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Cover: Mixed media with fine liners, colour pencils, and watercolour background of an Indian funnel web spider. © Elakshi Mahika Molur.

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ARTICLE

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Unregulated wild orchid trade in Manipur: an analysis of the Imphal Valley markets from the Indo-Burma hotspot

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Abstract: Unsustainable and illegal trade of wild orchids at local and international markets is a well-known conservation issue throughout the world. Local as well as international trade of wild orchids is under-reported and under-researched. The study assessed wild orchids traded in markets of the Imphal Valley, the northeastern Indian state of Manipur in 2022–23. Eighty-two wild orchid species from 33 genera were observed to be traded including the wild orchid species, viz., *Paphiopedilum hirsutissimum*, *Renanthera imschootiana*, and *Vanda coerulea*, protected under the Wildlife (Protection) Act, 1972 of India. The local wild orchid trade in Imphal is unregulated, unchecked and unmonitored, which is a serious concern for the conservation of wild orchid species in Manipur and within the Indo-Burma hotspot.

Keywords: CITES, Imphal valley, local wild orchid trade, Orchidaceae, orchid sanctuaries, *Renanthera imschootiana*, *Vanda coerulea,* wild orchids.

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Author details: Kamei Kambuikhonlu Kabuini was a master's student in the Department of Environmental Science, Manipur University. She has worked on her dissertation entitled "Unregulated commercialization of wild orchids in Manipur: An analysis of Imphal Valley markets". Dr. Maibam Dhanaraj Meitei is a faculty in the Department of Environmental Science, School of Human and Environmental Sciences, Manipur University, Canchipur, India. His research area is focussed on wetland studies, environmental pollution monitoring, phytotechnology and bioresource management.

Author contributions: MDM framed the concept of the project; KKK performed the survey; MDM and KKK were involved in analysis, manuscript writing, editing and finalizing the manuscript. All authors have read and approved the final version of the manuscript.

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INTRODUCTION

With an estimated 28,484 species, orchids account for 10% of angiosperms and represent the most diverse group of flowering plants, as well as the most threatened (Kumar 2024). Habitat loss coupled with climate change pose serious threats for orchids which are terrestrial, epiphytic and lithophytic (Barman & Devadas 2013; Brummitt et al. 2015). Orchids represent a significant illegally traded horticultural crop because of their beauty, rarity and popularity (Ballantyne & Pickering 2012; Phelps & Webb 2015; Hinsley et al. 2016). Consequently, all orchid species are included in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in Appendix I and II, where the trade of Orchidaceae family is either legally regulated or prohibited (UNEP-WCMC 2018). Additionally, the International Union for Conservation of Nature (IUCN) has listed 2023 orchid species in the 'Threatened' category (IUCN 2024).

Around 1484 orchid species are reported from India and the northeastern states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura represent an important orchid hotspot with a total of 856 species (Kumar et al. 2022). From the Indian subcontinent, the usage of orchids for medicine is reported since ancient times with different orchids mentioned in Ayurveda (Bose et al. 2017). Today, illegal trade of wild orchid species in northern India intended for their use in local traditional medicine and international trade for the Chinese herbal medicine is pushing different rare and threatened species towards extinction (Hinsley et al. 2018). Around 1295 species belonging to 179 genera found in India are listed in the Appendix II of CITES (De 2022). Moreover, as a result of high demand in the Indian market, orchid cut flowers worth INR 2321.84 lakhs were imported in 2018–19 (De 2020). Despite the increasing demand in India for both local and international trade, most of the orchid dealers haven't explored the concepts of mass scale multiplication techniques. The native sellers largely depend on the harvest from wild to meet the supply chain (TRAFFIC 2022; WWF-India 2022). In the northeastern state of Manipur, deforestation in the hills for jhum and charcoal harvesting, forest fire and illegal overexploitation for trade are the major threats to orchids. The state is home to 407 orchid taxa belonging to 95 genera (Mao & Deori 2018). The mass scale orchid production using micropropagation is still lacking in the state. Therefore, majority of the trade is based on wild collection from tropical and subtropical forests of Manipur. Hence, in order to highlight the problem of un-monitored wild orchid trade, a project was undertaken to identify major wild orchid selling areas in the Imphal valley region of Manipur and document the wild orchid species traded locally during 2022–23.

MATERIALS AND METHODS

Study area

Manipur is a state in the northeastern India region (24.663°E & 93.906°N) of the Indo-Burma hotspot. The state with an area of 22,327 km^2 can be sub-divided into two regions; central oval shaped Imphal or Manipur Valley (constituting 10%) and surrounding hills (Image 1). The 2,238 km^2 valley is surrounded by hills with a maximum elevation of 2,994 m (Laiba 1992). The region is dominated by tropical moist deciduous vegetation and records an annual rainfall of 1,500– 1,700 mm. The minimum temperature ranges 2–21 °C and maximum of 23–36 °C, respectively.

Market survey

The market surveys were performed in Khwairamband, Pishumthong, Naoremthong, Lamlong, Sekmai, and Bishnupur markets of the Imphal Valley during September–November, 2022 and February–April, 2023 (Image 1; Table 1). The markets were visited on a weekly basis during early morning hours (Image 2). The information's were collected based on a semi structured questionnaire (Q1) and field photographs of wild orchids along with the sellers were taken with due permission. Moreover, prior permission was obtained from sellers for participation under the assurance of anonymity and confidentiality. Ten female sellers (individuals mainly from Kangpokpi and Senapati districts) from 10 vendors were questioned. During the survey, information's such as local name of wild orchids, collection methods, frequency of collection, collection season, location of orchid habitat, rarity in wild, preference by buyers, demand in market and price in market were gathered. Later, wild orchids were identified using available standard literature wealth on orchids of Manipur (Deb 1961; Mao 1999; Kumar & Kumar 2005; Nanda et al. 2013; Mao & Deori 2018; Rao & Kumar 2018). The scientific names of wild orchids were cross checked using the online website (WFO Plant List 2024) of the Royal Botanic Garden, Kew and Missouri Botanical Garden (accessed on 6 September 2024). Further, information's on endemicity and threatened status of wild orchids were gathered and compiled (IUCN 2024).

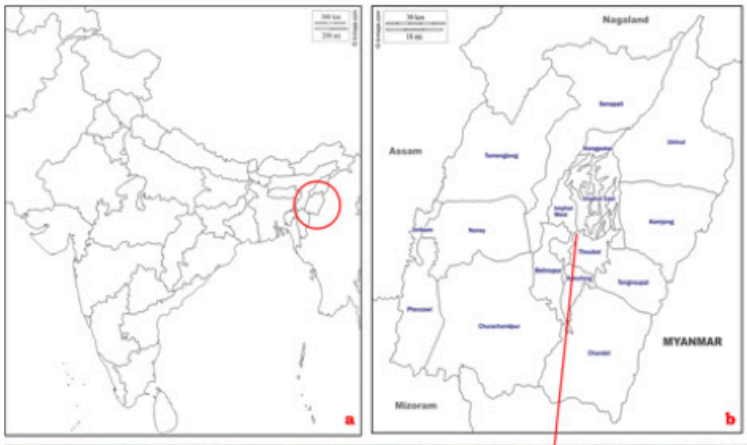

Table 1: Local bazaars surveyed for wild orchid trade.

Site	Latitude	Longitude
Sekmai Bazaar	N 24.826005	E 93.919110
Khurai Lamlong	N 24.830345	E 93.915717
Naoremthong	N 24.834325	E 93.916136
Khwairamband	N 24.817760	E 93.912400
Pishumthong	N 24.827280	E 93.911187
Bishnupur Bazaar	N 24.864179	N 93.959745

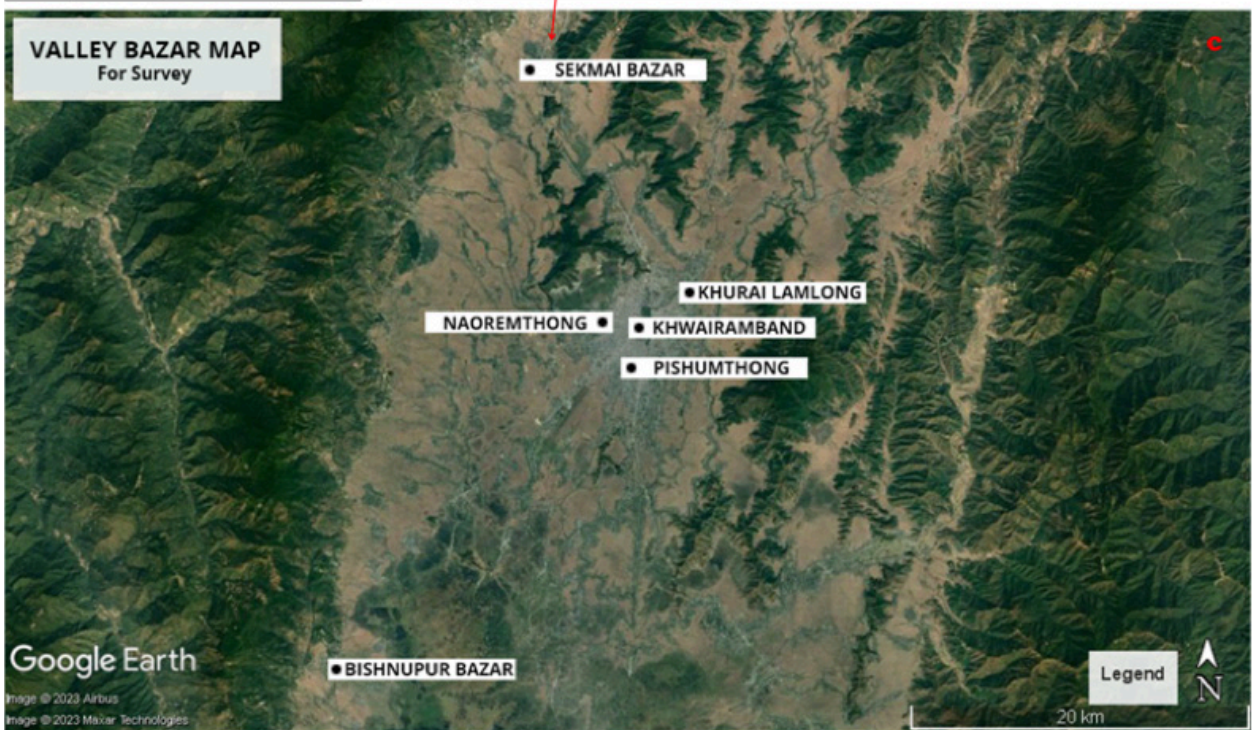

Image 1. a—Map of India | b—Manipur | c—the Imphal valley region with local bazaars surveyed for wild orchid trade documentation during 2022–2023.

Household survey

To assess the viability of wild orchids in local households, 15 local cultivators from 15 different localities of the Imphal Valley, viz., Thoubal, Kakching, Keishampat, Keishamthong, Wangoi, Namdunlong, Ragailong, Langthabal khoupum, Thongju, Khagempali, Singjamei, Chingmeirong, Kyamgei, and Sagoltongba were interviewed using semi-structured questionnaire (Q2). The buyer's questionnaire consisted of questions such as preferences of orchid, purchasing frequency, the total number of orchids purchased so far, number of orchids that died during household cultivation, the price range of orchids bought, knowledge of rare orchids and government role in orchid conservation in the state, etc.

Data analysis

The information obtained from wild orchid sellers and cultivators was analysed in the Department of Environmental Science, Manipur University. Further, the survival rate of wild orchids under cultivation in local households and knowledge of local buyers on the threatened and rare status of wild orchids were calculated from questionnaire data using Microsoft Excel 2010 for windows.

RESULTS AND DISCUSSION

Socio-demographic characteristics of orchid collectors and sellers

The wild orchid collectors and sellers belong to local tribal ethnic groups of Manipur (mainly from Kuki and Naga ethnic communities). For the individuals, wild orchid collection and their trade is a means of livelihood. The interview of local sellers revealed that the families involved in the trade during the study period were from economically weaker sections. As such, the trade of wild orchids, wild edibles, and horticultural plants collected from the jungles of Manipur serves as a significant income source for the individuals. More or less, they are agriculturalist or horticulturalists, or individuals devoted to floriculture.

Collection of wild orchids from jungles of Manipur

The orchid collection was mainly performed by villagers between 30 and 50 years old. Although the sellers were from Kangpokpi and Senapati Districts during the survey, the collectors mentioned that wild orchids came from all hill districts of Manipur, viz., Tamenglong, Churachandpur, Ukhrul, Tengnoupal, Kamjong, Pherzawl, Noney, and Chandel. Moreover, the orchid sellers interviewed were involved in trade for a minimum of 2–3 years. For local trade, wild orchid collection is performed throughout the year irrespective of flowering seasons. The epiphytic orchids were collected by experienced climbers gathering orchids by hand or using a long bamboo pole with a machete attached at the top to detach orchids from trunks and branches of tall trees. Another destructive method predominantly used by collectors is felling of host trees and gathering of all wild orchids, irrespective of demand. For terrestrial orchids, tubers were unearthed and whole plants were collected. As such, with no knowledge of sustainability among collectors, orchid habitats are often destroyed to a point with little chance for regeneration after harvest seasons. In addition, orchid collectors have little knowledge about threatened status of wild orchids. This has led to depletion of many orchid bio-resources in its natural habitats which are endemic or rare in the region.

Wild orchids traded in the Imphal Valley markets

During the survey, it was observed that Pishumthong bazaar is the main hub for local wild orchid trade in the valley (Image 1). On average, 4–5 local sellers were observed during market visits. The sellers were from Kangpokpi and Senapati Districts of Manipur. Further monitoring of other busy local bazaars at Naoremthong, Lamlong, Sekmai, and Bishnupur showed no reports of wild orchid traders opening their vendors during the study period. A total of 82 wild orchid species from 33 genera were locally traded during the study period, 2022–2023 (Table 2; Image 3). Orchids such as *Bulbophyllum reptans*, *Coelogyne alba*, *Coelogyne articulata*, *Liparis resupinata*, and *Pholidota imbricata* were marketed between price range of INR 30–50, respectively. The low-price range is associated with less fondness of local buyers. Hence, they are in low demand according to sellers. Moreover, wild orchids such as *Bulbophyllum* spp., *Liparis* spp., *Oberonia* spp., with unattractive flowers are rarely bought. The unattractive nature is concentrated on the color and size of flowers as per the buyer's opinion. On the contrary, the price of species such as *Cleisostoma simondii*, *Cymbidium bicolor*, *Cymbidium elegans*, *Dendrobium wardianum*, *Schoenorchis fragrans*, *Vanda alpina*, and *V. coerulea* ranged from INR 100–500, respectively. The higher price is associated with repeat purchases by local buyers and their rarity as per the seller's opinion. Further, most orchid species in high demand have captivating (large and colorful) unique flowers. The species such as *Coelogyne barbata*, *Cymbidium devonianum*, *C. elegans*, *C. lowianum*, *Dendrobium crepidatum*, *D. devonianum*, *D. falconeri*, *D. lituiflorum*, *D. parishii*, *D. polyanthum*, *Papilionanthe vandarum*, *Phaius flavus*, *Phalaenopsis marriottiana*, *P. taenialis*, *Pleione praecox*, *Renanthera imschootiana*, *Rhynchostylis retusa*, *Thunia alba*, *Vanda ampullacea*, and *V. coerulea* were some of the widely exploited and preferred wild orchids by local buyers as per sellers. As such, sellers fix the prices of wild orchids depending on their demand or rarity.

Further, seven threatened species were collected from wild habitats and traded locally (Table 3). Moreover, three wild orchid species, viz., *P. hirsutissimum*, *R. imschootiana*, and *V. coerulea* which are protected under the Schedule VI of the Wildlife (Protection) Act, 1972 of India was commonly and frequently traded (Image 3). Strict application of rules and regulations was not observed from the concerned authorities on this issue of legally protected wild orchid trade reported from the Imphal Valley. The statement is supported by local sellers freely trading orchids that are protected by the domestic legislation of India. Moreover, endemic species such as *Arachnis senapatianum* was also found traded. As such, the act of threatened and endemic wild orchid collection from their habitats without any regulation will pose a serious risk to population of such orchids in Manipur. Similar to the study, research on

Table 2. Wild orchid species locally traded in the Imphal valley region of Manipur during 2022–2023.

	Scientific name	Habit	Flowering season	Price (INR per piece)
1	*Acampe rigida* (Buch.-Ham. ex Sm.) P.F.Hunt	Epiphyte	May–June	100–250
2	*Acanthephippium striatum* Lindl.	Terrestrial	May–September	50–200
3	*Aerides multiflora* Roxb.	Epiphyte	May–June	250
4	*Aerides odorata* Lour.	Epiphyte	April–May	50–100
5	*Aerides rosea* Lodd. ex Lindl. & Paxton	Epiphyte	May–July	250
6	*Anthogonium gracile* Wall. ex Lindl.	Terrestrial	July	250
7	*Arachnis senapatianum* (Phukan & A.A.Mao) Kocyan & Schuit.	Epiphyte	May–June	200
8	*Arundina graminifolia* (D.Don.) Hochr.	Terrestrial	March–August	300
9	*Bulbophyllum affine* Lindl.	Epiphyte	June	100–300
10	*Bulbophyllum lobbii* Lindl.	Epiphyte	August–September	150
11	*Bulbophyllum odoratissimum* (Sm.) Lindl. ex Wall.	Epiphyte	May	150
12	*Bulbophyllum reptans* (Lindl.) Lindl. ex Wall.	Epiphyte	January–February	30–50
13	*Bulbophyllum rothschildianum* (O'Brien) J.J.Sm.	Epiphyte	August	250
14	*Calanthe masuca* (D.Don) Lindl.	Terrestrial	August–September	200
15	*Calanthe puberula* Lindl.	Terrestrial	August–October	200
16	*Cephalantheropsis longipes* Hook.f.	Terrestrial	November–December	150
17	*Chiloschista parishii* Seidenf.	Epiphyte	April–June	100–200
18	*Cleisostoma racemiferum* (Lindl.) Garay	Epiphyte	July	50–200
19	*Cleisostoma simondii* (Gagnep.) Seidenf.	Epiphyte	July–September	150–400
20	*Coelogyne alba* (Lindl.) Rchb.f.	Epiphyte	June–July	30–50
21	*Coelogyne articulata* (Lindl.) Rchb.f.	Epiphyte	April–May	30–50
22	*Coelogyne barbata* Lindl. ex Griff.	Epiphyte	October	150–300
23	*Coelogyne corymbosa* Lindl.	Epiphyte	May–June	100
24	*Coelogyne punctulata* Lindl.	Epiphyte	March	100–200
25	*Crepidium purpureum* (Lindl.) Szlach.	Terrestrial	June–July	200
26	*Cymbidium aloifolium* (L.) Sw.	Terrestrial	May–June	150
27	*Cymbidium bicolor* Lindl.	Epiphyte	April–May	100–500
28	*Cymbidium devonianum* Paxton	Epiphyte	May	100–350
29	*Cymbidium eburneum* Lindl.	Epiphyte or lithophyte	March–April	250
30	*Cymbidium elegans* Lindl.	Epiphyte or lithophyte	October–June	100–500
31	*Cymbidium iridioides* D.Don	Epiphyte or lithophyte	September–October	200
32	*Cymbidium lancifolium* Hook.	Epiphyte or lithophyte	May–June	100–300
33	*Cymbidium lowianum* (Rchb.f.) Rchb.f.	Epiphyte or lithophyte	April–May	200–300
34	*Dendrobium amoenum* Wall. ex Lindl.	Epiphyte	May–August	50–150
35	*Dendrobium aphyllum* (Roxb.) C.E.C.Fisch.	Epiphyte	April–May	50–100
36	*Dendrobium calocephalum* (Z.H.Tsi & S.C.Chen) Schuit. & Peter B.Adams	Epiphyte	August	300
37	*Dendrobium chrysanthum* Wall	Epiphyte	September–October	50–300
38	*Dendrobium chrysotoxum* Lindl.	Epiphyte	April–May	100–300
39	*Dendrobium crepidatum* Lindl. & Paxton	Epiphyte	April–May	50–100
40	*Dendrobium denneanum* Kerr	Epiphyte	May–June	50–100
41	*Dendrobium densiflorum* Lindl.	Epiphyte	April–May	50–100
42	*Dendrobium devonianum* Paxton	Epiphyte	April–May	50–200
43	*Dendrobium falconeri* Hook.	Epiphyte	April–May	50–100

	Scientific name	Habit	Flowering season	Price (INR per piece)
44	*Dendrobium formosum* Roxb. ex Lindl.	Epiphyte	May–June	50–150
45	*Dendrobium heterocarpum* Wall. ex Lindl.	Epiphyte	March	100–300
46	*Dendrobium jenkinsii* Wall. ex Lindl.	Epiphyte	April–May	50–150
47	*Dendrobium lituiflorum* Lindl.	Epiphyte	April–May	50–100
48	*Dendrobium moschatum* (Banks) Sw.	Epiphyte	May–June	50–300
49	*Dendrobium ochreatum* Lindl.	Epiphyte	April–May	50–150
50	*Dendrobium parishii* H.Low.	Epiphyte	May–June	50–100
51	*Dendrobium polyanthum* Wall. ex Lindl.	Epiphyte	May–June	100–250
52	*Dendrobium thyrsiflorum* B.S.Williams	Epiphyte	April–May	150
53	*Dendrobium wardianum* R.Warner	Epiphyte	April–May	200–500
54	*Eria coronaria* (Lindl.) Rchb.f.	Epiphyte or lithophyte	November	100–250
55	*Liparis resupinata* Ridl.	Epiphyte	November–December	30–50
56	*Oberonia acaulis* Griff.	Epiphyte	November–December	30–50
57	*Oberonia jenkinsiana* Griff. ex. Lindl.	Epiphyte	December–January	50
58	*Oberonia mucronata* (D.Don) Ormerod & Seidenf.	Epiphyte	September–October	50–100
59	*Oberonia teres* Kerr	Epiphyte	May	50–100
60	*Paphiopedilum hirsutissimum* (Lindl. ex Hook.) Stein	Epiphyte	October–November	350–500
61	*Papilionanthe vandarum* (Rchb.f.) Garay	Epiphyte	September–October	50–200
62	*Phaius flavus* (Blume) Lindl.	Terrestrial	April–June	100–300
63	*Phaius tankervilleae* (Banks) Blume	Terrestrial	March–May	150
64	*Phalaenopsis marriottiana* (Rchb.f.) Kocyan & Schuit.	Epiphyte	April–August	100–150
65	*Phalaenopsis taenialis* (Lindl.) Christenson & Pradhan	Epiphyte	April–July	150–350
66	*Pholidota imbricata* Lindl.	Epiphyte	June–July	30–50
67	*Pinalia acervata* (Lindl.) Kuntze	Epiphyte	May–June	50–200
68	*Pinalia spicata* (D.Don) S.C.Chen & J.J.Wood	Epiphyte	July–August	100
69	*Pleione praecox* (Sm.) D.Don	Epiphyte	September–October	100–300
70	*Polystachya concreta* (Jacq.) Garay & H.R.Sweet	Epiphyte	August–September	50–100
71	*Renanthera imschootiana* Rolfe	Epiphyte	April–May	100–250
72	*Rhynchostylis retusa* (L.) Blume	Epiphyte	April	150–300
73	*Schoenorchis fragrans* (C.S.P. Parish & Rchb.f.) Seidenf. & Smitinand	Epiphyte	July–August	350–500
74	*Schoenorchis gemmata* (Lindl.) J.J.Sm.	Epiphyte	May	150–350
75	*Spathoglottis pubescens* Lindl.	Terrestrial	August–September	200–300
76	*Thunia alba* (Lindl.) Rchb.f.	Epiphyte	June–July	100–300
77	*Uncifera obtusifolia* Lindl.	Epiphyte	February–March	50–200
78	*Vanda alpina* (Lindl.) Lindl.	Epiphyte	June	100–500
79	*Vanda ampullacea* (Roxb.) L.M.Gardiner	Epiphyte	April–May	100–300
80	*Vanda bicolor* Griff.	Epiphyte	August–October	100–150
81	*Vanda coerulea* Griff. ex Lindl.	Epiphyte	March–May	100–500
82	*Vanda cristata* Wall. ex Lindl.	Epiphyte	August–October	150

wild orchid collection and their commercial trade in illegal local and international markets is reported from different countries such as Vietnam (Bullough et al. 2021), Thailand, Lao PDR, & Myanmar (Phelps 2015), Nepal (Subedi et al. 2014), and China (Gale et al. 2019) etc. The research showed that illegal international trade of wild orchids is common in these countries. The illegal activities in turn posed a remarkable threat in the

Image 2. Wild orchid vendors at Pishumthong bazaar of Manipur. © Kamei Kambuikhonlu Kabuini.

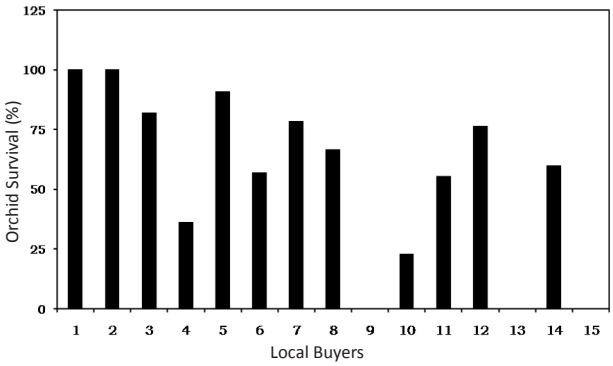

Figure 1. Wild orchid survival percentage among local orchid buyers of the Imphal Valley region.

conservation of the different wild orchids in their natural habitats.

Status of the wild orchids cultivated in local households

The interviews of local buyers showed that wild orchid customer base is diverse, encompassing people of various ages and genders, both young and old. The price of orchids they bought ranged from INR 30–500, respectively. The pricing of wild orchid is unpredictable. It was observed that survival rate varies significantly across different wild orchids when they were brought under cultivation and unexperienced buyers see varying levels of success in maintaining these plants (Figure 1). The reasons for low survival rates are change of habitat coupled with improper management due to lack of knowledge on orchid cultivation, diseases, and pest. The wild orchids grow in a particular habitat which is in the deep moist jungles of Manipur. Therefore, their removal and transplanting elsewhere forces the orchids to adapt to an entirely new set of environment where plants might not succeed. Among common host trees, buyers used Mango *Mangifera indica*, Pomelo *Citrus maxima*, Lemon *Citrus limon*, Plumeria *Plumeria rubra*, Bottle Brush *Callistemon citrinus*, and Hibiscus *Hibiscus rosa-sinensis*. However, most of the wild orchids were in plastic or terracotta pots, since majority of households didn't have good size trees (Image 4). Further, most orchids observed during the visits were not in their best health. Among buyers, only 33% had the knowledge of threatened and rare wild orchids. Most of the local buyers do not have basic awareness on legal restrictions surrounding the purchase and sale of wild orchids protected by domestic legislation. The results revealed a significant gap in awareness regarding the legality of wild orchid trade among surveyed participants.

Suggestive measures for conservation

From the market survey, it is evident that local trade of wild orchids in Manipur takes place without any inhibition in the Imphal Valley. Therefore, it becomes necessary that continuous monitoring of such situation should be a part of the concerned authorities' action plan for orchid conservation. The following measures are suggested for the conservation of wild orchids in Manipur region of the Indo-Burma hotspot:

(i) In situ conservation is the most desirable conservation strategy for wild orchids. The Government of Manipur needs to expand the Protected Areas Network (PAN) to include important orchid habitats in the state. For example, State Governments of Arunachal Pradesh, Sikkim, Karnataka, and West Bengal have designated various orchid rich areas as "Orchid Sanctuaries" under the Wildlife Protection Act, 1972 (amended in 1992). The actions will control smuggling or poaching of wild orchids. Further, there are options to establish community conservation reserves with collaboration of government agencies and local communities (Ngashangva 2021).

(ii) Initial ecological restoration of already degraded orchid rich habitats must be a priority of the concerned authority. The initiatives for afforestation of degraded

Image 3. Some of the wild orchid species: a—*Renanthera imschootiana* | b—*Pleione praecox* | c—*Dendrobium chrysanthum* | d—*Liparis resupinate* | e—*Cymbidium elegans* | f—*Vanda coerulea* which are traded in local bazaars of the Imphal Valley region. © Kamei Kambuikhonlu Kabuini.

Image 4. Cultivated orchids in local households of the Imphal Valley region. © Kamei Kambuikhonlu Kabuini.

areas with suitable host trees must be taken up.

(iii) Similar to Khonghampat Orchidarium, which is the only orchid *ex-situ* conservation center of Manipur, the state need more ex situ conservation centers in hill districts where wild orchid habitats are found.

(iv) It is time that a long-term population monitoring programme must be conducted by concerned authority to assess the health of wild orchid population.

(v) Endemic species such as *A. senapatianum* need immediate attention and actions. Their exploitation in an unsustainable way must be completely stopped by using various orchid conservation strategies.

(vi) Research is absent on wild orchid trade of Manipur in local and international markets. There is an urgent need of in-depth research that analyses the volume of local wild orchid market in Manipur and their illegal international trade via Myanmar.

(vii) The concerned authorities must continuously

Table 3. Wild orchid species which are threatened or protected by the Indian domestic legislation.

	Species	Rare/ Threatened	Legally protected in state and country* (Yes/No)
1	*Dendrobium chrysotoxum* Lindl.	Threatened	No
2	*Dendrobium densiflorum* Lindl.	Threatened	No
3	*Dendrobium falconeri* Hook. (Th)	Threatened	No
4	*Dendrobium parishii* H.Low.	Threatened	No
5	*Paphiopedilum hirsutissimum* (Lindl. ex Hook.) Stein	Rare	Yes
6	*Renanthera imschootiana* Rolfe	Threatened	Yes
7	*Vanda coerulea* Griff ex Lindl.	Threatened	Yes

* The Wildlife (Protection) Act, 1972.

and strictly monitor local wild orchid markets and their international trade. Further, strict actions must be taken up against illegal trade if carried out in the state. For example, trade of scheduled species such as *Paphiopedilum hirsutissimum*, *Renanthera imschootiana*, and *Vanda coerulea* is illegal.

(viii) Training programmes on mass scale multiplication of wild orchids for trade using tissue culture techniques and establishment of micropropagation units in the state will reduce stress on wild orchid population. Further, it will improve economy of the state.

(ix) The lack of awareness is an important issue in the society, which must be immediately tackled by the concerned authorities. As such, various conservation awareness programmes must be initiated to sensitize the common mass on the issue and invite the locals to be a part of conservation programmes.

REFERENCES

Ballantyne, M. & C. Pickering (2012). Ecotourism as a threatening process for wild orchids. *Journal of Ecotourism* 11(1): 34–47. https://doi.org/10.1080/14724049.2011.628398

Barman, D. & R. Devadas (2013). Climate change on orchid population and conservation strategies: a review. *Journal of Crop and Weed* 9(2): 1–12.

Bose, B., H. Choudhury, P. Tandon & S. Kumaria (2017). Studies on secondary metabolite profiling, anti-inflammatory potential, in vitro photo protective and skin-aging related enzyme inhibitory activities of *Malaxis acuminata*, a threatened orchid of nutraceutical importance. *Journal of Photochemistry & Photobiology B: Biology* 173: 686–695. https://doi.org/10.1016/j.jphotobiol.2017.07.010

Brummitt, N.A., S.P. Bachman, J. Griffiths-Lee, M. Lutz, J.F. Moat, A. Farjon, J.S. Donaldson & C. Hilton-Taylor (2015). Green plants in the red: a baseline global assessment for the IUCN sampled Red List index for plants. *PLoS ONE* 10(8): 0135152. https://doi.org/10.1371/journal.pone.0135152

Bullough, L.A., N. Nguyê, R. Drury & A. Hinsley (2021). Orchid obscurity: understanding domestic trade in wild- harvested orchids in Viet Nam. *Frontiers in Ecology and Evolution* 9: 631795. https://doi.org/10.3389/fevo.2021.631795

De, L.C. (2020). Export and import scenario of orchids in India. *Journal of Agriculture and Forest Meteorology Research* 3(5): 402–404.

De, L.C. (2022). *Indian Orchids in Cites Appendices*. ICAR-NRC for Orchids, Delhi, 108– 162 pp.

Deb, D.B. (1961). Monocotyledonous plants of Manipur territory. *The Bulletin of the Botanical Survey of India* 3(2): 126–129. https://doi.org/10.20324/nelumbo/v3/1961/76534

Gale, S.W., P. Kumar, A. Hinsley, M.L. Cheuk, J. Gao, H. Liu, Z.-L. Liu & S.J. Williams (2019). Quantifying the trade in wild-collected ornamental orchids in south China: diversity, volume and value gradients underscore the primacy of supply. *Biological Conservation* 238: 108204. https://doi.org/10.1016/j.biocon.2019.108204

Hinsley, A., A. Nuno, M. Ridout, F.A.V.S. John & D.L. Roberts (2016). Estimating the extent of cites noncompliance among traders and end-consumers; lessons from the global orchid trade. *Conservation Letters* 10(5): 602–609. https://doi.org/10.1111/conl.12316

Hinsley, A., H.J. De Boer, M.F. Fay, S.W. Gale, L.M. Gardiner, R.S. Gunasekara, P. Kumar, S. Masters, D. Metusala, D.L. Roberts, S. Veldman, S. Wong & J. Phelps (2018). A review of the trade in orchids and its implications for conservation. *Botanical Journal of the Linnean Society* 186: 435–455. https://doi.org/10.1093/botlinnean/box083

IUCN (2024). The IUCN Red list of threatened species. Orchid specialist Group. IUCN, Gland, Switzerland. https://www.orchidspecialistgroup.com/. Assessed on 6 September 2024.

Kumar, C.S. & P.C.S. Kumar (2005). An Orchid Digest of Manipur, northeastern India. *Rheedea* 15(1): 1– 70.

Kumar, P. (2024). Notes on Asian Orchidaceae – I: *Cremastra appendiculata* var. *appendiculata* and *Hemipilia nana*. *Feddes Repertorium* 135(3): 258–269. https://doi.org/10.1002/fedr.202300042

Kumar, S., R.S. Devi, R. Choudhury, M. Mahapatra, S.K. Biswal, N. Kaur, J. Tudu & S. Rath (2022). Orchid diversity, conservation, and sustainability in northeastern India, pp. 111–139. In: Furze, J.N., S. Eslamian, S.M. Raafat & K. Swing (eds). *Earth Systems Protection and Sustainability*. Springer, 337 pp.

Laiba, M.T. (1992). *The Geography of Manipur*, *1st Edition.* Imphal, India, 376 pp.

Mao, A.A. (1999). Notes on orchids of Senapati and surrounding hills, Manipur, India. *The Journal of the Orchid Society of India* 13(1–2): 55– 58.

Mao, A.A. & C. Deori (2018). *Checklist of orchids of Manipur - A pictorial handbook*. Forest Department, Government of Manipur and Botanical Survey of India, Government of India, Imphal, India, 287 pp.

Nanda, Y., S.H. Bishwajit, R.A. Nageswara & S.P. Vij (2013). Contributions to the orchid flora of Manipur (India) - 1. *Pleione* 7(2): 560–566.

Ngashangva, N (2021). Conserving orchids through community participation in a Manipur village. Mongabay. In: Mongabay, California, US. https://india.mongabay.com/2021/02/commentary-

conserving-orchids-through-community-participation-in-a-manipur-village/. Assessed on 18 October 2024.

Phelps, J. (2015). A blooming trade: illegal trade of ornamental orchids in mainland Southeast Asia (Thailand, Lao PDR, Myanmar). In: TRAFFIC, Cambridge, UK. https://www.traffic.org/publications/reports/a-blooming-trade-illegal-trade-of-ornamental-orchids-in-mainland-southeast-asia/. Assessed on 17 June 2024.

Phelps, J. & E.L. Webb (2015). ''Invisible'' wildlife trades: southeast Asia's undocumented illegal trade in wild ornamental plants. *Biological Conservation* 186: 296–305. https://doi.org/10.1016/j.biocon.2015.03.030

Rao, A.N. & V. Kumar (2018). Updated checklist of orchid flora of Manipur. *Turczaninowia* 21(4): 109– 134. https://doi.org/10.14258/turczaninowia.21.4.12.

Subedi, A., B. Kunwar, Y. Choi, Y. Dai, T. van Andel, R.P. Chaudhary, H.J. de Boer & B. Gravendeel (2014). Collection and trade of wild-harvested orchids in Nepal. *Journal of Ethnobiology and Ethnomedicine* 9: 64. https://doi.org/10.1186/1746-4269-9-64

The Wildlife Protection Act of India (1972). The Wildlife Protection Act of India 1972. MoEFCC, GOI, India. http://www.moef.nic.in/sites/default/files/wildlife1l.pdf. Electronic version assessed 21 July 2024.

TRAFFIC (2022). Factsheet on orchids in India's illegal wildlife trade. In: TRAFFIC, Cambridge, UK. https://www.traffic.org/publications/reports/factsheet-on-orchids-in-indias-illegal-wildlife-trade/ Assessed on 18 October 2024

UNEP-WCMC (2018). CITES Trade Statistics Derived from the CITES Trade Database. UNEP World Conservation Monitoring Centre, Cambridge, UK. Assessed on 20 July 2024.

WFO Plant List (2024). WFO Plant List snapshots of the Taxonomy. https://wfoplantlist.org/. Assessed on 6 September 2024.

WWF-India (2022). Protected orchids of India. In: India water Portal. https://www.indiawaterportal.org/climate-change/climate/protected-orchids-india/. Assessed on 18 October 2024.

Supplementary Q1: Interview for data collection (sellers)

1. Name:
2. Age
3. Gender
4. Locality
5. Orchid collected from:
6. Did you get permission from the concerned department?
7. If so, what?
8. If not, why?
9. List of collected orchid:
10. Collection season:
11. Do you collect only orchid?
12. How much is collected?
13. How often do you collect?
14. Status of the orchid in its natural habitat? Abundant/ scarce.
15. How far do you have to walk to collect the orchid?
16. How often do you not find the orchid?
17. Harvesting technique (a). cutting whole tree. (b). climb and collect.
18. Health of the orchid at the time of harvesting?
19. What measure do you take up to improve the health of the orchid before selling?
20. Do you harvest every orchid that you find regardless of its demand?
21. Do you harvest only those orchids that are in high demand?
22. What changes can you see the population of orchid in its natural habitat?
23. How much is the demand of the orchid in the market?
24. Most sold species.
25. Least sold species.
26. What do you do with the orchids that are not sold in the market?
27. How many customers do you have?
28. How many of them are regular customer?
29. Do you have customer from outside of the state or country?
30. Do you have any knowledge on rare orchid?
31. Any measures taken up to conserve the rare orchid sp.?
32. Do you run a nursery?
33. If yes, how many sp. do you have in your nursery?

Signature of the informant

Supplementary Q2: Interview for data collection (buyers)

1. Name:
2. Age:
3. Gender:
4. Locality:
5. Profession:
6. What is the selling point?
7. What are the preferences when you buy?
8. How often do you buy?
9. Number of different orchids you have purchased.
10. Price range of the orchids bought.
11. Is the price expensive/reasonable?
12. Condition of the orchids at the time of purchasing.
13. Number of Orchids Planted.
14. Number of Orchids survived.
15. Possible reasons for the death.
16. Measures taken up to revive dying orchids.
17. Orchids with repeated purchase.
18. Reasons for repeated purchase.
19. Reasons for buying.
    For Commercialization
    For Personal use
20. Planting area a) Pots b) Trees
21. Do you have any knowledge regarding rare orchid species trade?
22. Number of rare orchids collected so far.
23. Do you know the practice adopted by the collectors for harvesting?
24. How often do you see orchids naturally growing in your locality?
25. Have you resold the orchids you have purchased?
26. How many have you resold?
27. Do you follow any propagating method to increase the number of orchid species for reselling purpose?
28. Rate at which you resold.
29. How much is the demand?
30. Do you know that the orchid trade in Manipur is via illegal way?
31. If so, what should be the mechanism to regulate the conditions? (Personal view)
32. Any comment on the conservation of orchids in the natural habitats. (Mechanisms you wish to propose)
33. Do you think that orchid conservation is possible by planting the species in households of valley?
34. Do you think orchid trade should be regulated by the government?

Signature of the informant

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