes: *U.S. Exploring Expedition s.n.* (W Reichenbach 37727 W68809), Samoa, Ovalau; *U.S. Exploring Expedition s.n.* (US 37773) Samoa; *Seemann 587* (AMES 00101970, BM000088475, K 00079501, K-L s.n., P [?: see notes], W 37711), [Fiji,] Viti Levu, Tailevu Province, Namara; *Graeffe s.n.* (repository unknown), Upolu, Samoa; *Whitmee s.n.* (BM 000082108, K 00079502), [Samoa,] Sawai'i.

Oberonia asperula J.J.Sm. (1908) 30. — Syntypes: *Versteeg 1322* (BO, L0061733), [Indonesia,] S. New Guinea (L type label), Noord River, at foot of Nepenthes Hill (protologue), on trees in *Metroxylon* swamps (Smith 1909), *syn. nov.*

Oberonia rivularis Schltr. in K.Schum. & Lauterb. (1905) 115. — Syntypes: *Schlechter 13801* (B, lost, K 00079467 [no flowers]), [Papua New Guinea,] at the riverboard of the Nuru mid-section, ~200 m, *syn. nov.*

Oberonia (Sect. *Scytoxiphium*) *inversiflora* J.J.Sm. (1912) 487 ('*inversiflorum*'). — Type: *Lorentz Exp. 1909, Rachmat live plant number 431* (syn BO

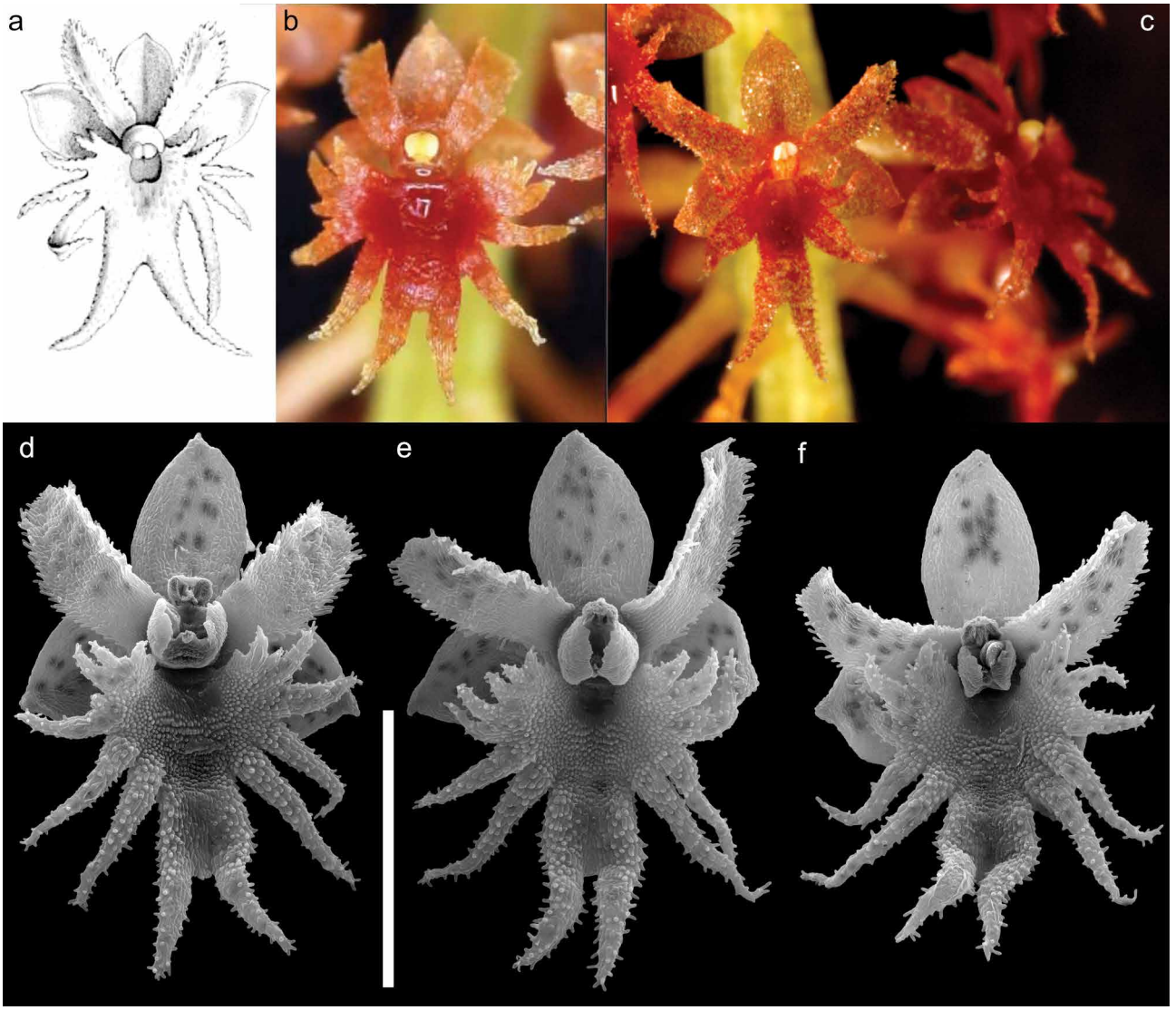

Fig. 7 *Oberonia griffithiana*. a. Illustration from Lindley (1838); b. representative figure of *O. khuongii* from Averyanov et al. (2019); c–f. HOAG 148 ex Stadtgärtnerei Zürich, Switzerland; c. flower; d–f. scanning electron micrographs. — Scale bar = 1 mm.

Bogor cult.). *Exp. s.n.* (possible syn L 0061748), *s. coll.* (possible syn BO 0071552, L 0727884, U.1459111, U.1459112), without locality 'Cult in Hort. Bog.' signed by J.J. Smith, Dutch New Guinea, hills near Alkmaar, *syn. nov.*

Oberonia hosokawai Fukuy. in Hosok. (1941) 290 ('*hosokawae*'). — Syntypes: *Hosokawa 9599* (syn AMES 67290/Harvard Barcode 114495, L0061745, MICH 1115255, TAI 118740, US 2036596), Micronesia, Ponape, Mount Asama-san, 500–800 m (protologue), US label 500–200 m, *syn. nov.*

Notes — The types of *O. heliophila* were treated in detail by Kores (1989). His cited 'isolectotype' AMES 3034 is not recorded in the AMES herbarium catalogue. AMES 3034 was cited for multiple localities, which suggest that multiple specimens from several different gatherings were mounted on one herbarium sheet. Given the large size of the plant, an alternate interpretation is that AMES 3034 does not refer to a specimen registration number, but an accession number of an entire collection. A specimen of *Seemann 587* at P according to Kores (1989) could not be found in the P collection or catalogue.

Oberonia asperula is a synonym of *O. heliophila*. The shared characters (Fig. 8e) include the very large plant size in the genus, the acaulescent habit and long acuminate, fleshy leaves. The flower with the thick trapezoidal lip, the narrow oblong petals, the broad, reflexed and pubescent sepals, the pubescent pedicelled ovary, the broad strongly double incised bracts, the very short column, and the green coloration of the flower.

Oberonia rivularis is a clear synonym of *O. heliophila* after examining syntype material of both taxa. The large size of the plant, the flowers in well-separated whorls, the green lip with tan remaining tepals, the broad ovate-acuminate lip with serrated margins all support the synonymy (Fig. 8c). Schlechter in Schumann & Lauterbach (1905) noted that *O. rivularis* is the smallest of the section *Scytoxiphium* Schltr. in New Guinea, a statement copied by O'Byrne (1994). It is unclear what may have led Schlechter to such a statement because in terms of vegetative size, it is amongst the largest species.

The possible syntypes of *O. inversiflora* in L are difficult to assess. Only one specimen identified by J.J. Smith as *O. inversiflora* (L 1513897) can positively be excluded, because of a collection number mismatch (C 278 on sheet, *Rachmat 431* in protologue). The other specimens can neither be confirmed nor excluded. The 1912 and 1913 Soeda Sublimaat [= Soda sublimate = mercury chloride] dates are pest treatment dates, and not collection dates.

Oberonia inversiflora shares multiple characters with *O. heliophila* (Fig. 8d). It is an unusually large plant for the genus with leaves to 40 cm long and has a very compressed vegetative axis. The flowers share the deeply incised bract, the very hairy pedicelled ovary, the few hairs on the back of the sepals, the straw to pale brown sepals, the thick, light green lip with small triangular side lobes and broad ovate apical lobes. There are no characters that could support a separate status. The illustration of *O. inversiflora* by Smith (Fig. 8d) shows somewhat wider petals. Those fall within the range of variability found by

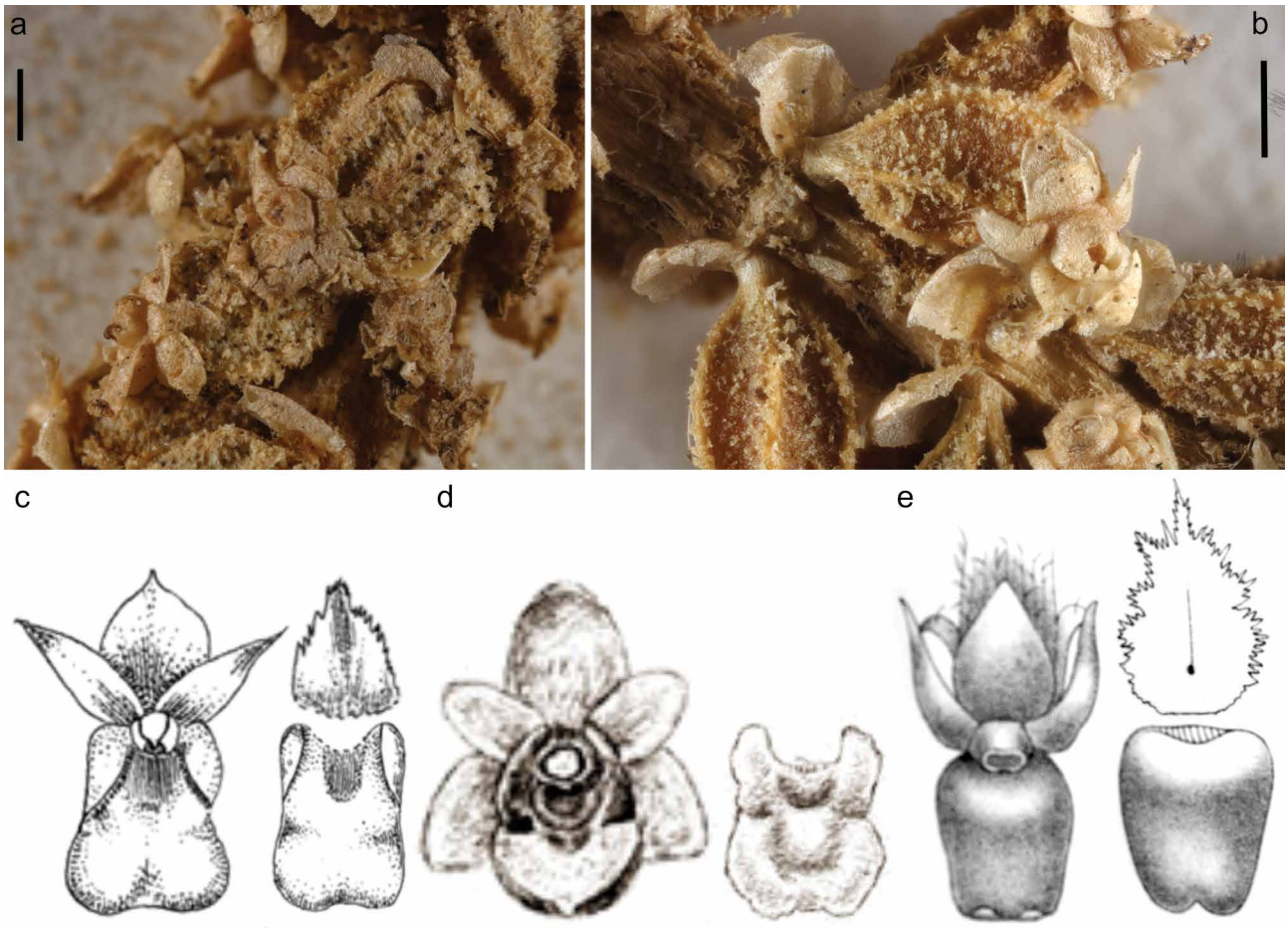

Fig. 8 *Oberonia heliophila*. a. Flowers from lectotype *U.S. Exploring Expedition s.n.* W37726 of *O. heliophila*; b. flowers on MICH syntype of *O. hosokawai*; c. original figures of *O. rivularis* from Schlechter (1923); d. drawing of flower of *O. inversiflora* by J.J. Smith (from Schuiteman & De Vogel 2006); e. illustration of flower of *O. asperula* from Smith (1909). — Scale bars: a–b = 1 mm.

examination of multiple flowers by SEM (Fig. 9), accordingly, are taxonomically meaningless. *Oberonia heliophila* is known from Papua New Guinea. Accordingly, the two species are synonyms.

The spelling of the species introduced as *O. hosokawae* [*sic*] has to be corrected. The species was named in honour of the collector of the plant Takahide Hosokawa, a man. In accordance with ICN (2018) Art. 60.8a, the spelling of the name is here corrected from *O. hosokawae* to *O. hosokawai*. There are an additional eight species epithets that need to be corrected as well: *Carpesium hosokawae* Kitam. (*Asteraceae*), *Glochidion hosokawae* Fosberg (*Phyllanthaceae*), *Pandanus hosokawae* Kaneh. (*Pandanaceae*), *Psychotria hosokawae* Fosberg (*Rubiaceae*), *Eria hosokawae* A.D.Hawkes & A.H.Heller, *Microtatorchis hosokawae* Fukuy. (now *Taeniophyllum hosokawae* (Fukuy.) L.O.Williams), *Habenaria hosokawae* Fukuy., *Moerenhoutia hosokawae* (Fukuy.) Tuyama (all *Orchidaceae*). There is one properly formed name, *Cirsium hosokawai* Kitam. (*Asteraceae*). The type repository for *O. hosokawai* was not specified in the protologue, for which reasons all specimens of the type gathering are syntypes.

Oberonia hosokawai is a synonym of *O. heliophila*. The shared characters include the very large size of the plant with slightly falcate leaves in an acaulescent fan, the broad floral bract with serrated margin, the narrow acuminate petals, the thickened lip with broad ovate basiochile, short and thick column, hairs on fruit (MICH 1115255: Fig. 8b). Further supporting evidence includes that Hawkes (1952) placed the species in the section *Scytoxyphium*, to which *O. heliophila* belongs.

Oberonia lycopodioides (J.Koenig) Ormerod

Oberonia lycopodioides (J.Koenig) Ormerod in Seidenf. (1995) 21. — *Epidendrum lycopodioides* J.Koenig (1791) 21. Lectotype (designated by Averyanov 2013): *Koenig s.n.*, 5 Sept. 1779 (lecto K: not seen in 2018, not in K database; isolecotype LIV), [Peninsular Malaysia,] Malacca.

Notes — *Oberonia ancipita* used by Náves in Blanco (1880: 230) with 'type' *Cuming 2115* (BM 000088321, K s.n., L.1513842, MO 125587, Philippines; Bohol on one portion of K sheet) has been identified as a synonym of *O. lycopodioides* (e.g., Bunpha et al. 2019, WCSP 2020). Náves referred to '*Malaxis ancip*. Rchb.f. in Walp l. c. 214 ex Vidal ms Philipp, fide'. The entry by Náves was not intended to be an introduction of a new name as he clearly attributed the name *ancipita* to Lindley, and also cited '*Malaxis ancip*. Rchb in Walp. l. c. 214' (= Reichenbach 1861: 214). The confusion might have started with Reichenbach (1855: 223) inflecting Lindley's species epithet *anceps* in his Latin text: 'aff. O. ancipiti; quae in affinibus anciptibus Lindl.; In O. ancipiti (e.g., Cuming 2115)'. The ancip... spelling is only found in Reichenbach (1855: in Bonplandia) and not in Reichenbach (1861). It suggests that Náves' reference to 'Rchb.f. in Walp.' is a further error and should have referred to Bonplandia. The mention of *Cuming 2115* by Náves, copied from Reichenbach (1855) and not found in Reichenbach (1861), should be regarded as a voucher for the presence of the species in the Philippines, and not as a type designation. *Oberonia ancipita* is an orthographic variant of *Oberonia anceps* by Náves without any nomenclatural consequences. Vidal (1886: 266) referred to *O. ancipita*, Lindl.? (*Malaxis anceps* Reichb.f.) so wondered whether *ancipita* was a Lindley name, not a Náves name. It is further evidence that Náves never intended to introduce a new name, and that it was not perceived as a new name by his con-

Fig. 9 *Oberonia heliophila* SEM images. a. *Schuiteman 90/555* L23197 from Papua New Guinea; b–c. *Harris 1514* L19688 from Papua New Guinea; d. *de Vogel s.n*. L20059 from New Guinea; e. *Mulder s.n*. L22448 from Fiji; f. *Hunt 2226* K28510 from the Solomon Islands. — Scale bar = 1 mm.

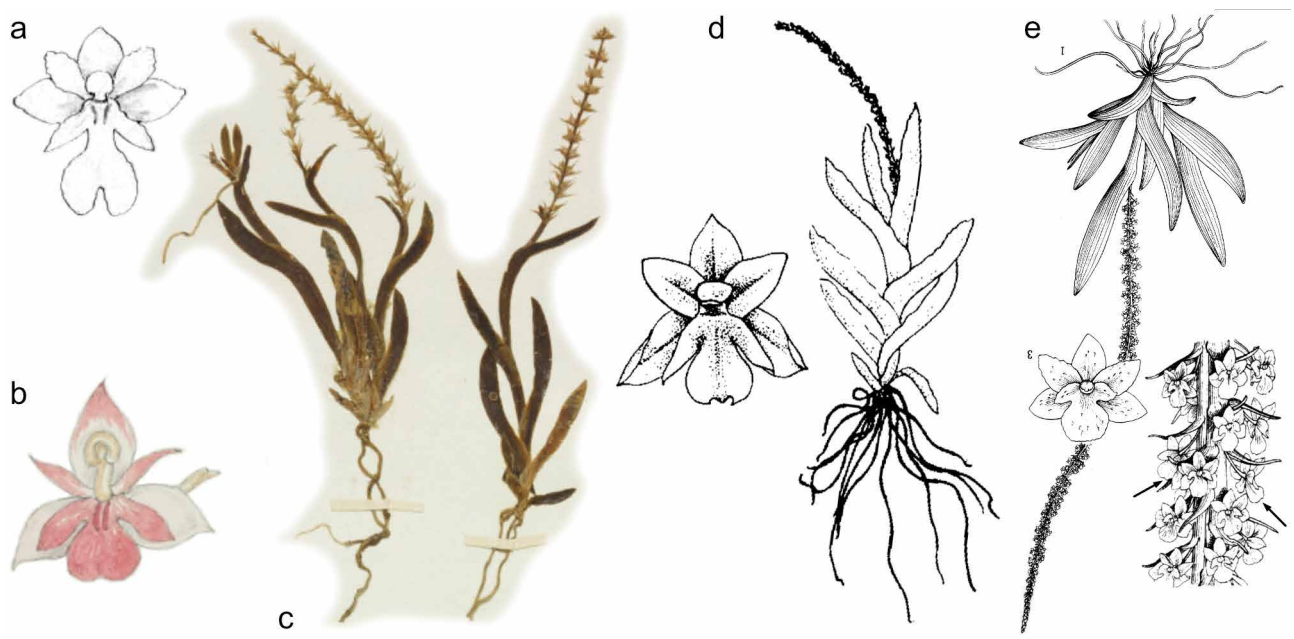

Fig. 10 *Oberonia obcordata*. a. Drawing of flower from *Griffith s.n.* K 000974238; b. drawing of flower from *Hooker f. & T. Thomson 112* (K 000974237); c. habit of *Hooker f. & T. Thomson 112* K 000974237; d. illustration of *O. delicata* from Tsi & Chen (1994); e. *Oberonia menghaiensis* illustration from Chen (1982).

temporaries. It is not clear when the orthographic variant was given the status of a distinct taxon; Merrill (1924: 307), Kress et al. (2003) and Bunpha et al. (2019) are the only known sources that use the name, in all cases as a synonym of *O. anceps* or *O. lycopodioides*. A contributing factor for the confusion could be the rarity of the work. A copy could be examined in the P library. *Cuming 2115* has been confirmed to be *O. lycopodioides* by the present author. Náves introduced known orthographic spelling variants such as *Phalaenopsis lueddemannii* for *P. lueddemanniana* Rchb.f. Accordingly, treating *Oberonia ancipita* as an orthographic variant has a precedent with other 'names' in Náves (in Blanco 1880).

Oberonia obcordata Lindl. — Fig. 10

Oberonia obcordata Lindl. (1859) 7. — Syntypes: *Griffith s.n.* (K 000974238), [India,] Darjeeling; G*riffith s.n.* (K 000974231), [India, Meghalaya,] Khasia Myrung; *Hooker f. & Thomson 112* (K 000974237), [India,] Sikkim, 2000 ft.
Oberonia menghaiensis S.C.Chen (1982) 190, f. 1.1–3. — Syntypes: *C.W. Wang 76269* (AMES 50102/Harvard Barcode 00101993, PE 1641349/barcode 27299 (see Lin & Yang 2015: text-fig. p. 335), PE 1641348/barcode 273000), China, Yunna, Menghai, Hei-lung-tan, 1800 m, *syn. nov*.

Notes — Chen (1982) referred to the gathering as a 'holotype', but did not specify a repository, for which reason any specimen from that gathering is a syntype. The specimen has been identified on the PE type sheets as *O. obcordata* in 1973. The shared characters include the caulescent habit with falcate leaves widest in the lower third of the leaf's length, the ovate petals with erose margins (variable in the species from more club-shaped to broad-base oblong), the incised lip with downturned lateral lobes. The lip is not shown bilobed in the main figure, but the insert (Fig. 10e insert: arrows) shows at least some flowers with the more typical indentation of the apical lobe. The indentation is variable in the species as shown on the type sheets of *O. obcordata* (Fig. 10a, b). In conclusion, *O. menghaiensis* is a synonym of *O. obcordata*.

Oberonia pachyphylla King & Pantl. — Fig. 11

Oberonia pachyphylla King & Pantl. (1898) 5, pl. 4. — Lectotype (designated by Seidenfaden 1968: 102, inadvertent lectotype designation by reference to CAL!, type): *Pantling 429* (CAL), [India,] near the base of the Sikkim-Himalaya, at Salgurra near Siliguri, 900 ft.
Oberonia janae Aver. in Aver. et al. (2015) 171, f. 12C, 14. — Type: *Leong–Skornickova et al. JLS-2678* (holo SING [not found in Oct. 2018]; iso LE, VNMN), Vietnam, Binh Thuan province, Bac Binh district, Phan Son commune, Sa Mai mountain, N11°29'36.6" E108°20'18.2", 824 m, *syn. nov*.

Notes — *Oberonia janae* is a synonym of *O. pachyphylla*. Averyanov et al. (2015) compared the two species and noted as differentiating characters the more deeply incised serrations on the lateral lobes of the lip and the papillae/hairs on the back of the sepals. The depth of the serration appears to be variable based on various illustrations in the literature (Seidenfaden 1968: f. 69, see Fig. 11e–g, Pradhan 1979: text-fig.; Ansari & Balakrishnan 1990: f. 33, see Fig. 11g). The backside of the sepals has never been illustrated, yet Averyanov et al. (2015) did not cite voucher material for *O. pachyphylla* s.str. Ansari & Balakrishnan (1990) described the sepals as gland dotted and illustrated it with small circles over the surface. That description was based on the lectotype, a pressed specimen. Proper glands are unknown on the flowers of *Oberonia*, but pressed hairs may appear like glands. Accordingly, this alleged differences has not been properly documented. Additionally, the cited difference in the erose margin of the bract is in error, as the illustration of King & Pantling (1898: pl. 4, see Fig. 11c) showed that serrations clearly in the protologue of *O. pachyphylla*. The shared characters include the habit (Fig. 11a, h), the fleshy leaves, the subsessile flowers, the bract with erose margin of the bract (Fig. 11c, l), the overall shape of the lip with incised lateral lobes (Fig. 11b, d–g, i–k). The distribution of *O. pachyphylla* s.str. encompasses Vietnam and neighbouring countries (e.g., Averyanov 2013), making a microendemic cryptic species even more unlikely.

The case of *O. equitans* and its 10 synonyms confirmed by molecular phylogeny and SEM investigations of the flowers shows the extensive phenotypic plasticity in *Oberonia* spp. (Geiger et al. 2020). The variability of lateral processes is equally well documented in other species such as *O. insectifera* Hook.f. (Geiger 2019), as well as in *O. pachyphylla* discussed above. Accordingly, the variety named in Averyanov et al. (2015) does not justify species-level recognition; it falls well within intraspecific variability.

Oberonia seidenfadenii (H.J.Su) Ormerod appears to be another likely synonym of *O. pachyphylla*. As I have not yet been able to track the protologue in the Journal of the Experimental Forest of National Taiwan University, I cannot address it with sufficient confidence.

Oberonia pachystachya Lindl. — Fig. 12

Oberonia pachystachya Lindl. (1859) 6. — Syntypes: *Catlett 37* (K s.n.; illustration of type lot in W35392). S.[outh] Sea Islands.

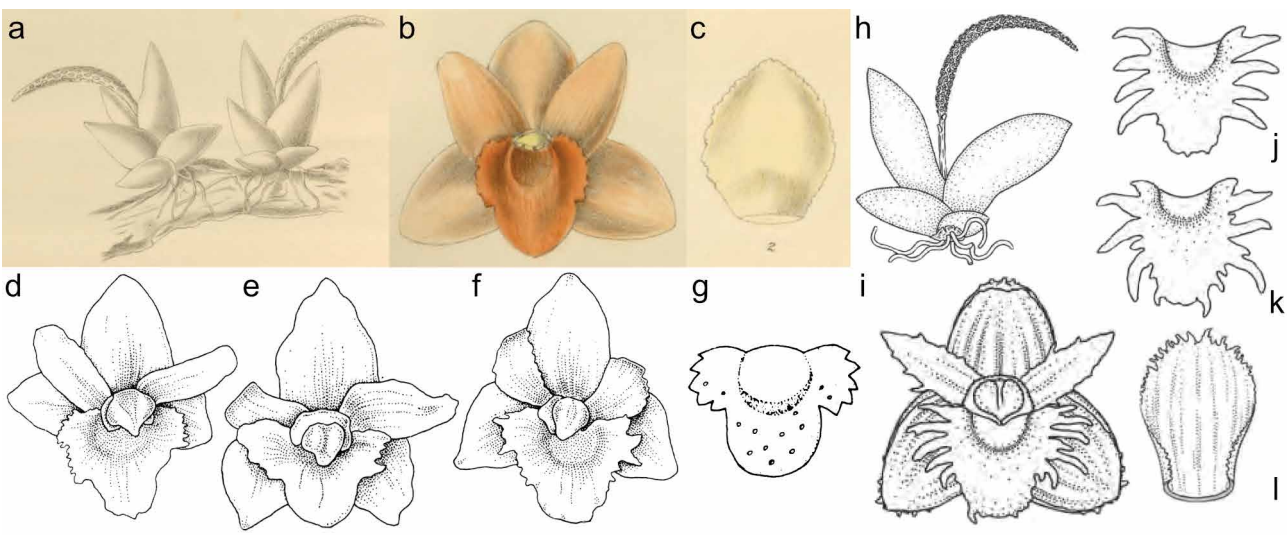

Fig. 11 a–c. Illustrations of *O. pachyphylla* from King & Pantling (1898: pl. 4). a. Habit; b. flower; c. bract; d–f. drawings of flowers from Seidenfaden (1968: f. 69) showing the variability of the serrations along the lateral lobes of the lip; g. drawing of lip from lectotype *Pantling 429* CAL by Ansari & Balakrishnan (1990: f. 33g); h–l. illustrations from the protologue of *O. janae* from Averyanov et al. (2015: f. 14); h. habit; i. flower; j–k. lips; l. bract.

Oberonia trigonoglossa Schltr. (1911a) 166; (1923) pl. 65, f. 231. — Syntype: *Schlechter 18840* (B, lost), [Papua New Guinea,] forests of the Bismarck mountains, 1600 m, *syn. nov*.

Notes — Lindley's description is rather rudimentary; however, the illustration on the type in Lindley herbarium at K clearly shows the same species (Fig. 12). The erect habit with multiple rather short leaves on the stem, and rather short inflorescence agrees between *O. trigonoglossa* and *O. pachystachya*. Additional common characters include the acuminate acute bract (Fig. 12c, e), the ovate-oval petals with erose margin (Fig. 12b, f), and the inverted triangular lip (Fig. 12b, d), described as oval pointed by Lindley.

Oberonia rhizomatosa J.J.Sm. — Fig. 13, 14

Oberonia rhizomatosa J.J.Sm. (early 1911a) 2; (1911b) 531, pl. 79A. — Syntype: *Gjellerup 156* (BO), German New Guinea, Bougainville Mountains.
Oberonia repens Schltr. (11 Oct. 1911a) 161; (1923) pl. 62, f. 221. — Syntype: *Schlechter 20045* (B, lost), [Papua New Guinea,] in the forests of the Torricelli mountains, 600 m, *syn. nov*.
Oberonia torana J.J.Sm. (1915) 216, pl. 70, f. 122. — Syntypes: *Gjellerup 777* (BO), Indonesia, Irian Jaya, Berkombor at Tor river, 25 m; *Gjellerup 912* (BO, L 0061802), Indonesia, Irian Jaya, Gauthier mountains on N slope, 300 m, *syn. nov*.
Oberonia ponapensis Tuyama (1940) 275, pl. 2, f. i. — Type: *Hatusima 11102* (holo TI 12969; iso TI 12968), Caroline Islands [Federate States of Micronesia], Ponape [= Pohnpei], at peak of Mount Troton, 600 m, *syn. nov*.
Hippeophyllum microphyllum S.C.Chen (2003) 180, f. 1 (*non Oberonia microphylla* (Blume) Lindl.). — *Oberonia chenii* Ormerod (2004) 378. — Type: *van Royen & Sleumer 7662* (holo K 000942975; iso L.1512780), Indonesia, Irian Jaya, Vogelkop Peninsula, Ilje River valley, path from Banfot to Sudjak, 840 m, *syn. nov*.

Notes — *Oberonia rhizomatosa* and *O. repens* were both described in 1911. Schlechter's *O. repens* is precisely dated to October 11, 1911. The description of *O. rhizomatosa* was on page 2 of the volume published in 1911, so most likely in the first half of the year. Accordingly, Smith's name is taken as the correct name for this species. The fact that Schlechter referred to *O. rhizomatosa* in his description of *O. repens* further supports the earlier publication date for *O. rhizomatosa*.

The illustrations in Smith (1911b) were given with fractional size indications, which were used as basis to scale the floral elements to same relative size. The 1 mm scale bar is derived from the absolute size indications in the Latin protologue, where the longer scale bar is based on the lip, while the shorter is based on the measurement for the sepal. The difference between the two scale bars is over 40 %. It is a further example of how imprecise measurements and scales are in descriptions of *Oberonia*. Accordingly, such measurements should be viewed with much caution, and minor size differences in the literature are most likely due to measurement errors.

Additionally, the shape of the lip differs between the drawing of the entire flower and in the illustration of the parts. For the entire flower, the lateral lobes are more narrow than the epichile lobes, while those relations are reversed in the isolated lip. The lateral lobes are shown without auricles in the entire flower, but with distinct auricles in the isolated lip.

Oberonia repens is a synonym of *O. rhizomatosa*. The shared characters include the uncommon creeping habit, narrow leaves and the overall shape of the lip. Schlechter (1911a: translated from original German) noted the similarity to *O. rhizomatosa* and indicated that 'the labellum and petals in the here described species seem to be quite different' without elaborating on any specifics.

The description of *O. torana* was based solely on *Gjellerup 777*, so should be given preferential standing; however, the repository of that gathering is uncertain as the specimen was not figured by Schuiteman & De Vogel (2006). Smith (1915) wondered whether *O. torana* might be the same as *O. repens*, but did not compare his *O. torana* to his earlier *O. rhizomatosa*. The descriptions and flower drawings leave no doubt about Smith's conclusion. The creeping rhizome, the moderately caulescent habit with long, thin, falcate leaves also seen in *Gjellerup 912* specimens, are in prefect agreement with *O. rhizomatosa*.

Oberonia ponapensis shares the rather uncommon creeping habit, moderately caulescent growth with narrow leaves, and the flower with lobed petals and the lip with upward-turned, trapezoidal lateral lobes and two lobes of the epichile. The habit of the two growths mounted on the holotype sheet (Fig. 13h) show how smaller plants are little caulescent similar to Smith's drawing of *O. rhizomatosa*, while larger plants develop a more caulescent habit. Notice the horizontal rhizome at the base of the larger two growths.

The epichile lobes were described by Tuyama (1940: 275) as 'falcatos triangulos acutos producta', which is different from the rounded lobes seen in the SEM images shown here. While Tuyama did not illustrate the flower, a specimen from Ponape identified as *O. ponapensis* and with identical habit could be examined (Fig. 13i). The imperfectly rehydrated flower shows lateral lobes wider than the epichile lobes, and the epichile lobes appear to be more curved with pointed tip similar to Tuyama's description. Those differences, though, can easily be attributed to artefacts due to drying and rehydration of the flower, including the necessary unfolding of overlapping floral elements. The right petals with erose margin appears to have a rather narrow

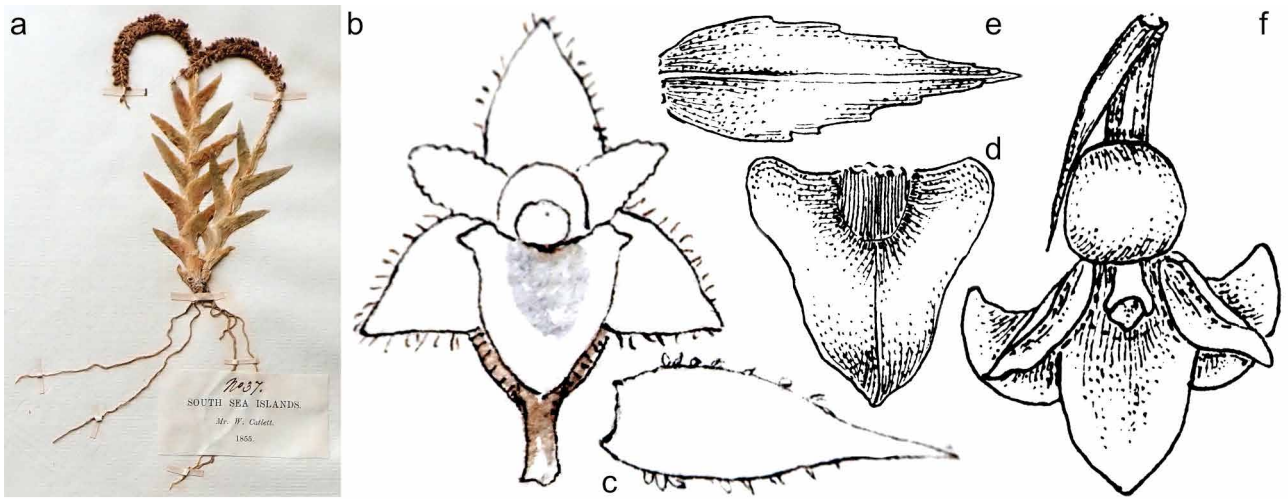

Fig. 12 a–c. Syntype *Catlett 37* (K) of *O. pachystachya*. a. Habit; b–c. drawings on syntype sheet *Catlett 37* (K); b. flower; c. floral bract; d–f. illustrations of *O. trigonoglossa* from Schlechter (1923: pl. 65, f. 231); d. lip; e. floral bract; f. top view of entire flower.

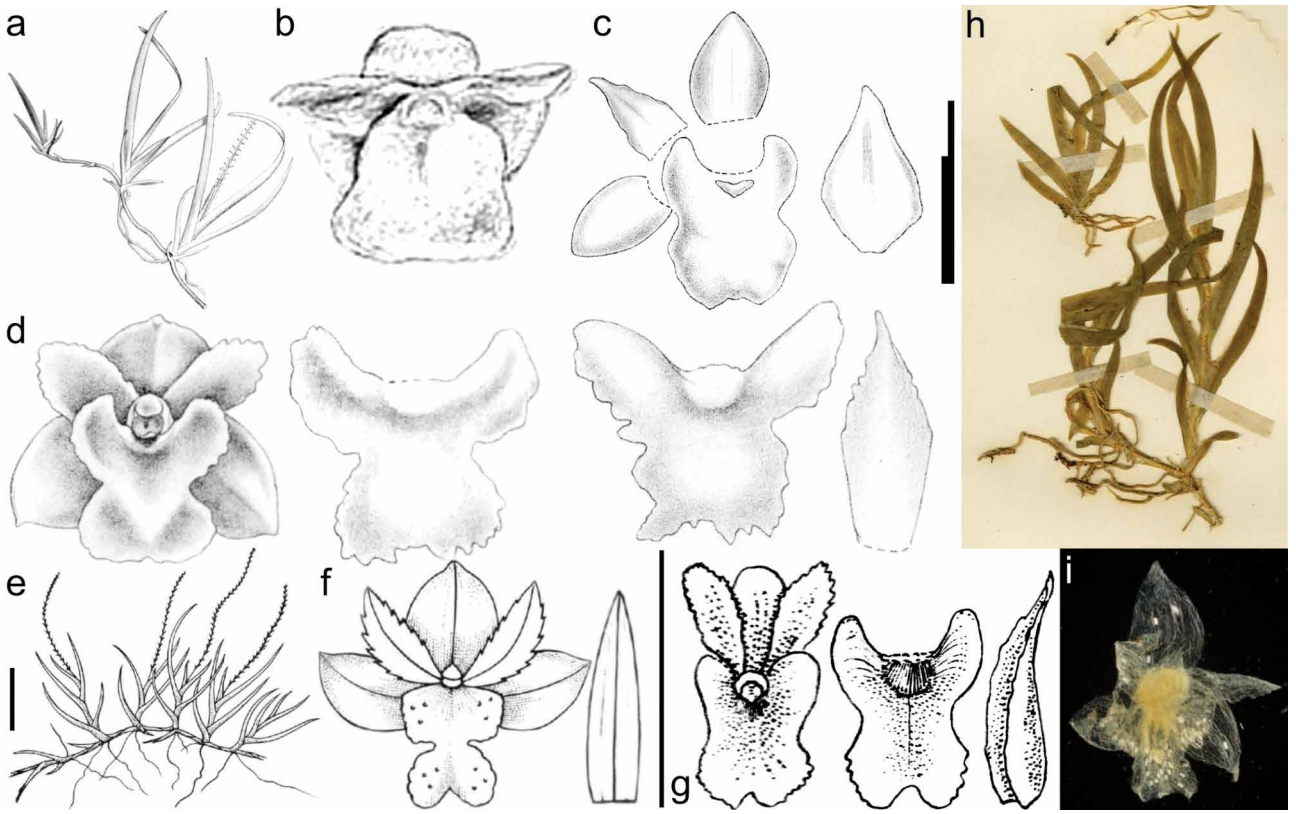

Fig. 13 a–c. *Oberonia rhizomatosa* drawings from Smith (1911b). a. Habit; b. entire flower; c. floral parts including bract; 1 mm scale bars based on contradictory scale and size information in Smith (1911a, b); d. *Oberonia torana* drawing from Smith (1915), including two separated lips and the floral bract; e–f. *Hippeophyllum microphyllum* from Chen (2003); e. habit; f. flower and bract; g. drawing of *O. repens* from Schlechter (1923: pl. 62, f. 221); h. habit of two plants from holotype *Hatusima 11102* TI 12969 of *O. ponapensis*; i. rehydrated flower from Ponape *Glassman 2857* F 2272001. — Scale bars c, f = 1 mm; e = 2 cm.

Fig. 14 *Oberonia rhizomatosa*, whole flowers and seeds by SEM. a–c, e. Frontal, top with bract (*Polak 699* L15582 from Irian Jaya); d. oblique view (*Schuiteman 90/475* L22510 from Papua New Guinea); f. seeds (*Darbyshire & Hoogland 8118* CANB 104114 from Papua New Guinea). — Scale bars: a–e = 1 mm; f = 100 µm.

shape. The latter is due to the top margin being folded over, and is remarkably similar to J.J. Smith's (1911b, see Fig. 13a) illustration of *O. rhizomatosa*. The white rectangular inclusions are calcium oxalate raphide bundles (Geiger unpubl. data).

Oberonia ponapensis was compared to *O. brunnea* Schltr., *O. linearis* Schltr., *O. radicans* Schltr. with similar lateral lobes but much more pointed lobes of the epichile, and most importantly without creeping rhizomes.

Hippeophyllum micranthum = *O. chenii* is another synonym of *O. rhizomatosa*. It shares the uncommon creeping habit, the serrated lateral petals and the quadrilobed lip with *O. rhizomatosa*. The flowers were described as dark red in colour, as in *O. repens* by Schlechter (1911a), and 0.8 mm wide. Chen (2003) did not compare his species to any others, and did not include a single reference in his description. A perusal of Schlechter's (1911a) well-known work from the same region would have quickly identified his plant to at least one of the already described names.

Oberonia spathipetala J.J.Sm. — Fig. 15

Oberonia spathipetala J.J.Sm. (1908) 30. — Syntype: *Branderhorst 191* (BO), [Indonesia, Irian Jaya,] S coast, N of the Kampoeng Gelieb.

Oberonia odontopetala Schltr. (1911a) 159; (1923) pl. 61, f. 217. — Syntypes: *Schlechter 19571* (B, lost; BO, L 0061767, AMES 34056/Harvard barcode 00102012), on trees in the forest around Dschischungari, Papua New Guinea, 800 m, *syn. nov*.

Oberonia pectinata Schltr. (1911a) 159; (1923) pl. 61, f. 218. — Syntype: *Schlechter 18540* (B, lost), forests of the Bismarck mountains, Papua New Guinea, 1100 m, *syn. nov*.

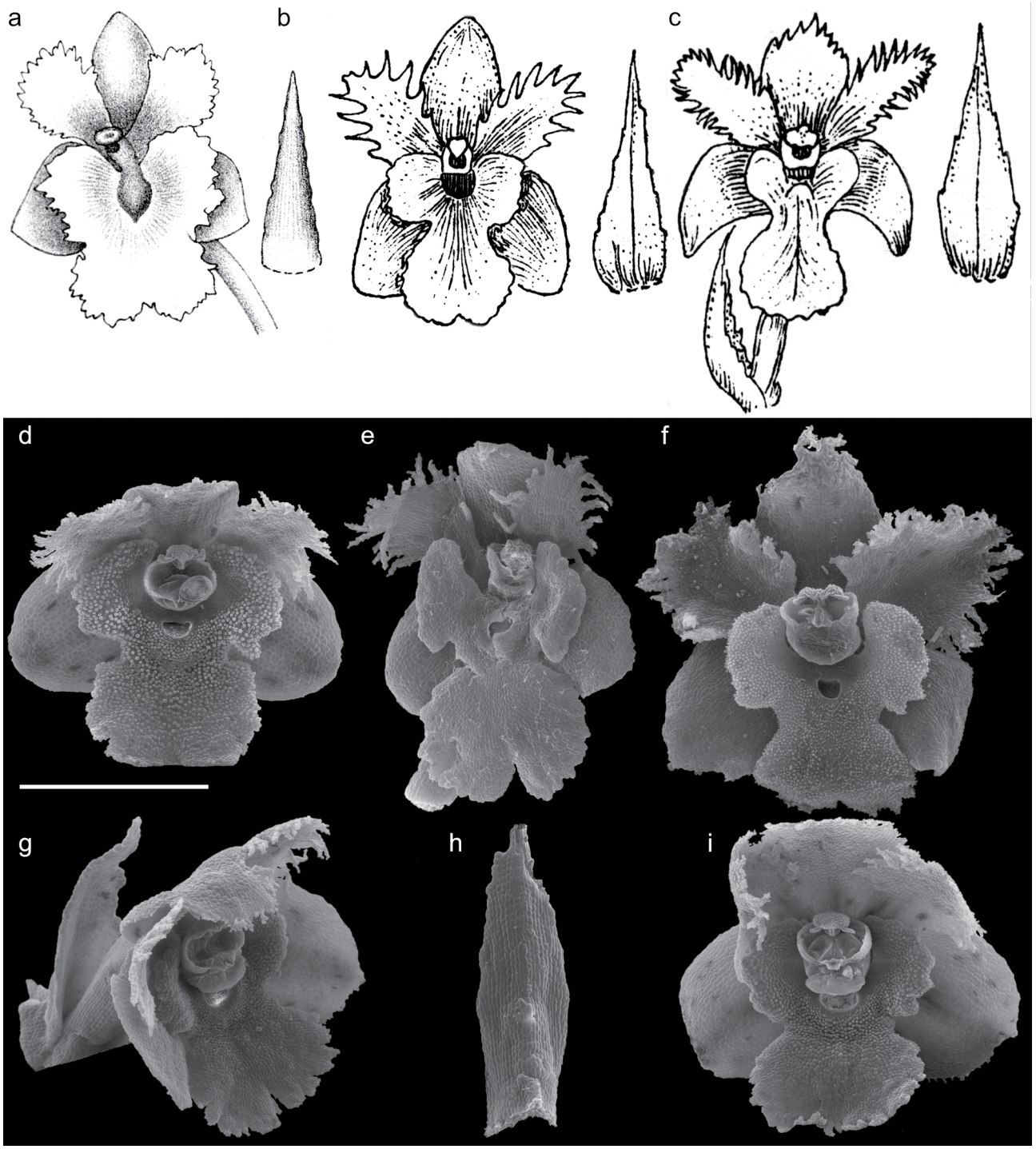

Fig. 15 *Oberonia spathipetala*. a. Illustration of *O. spathipetala* from Smith (1909: f. 28); b. illustration of *O. odontopetala* from Schlechter (1923: pl. 61, f. 217); c. illustration of *O. pectinata* from Schlechter (1923: pl. 61, f. 218); d–i. SEM images of flowers of *O. spathipetala*; d. *Clements 6545* CANB9013003 from Papua New Guinea; e. *Cruttwell 1523* K 32712 Papua New Guinea; f. *Schuiteman 77* L10815 from Papua New Guinea; g–i. *Mason 13* K 32739 from New Guinea; h. floral bract. — Scale bar = 1 mm.

Notes — Smith (1909) used 'n. sp.' in the treatment of *O. spathipetala*, obviously a lapsus calami, that cannot be interpreted as an introduction of a new, homonymous name by the same author.

Oberonia odontopetala and *O. pectinata* share the strongly toothed lateral petals, the T-shaped lip with expanded epichile, and have identical habits. The margin of the median sepal ranges from entire (Fig. 15d–e) to apically toothed (Fig. 15f–g, i) with every intermediate state seen. Similarly, the degree of toothing of the lateral petals is variable between specimens based on additional 16 herbarium specimens examined in BM, CANB, E, K, NSW, SING, and WU. The two illustrations in Schlechter (1923) represent points along a continuous gradient.

DISCUSSION

Why are there so many synonyms in *Oberonia*? It seems that small-flowered orchids are presumed to be under-studied, and that every specimen not immediately recognised by the author is considered to be new. A few cases in point illustrate that pattern, which continues to the present day.

Failure to review of the literature, including the authors own previous publication, is an important contributor; one can also view it as lapses of memory, particularly with highly prolific authors. Smith (1908, 1912) described both *O. asperula* as well as *O. inversiflora* from Papua New Guinea, both synonyms of *O. heliophila*. Smith (1912) did not compare his new *O. inversiflora* to his own *O. asperula*, which is even more surprising, as *O. heliophila* is a notably large species of *Oberonia*. Smith (1915) equally omitted comparing his *O. torana* to his earlier *O. rhizomatosa*.

Limited material is a more understandable source for the introduction of duplicate names. The description of *O. odontopetala* and *O. pectinata* were both based on single gatherings by Schlechter (1911a). With additional material examined, it becomes clear that those are just endpoints in a continuous range of character state distributions. It highlights the fact, that small differences observed in single gatherings should be viewed with much restraint. It is a well-known problem in statistics. For small numbers of observations to be significant, the differences need to be large. For small differences to be significant, a large number of observations of both groups is necessary. Intraspecific variability is hardly ever addressed explicitly, and expected variability based on observations from well-documented species is equally rare. That also applies to Bunpha et al.'s (2019) erroneous resurrection of *O. fungumolens* Burkill correctly synonymized under *O. padangensis* Schltr. by Geiger (2019) as discussed by Geiger et al. (2020).

Many of the more recent introductions of new synonyms may easily be termed 'taxonomic vandalism' (see also Moore et al. 2014, Páll-Gergeley et al. 2020). The actions encompass a range transgressions. Active ignorance of expert advice is one source as in the case of *O. khuongii*, where the present author informed the colleagues about the identity of their specimen early on. Why Averyanov et al. (2019) ignored the information and did not even attempt to justify the distinction is astounding. The illustrations in the protologue of *O. griffithiana* are exquisite, the publication is available on-line.

A second source is lack of basic scholarship as in *Oberonia saintberchmansii* from India, whose authors failed to consult and cite the key work on *Oberonia* from India (Ansari & Balakrishnan 1990). The perusal of that publication would have immediately identified the specimen as *O. brunoniana* and was noted by Schuiteman (pers. comm.). Why reviewers did not point out the missing citation is a further mystery. Chen (2003) did not cite a single work in his description of *Hippeophyllum micranthum*. Geiger et al. (2020) discussed further factors, such as the lack of recognition in systematics for identifying synonyms. While the description of new species and even the transfer of species from one genus to another garners recognition, identifying that multiple names refer to one and the same species is at best viewed as 'stamp collecting'. The profound ramifications of taxonomic clean ups are little appreciated. Geiger (2019) demonstrated that a *O. attenuata* Dockrill considered to represent a highly threatened or even extinct species was only a regional name for the wide-spread *O. insectifera*, with immediate consequences for threat assessment and conservation. Biogeographic implications and assessment of rates of endemism are equally significant results of fine-scale taxonomic work. That applies to the here identified synonyms of *O. heliophila*. The species was considered restricted to the smaller Western Pacific Islands, but is now demonstrated to occur as far east as New Guinea. The same case of multiple restricted range species being recognised as one more wide-spread species also applies to *O. rhizomatosa* and its here identified synonyms.

It is remarkable that there are no global revisions or monographs for the vast majority of orchids, including such well-known groups as *Dendrochilum* or *Phreatia*. The only major effort has been taken with pleurothallids and the Icones Pleurothallidinarum series by the late C. Luer and colleagues. A shift in focus from describing new species to critical assessment of already described taxa would be highly desirable.

Acknowledgements André Schuiteman kindly brought the publication of George et al. (2019) to my attention. André Schuiteman (K), Brendan Lepschi (CANB), Barbara Gravendeel and Christel Schollaardt (L), and Sean Lahmeyer (HNT) facilitated loans of material. Robert Vogt and Nils Köster (B), Jacek Wajer (BM), Brendan Lepschi and Mark Clements (CANB), Hannah Atkins (E), Christine Niezgoda (F), André Schuiteman (K), Brad Ruhfle (MICH), James Solomon and Donna Herrera (MO), Katharine McCroll and Peter Weston (NSW), Marc Pignal (P), Balizah Mohd Ibrahim, Hubert Kurzweil, Paul Leong, Serena Lee (SING), Hugo Junker (Stadtgärtnerei Zürich), Rusty Russell (US), and Ernst Vitek (W) provided accommodations during collection visits. Brendan Lepschi provided insights into details of ICN. Anonymous reviewers gave constructive criticism.

REFERENCES

Abraham A, Vatsala P. 1981. Introduction to orchids with illustrations and descriptions of 150 South Indian orchids. Tropical Botanical Garden and Research Institute, Trivandrum.

Ames O. 1920. The orchids from Mount Kinabalu. Orchidaceae, illustration and studies in 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 [accessed 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.

Averyanov LV, Nguyen KS, Maisak T. 2019. Plant diversity, flora and vegetation of Hin Nam No protected area. Lambert Academic Publishing, Bea Bassin, Mauritius.

Averyanov LV, Ngyuyen KS, Nguyen TT, et al. 2015. New orchids in the flora of Vietnam. Wulfenia 22: 137–188.

Barthlott W, Gorsse-Veldmann B, Korotkova N. 2014. Orchid seed diversity, a scanning electron microscopy survey. Englera 32: 1–245.

Blanco FM. 1880. Flora de Filipinas ed. 3, 4. Establecimiento Tipografico de Plana y Ca, Manila.

Bunpha K-O, Sridith K, Pedersen HÆ. 2019. A taxonomic revision of Oberonia (Orchidaceae: Epidendroideae: Malaxideae) in Thailand. Phytotaxa 420: 102–156.

Chen S, Tsi Z, Lang K, et al. 1999. Flora Reipublicae Popularis Sinicae 18. Science Press, Beijing.

Chen SC. 1982. Notes on some Chinese species of Oberonia. Acta Phytotaxonomica Sinica 20: 190–195.

Chen SC. 2003. Hippeophyllum microphyllum, a new species of Orchidaceae from Papua New Guinea. Novon 13: 180–181.
Fernald HT. 1939. On type nomenclature. Annals Entomological Society of America 22: 689–702.
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. 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. 2019. Studies on Oberonia 5 (Orchidaceae: Malaxideae). Twenty-four new synonyms, and a corrected spelling. Blumea 64: 123–139.
Geiger DL, Crain BJ, McCormick MK, et al. 2020. Studies on Oberonia 7. Ten new synonyms of Oberonia equitans (G.Forst.) Mutel indicated by morphology and molecular phylogeny. Lindleyana 89: 656–667.
George KV, Mathew J, Antony S. 2019. Oberonia saint-berchmansii (Orchidaceae): A new species from south Western Ghats, India. Species 20: 110–113.
Hallé N. 1977. Flore de la Nouvelle Calédonie et Dépendances. 8. Orchidacées. Muséum National d'Histoire Naturelle, Paris.
Hawkes AD. 1952. Notes on a collection of orchids from Ponape, Caroline Islands. Pacific Science 6: 3–12.
Ho P-H. 1993. An illustrated Flora of Vietnam 3 (2). Mekong Printing, Montreal.
Holttum RE. 1953. A revised Flora of Malaya 1. Orchids of Malaya. Government Printing Office, Singapore.
Hooker JD. 1858. Oberonia acaulis. Curtis's Botanical Magazine 84: 2 pp., pl. 5056.
Hooker JD. 1888. Flora of British India. 5. Reeve & Co, London.
Hosokawa T. 1941. Materials of the botanical research towards the flora of Micronesia XXI. Transactions of the Natural History Society of Formosa 31: 286–291.
ICN. 2018. International Code of Nomenclature for algae, fungi, and plants. https://www.iapt-taxon.org/nomen/main.php [accessed 4 July 2018].
King G, Pantling R. 1897. Some new Indo-Malayan orchids. Journal of the Asiatic Society of Bengal 66: 578–605.
King G, Pantling R. 1898. Orchids of the Sikkim-Himalaya. Annals of the Royal Botanic Garden, Calcutta 8: i–iii, i–iv, 1–12, 1–342, 1–2, pls. 1–133.
Koenig IG. 1791. Descriptiones Epidendroum in India orientali factae. In: Retzius AJ (ed), Observationes botanicae: sex fasciculis comprehensae, section 6: 41–67. Siegfried Lebrecht Crusius, Lipsiae/Leipzig.
Kores PJ. 1989. A precursory study of Fijian orchids. Allertonia 5: 1–222.
Kress WJ, DeFilipps RA, Farr E, et al. 2003. A checklist of the trees, shrubs, herbs, and climbers of Myanmar. Contributions from the United States National Herbarium 45: 1–590.
Li Y, Tong Y, Xing F. 2016. DNA barcoding evaluation and its taxonomic implication in the recently evolved genus Oberonia Lindl. (Orchidaceae) in China. Frontiers in Plant Science 7, article 1791: 1–9.
Lin Q, Yang Z. 2015. Type specimens in China National Herbarium (PE) 5 Angiospermae (2). Henan Science and Technology Press, Zhengzhou.
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 (8): 1–8.
Lucksom SZ. 2007. The orchids of Sikkim and North East Himalaya. Privately published.
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.
Merrill ED. 1924. An enumeration of Philippine flowering plants 1. Bureau of Printing, Manila.
Misra S. 2004. Orchids of Orissa. Bishen Singh Mahendra Pal Singh, Dehra Dun.
Misra S. 2014. Orchids of Odisha. Bishen Singh Mahendra Pal Singh, Dehra Dun.
Moore M, Jameson ME, Paucar-Cabrera A. 2014. Taxonomic vandalism is an emerging problem for biodiversity science: A case study in the Rutelini (Coleoptera: Scarabaeidae: Rutelinae). Entomological Society of America 62nd Annual Meeting, Portland, Oregon, November 16–19, 2014.
O'Byrne P. 1994. Lowland orchids of Papua New Guinea. National Parks Singapore, Singapore.
Ormerod B. 2004. The Orchadian 14: 378 [not seen].
Páll-Gergeley B, Hunyadi A, Auffenberg K. 2020. Taxonomic vandalism in malacology: Comments on molluscan taxa recently described by N.N. Thach and colleagues (2014–2019). Folia Malacologica 28: 35–76.
Pradhan UC. 1979. Indian orchids: guide to identification and culture 2. Privately published, Kalimpong.
Raskoti BB. 2009. The orchids of Nepal. Raskoti & Ale, Kathmandu.
Reichenbach Jr HG. 1855. Symbolae Orchidaceae. Bonplandia 3: 212–227.
Reichenbach Jr HG. 1861. Ordo XXVIII Orchides Juss. Walpers Annales Botanices Systematicae 6: 167–933.
Reichenbach Jr HG. 1878. Orchideae Wilensianae indescriptae. Otia Botanica Hamburgensia 1: 50–56.
Ridley HN. 1905. New and little known Malayan plants. Series II. Journal of the Straits Branch of the Royal Asiatic Society 44: 189–211.
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. Die Orchideen von Deutsch-Neu-Guinea. Fedde Repertorium Speciarum Novarum, Regni Vegetalis, Beihefte 1: LXVI, 1–1079.
Schlechter R. 1911b. Zur Kenntnis der Orchidaceae von Celebes, part 1. Fedde Repertorium Speciarum Novarum, Regni Vegetalis 10: 1–40.
Schlechter R. 1923. Figuren-Atlas zu den Orchideen von Deutsch-Neu-Guinea. Fedde Repertorium Speciarum Novarum, Regni Vegetalis, Beihefte 21: pls. 1–372.
Schlechter R. 1934. Blütenanalysen neuer Orchideen IV. Indische und malesische Orchideen. Fedde Repertorium Speciarum Novarum, Regni Vegetalis, 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.
Schumann K, Lauterbach K. 1905. Nachträge zur Flora der deutschen Schutzgebiete in der Südsee (mit Ausschluss Samoa's und der Karolinen). Gebrüder Borntraeger, Leipzig.
Seidenfaden G. 1968. The genus Oberonia in mainland Asia. Dansk Botanisk Arkiv 25: 1–125.
Seidenfaden G. 1978. Orchid genera of Thailand VII Oberonia Lindl. & Malaxis Sol. ex Sw. Dansk Botanisk Arkiv 33: 1–91.
Seidenfaden G. 1995. Contributions to the orchid flora of Thailand XII. Opera Botanica 124: 1–90.
Seidenfaden G, Smitinand T. 1959. The orchids of Thailand, a preliminary list, Part 1. The Siam Society, Bangkok.
Smith JE. 1812. Malaxis. In: Rees A (ed), Cyclopaedia: 3 unnumbered pages [~178–180]. Longman, Hurst, Rees, Orme & Brown, London.
Smith JJ. 1905. Die Orchideen von Java. Brill, Leiden.
Smith JJ. 1908. Vorläufige Beschreibungen neuer papuanischer Orchideen. Bulletin du Département de l'Agriculture aux Indes Néerlandaises 19: 1–39.
Smith JJ. 1909. Die Orchideen von Niederländisch-Neu-Guinea. Nova Guinea 8 (1): 1–148, pls.
Smith JJ. 1911a. Vorläufige Beschreibungen neuer papuanischer Orchideen III. Bulletin du Département de l'Agriculture aux Indes Néerlandaises 45: 1–12.
Smith JJ. 1911b. Die Orchideen von Niederländisch-Neu-Guinea (Fortsetzung). Nova Guinea 8: 521–611, pls. 75–112.
Smith JJ. 1912. Neue papuanische Pflanzen. I. Fedde Repertitorium Speciorum Novarum, Regni Vegetalis 10: 486–488.
Smith JJ. 1915. Die Orchideen von Niederländisch-Neu-Guinea. Nova Guinea 12: 173–272.
Smith JJ. 1927. Die Orchideen von Java, Siebenter Nachtrag. Bulletin du Jardin Botanique de Buitenzorg ser. 3, 9: 23–64, pls. 2–8.
Sokal RR, Rohlf FJ. 1981. Biometry. Freeman, San Francisco.
Tsi Z-H, Chen S-C. 1994. New taxa of Orchidaceae from Xishuang-Banna of south Yunnan, China. Acta Phytotaxonomica Sinica 32: 553–562.
Tuyama T. 1940. Orchidaceae Novae Micronesiacae, III. Botanical Magazine, Tokyo [Shokubutsugaku zasshi] 54: 273–280, pl. 2.
Van Steenis-Kruseman MJ. 2017. Cyclopaedia of Malesian Collectors. http://www.nationaalherbarium.nl/FMCollectors/QuickSearch.htm [accessed 4 July 2018].
Vidal y Soler DS. 1886. Revision de Plantas Vasculares Filipinas. Establecimiento Tipo-Litográfico de M. Pérez Hijo, Manila.
WCSP. 2020, continuously updated. World Checklist of Selected Plant Families. Facilitated by the Royal Botanic Gardens, Kew. Published on the internet; http://wcsp.science.kew.org/ [accessed 29 March 2020].
Wight R. 1851. Icones Plantarum Indiae Orientalis 5, 1. Cramer & Swann, Weinheim. [Reprint of 1963 examined.]
Wood JJ, Beaman TE, Lamb A, et al. 2011. The orchids of Mount Kinabalu 2. Natural History Publications (Borneo), Kota Kinabalu.