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Assessment of Conservation Status of the Family Orchidaceae: Possibly Extinct Species of Bangladesh

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ABSTRACT

The status of occurrence of orchid taxa and their probable threats have been assessed throughout Bangladesh especially in the recorded areas of orchid species. The assessment was based on long- term field investigation, collection and identification of orchid taxa; examination and identification of herbarium specimens preserved in different national and international herbaria and survey of relevant up to date floristic literature. Enumeration of these orchid taxa is provided with updated nomenclature and short annotation about habitats, phenology, potential values, recorded locality, global distribution, conservation status and list of specimens available in different herbaria. 32 orchid species belonging to 22 genera, out of 187 total recorded species, are recognized as extinct from the flora of Bangladesh due to anthropogenic and natural causes. These have neither been collected nor reported to occur elsewhere in Bangladesh for more than 50-100 years and could not be located in their recorded localities through field investigations. Among these extinct species, 12 are epiphytic in nature and 20 species are terrestrial and more than 50% are economically very important for their potential medicinal, horticultural and ornamental values. It is apparent that, while orchids are so numerous and widespread, many are threatened with extinction. Orchids of limited geographical range are severely threatened. Many orchids, by the nature of their life-style, are naturally rare and confined to limited areas. Immediate action plans are required to combat the threat of extinction of this valuable plant group.

Key Words: Ex-situ Conservation; In-situ Conservation; Orchids; Extinction; Over-harvesting; Habitat Loss.

INTRODUCTION

Orchidaceae, the second largest flowering plant family, is represented mostly in the tropical regions of the world by 880 genera and about 26,567 species (Cai et al. 2015) and a few in the arctic regions. One of the best-known plant groups in the global horticultural and cut flower trade (De 2015, Flora Holland 2015), orchids are also harvested, grown and traded for a variety of purposes, including as ornamental plants, medicinal products and food. It is represented by 187 species in Bangladesh (Rahman et al. 2017) and distributed throughout the country especially in Chattogram, Chittagong Hill Tracts, Cox's Bazar, greater Sylhet, Gazipur and Sundarbans (Huda 2007). William Roxburgh (1814) for the first time recorded 12 species of orchids in his Hortus Bengalensis from the area now in Bangladesh and later described in his Flora Indica (1932). Thereafter, Nathalian Wallich (1828-1849), Hooker (1885-1890, 1890-1894), Kurz (1877), Prain(1903), Heinig (1925), Datta and Mitra (1953) and Sinclair (1956) made remarkable contributions towards the account of the Orchidaceae with a total of 110 species. Several works in its exploration and chemical evaluation are ongoing by a good number of researchers in country and abroad.

Unfortunately, their detailed taxonomic account has remained elusive despite the fact that some of them have succumbed to unregulated commercial collection and habitat destruction pressures and are endangered of survival and even believed to have become extinct. A

systematic enumeration of these plants is thus, highly desirable. Besides facilitating the preparation of a detailed account of the orchid flora of Bangladesh, such an enumeration is expected to be useful in developing appropriate conservation strategies for the endangered species (Huda 2007).

In addition to their geographical and taxonomic diversity, orchids are widely used and traded for a variety of reasons, both legally and illegally, sustainably and unsustainably (Fay 2015). There are growing concerns that trade, although largely unreported, is threatening wild orchid populations and species in many places. Orchids may be particularly vulnerable to over-harvest because many species have a limited range and/or occur at low densities due to a variety of interacting factors such as recent speciation, specialized pollination mechanisms, habitat specificity and the restricted distribution of mycorrhizal symbionts (Dodson and Gentry 1991, Swarts and Dixon 2009, McCormick and Jacquemyn 2014). The limited ecological studies on the conservation impacts of wild collection of epiphytic orchids suggest a low tolerance to harvest (Mondragón 2009, Hu et al. 2017). However, efforts to address unsustainable and illegal trade are hampered by a lack of awareness of the importance of this work, and the low profile of orchid conservation relative to that of other taxonomic groups. So, it is now important to assess the conservation status and occurrence of orchid taxa in Bangladesh to restore and conserve valuable orchid species in this area.

MATERIAL AND METHODS

We have Investigated the family Orchidaceae of Bangladesh for its species diversity and current status of occurrence. The present study was initiated in 1996 with a view to preparing an exclusive list of Bangladesh orchids. For this purpose, frequent surveys were made in the orchid rich-areas especially in Chattogram, Chittagong Hill Tracts, Cox's Bazar, greater Sylhet, Madhupur and Sundarban forests during 1996-2019, for field collections. The collections were critically examined and compared with those maintained in the Herbaria of Aberdeen University (ABD), Royal Botanic Gardens, Kew (K), British Museum (BM), Singapore Botanic Gardens Herbarium (SING) and Edinburgh (E), for proper identification. The earlier orchid acquisitions from Bangladesh kept at the Herbarium of Chittagong University (HCU), Dhaka University Salar Khan Herbarium (DUSH), Bangladesh Council for Scientific and Industrial Research Herbarium, Chattogram (BCSIRH), Bangladesh Forest Research Institute Herbarium (BFRIH), Chattogram, Bangladesh National Herbarium (BNH), Central National Herbarium, Kolkata (CAL).

Literature, relevant to the records of orchids of Bangladesh, has been thoroughly surveyed and a list of taxa prepared with their recorded localities in the flora, and these are: Seidenfaden (1978a, b, 1985, 1988), Moyeen (1982), Biswajit (1987), Khan and Halim (1987, 1991), Halim and Khan (1991), Ahmed and Pasha (1993, 1994, 1998, 1998a), Ahmed et al. (1989, 1989a, 1989b, 1989c, 1991, 1993, 1994), Rahman and Huda (1998, 2001), Huda and Rahman (1999), Huda et al. (1999, 2001), Khanam et al. (2001), Huda (2007, 2008), Islam et al. (2016), Rahman et al. (2017).

Recent floristic literature published with local taxa have also been consulted for occurrence and distribution of orchids in different localities of Bangladesh, and these are: Jayaweera (1981), Abraham and Vatsala (1981), Kirtikar and Basu (1981), Huq and Khan (1984), Khan et al. (1994), Rahman and Uddin (1997), Uddin et al. (1998), Bose et al. (1999), Huda (2000), Khan and Huq (2001), Rashid and Mia (2001), Uddin et al. (2002), Uddin and Hassan (2004), Deb et al. (2009), Momen et al. (2006), Islam et al. (2009), Tutul et al. (2009), Uddin and Hassan (2010), Arefin et al. (2011), Hossain (2011), Uddin and Hassan (2012), Behera et al. (2013), Pant (2013), Uddin et al. (2013) and Gogoi et al. (2014). Identification and collection of orchid taxa have been made following standard taxonomic methods and herbarium specimens are preserved at Herbarium of Chittagong University. Karthikeyan et al. (1989) and Pearce and Cribb (2002) have been followed for species citations.

RESULTS AND DISCUSSION

Assessment of the status of occurrence of orchid species revealed that, 32 species under 22 genera out of 187 recorded orchid taxa of Bangladesh are thought to be probably extinct from the flora according to the definition of extinct category (IUCN 2001). They could not be located in their collection localities of Bangladesh during field investigations conducted by the authors themselves and even different works conducted on orchids since 1971. Moreover there is no report of occurrence of any of these taxa could be found even in

different floristic works. Huda (2008) in his compilation of orchids in the Encyclopedia of Flora and Fauna of Bangladesh cited 179 taxa where 4 previously recorded species were missing. Islam et al. (2016) recently in their list of orchid taxa from greater Sylhet missed 10 species which had been previously recorded in the works of Wallich (1828-1849), Hooker (1885-1890), Barbhuiya and Gogoi (2010). Further a number of species cannot be assessed due to lack of proper flowering stage or adequate herbarium specimen. Out of these 32 extinct species, 12 (38%) species are epiphytic and 20 (63%) are terrestrial, and economically, 8 (25%) of these are of medicinal and 14 (44%) are of horticultural value.

Orchids in the wild mostly found to grow as epiphytic on the trunk of old trees, like raintree, mostly in the rainforests of Chattogram, Cox's Bazar, Hill Tracts districts, Tangail, greater Sylhet and Sundarbans. It has been difficult to collect and locate many rare orchids from remote forested areas due to lack of entrance facilities. Moreover, many old forests are either fully or partially destroyed and many recorded rare orchids of both epiphytic and terrestrial habitats either disappeared or could not be located. More intensive investigations to the very remote areas for collection and identification of orchids are required which may provide the rediscovery of some of these recorded taxa, thought to be lost.

However, the study provided the status of occurrence and rate of extinction of orchid taxa in the wild, and data of recorded/collected localities on which basis further attempts for their rediscovery and conservation management (in-situ/ex-situ) could be made following National Conservation Strategy of Bangladesh.

Enumeration of the Possibly Extinct Orchid Taxa

All possibly extinct taxa are enumerated below with the information on each species about its current nomenclature, synonym(s), ecology, flowering period, potential values, recorded localities, global distribution, status of occurrence and list of examined herbarium specimens. The species are arranged alphabetically.

Acanthphippium sylhetense Lindl., Gen. Sp. Orch. Pl.: 177 (1833)
Synonym: *Acanthphippium ingiflorum* riff. (1851).
Ecology: Grow in dense shade of the forest in a patch.
Potential value: Medicinal.
Flowering period*:* April to May.
Global distribution: Bangladesh, China, Fiji Island and India (Assam).
Distribution in Bangladesh: Sylhet.
Threat to the species: Anthropogenic disturbance and habitat destruction.
Last authentic record: No record after Hooker in 1880-90 from Sylhet.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Anaectochilus roxburghii (Wall.) Lindl., Gen. Sp. Orchid. Pl.: 499 (1840)
Synonyms: *Chrysobaphus roxburghii* Wall. (1826), *Anaectochilus yungianus* Hu (1971), *Zeuxine roxburghii* (Lindl.) Hiroe (1971).
Ecology: In dark, damp gullies, at edge of forests; 330-1200 m altitude.
Potential value: Medicinal.
Flowering period: April-June.
Global distribution: Bangladesh, India, Bhutan, Thailand, China, Laos and Vietnam.
Distribution in Bangladesh: Sylhet.
Threat to the species: Cleaning of forest floor and rapid deforestation.
Last authentic record: No record after Lindley 1830 from Sylhet.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Ascocentrum ampullaceum (Roxb.) Schltr. in Repert. Spec. Nov. Regni Veg.Beih. 1: 975 (1913).
Synonyms: *Aerides ampullacea* Roxb. (1832); *Oeceoclades ampullacea* (Roxb.) Lindl. ex Voigt (1845); *Gastrochilus ampullaceus* (Roxb.) Kuntze (1891); *Saccolabium ampullaceum* (Roxb.) Lindl. (1832).
Ecology: Epiphytic.
Potential value: Not known.
Flowering period: March-May.
Global distribution: Bangladesh, Bhutan, China, India (including Andaman Islands), Laos, Myanmar, Nepal, and Thailand.
Distribution in Bangladesh: Sylhet.
Threat to the species: Habitat destruction.
Last authentic record: No report of collection after Hook.f. in 1890 from Sylhet.
Specimen examined: No herbarium specimens available in DACB, DUSH, HCU, BFRIH and BCSIRH.

Calanthe densiflora Lindl., Gen. Sp. Orchid. Pl.: 250 (1833)
Synonyms: *Alimorchis densiflora* (Lindl.) Kuntze

(1891), *Calanthe kazuoi* Yamamoto (1930).
Ecology: On moist rocks, in degraded evergreen forests; 1650-3000 m alt.
Potential value: Not known.
Flowering period: October-December.
Global distribution: Bangladesh, India, Bhutan, Nepal, China, Japan and Vietnam.
Distribution in Bangladesh: Sylhet.
Threat to the species: Habitat destruction and deforestation.
Last authentic record: No record after Lindley in 1830 Sylhet.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Calanthe puberula Lindl., Gen. Sp. Orchid. Pl.: 252 (1833).
Synonyms: *Alismorchis puberula* (Lindl.) Kuntze (1891), *Calanthe amoena* W.W. Smith (1921), *C. lepida* W.W. Smith (1921), *Paracalanthe reflexa* var. *puberula* (Lindl.) Kudo (1930).
Ecology: On moist rocky or hard soil in the forests; 160-1830 m alt.
Potential value: Medicinal.
Flowering period*:* October-December.
Global distribution: Bangladesh, India, Bhutan, Myanmar, China, Taiwan and Vietnam.
Distribution in Bangladesh: Sylhet.
Threat to the species: Habitat destruction.
Last authentic record: No record after Lindley in 1830 from Sylhet.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Dendrobium chryseum Rolfe in Gard. Chron. Ser. 3, 3: 233 (1888).
Synonyms: *Dendrobium clavatum* Wall. ex Lindl. (1852). *Callista clavata* (Wall ex Lindl.) Kuntze (1891), *Dendrobium tibeticum* Schltr. (1921), *D. clavatum* var. *aurantiacum* (Rchb. f.) (1951).
Ecology: It is found to grow on rocks by waterfall in riverine forest; 1500-2000 m.
Potential value: Not known.
Flowering period: June.
Global distribution: Bangladesh, India, Nepal, Myanmar, Bhutan, Thailand, China and Vietnam.
Distribution in Bangladesh: Sylhet.
Threat to the species: Change in the forest ecosystem and degradation of riverine forest.
Last authentic record: No record after Hook f. in 1890 from Sylhet.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Dendrobium pachyphyllum (Kuntze) Bakh.f. in Blumea 12: 69 (1963).
Synonyms: *Bolbodium pumilum* (Kuntze) Brieger (1981); *B. pusillum* (Blume) Rausch. (1983); *Callista pachyphylla* Kuntze (1891); *C. pusilla* (Blume) Kuntze (1891); *C. pumila* Kuntze (1891); *Desmotrichum pusillum* Blume (1825); *Dendrobium pusillum* (Blume) Lindl. (1830) *nom. illeg*; *D. pumilum* Roxb. (1832) *nom. illeg*; *D. perpusillum* Balakar.(1970).
Ecology: Epiphytic.
Potential value: Medicinal.
Flowering period: July-August.
Global distribution: Bangladesh, Borneo, India, Java, Malaysia, Myanmar, Sumatra, Thailand and Vietnam.
Distribution in Bangladesh: Cox's Bazar.
Threat to the species: Habitat destruction.
Last authentic record: No record after Ompdale & Ahmed in 1945 from Cox's Bazar.
Specimen examined: Cox's Bazar, 06.07.1945, Ompdale and Ahmed *s.n.* (DUSH) and no herbarium specimen available in BNH, HCU, BFRIH and BCSIRH.

Dendrobium ruckeri Lindl.in Wall. Cat. 2003; Gen. & Sp. Orchid. 82 (1830).
Synonym: *Callista ramose* Kuntze, *Callista ruckeri* (Lindl.) Kuntze, *Dendrobium ramosum* Lindl. (1830).
Ecology: Epiphytic.
Potential value: Not known.
Flowering period: Not known.
Global distribution: Bangladesh, India, Bhutan, Myanmar.
Distribution in Bangladesh: Sylhet.
Threat to the species: Habitat destruction.
Last authentic record: No record after Hook f. in 1880 from Sylhet.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Dendrobium blumei Lindl. Sp. Orchid. Pl. 88 (1830).
Synonym: *Aporum blumei* (Lindl.) Rauschert (1983); *Callista boothii* (Teijsm. & Binn.) Kuntze (1891); *Callista tuberifera* (Hook.f.) Kuntze(1891); *Ceraia boothii* (Teijsm. & Binn.) M.A. Clem. (2003); *Ceraia fimbriata* (Blume) M.A.Clem. (2003); *Dendrobium boothii* Teijsm. & Binn.(1862); *Dendrobium tuberiferum* Hook.f. (1890).

Ecology: The species used to grow on the trees as epiphyte.
Potential value: Not known.
Flowering period: Not known.
Global distribution: Bangladesh, Malaysia and Singapore.
Distribution in Bangladesh: Chittagong.
Threat to the species: Habitat destruction.
Last authentic record: No record after Hook f. in 1880 from Chittagong.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Eulophia bracteosa Lindl., Gen. Sp. Orchid. 180. (1833).
Synonym: *Eulophia grandiflora* Lindl.
Ecology: On the slopes of the hills.
Potential value: Horticultural.
Flowering period*:* August.
Global distribution: Bangladesh, Myanmar and India.
Distribution in Bangladesh: Chittagong.
Threat to the species: Habitat destruction.
Last authentic record: No record after Hook f. in 1890 from Chittagong.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Eulophia herbacea Lindl. In Duthie. Fl. Upp. Gang. P1.3: 196 (1920).
Synonyms: *Eulophia brachypetala* Lindl., *Limodorum bicolor* Roxb. (1832).
Ecology: Terrestrial.
Potential value: Medicinal.
Flowering period*:* May–July.
Global distribution: Bangladesh, India, Philippines.
Distribution in Bangladesh: In Bangladesh, it is found in Rangpur.
Threat to the species: Habitat destruction.
Last authentic record: No record after Hook f. in 1890 from Rangpur.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Gastrochilus calceolaris (Buch-Ham. ex J. E. Smith) D. Don, Prodr. Fl. Nepal.: 32 (1852).
Synonyms: *Aerides calceolaris* Buch.-Ham. ex J. E. Smith (1819), *Epidendrum calceolare* Buch.-Ham. (1825), *Sarcochilus nepalensis* Sprengel (1826), *Saccolabium calceolare* (Buch.-Ham. ex J.E.Smith) Lindl.(1833), *Aerides leopardium* Wall.ex Lindl. (1838), *A. leopardorum* Wall.(1890).
Ecology: Epiphytic in hot valleys; at 1500-2000m alt.
Potential value: Medicinal.
Flowering period: March-May.
Global distribution: Bangladesh, India, Nepal, Myanmar, Bhutan, China, Thailand, Vietnam, Malaysia.
Distribution in Bangladesh: In Bangladesh, it is found in Sylhet.
Threat to the species: Habitat destruction.
Last authentic record: No record after Hook f. in 1890 from Sylhet.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Habenaria digitata Lindl., Gen. Sp. Orch. Pl.: 307 (1833).
Synonym: *Bonatea panduana* Lindl. *ex* Wall., *Habenaria graveolens* Duthie, *Habenaria trinervia* Wight, *Bonatea benghalensis* Griff.
Ecology: Terrestrial.
Potential value: Not known.
Flowering period: Not known.
Global distribution: Bangladesh, India, Myanmar, Thailand, Nepal.
Distribution in Bangladesh: Sylhet.
Threat to the species: Anthropogenic disturbance and habitat destruction.
Last authentic record: No record after Hook.f.(1890) from Sylhet.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Habenaria gracilis Coleb., Exot. Fl.: t. 135(1824).
Synonym: *Bonatea gracilis* Lindl.(1835).
Ecology: Terrestrial.
Potential value: Not known.
Flowering period: Not known.
Global distribution: Bangladesh and Brazil.
Distribution in Bangladesh: Sylhet.
Threat to the species: Habitat destruction.
Last authentic record: No record after Hook.f.(1890) from Sylhet.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Habenaria longifolia Buch.-Ham. ex Lindl.; Gen. Sp. Orchid. Pl.: 324 (1835).
Synonym: *Gymnadenia longifolia* Lindl. ex Wall.
***Ecology*:** Terrestrial.
Potential value: Not known.
Flowering period: Not known.
Global distribution: Bangladesh, India, Bhutan, China,

Malaya, Myanmar, Sri Lanka.
Distribution in Bangladesh: According to Prain (1903) it was recorded from Central Bengal.
Threat to the species: Habitat destruction.
Last authentic record: No record after Prain 1903 from Central Bengal.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Habenaria viridifolia (Rottler ex Sw.) R.Br. Gen. Sp. Orchid. Pl. 319 (1835).
Synonym: *Coeloglossum luteum* Dalzell, *Habenaria graminea* A.Rich.
Ecology: Terrestrial.
Potential value: Medicinal.
Flowering period: Not known.
Global distribution: India, Sri Lanka, Thailand and Indo-China.
Distribution in Bangladesh: According to Hook f. (1890) it was recorded from Lower Bengal.
Threat to the species: Habitat destruction and over exploitation.
Last authentic record: No record after Hook f. in 1890 from Lower Bengal.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Liparis gamblei Hook.f., Icon. Pl. Ser. 3(19): t. 1812 (1889).
Synonym: *Leptorkis gamblei* (Hook.f.) Kuntze (1891).
Ecology: Terrestrial.
Potential value: Not known.
Flowering period: June-July.
Global distribution: Bangladesh, Bhutan, NE India and Vietnam.
Distribution in Bangladesh: Chittagong Hill Tracts.
Threat to the species: Habitat destruction.
Last authentic record: No record after Lister from Chittagong Hill Tracts.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Malaxis biaurita (Lindley) Kuntze, Gen. Pl. 2: 673. (1891)
Synonym: *Microstylis biaurita* Lindley (1830).
Ecology: Terrestrial.
Potential value: Not known.
Flowering period: July.
Global distribution: Bangladesh, India, China, the Andaman Islands, Myanmar, Laos, Nepal and Thailand.
Distribution in Bangladesh: Sylhet and Comilla.
Threat to the species: Habitat destruction.
Last authentic record: No record after Lindley in 1830-40 from Sylhet and Comilla.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Malaxis calophylla (Rchb. f.) Kuntze in Revis. Gen. Pl.: 673 (1891).
Synonyms: *Epidendrum variegatum* Konig in Retzius (1791), *Microstylis calophylla* Rchb. f. (1879), *M. wallichii* var. *brachycheila* Hook. f. (1890), *M.scottii* Hook. f. (1890), *Malaxis calophylla* var. *brachycheila* (Hook.f.) T. Tang &. T. Wang (1951).
Ecology: Terrestrial.
Potential value: Horticultural.
Flowering period: July.
Global distribution: Bangladesh, Bhutan, Myanmar, Thailand, China, Cambodia, Malaysia and Borneo.
Distribution in Bangladesh: In Bangladesh, it is found in Dhaka.
Threat to the species: Habitat destruction.
Last authentic record: No record after Clarke from Dhaka.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Pachystoma pubescens (Blume) Blume, Mus. Bot. 2: 178. (1856).
Synonyms: *Apaturia senilis* Lindl. (1831), *Pachystoma senile* (Lindl.) Rchb. f. (1858), *Pachystoma edgeworthii* Falconer ex Rchb. f. (1862).
Ecology: Terrestrial.
Potential value: Not known.
Flowering period: February to May.
Global distribution: Bangladesh, India, Bhutan, Myanamr, China, Sumatra, Java, Borneo, New Guinea, the Philippines and Malaysia.
Distribution in Bangladesh: Cox's Bazar.
Threat to the species: Habitat destruction.
Last authentic record: No record after Sinclair in 1956 from Cox's Bazar.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Paphiopedilum insigne (Wall. ex Lindl.) Pfitz., in Engler, Bot. Jahrb. 19: 41 (1894)
Synonym: *Cypripedium insigne* Wall. exLindl. (1840).
Ecology: Epiphytic.
Potential value: Horticultural.
Flowering period: October to March.
Global distribution: Bangladesh, Bhutan, Nepal, India.

Distribution in Bangladesh: Sylhet.
Threat to the species: Habitat destruction.
Last authentic record: No record after Lindley in 1830 from Sylhet.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Paphiopedilum venustum (Wall. ex Sims) Pfitzer., Jahrb. Wiss. Bot.19: 165 (1888).
Synonyms: *Cypripedium venustum* Wall. (1820), *C. pardinum* Reichb.f. (1869), *Cordula venusta* (Wall.ex Sims) Rolfe (1920), *Stimegas venustum* (Wall. ex Sims) Raf. (1838).
Ecology: Terrestrial.
Potential value: Not known.
Flowering period: March-May.
Global distribution*:* Bangladesh, Bhutan, China, India and Nepal.
Distribution in Bangladesh: Sylhet.
Threat to the species: Habitat destruction.
Last authentic record: No record after Lindley in 1830 from Sylhet.
Specimen examined: No herbarium specimen available at DACB, DUSH, HCU, BFRIH, BCSIRH.

Pecteilis triflora (D. Don)Tang &Wang, Acta Phytotax. Sin. 1: 62 (1951).
Synonym: *Habenaria triflora* D. Don. (1825), *H.uniflora* Buch.-Ham. ex D.Don (1825), *Platanthera candida* Lindl. (1835), *P. uniflora* (D. Don) Lindl. (1835); *Orchis uniflora* Buch.-Ham. ex D.Don (1825).
Ecology: Terrestrial.
Potential value: Horticultural.
Flowering period: August.
Global distribution*:* Bangladesh, India and Nepal.
Distribution in Bangladesh: Mymensingh.
Threat to the species: Habitat destruction.
Last authentic record: No record after Hook f. in 1890 from Mymensingh.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Podochilus khasianus Hook. f. Fl. Brit. India 6(1): 81 (1890).
Synonym: *Podochilus chinensis* Schltr. (1924).
Ecology: Epiphytic or Lithophytic.
Potential value: Horticultural.
Flowering period: March- May.
Global distribution: Bangladesh, India, Bhutan, China.
Distribution in Bangladesh: Sylhet.
Threat to the species: Habitat destruction.
Last authentic record: No record after Hook. f. in 1890 from Sylhet.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Pterocerasteres (Blume) Holttum in Kew Bull. 14: 217 (1960).
Synonym: *Aerides suaveolens* Roxb. (1832), *Dendrocollateres* Blume (1825), *Ornitharium striatulum* Lindl. & Paxton (1851), *Pteroceras radicans* Hassk. (1842), *Sarcochilus suaveolens* (Roxb.) Hook. f. (1890).
Ecology: Epiphytic.
Potential value: Horticultural.
Flowering period*:* June.
Global distribution: Bangladesh, Borneo, Cambodia, eastern Himalayas, India, Java, Laos, Lesser Sunda Islands, Moluccas, Myanmar, Nepal, Thailand, the Philippines, Sulawesi, Sumatra and Vietnam.
Distribution in Bangladesh: Chittagong.
Threat to the species: Habitat destruction.
Last authentic record: No record after Roxburgh in 1814 from Chittagong.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Spathoglottis pubescens Lindl., Gen. Sp. Orchid. Pl.: 120 (1831).
Synonym: *Spathoglottis pubescens* var. *parviflora* (Lindl.) Hook. f. (1890), *Epipactis graminifolia* Roxb. (1832), *Pogonia graminifolia* (Roxb.) Voigt (1845), *Spathoglottis bensonii* Hook.f. (1890), *S. fortunei* Lindl. (1845), *S. khasyana* Griff. (1851), *S. parvifolia* Lindl. (1845).
Ecology: Terrestrial.
Potential value: Horticultural.
Flowering period: June-September.
Global distribution: Bangladesh, India, Myanmar, Bhutan and China.
Distribution in Bangladesh: Sylhet.
Threat to the species: Habitat destruction.
Last authentic record: No record after Huda et. al. in 1999 from Chittagong.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Tainia latifolia (Lindl.) Reichb.f., Bonplandia 5: 54 (1857).
Synonyms: *Ania latifolia* Lindl. (1831), *Mitopetalum latifolium* (Lindl.) Bl. (1856), *Eulophia hastate* Lindl. (1859), *Tainia hastata* (Lindl.) Hook. f. (1890), *T. khasiana* Hook. f.(1890).

Ecology: Terrestrial.
Potential value: Horticultural.
Flowering period: March.
Global distribution: Bangladesh, Bhutan, Cambodia, China, India, Java, Laos, Myanmar, Thailandand Vietnam.
Distribution in Bangladesh: Sylhet.
Threat to the species: Habitat destruction.
Last authentic record: No record after Hook f. in 1890 from Sylhet.
Specimen examined: Sylhet; Wallich, Wall. Cat. 3741(K-W, KAL). But no herbarium specimen available at DUSH, HCU, BFRIH, BCSIRH.

Theocostele alata (Roxb.) Parish and Reichb. f. in Trans. Linn. Soc. 30: 135 and 144, t. 29 (1874).
Synonyms: *Cymbidium alatum* Roxb. (1832). *Thecostele zollingeri* Rchb. f. (1857), *Collabium wrayi* Hook. f. (1890), *Thecostele maculosa* Ridl. (1893).
Ecology: Epiphytic.
Potential value: Horticultural.
Flowering period: July.
Global distribution: Bangladesh, India, Myanmar, Thailand, Laos, Vietnam, Malaysia, the Philippines and Sumatra.
Distribution in Bangladesh: Chittagong.
Threat to the species: Habitat destruction.
Last authentic record: No record after Roxburgh in 1814 from Chittagong.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Trias oblonga Lindl., Gen. Sp. Orch. Pl.: 60 (1830).
Synonym: *Bulbophyllum burkillii* Gage (1906), *B. oblongum* (Lindl.) Reichb.f (1864), *B. moulmiense* Reichb.f (1861), *Dendrobium tripterum* Wall. (1890), *Trias ovata* Lindl.(1830).
Ecology: Epiphytic.
Potential value: Horticultural.
Flowering period: Spring (IOSPE PHOTOS).
Global distribution: Bangladesh, India, Myanmar and Thailand.
Distribution in Bangladesh: Sundarbans.
Threat to the species: Habitat destruction.
Last authentic record: No record after Prain in 1903 from Sundarban.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Uncifera acuminata Lindl. in J. Proc. Linn. Soc., Bot. 3: 40 (1859).e
Synonym: *Saccolabium acuminatum* (Lindl.) Hook. f., Icon. Pl. ser. 4(22): t.2135 (1894).
Ecology: Epiphytic.
Potential value: Horticultural.
Flowering period: July to September.
Global distribution: Bangladesh, India, China, Nepal and Bhutan.
Distribution in Bangladesh: Chittagong Hill Tracts.
Threat to the species: Habitat destruction.
Last authentic record: No record after J.L. Lister from Chittagong Hill Tracts.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Vanda crisata Lindl.; Gen. Sp. Orch. Pl.: 216 (1833).
Synonyms: *Aerides cristata* (Lindl.) Wall. ex Hook.f. (1890), *Vanda striata* Reichb.f. (1868), *Trudelia cristata* (Lindl.) Senghas in Schltr. (1988).
Ecology: Epiphytic.
Potential value: Medicinal.
Flowering period: May.
Global distribution: Bangladesh, India, Bhutan, China and Nepal.
Distribution in Bangladesh: Sylhet.
Threat to the species: Habitat destruction.
Last authentic record: No record after Hook f. in 1890 from Sylhet.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

Vrydagzynea albida (Blume) Blume, Coll. Orchid: 71 (1858).
Synonym: *Hetaeria albida* Blume (1825), *Physurus viridiflorus* Lindl. (1857).
Ecology: Terrestrial.
Potential value: Horticultural.
Flowering period: September–November.
Global distribution: Bangladesh, Borneo, India, Java, Malaysia, New Guinea, Sumatra, Thailand, the Philippines and Vietnam.
Distribution in Bangladesh: According to Hook f (1890) it was recorded from Lower Bengal.
Threat to the species: Habitat destruction.
Last authentic record: No record after Hook f in 1890 from Lower Bengal.
Specimen examined: No herbarium specimen is found at BNH, DUSH, HCU, BFRIH, BCSIRH, KAL.

CONCLUSION

Despite appearing to be one of the most legally protected groups of organisms, many orchid species around the world are under threat from illegal and unsustainable trade for many purposes, primarily for horticulture, food and medicine. With regard to Bangladesh context, extinction of these 32 species is alarming to the remaining species as most of the orchids are monogeneric. We understand more about the distribution, rarity, threats and extinction of orchids than ever before, and we have the scientific tools to address many of the problems, yet many species face daily threats including habitat loss and unsustainable exploitation. Many international plant conservation groups, including the Orchid Specialist Group of the IUCN Species Survival Commission, are using orchids as flagship species in the conservation debate. These organizations have a vital role to play in countering the trend of biodiversity loss by promoting effective orchid conservation, improving networking and technology transfer, interacting with decision-makers, and in educating the orchid community. Besides habitat preservation, a conservation priority for orchids should be, to better understand trade and to address its threats.

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