Establishing species distributions in large tropical plant genera insights from twelve new Thai records of Oberonia (Orchidaceae)

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Establishing species distributions in large tropical plant genera: insights from twelve new Thai records of *Oberonia* (*Orchidaceae*)

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Key words

Flora of Thailand
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Abstract Establishing species distributions is particularly challenging in large tropical genera of inconspicuous plants. One such genus is *Oberonia* (*Orchidaceae*) which we are currently revising for Thailand. When encountering material of a putatively new species, great care has been taken to make a wide geographic search for matching extra-Thai taxa. Against this background, we here record 12 species as new for Thailand: *O. dissitiflora*, *O. evrardii*, *O. gracilis*, *O. insectifera*, *O. lotsyana*, *O. microphylla*, *O. orbicularis*, *O. semifimbriata*, *O. singalangensis*, *O. stenophylla*, *O. suborbicularis*, *O. wenzelii*. Seven records are based (at least in part) on older collections, suggesting that many gaps in currently known species distributions can be filled through revision of existing collections alone. Our wide geographic search for taxonomic matches had three important implications: 1) we succeeded in identifying five species that had not previously been recognized for Thailand or neighbouring regions; 2) we realized that circumscription of three species should be widened, with implications for their known distributions; 3) comparison of numerous collections enabled us to report additionally six new records (*O. evrardii* for Myanmar; *O. insectifera* for Papua New Guinea; *O. semifimbriata* for Borneo; *O. wenzelii* for India, Myanmar and Java). Eventually, we draw attention to new online tools and resources that facilitate improvements of taxonomic and geographic knowledge in large tropical genera.

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INTRODUCTION

Apparent absence of a species in a given area (within or outside its known range) may represent either true absence or non-detection in spite of the species actually being present (e.g. MacKenzie et al. 2002) – a circumstance that is insufficiently acknowledged in many plant distribution studies. In eastern China, G. Chen et al. (2009) assessed detection rate in a 24 ha permanent plot where the true distribution of six species of woody plants was known from a detailed earlier inventory. Two botanists independently resurveyed each 20 by 20 m sampling quadrat, and the rate of occupied quadrats actually being detected as occupied was only 0.09–0.34 on average for the six species (G. Chen et al. 2009). It can easily be imagined, how detection rate will further decrease with decreasing plant size and increasing geographic scale and rarity of species.

As overall species diversity decreases with increasing latitude (e.g. Gaston 1996, Francis & Currie 2003, Schödelbauerová et al. 2007), plant genera in tropical regions must be generally expected to contain more undiscovered species than genera in temperate regions – an expectancy that is accentuated by the longer exploration history of most temperate regions. Especially due to their generally shorter exploration history, tropical regions must also be expected to hold more undetected occurrences of known species than temperate regions.

The perceived ('known') size of a genus is not only determined by the addition of species discovered during field exploration; the recognized number of species is also the result of revisionary work (e.g. Alroy 2002). In general, it is probable that currently accepted species described long ago are more stable than those recently described, because it is more likely that they have already 'passed' one or more critical revisions (Alroy 2002, Jones et al. 2012). The risk of species distributions being erroneously perceived due to taxonomic mistakes is particularly high in large genera, as the large number of constituent taxa and their often complex morphological relationships make it difficult to keep an overview (Van Welzen et al. 2009). In consequence, it must be expected that much synonymy is overlooked (implying frequent underestimation of range size), whereas material representing undescribed species may accumulate unnoticed in herbaria. Hardly surprising, revisions of large genera are rare, and it frequently happens that new species are described in individual papers following comparison of the plant material with congeneric species from just the same region and immediately adjoining areas.

The difficulties of establishing species distributions in large tropical plant genera are evident. From a pragmatic point of view, two questions deserve special attention: 1) Does revision of already existing collections contribute significantly to generate new distribution data?; and 2) before potentially deciding to describe a new species, is it usually sufficient to compare the underlying material with taxa from the same region and immediately adjoining areas only? During a revision of the orchid genus *Oberonia* Lindl. in Thailand (Bunpha et al., in prep.), we have recognized several species as new national records. These new records, including their background and context, provide insights pertaining to both questions.

A CASE STUDY IN OBERONIA (ORCHIDACEAE)

The genus *Oberonia* exhibits a number of features that make it particularly challenging in connection with distribution mapping at species level. Thus, it is species-rich (recent estimates

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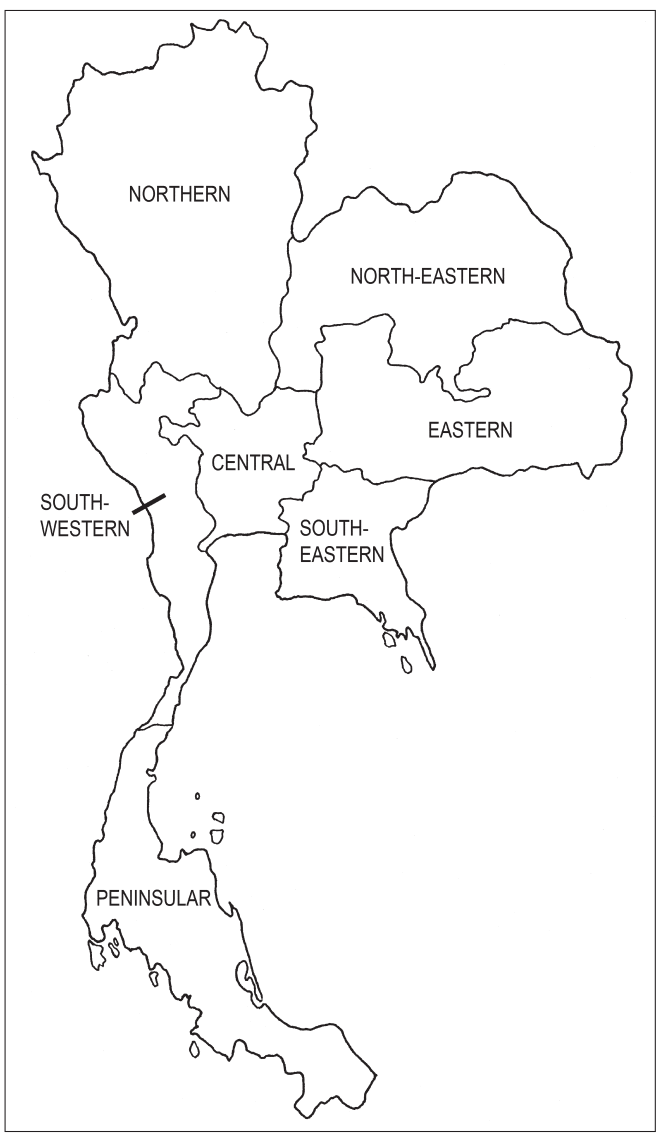
ranging from 150–350 species; X. Chen et al. 2009, Ratheesh Narayanan et al. 2010), it has a wide tropical distribution (ranging from eastern Africa across Southeast Asia to the south-western Pacific islands, cf. Pridgeon et al. 2005), and it consists of small inconspicuous epiphytes with tiny, usually greenish to brownish flowers. A taxonomic study of *Oberonia* in mainland Asia (Seidenfaden 1968) is the only true revision of the genus that has covered more than one country, and *Oberonia* is in general heavily understudied. On a national Thai basis, *Oberonia* was revised by Seidenfaden & Smitinand (1959–1965) and Seidenfaden (1978) who accepted 26 and 33 species, respectively.

A new revision of *Oberonia* in Thailand was commenced in 2010 and will soon be completed (Bunpha et al., in prep.). Whenever material of a putatively new species was encountered, great care was taken to make a wide geographic search for one or more matching taxa not previously recorded from Thailand. Our attempts failed in one case, leading to the description of a new species (Bunpha et al. In press). In the remaining 12 cases, our attempts were successful, leading to the recognition of 12 new records for Thailand. These cases are surveyed and discussed below (as are six new records for other parts of tropical Asia – and six new synonyms with implications for known species ranges). In the subsections 'Occurrence in Thailand', the provinces concerned are arranged according to the seven floristic regions traditionally recognized for Thailand (Map 1).



Map 1 Map showing the floristic regions traditionally recognized for Thailand. Each region comprises several administrative provinces.

SPECIES NEWLY RECORDED FOR THAILAND

1. *Oberonia dissitiflora* Ridl.

Oberonia dissitiflora Ridl. (1896) 218. — Type: *Ridley s.n.* (holo SING), Singapore, Kranji, 10 July 1890.
Oberonia indragiriensis Schltr. (1906) 304. — Type: *Schlechter 13306* (holo B n.v., probably destroyed), Sumatra, Riau, Indragiri, Danau Kotta, May 1904.
Oberonia indragiriensis Schltr. var. *javanica* J.J.Sm. (1921) 266. — Type: *Bakhuizen van den Brink s.n.* (not located), Java, Jawa Barat, Bogor, Tjiomas, flowering in cultivation April 1920.

Occurrence in Thailand — Central (Nakhon Nayok); South-western (Uthai Thani).

Distribution — Thailand, Peninsular Malaysia (e.g. Seidenfaden & Wood 1992), Singapore (e.g. Ridley 1896), Sumatra (e.g. Comber 2001), Java (e.g. Comber 1990).

Specimens examined. Thailand, *Buakhlai 100* (BCU), Nakhon Nayok Province, Khao Yai National Park, Khao Khiao, c. 600 m alt., 15 Oct. 2005; *Srisom 18* (BKF), Uthai Thani Province, Huai Kha Khaeng Wildlife Sanctuary, 26 Oct. 2012.

Notes — 1. Examination of the *Oberonia* material in BCU revealed a previously misidentified specimen of *O. dissitiflora* from central Thailand, and in 2012 this was followed by a new collection from the south-western part of the country. In contrast, a previous report of *O. dissitiflora* from Thailand (Comber 1990) appears to be unsubstantiated, for which reason we consider the two recent collections to represent the first confirmed Thai record.

2. The holotype of *O. indragiriensis* was probably lost during the World War II bombing of B, and we have not been able to locate the type of *O. indragiriensis* var. *javanica*. However, based on the protologues, we agree with Holttum (1964) that *O. indragiriensis* s.l. is probably conspecific with *O. dissitiflora*.

2. *Oberonia evrardii* Gagnep.

Oberonia evrardii Gagnep. (1929) 326. — Type: *Evrard 300* (holo P), Vietnam, Lam Dong Province, Da Lat, "ravin boisé au chalet Rimaud", Oct. 1920.

Occurrence in Thailand — Northern (Tak); South-western (Kanchanaburi).

Distribution — Myanmar (Note 2), Thailand, Vietnam (e.g. Seidenfaden 1992).

Specimens examined. Myanmar, *MacGregor 822* (E), Shan State, Kengtung, Aug. 1909. – Thailand, *Nielsen et al. 1885* (BKF), Kanchanaburi Province, Thong Pha Phum, 23 Aug. 2004; *Tetsana et al. 431* (PSU), Tak Province, Amphoe Umphang, Doi Hua Mot, 900 m alt., 26 Aug. 2011; *Tetsana et al. 434* (PSU), Tak Province, Amphoe Umphang, between Doi Hua Mot and Umphang, 1280 m alt., N16°14'40.5", E98°59'55", 27 Aug. 2011; *Thaithong 1409* (BCU), Tak Province, Amphoe Umphang, between Umphang and Mae Sot, km 115, 3 Sept. 1993.

Notes — 1. An *Oberonia* that did not match any species previously recorded for Thailand was collected in 2011 in the northern part of the country, during a field trip with participation of the first author. The material was identified as *O. evrardii* based on comparison with the protologue and with the holotype in P. We later realized that two earlier collected specimens (one from the same area, one from south-western Thailand) also belong to this species.

2. *Oberonia evrardii* is here newly recorded for Myanmar, based on a previously misidentified herbarium specimen.

3. *Oberonia gracilis* Hook.f.

Oberonia gracilis Hook.f. (1886–1890) 685 [publ. 1888]. — *Iridorkis gracilis* (Hook.f.) Kuntze (1891) 669. — Type: *King's collector 564* (holo K n.v.), Peninsular Malaysia, Perak, Kinta River.
Oberonia nitidicauda J.J.Sm. (1918) 15, *syn. nov.* — Type: *Winckel 310* (holo BO n.v., iso L), Java, Jawa Barat, Priangan, Tjibeber, c. 1000 m, 1917.

Occurrence in Thailand — Peninsular (Nakhon Si Thammarat, Songkhla, Yala).

Distribution — Thailand, Peninsular Malaysia (e.g. Seidenfaden & Wood 1992), Java (e.g. Comber 1990).

Specimens examined. Thailand, *Niyomdham et al. 6944-1* (BKF), Nakhon Si Thammarat Province, Khao Luang National Park, Khiriwong, 500–1000 m alt., 25 Feb. 1991; *Tetsana et al. 382* (PSU), Songkhla Province, Amphoe Hat Yai, Ton Nga Chang Wildlife Sanctuary, Namtok Ton Nga Chang, c. 450 m alt., 2 Aug. 2011, flowering in cultivation 30 Sept. 2011; *Wai 368* (PSU), Yala Province, Amphoe Betong, Ban Chulabhorn Phattana 10, 550 m alt., 27 Oct. 2005.

Notes — 1. During recent revisions of the Thai *Oberonia* material in BKF and PSU, two previously unrecognized spirit samples of *O. gracilis* were noted. Together with a plant that was collected in fruit during a recent field trip with participation of the first author, and which subsequently flowered in cultivation, they represent a new national record.

2. Comparison of *O. gracilis* (as represented by the protologue, the material from Thailand and the drawing of the holotype provided by Seidenfaden 1968: f. 65) with the later *O. nitidicauda* (as represented by the protologue, an isotype in L and the illustration provided by Smith 1922: t. 31[III]), we are convinced that the two taxa are conspecific, and we therefore propose *O. nitidicauda* as a new synonym.

4. *Oberonia insectifera* Hook.f.

Oberonia insectifera Hook.f. (1890a) t. 2004. — Type: *King's collector 2793* (holo K), Peninsular Malaysia, Perak, Larut.

Occurrence in Thailand — Peninsular (Narathiwat).

Distribution — Thailand, Peninsular Malaysia (e.g. Seidenfaden & Wood 1992), Borneo (e.g. Wood & Cribb 1994), Papua New Guinea (Note 2).

Specimens examined. Papua New Guinea, *Woods et al. 1091* (E), Morobe Province, hill above Markham Point near Lae, c. 106 m alt., 9 May 1968. – Thailand, *Puudjaa 1812* (BKF), Narathiwat Province, Amphoe Waeng, Bala, 25 April 2012.

Notes — 1. A recent collection of this species from peninsular Thailand represents a new national record.

2. *Oberonia insectifera* is here newly recorded for Papua New Guinea, based on a previously unidentified herbarium specimen.

5. *Oberonia lotsyana* J.J.Sm.

Oberonia lotsyana J.J.Sm. (1905) 241. — Type: not designated.

Occurrence in Thailand — Northern (Chiang Mai).

Distribution — Thailand, Sumatra (e.g. Comber 2001), Java (e.g. Comber 1990).

Specimen examined. Thailand, *Seidenfaden & Smitinand GT 8294* (C), Chiang Mai Province, Doi Inthanon National Park at km 35, 1640 m alt., 4 March 1978, flowering in cultivation 1 Sept. 1978.

Note — A spirit sample of this species from northern Thailand, previously misidentified as *O. rufilabris* Lindl., was found during recent revision of the Thai *Oberonia* material in C.

6. *Oberonia microphylla* (Blume) Lindl.

Oberonia microphylla (Blume) Lindl. (1830–1840) 17 [publ. 1830]. — *Malaxis microphylla* Blume (1825–1826) 395 [publ. 1825]. — *Iridorkis microphylla* (Blume) Kuntze (1891) 669. — Type: *Blume 1896* (holo L), Java, Salak.
Oberonia rosea Hook.f. (1890b) t. 2005, *syn. nov.* — Type: not designated.
Oberonia kusukusensis Hayata (1914) 26, f. 3i–k, *syn. nov.* — Type: *Hayata & Sasaki s.n.* (holo TI n.v.), Taiwan, Kusukusu, June 1912.

Occurrence in Thailand — Peninsular (Nakhon Si Thammarat).

Distribution — Taiwan (e.g. X. Chen et al. 2009), Vietnam (e.g. Seidenfaden 1992), Thailand, Peninsular Malaysia (e.g. Seidenfaden & Wood 1992), Java (e.g. Comber 1990).

Specimens examined. Thailand, *Chantanaorrapint et al. 20* (PSU), Nakhon Si Thammarat Province, Amphoe Nopphitam, San Yen, Khao Nan National Park, 1100 m alt., 12 March 2009; *Middleton et al. 4417* (BK, BKF), Nakhon Si Thammarat Province, Amphoe Ron Phibun, Namtok Yong National Park, Khao Ram Rom, 850 m alt., 9 Sept. 2008.

Notes — 1. During revision of the *Oberonia* material in BK, BKF and PSU, two collections of *O. microphylla* from peninsular Thailand were noted. The older collection (from 2008) had previously been misidentified as *O. stenophylla* Ridl., whereas the younger collection (from 2009) had been identified as *O. rosea* by the collectors.

2. Comparison of *O. microphylla* (as represented by the protologue, the material from Thailand and the illustrations in Smith 1908–1914: t. CLXX, Comber 1990: 156) with the younger *O. rosea* (as represented by the protologue and the drawing provided by Seidenfaden 1968: f. 53), convinced us that the two taxa are conspecific, and we therefore propose *O. rosea* as a new synonym. We have not examined the type or any other authoritative material of *O. kusukusensis*, but based on the protologue we believe that X. Chen et al. (2009) were right in considering this taxon conspecific with *O. rosea*. Consequently, also *O. kusukusensis* is here proposed as a new synonym of *O. microphylla*.

7. *Oberonia orbicularis* Hook. f.

Oberonia orbicularis Hook. f. (1886–1890) 677 [publ. 1888]. — *Iridorkis orbicularis* (Hook.f.) Kuntze (1891) 669. — Type: *Clarke 9610* (holo K), India, Sikkim, Dikkeeling, c. 915 m alt., 12 Oct. 1819.

Occurrence in Thailand — Northern (Chiang Mai).

Distribution — Sikkim (e.g. Seidenfaden 1968), Thailand.

Specimen examined. Thailand, *Kerr 500* (BK, K), Chiang Mai Province, Mae Samoeng, c. 700 m alt., 21 Oct. 1922.

Notes — 1. During recent revisions of the Thai *Oberonia* material in BK and K, we noted that *Kerr 500* from northern Thailand, in spite of being traditionally referred to '*O. iridifolia* (Roxb.) Lindl.' (e.g. Seidenfaden 1968, 1978), closely matches *O. orbicularis* which has not previously been recognized as a member of the Thai flora.

2. Pradhan (1979) treated *O. orbicularis* as a synonym of *O. pachyrachis* Rchb.f., a practice adopted by e.g. Pearce & Cribb (2002), whereas X. Chen et al. (2009) placed the former as a synonym of *O. obcordata* Lindl. However, in line with e.g. Sathish Kumar & Manilal (1994), we prefer to recognize *O. orbicularis* as a distinct species (Bunpha et al., in prep.).

8. *Oberonia semifimbriata* J.J.Sm.

Oberonia semifimbriata J.J.Sm. (1928) 46. — Type: *Lörzing 5314* (holo L; iso AMES n.v., K, P), Sumatra, Sumatera Utara, Sibolangit, c. 400 m alt., 5 Oct. 1917.

Occurrence in Thailand — Peninsular (Songkhla).

Distribution — Thailand, Peninsular Malaysia (e.g. Seidenfaden & Wood 1992), Sumatra (e.g. Comber 2001), Borneo (Note 2).

Specimens examined. Borneo, *Giles 684* (K), 'N. Borneo', sine loco et anno, flowering in cultivation 22 Sept. 1965. – Thailand, *Tetsana & Bunpha 285* (PSU), Songkhla Province, Amphoe Hat Yai, Ton Nga Chang Wildlife Sanctuary, Namtok Ton Nga Chang, c. 350 m alt., 5 May 2011; *Tetsana & Bunpha 385* (PSU), Songkhla Province, Amphoe Hat Yai, Ton Nga Chang Wildlife Sanctuary, Namtok Ton Nga Chang, c. 350 m alt., 8 Aug. 2011.

Notes — 1. The first known Thai specimens of this species were collected by N. Tetsana and the first author during field

trips in connection with our ongoing revision of *Oberonia* in Thailand.

2. *Oberonia semifimbriata* is here newly recorded for Borneo, based on an already correctly identified spirit sample that has not previously been cited in the literature.

9. *Oberonia singalangensis* Schltr.

Oberonia singalangensis Schltr. (1911) 432. — Type: *Beccari s.n.* (holo B n.v., probably destroyed), Sumatra, Sumatera Barat, Gunung Singalang, c. 1700 m alt., June–July 1878.
Oberonia singalangensis Schltr. var. *major* J.J. Sm. (1932) 113. — Type: not designated.

Occurrence in Thailand — Northern (Phitsanulok, Tak).
Distribution — Thailand, Sumatra (e.g. Comber 2001).

Specimens examined. Thailand, *Phueakklai et al. 50-2* (BKF), Phitsanulok Province, Thung Salaeng Luang National Park, river Salaeng Haeng, 750 m alt., 25 Sept. 2007; *Seidenfaden & Smitinand GT 5639/vial 2048* (C), Phitsanulok Province, Thung Salaeng Luang National Park, river Salaeng Haeng, 25 Feb. 1964, flowering in cultivation 23 Oct. 1964; *Seidenfaden & Smitinand GT 5639/vial 2248* (C), Phitsanulok Province, Thung Salaeng Luang National Park, river Salaeng Haeng, 25 Feb. 1964, flowering in cultivation Feb. 1981.

Note — Two previously misidentified collections of this species from northern Thailand were found during recent revision of the Thai *Oberonia* material in BKF and C. Together with a live plant from Thung Yai Naresuan Wildlife Sanctuary (Tak Province) that recently flowered in Queen Sirikit Botanic Garden, Chiang Mai, they represent a new national record.

10. *Oberonia stenophylla* Ridl.

Oberonia stenophylla Ridl. (1896) 218. — Type: *Kelsall & Lake s.n.* (holo SING), Peninsular Malaysia, Johor, Hulu Sembrong, 30 Oct. 1892.
Oberonia flabellifera Holttum (1947) 284, *syn. nov.* — Type: *Corner/S.F.N. 28162* (not located), Peninsular Malaysia, Johor, Mawai.
Oberonia polyschista Schltr. (1906) 305, *syn. nov.* — Type: *Schlechter 13264* (holo B n.v., probably destroyed), Sumatra, Riau, Indragiri, Sungei Lalah, May 1901.
Oberonia sumatrana Schltr. (1906) 306, *syn. nov.* — Type: *Schlechter 13304* (holo B n.v., probably destroyed), Sumatra, Riau, Indragiri, Danau Kotta, May 1901.

Occurrence in Thailand — Peninsular (Narathiwat).
Distribution — Thailand, Peninsular Malaysia and Singapore (e.g. Seidenfaden & Wood 1992), Sumatra (e.g. Comber 2001), Java (e.g. Comber 1990), Borneo (e.g. Wood & Cribb 1994).

Specimen examined. Thailand, *Puudjaa 1803* (BKF), Narathiwat Province, Amphoe Waeng, Bala, 25 Apr. 2012.

Notes — 1. A recent collection of this species from peninsular Thailand represents a new national record.

2. Comber (2001) considered the simultaneously described *O. polyschista* and *O. sumatrana* conspecific and adopted the former name for the combined species. The holotypes of *O. polyschista* and *O. sumatrana* were probably destroyed during the World War II bombing of B, and we have been unable to locate the type of *O. flabellifera*. However, based on the protologues and on later accounts (e.g. Holttum 1964, Seidenfaden & Wood 1992, Comber 2001), we have little doubt that all three taxa are conspecific with *O. stenophylla*, and we therefore propose them as new synonyms.

11. *Oberonia suborbicularis* Carr

Oberonia suborbicularis Carr (1929) 1. — Type: *Carr A102/spirit 1125* (holo SING), Peninsular Malaysia, Pahang, Tembeling.

Occurrence in Thailand — South-western (Ratchaburi).
Distribution — Thailand, Peninsular Malaysia (e.g. Seidenfaden & Wood 1992), Sumatra (e.g. Comber 2001).

Specimen examined. Thailand, *Tetsana & Bunpha 427* (PSU), Ratchaburi Province, Amphoe Suan Phueng, Khao Kra Chom, trail to Namtok Pha Daeng, 20 Aug. 2011, flowering in cultivation 23 Jan. 2011.

Note — The first known Thai collection of this species was made by N. Tetsana and the first author during a field trip in connection with our ongoing revision of *Oberonia* in Thailand.

12. *Oberonia wenzelii* Ames

Oberonia wenzelii Ames (1915) 77. — Type: *Wenzel 0388* (holo AMES, photo seen), Philippines, Island of Leyte, Jaro, 30 Apr. 1914.
Oberonia jenkinsiana auct. non Griff. ex Lindl.: Seidenfaden (1968) 108 p.p., f. 75.

Occurrence in Thailand — Peninsular (Phangnga).
Distribution — India (Note 2), Myanmar (Note 3), Thailand, Java (Note 4), Philippines (e.g. Valmayor 1984).

Specimens examined. India, *Pantling 185* (BM, P; both probably misnumbered), West Bengal, Darjeeling District, Engo plateau, c. 460 m alt., July 1899. – Indonesia, Java, *sine coll./Herb. Mus. Paris P00364399* (P), sine loco et anno. – Myanmar, *Rule 5349* (K), sine loco, 14 Oct. 1961, flowering in cultivation 21 May 1962. – Thailand, *Tetsana & Bunpha 397-2* (PSU), Phangnga Province, Amphoe Takua Pa, Sri Phang Nga National Park, Namtok Tam Nang, 26 Dec. 2011.

Notes — 1. The first known Thai collection of this species was made by N. Tetsana and the first author during a field trip in connection with our ongoing revision of *Oberonia* in Thailand.

2. *Oberonia wenzelii* is here newly recorded for India. King & Pantling (1898), in their account on the orchids of Sikkim, cited *Pantling 185* under *O. jenkinsiana* Griff. ex Lindl. However, as already suggested by Seidenfaden (1968), '*Pantling 185*' is confusing. The specimen in K (labelled Sikkim, 1894) matches *O. jenkinsiana*, whereas we refer the specimens in BM and P to *O. wenzelii*. In reality, the latter specimens are probably erroneously numbered, as the labels indicate: Engo plateau, 1500 ft. alt., July 1899; i.e. the year after *Pantling 185* was cited in King & Pantling (1898). Additional specimens labelled *Pantling 185* are deposited in CAL (cf. Ansari & Balakrishnan 1990) and G (cf. Seidenfaden 1968, 1978), but we have had no opportunity to examine them.

3. *Oberonia wenzelii* is here newly recorded for Myanmar, based on a previously misidentified spirit sample.

4. *Oberonia wenzelii* is here newly recorded for Java, based on a previously misidentified herbarium specimen.

DISCUSSION

In the latest revision of *Oberonia* in Thailand, Seidenfaden (1978) recognized 33 species. Thus, although three new species based on Thai material have been proposed in the meantime (Seidenfaden 1995, Bunpha et al. In press), the 12 new national records reported in this paper constitute a considerable addition to the *Oberonia* flora of Thailand.

Five of the new Thai records (*O. insectifera*, *O. semifimbriata*, *O. stenophylla*, *O. suborbicularis*, *O. wenzelii*) are based solely on new collections obtained since the revision was commenced in 2010, four new records (*O. lotsyana*, *O. microphylla*, *O. orbicularis*, *O. singalangensis*) are based on previously misidentified herbarium specimens collected prior to the revision, whereas three new records (*O. dissitiflora*, *O. evrardii*, *O. gracilis*) are based on both categories of data. Without disregarding the obvious need for continued field exploration (e.g. Giam et al. 2010, Webb et al. 2010), these figures suggest that many gaps in the currently known distributions of *Oberonia* species could be filled based on critical herbarium studies alone. We furthermore consider it likely that the same would be the case for many other tropical plant genera that share the characteristics of being widespread and rich in small inconspicuous species.

Whereas seven of the newly recorded species, as circumscribed here, were already known from a region (Peninsular Malaysia) adjacent to Thailand, the nearest previously recognized occurrences of the remaining species are found as far away as Sikkim (*O. orbicularis*), Vietnam (*O. evrardii*), Sumatra (*O. lotsyana*, *O. singalangensis*) or the Philippines (*O. wenzelii*). In each of these five cases, the Thai material could have been erroneously described as a new species if our search for a taxon matching our Thai plants had been limited to Thailand and immediately adjoining areas.

A geographically wide search produces a healthier taxonomy, especially by 1) extending the ranges of known species; 2) reducing the number of poorly distinguished local endemics; and 3) ensuring that we do not unduly describe new local endemics – all of these aspects with various implications for conservation priorities. In our study of *Oberonia*, more than one match was occasionally found, leading to revised species circumscriptions. In some cases, this has also influenced species ranges. Firstly, the reduction of *O. nitidicauda* (an alleged Javanese endemic) to a synonym of *O. gracilis* means that the latter should no longer be considered endemic to Peninsular Malaysia. Secondly, the reduction of *O. rosea* and *O. kusukusensis* (traditionally regarded as conspecific and distributed in Taiwan, Vietnam and Peninsular Malaysia) to synonyms of *O. microphylla* implies that the total range of the combined species also comprises Java (as *O. microphylla* was previously considered a Javanese endemic). Thirdly, the reduction of *O. polyschista* and *O. sumatrana* (since the publication of Comber 2001 regarded as conspecific and endemic to Sumatra) to synonyms of *O. stenophylla* means that the distribution of the latter species does not only encompass Peninsular Malaysia, Singapore, Java and Borneo as previously presumed, but also Sumatra. Finally, the reduction of *O. flabellifera* (Peninsular Malaysia) to *O. stenophylla* (already known from Peninsular Malaysia) removes yet another allegedly endemic *Oberonia* species.

The last important outcome of our wide search for matching taxa and collections (a search that involved examination of large volumes of plant material) was the discovery of a few collections that belong to some of the same species as here newly recorded for Thailand, but representing new records for other regions, viz. India (*O. wenzelii*), Myanmar (*O. evrardii*, *O. wenzelii*), Borneo (*O. semifimbriata*), Java (*O. wenzelii*) and Papua New Guinea (*O. insectifera*).

In spite of our new records – or, in certain cases, because of them – most of the species treated in this paper appear to have a more or less disjunct distribution. This is particularly true for *O. insectifera* (Thailand, Peninsular Malaysia, Borneo, New Guinea), *O. microphylla* (Taiwan, Vietnam, Thailand, Peninsular Malaysia, Java) and *O. wenzelii* (Sikkim, Myanmar, Thailand, Java, the Philippines), but it also pertains to *O. evrardii*, *O. gracilis*, *O. lotsyana*, *O. orbicularis* and *O. singalangensis*. It seems highly likely that the disjunctions are artefacts that will disappear as geographically intermediate populations are discovered in the field, currently misidentified collections are detected in herbaria, and/or further taxa with known occurrences in intermediate areas prove to be conspecific. In principle, species distribution modelling might help here; but in most cases the number of collections available is too low to make reliable models – Feeley & Silman (2011) demonstrated that, in order to be accurate, models need to be based on more detected occurrences (collections) than previously acknowledged.

In order to search broadly for a species matching an unidentified collection, the challenge is to access all the specimens (especially types), protologues and illustrations needed for comparison; but this is now getting easier day by day. For example, the Global Plant Initiative (http://gpi.myspecies.info), currently involving more than 165 partner herbaria, aims at digitizing all type specimens of plants and making them available through JSTOR Plant Science (http://plants.jstor.org). Furthermore, many individual herbaria and museums scan larger or smaller quantities of their collections and make them freely accessible online (the most ambitious case being the Sonnerat Database of Museum National d'Histoire Naturelle in Paris; http://www.mnhn.fr/base/sonnerat.html). Yet another important initiative is the Biodiversity Heritage Library (http://www.biodiversitylibrary.org), an international consortium of natural history and botanical libraries that digitizes the legacy literature of biodiversity held in the member libraries and makes it available for open access.

Admittedly, a scanned image of a herbarium specimen does not always allow all the important details to be observed (especially not in plants as small-flowered as *Oberonia*), but in the vast majority of cases, online browsing of specimen images does at least help to decide which species can be safely disregarded (in effect reducing the number of herbaria and specimens to be consulted). An alternative approach would be to revise a large genus as team work that involves authors with easy access to different selections of herbaria and libraries (see also Van Welzen et al. 2009) – an approach that could be established within, for example, the online virtual research environment of a 'scratchpad' (http://scratchpads.eu). Indeed, the prospects of getting the taxonomy and, hence, the species distributions right in *Oberonia* and other large plant genera are being greatly improved by the development of new online tools and resources.

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