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Notes on *Aphyllorchis gollanii* and *Aphyllorchis alpina* (Orchidaceae) and lectotypification of both names

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Abstract

Morphological characters of *Aphyllorchis gollanii* Duthie have been studied and compared to those of *Aphyllorchis alpina* King & Pantling based on protologues, type specimens of both species and other specimens and fresh collections from Indian Himalayan Region. Both species proved to present identical or overlapping characters. Therefore, they are treated as conspecific. Lectotypes are designated for both *Aphyllorchis alpina* and *Aphyllorchis gollanii*.

Résumé

Les caractères morphologiques d'*Aphyllorchis gollanii* Duthie ont été étudiés et comparés à ceux d'*Aphyllorchis alpina* King & Pantling sur la base des protologues, des spécimens types et de plantes vivantes de la région indienne de l'Himalaya. Les deux espèces se sont avérées présenter des caractères identiques ou se chevauchant. Elles sont ici traitées comme conspécifiques. Des lectotypes sont désignés pour *Aphyllorchis alpina* et *Aphyllorchis gollanii*.

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Keywords: Indian Himalayan Region, lectotype, taxonomy.
Mots clés : lectotype, région de l'Himalaya indien, taxinomie.

Introduction

The genus *Aphyllorchis* Blume (1825: fig. 77) [Orchidaceae-Epidendroideae-Neottieae (Chase *et al*., 2015)] is characterized by its mycoheterotrophic habit, with leafless, unbranched stem having cymbiform or cylindric sheaths at base and flowers with spurless labellum. Members of this genus inhabit temperate or sub-alpine forest floor with humus rich soil. It can be differentiated from the allied genera by its leafless habit and the presence of a pair of auricles near the base of its ecallose labellum (Pridgeon *et al*., 2005). The genus comprises 22 species (Chase *et al*., 2015) distributed in the Himalayas and South-East Asia, extending up to Japan and Australia (Pridgeon *et al*., 2005). Four species [*A. alpina* King & Pantling (1898: 261); *A. gollanii* Duthie (1902: 42); *A. montana* H.G. Reichenbach (1876: 57); *A. vaginata* J.D. Hooker (1890: 117)] are reported from India, distributed mainly in the Himalayan region and one extending southwards in Peninsular India (Singh *et al*., 2019).

During the revision work on the genus *Aphyllorchis* for Flora of India under the National Mission on Himalayan Studies, all the Indian species of the genus have been thoroughly revised: type specimens, protologues and fresh collections have been studied. Of the four species recorded from India, *Aphyllorchis vaginata* has now been transferred and treated under the genus *Chamaegastrodia* Makino & F. Maekawa (1935: 596) (Seidenfaden, 1994; Govaerts, 2003; Bhattacharjee & Chowdhery, 2018). Another species *Aphyllorchis gollanii* which was once considered as endemic to Garhwal region of Uttarakhand (Deva & Naithani, 1986; Chowdhery & Agrawala, 2013; Jalal & Jayanthi, 2015) is found to possess morphological features identical to or overlapping those of *Aphyllorchis alpina.* Therefore, *A. gollanii* is reduced here to a taxonomic synonym of *A. alpina*. Further, while examining the original or type materials of both *A. alpina* and *A. gollanii* it was realised that multiple syntype specimens exist for both names. Thus, designation of Lectotypes for both names is needed. The taxonomic consequences along with the description, phenology, distribution and illustrative photo-plates of *A. alpina* are presented here for its easy recognition. The relationship between both taxa is also discussed along with notes on the typification.

Taxonomic treatment

Aphyllorchis alpina King & Pantling, *Annals of The Royal Botanic Garden (Calcutta)* 8: 261, t.347. 1898; H.J. Chowdhery, *Orchid Flora of Arunachal Pradesh*: 69, f.30. 1998; N. Pearce & P.J. Cribb, *The Orchids of Bhutan*: 36. 2002; S.Z. Lucksom, *The Orchids of Sikkim and North East Himalaya*: 23, f.17, pl.2. 2007; Chen & S. Gale, *Flora of China* 25: 178. 2009; J.S. Jalal & J. Jayanthi, *Richardiana* 13: 142. 2013; S.K. Singh *et al*., *Orchids of India*: 61. 2019.

Types: India, Sikkim, Singalelah, 13000 feet, July 1896, *Pantling 462* [Lectotype: designated here P-00345168!; Isolectotypes: CAL-0000000641!; CAL- s.n.; BM-000062040-Photo!, K, W (could not be traced)]; Sikkim, Tankra La, 14000 feet, July 1897, *Pantling 462* [Residual syntype: CAL-0000000642!]; Sikkim, West district, Mon Lepcha – Dzongri (Jongri), 13000 feet, August 1887, *King's Collector s.n.* [Residual syntype: CAL-459878!]; Sikkim, *King's Collector 4459* [Residual syntype: W (could not be traced)].

Aphyllorchis gollanii Duthie, *Journal of the Asiatic Society of Bengal, Pt. 2, Natural History* 71(1): 42. 1902 and *Annals of the Royal Botanic Garden (Calcutta)* 9: 155, t. 122. 1906 ***syn. nov.***; S. Deva & H.B. Naithani, *Orchid Flora of North West Himalaya*: 31, f.5. 1986; Chen & S. Gale, *Flora of China* 25: 178. 2009; J.S. Jalal & J. Jayanthi, *Richardiana* 13: 142. 2013; J.S. Jalal & J. Jayanthi, *Lankesteriana* 15(1): 13. 2015; S.K. Singh *et al*., *Orchids of India*: 61. 2019.

Types: India, Uttarakhand, Tehri-Garhwal, Nagtibba, 9000 - 10000 feet, August 1899, *Mackinnon's collector* (*Ramsukh*) *23000* [Lectotype, designated here, DD!]; N.W. Himalaya, Tehri-Garhwal, Nagtiba July 1900, *Duthie 24146* [Residual syntypes: CAL-459880!; AMES-01941371]; N.W. Himalaya, Tehri-Garhwal, Bouk Hill, July 1900, *Harsukh 24146* [Residual syntype: DD!]; N.W. Himalaya, Tehri-Garhwal, Bouk Hill, 10000 feet, July 1900, *P.W. Mackinnon s.n.* [Residual syntype: CAL-0000000636!]; N.W. Himalaya, Tehri-Garhwal, Nagtiba, 8000 feet, 4.08.1899, *P.W. Mackinnon s.n.* [Residual syntype: CAL-0000000637!]; N.W. Himalaya, Tehri-Garhwal, Lokham Jounsar, 8000 feet, 29.08.1900, *P.W. Mackinnon s.n.* [Residual syntype: CAL-459879!]; *Gollan 2062* (Residual syntype could not be traced).

Description (Fig. 1 & 5): mycoheterotrophic herbs, 45-120 cm tall. Rhizome elongated, clothed with ovate-lanceolate, imbricate scales. Stem erect, robust, terete, purplish-brown, many noded; nodes with 1.5-5.5 cm long, ovate-tubular, unequal, sub-acute sheaths. Raceme 10-35 cm long,

irregularly ridged, puberulous, sub-densely 8-many-flowered. Floral bracts longer than pedicel plus ovary, 2.4-3.2 × 0.3-0.5 cm, linear-lanceolate, acuminate, usually deflexed, sometimes erect after anthesis, yellowish-green, speckled with purplish brown. Flowers not fully opening, somewhat campanulate, 3-4 cm long, 1.8-2.5 cm across, yellowish-green, externally speckled with purplish-brown, more so along the veins; labellum darker yellow towards apex, diffused with purplish brown in the middle. Pedicel plus ovary 1.2-2 cm long, 3-4 mm diam., cylindric, ridged, puberulous. Sepals subequal, 1.8-2.4 × 0.5-0.7 cm, lanceolate, weakly concave, long acuminate, strongly deflexed or spreading at apex, 3-5-veined, veins thickened dorsally. Petals 1.5-2.1 × 0.6-0.9 cm, very shortly clawed at base, ovate-lanceolate, acuminate, mid-vein prominently thickened dorsally. Labellum 1.6-2 × 0.6-0.7 cm, clawed at base, claw with 2 auricular lobes, concave; blade or epichile hinged on the claw, deflexed, oblong-ovate in outline, with somewhat involute margin, obscurely 3-lobed; side-lobes erect, concave; mid-lobe ovate, acute-acuminate, erose-crenulate at base, entire towards apex. Column 1.2-1.4 cm long, erect, stout, slightly curved; anther dorsal, broadly ovate; anther 2-celled; pollinia 2, cohering, deeply cleft, yellowish; stigma large, with an overlapping irregularly lobulate border. Capsule 2.5-3.5 × 0.5-0.7 cm, shortly stalked, ovoid-ellipsoid.

Flowering & Fruiting: July - September.

Habitat: Mycoheterotrophic; in forest litter and on decaying wood at 2000 - 4000 m.

Distribution: INDIA (Arunachal Pradesh, Sikkim, Uttarakhand, West Bengal); CHINA; NEPAL.

Other specimens examined: **Arunachal Pradesh:** Dibang Valley, Pasupani to Chitu, Pani Camp beyond Mipi, 10.07.2002, *M. Bhaumik & M.K. Pathak 4240* (CAL-64551!, ASSAM!); Lower Subansiri, On the way to Tale valley, 15.07.1981, *Hegde 3815* (OHT-548!; 1024!; 1025!; 1026!). **Sikkim:** North District, Chungthang, 1700 - 2000 m., July 2019, *Aazhivaendhan s.n.* (BSHC!).

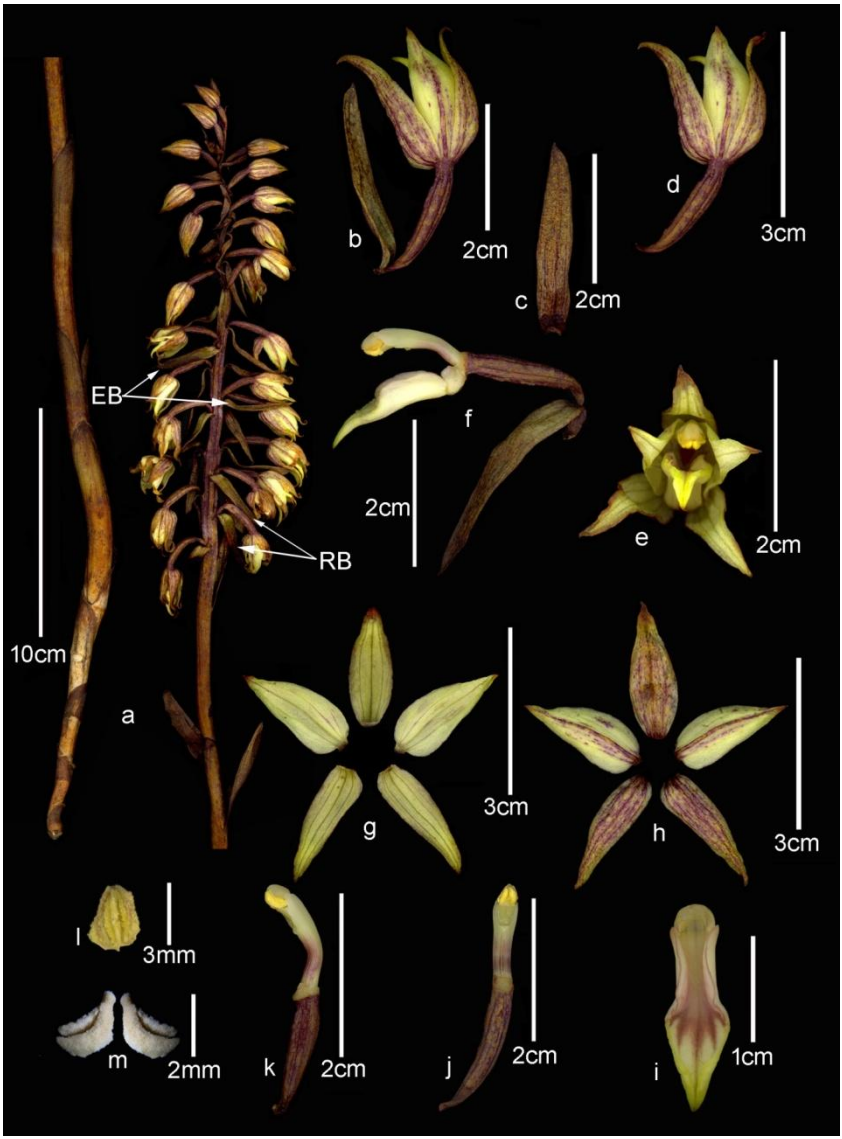

Fig. 1: ***Aphyllorchis alpina*** **King & Pantling**

a. habit (EB: erect bracts, RB: reflexed bracts); b. flower with floral bract; c. floral bract; d. lateral view of flower; e. front view of flower; f. lateral view of flower (sepals and petals removed); g. sepals and petals (inner surface); h. sepals and petals (outer surface); i. labellum (front view); j-k. column with pedicel and ovary; l. anther; m. pollinia
[Source: *Aazhivaendhan s.n.* (BSHC)].

Taxonomic Discussion:

Aphyllorchis gollanii was first described by Duthie (1902) based on specimens collected from Nagtiba (8000 and 10000 feet), Tehri Garhwal of Western Himalaya. The species has not been located since then from the type locality, despite being surveyed several times by various workers (Deva & Naithani, 1986; Jalal & Jayanthi, 2015). It was considered as endemic to India by Misra (2007) and again by Misra (2019) although it was reported from China in 2009 (Chen & Gale, 2009). While describing the species, Duthie (1902) noted its nearest ally as *Aphyllorchis alpina* King & Pantling, a high elevation species from Sikkim Himalaya. He differentiated *A. gollanii* by the presence of rhizomes without scales; the usually reflexed floral bracts becoming erect with the opening of flowers; the much shorter raceme; the labellum being attached to the base of column not forming a pouch; the epichile with no concavity at apex; and the different flower colour. Careful observation of the type specimens, original illustration and other original materials referred to by Duthie revealed some contradiction in the original description. Further comparative study of type, protologue, original illustration and fresh and herbarium specimens of *Aphyllorchis alpina* proved that both species are conspecific.

In the seven herbarium specimens studied by Duthie, rhizomes are either absent or represented by small fragments. These fragmented rhizomes clearly show the presence of loosely imbricate, distichous scales. This was observed by other workers as well and annotated on *Harsukh* 24146 (DD). However, the original description says "rhizome not scaly". Rhizome structure was not included in the original drawing published by Duthie (1906). Most of the specimens of *Aphyllorchis alpina* also do not contain the rhizome, but the specimen (*Pantling 462*, P) has a well-preserved rhizome with the characteristic imbricate scales which are similar to the rhizome fragments observed in *Aphyllorchis gollanii* [Fig. 2 (a-d); Fig. 4 (a-d); Fig.5 (a-b)].

In the protologue of *A. gollanii*, the floral bracts are said as deflexed towards the base and ultimately erect towards apex with the opening of flower. In all the seven specimens plus the original drawing the floral bracts are completely erect or a mixture of both erect and deflexed bracts is found in the same plant but not with the mentioned pattern. The fruiting specimens also show deflexed bracts whereas the buds or young flowers have erect bracts. Similar mixture of erect and deflexed floral bracts were

also found in the type specimens and subsequent collections of *Aphyllorchis alpina* from Eastern Himalaya. It suggests that this character does not bear any significance for describing this species [Fig. 2 (a-d); Fig. 4 (a-d); Fig. 5 (a-b)].

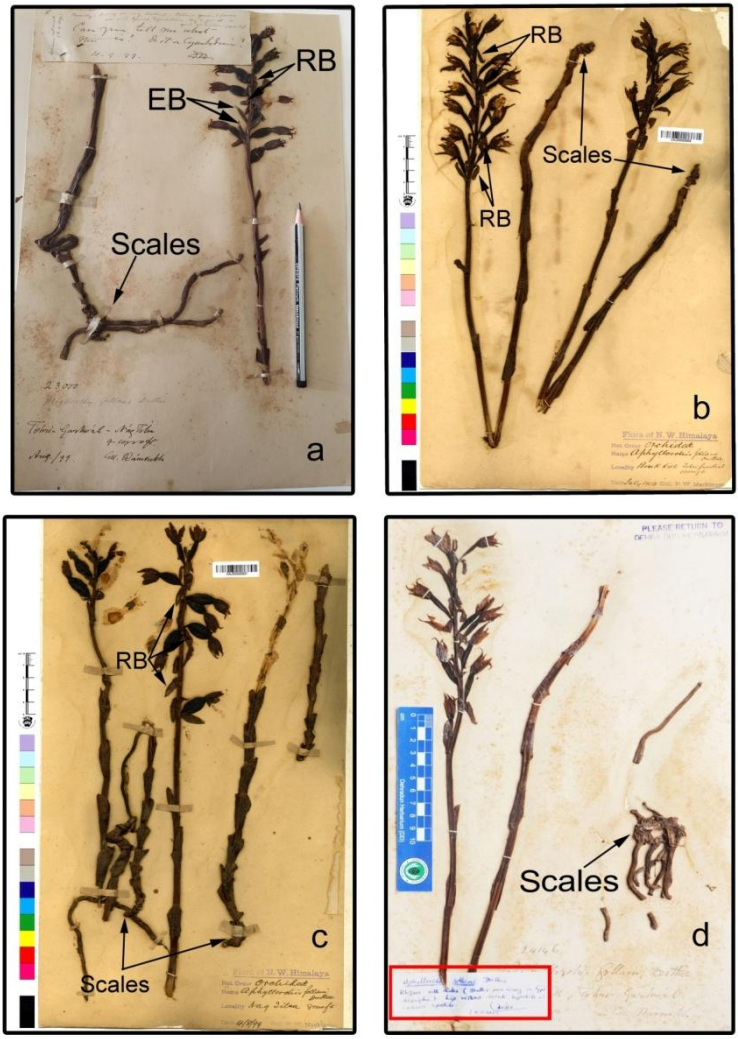

Figure 2: type specimens of *Aphyllorchis gollanii* Duthie

a. *Ramsukh* 23000 (DD), selected here as lectotype; b. *P.W. Mackinnon s.n.* (CAL-0000000636); c. *P.W. Mackinnon s.n.* (CAL-0000000637); d. *Harsukh* 24146 (DD). EB = erect bract; RB = reflexed bract.

For *A. gollanii*, length of rachis has been mentioned as ca. 10 cm and also said as much shorter than that in *A. alpina*. But the type specimens present variable lengths of rachis ranging between 10-20 cm. The same has been observed in *A. alpina* as well, where rachis is found elongated up to 35 cm. During the field surveys in Eastern Himalaya, it was observed that the plants found at relatively lower elevation and under shade show longer inflorescence with darker flowers, whereas the plants seen at higher elevation in exposed slopes were shorter with different colour shade in the flowers [Fig. 1; Fig. 2 (a-d); Fig.4 (a-d); Fig. 5 (a-b)].

Duthie mentioned the labellum of *A. Gollanii* as "deflexed from a concave winged claw, attached to the base of column, not forming a pouch; epichile with no convexity near the apex". The labellum structure depicted in the drawings [in Duthie, 1906; and Deva & Naithani, 1986 (based on the type material)] has been found identical to that of *A. alpina* as depicted in drawing by King & Pantling (1898). In both species, the claw has auricular lobes that form concave-saccate base but never adnate to the body of column forming a pouch. Fresh collection from Sikkim also confirms the same [Fig. 3 (a-d)].

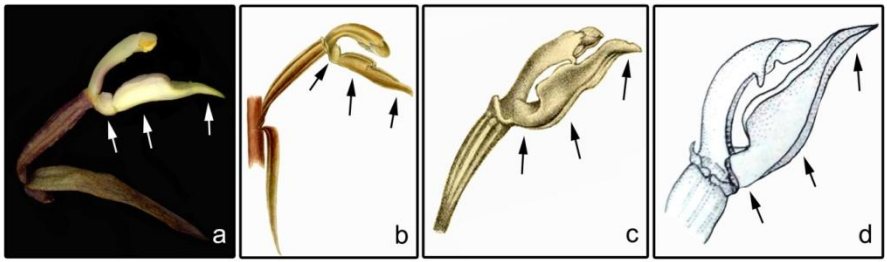

Figure 3: comparison of labellum structure in *Aphyllorchis alpina* and *Aphyllorchis gollanii*

A. alpina: a. *Aazhivaendhan s.n.* (BSHC); b. King & Pantling (1898); *A. gollanii*: c. Duthie (1906); d. Deva & Naithani (1986)

[The arrows indicate the similarity at base, middle and apical portions of labellum].

The columnar structure including the irregularly lobulate stigma margin is also found identical in both species. Flower colour is always influenced by the growing stage and local climatic condition, thus not to be considered as remarkable. The flower colours mentioned for both species fall under the same range [Fig. 1; Fig. 5 (a-b)].

Duthie (1902) mentioned *Aphyllorchis alpina* as "a high-elevation Sikkim species". But elevation ranges of *A. alpina* and *A. gollani* are almost similar. The former has been reported from other places of Sikkim and Arunachal Pradesh from further lower elevation.

In view of the above discussion, *Aphyllorchis gollani* can no longer be considered as a distinct species. As *A. alpina* has the priority as per article 11 of ICN (Turland *et al.*, 2018), *A. gollanii* is treated as a synonym.

Discussion on Typification:

***Aphyllorchis alpina*:** the type information was mentioned in the protologue as "Sikkim, at Sin-ga-le-la and Mon Lepcha; elevation about 14000 feet; *Pantling* No.*462*, in flower during July and August; *King's Collector* No. 4459". This indicates that King & Pantling (1898), while describing the species, had studied multiple specimens collected from Sikkim. As none of these was designated as 'type' or 'holotype' all these specimens form the syntype material. Following specimens and original materials could be located from all the herbaria where King & Pantling's collections are housed.

Sikkim, Singalelah, 13000 feet, July 1896, *Pantling* 462 [1 specimen at P (Fig. 4b), 2 at CAL (Fig. 4a), and 1 at BM. The materials mentioned as studied from K and W by Pearce & Cribb (2002) could not be located.

Sikkim, Tankra La, 14000 feet, July 1897, *Pantling* 462 [CAL (fig. 4c)]. Although Tankra La was not mentioned in the protologue, it is evident (from Pantling's annotation on the specimen) that the authors have studied the specimen before describing the species. Thus, it should be considered as a part of the original materials.

Sikkim, Mon Lepcha – Dzongri (Jongri), 13000 feet, August 1887, *King's Collector s.n.* (CAL). Pearce and Cribb (2002) have considered that the Mon Lepcha collection by *King's Collector* is the specimen bearing the number *4459*. But this specimen at CAL does has no any number and was collected in 1887 instead of 1877 as mentioned in the protologue. In fact, King & Pantling (1898) said, they sent the specimen collected in 1877 (*King's Collector 4459*) to Professor Reichenbach, who, however, never described it. They could not trace the specimen in the herbarium Reichenbach subsequently.

Sikkim, *King's Collector 4459* [W (could not be traced)]

Out of these six existing specimens, the one at P (P-00345168) is complete and truly represents the original description and illustration of the species.

Thus, it is selected here as the lectotype for the purpose of typifying the name *Aphyllorchis alpina* King & Pantling [Fig. 4 (b)].

Figure 4: syntype of *Aphyllorchis alpina* King & Pantling

a. *Pantling 462* (CAL-0000000641); b. *Pantling 462* (P-00345168), selected here as Lectotype; c. *Pantling 462* (CAL-0000000642); d. *M. Bhaumik & M.K. Pathak 4240* (CAL-64551). EB = erect bract; RB = reflexed bract.

***Aphyllorchis gollanii*:** the type information was mentioned in the protologue as "Western Himalaya: Tehri-Garhwal, on Nag Tiba, at elevations between 8000 and 10000 feet, *Gollan* (No. *2062*) and *Mackinnon's collector* (No. *23000*). The original specimens, discovered in 1881 by Mr. W. Gollan, after whom the name of this plant, were in too young a condition even for determining the genus". This indicates that Duthie (1902) had studied multiple specimens collected from Tehri-Garhwal (Nag Tiba) while describing the species. As none of these was designated as "type" or "holotype" all these specimens form the syntype material. The specimen (*Mackinnon's collector23000*) has been mentioned later by Duthie (1906) as (*Duthie's collector23000*) and by Deva & Naithani (1986) as (*Ramsukh 23000*). Duthie's work was largely based on plants collected by *Mackinnon* and his collectors, *Inayat* and his collectors and Duthie's own plant collectors. Ramsukh and Harsukh were two of the plant collectors who worked for them. However, the herbarium labels did not precisely indicate the collectors' name. Following specimens and original materials could be located from all the herbaria where Duthie's collections are housed.

India, Uttarakhand, Tehri-Garhwal, Nagtiba, 9000 - 10000 feet, August 1899, *Mackinnon's collector* (*Ramsukh*) *23000* (DD). This specimen was mentioned in the protologue but not with Ramsukh's name as the collector. This was sent by Duthie to Rolfe for its identification and a note bearing the conversation is still available on the specimen.

N.W. Himalaya, Nagtiba, 8000 feet, 04.08.1899, *P.W. Mackinnon s.n.* (CAL); N.W. Himalaya, Lokham?, Jaunsar, 8000 feet, 29.08.1900, *P.W. Mackinnon s.n.* (CAL); N.W. Himalaya, Bouk Hill, Tehri Garhwal, 10000 feet, July 1900, *P.W. Mackinnon s.n.* (CAL); N.W. Himalaya, Tehri Garhwal, Nag Tiba, July 1900, *J.F. Duthie24146* (CAL; AMES).

Although the last three specimens have not been mentioned in the protologue, they were evidently studied by Duthie while describing the species. Thus, they are part of original materials [vide Article 9.1 and 9.4 of ICN (Turland *et al.* 2018)].

N.W. Himalaya, Tehri-Garhwal, Bouk Hill, July 1900, *Harsukh24146* (DD!).

Gollan 2062 (could not be traced).

The specimen *Ramsukh 23000* at DD truly represent the original description and illustration of the species and also bears the annotations by the original author. Thus, it has been selected here as the lectotype for the purpose of typifying the name *Aphyllorchis gollanii* Duthie [Fig. 2 (a)].

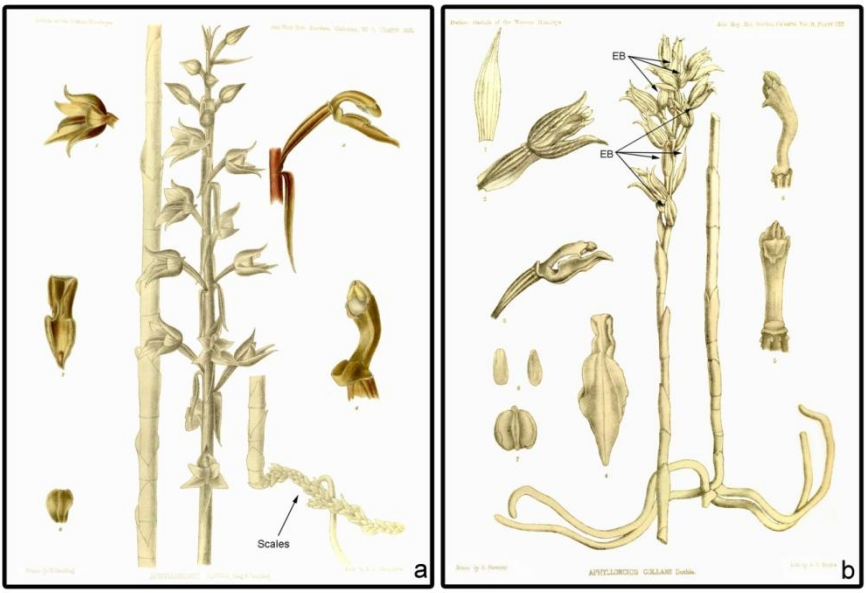

Figure 5: illustrations of *Aphyllorchis alpina* and *Aphyllorchis gollanii*

A. alpina: a. King & Pantling (1898); *A. gollanii*: b. Duthie (1906). EB = erect bract.

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