

THE ROLE OF ONLINE PLATFORMS IN THE ILLEGAL ORCHID TRADE

FROM SOUTH EAST ASIA

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Summary

The ornamental orchid trade is global and comprises both a large, well-established legal market and a significant but largely unknown illegal trade. Much, though not all, of this illegal trade is driven by demand from specialist collectors for rare species. The trade in wild-harvested plants can have a severe impact on biodiversity: in one documented case, intense demand for a rare species of slipper orchid saw it harvested to near extinction. Illicit sales of wild orchids have been recorded on several online platforms, including e-commerce and social-media websites, forums and private websites, and sellers encompass both hobbyists and formal businesses. Consumers range from houseplant buyers, who want to purchase attractive plants, to specialist growers with a preference for rare species. For consumers who want to avoid illegal avenues of trade, and for researchers and law enforcement who want to monitor the trade, legality can be difficult to determine. However, it can be possible if the plant's origin, species and final destination can be identified. This brief makes a substantial contribution to our ability to identify illicit orchid trade and the platforms most likely to host it.

Key points

- Widespread use of online platforms has boosted illicit trade in orchids by allowing sellers to connect with specialist buyers across the world. This has been shown to drive demand for illegal and unsustainable harvesting of rare and newly described species.
- There is considerable overlap between the legal and illegal online orchid trade, as the same platforms, buyers and sellers are often involved in both licit and illicit transactions.
- Because of the legal complexities and overlaps with the legal orchid trade, non-specialist buyers who may have no knowledge of the regulations governing the trade in wild plants may unwittingly purchase illegal specimens or find them more easily or cheaply than legal alternatives.
- Determining the legality of a sale is challenging owing to geographical variations in legislation and the difficulty in identifying the origin of a plant. But it is possible. Information about identification techniques must be simplified to help law-enforcement agencies facilitate monitoring and interventions.
- More than 70% of CITES-listed species are orchids, but non-compliance with legal trade rules occurs globally, and there are almost no initiatives dedicated to halting their illegal trade. This reflects a general trend of 'plant blindness' among conservation funders and practitioners.

Methods

The information that forms the basis for this report has been derived from the author's extensive previous research into the global trade in orchids.

A significant part of that research focuses on illegal online trade in collected wild orchid specimens, and its potential negative implications for global orchid conservation.¹ This included the first systematic survey of international wildlife trade over social media platforms, using orchids as a case study.² That study identified and investigated trade by orchid enthusiasts and collectors on the world's largest social-media website, showing the opportunity that social-media platforms offer individuals willing to engage in illicit trade.

Analysis was conducted on the nature of the informal trade in orchids taking place through these forums, identifying a high proportion of wild plants on offer. Social network analysis techniques were used to map the networks in

which trade was taking place, with most sales occurring in a community that consisted of English-speaking and South East Asian groups. Another investigation of online trade documented plants available on South East Asian orchid nursery websites,³ showing that illicit trade may prevent countries from benefiting from legitimate trade in their own endemic species.

Additional research has used innovative approaches to investigating the orchid trade. This has included proposing the use of propagation time estimates for orchid species as a guide for law-enforcement efforts to help identify plants in international trade that are likely to be of wild (and therefore illicit) origin. If specimens of a newly described species are offered for sale, and if the production time of that species means it is unlikely to have been produced legally within that time frame, then this is a strong indicator that the plant is an illegal specimen.

Meanwhile, further research has investigated preferences among orchid buyers, finding that specialist orchid hobbyists are both more likely to prefer rare species and buy their orchids online than casual house-plant buyers.⁵ This casts light on the online demand for new, rare and often illegally collected orchid specimens, and on how the international trade, which online trade facilitates, may pose a challenge to law-enforcement and conservation efforts.

Introduction

Orchids have been collected, cultivated and traded for millennia, with some of the first records of their horticulture coming from China, dating from between AD 220 and 265.6 Their use in medicine dates back even further, to the 28th century BC.7 Today, the global orchid trade is international in scale, and involves thousands of species being sold for a variety of purposes. There is a widespread ornamental trade in colourful live plants and cut flowers, and a sizeable market for parts and derivatives used to make traditional medicines and food.8 This report addresses the better known international online trade in live orchids for ornamental use, which entails a complex set of overlapping legal and illegal markets that involve large numbers of wild and artificially propagated plants.

On a global scale, the ornamental orchid trade can be divided into two main types: the mass-market trade, in which casual buyers purchase pot plants, usually easy-to-grow hybrids of a few genera, and the market driven by specialist growers, who usually have collections of plants and buy a large variety of species and hybrids. Due to a demand for rarity in the specialist market, this is usually where the illegal trade in wild plants takes place. However, casual buyers may also unwittingly buy illegally traded plants in instances where they are sold openly at a similar price to artificially propagated plants.⁹

While orchids have been sold in street markets, shops, at orchid shows or through nurseries for many years, with the growth of internet usage, orchids are now also available on e-commerce websites, social media, private websites and forums. Sellers – both online and offline – include formal businesses, such as plant nurseries, individuals who sell more informally as sole traders, and hobbyists who sell surplus plants within their networks.

International trade in all orchid species is monitored and controlled by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and a large-scale legal trade, mainly in artificially propagated plants, occurs in compliance with the convention. However, a significant illegal trade still occurs and, although its scale is largely unknown, it is worldwide in scale. Some of the major centres of wild collection occur in orchid-rich areas, such as South East Asia, but collection of wild plants for commercial trade has been reported in more than 10 countries. Ocnsumer countries are hard to determine, but there are well-developed specialist markets in the US, Australia and Japan, and in several countries in South East Asia and Europe.

The illegal and unsustainable orchid trade can seriously threaten many species, but with certain groups more at threat from the trade than others. These include the tropical Asian slipper orchids *Paphiopedilum* spp., several species of which are 'Critically Endangered' due to over-collection. With the development of online marketplaces,

this threat has most likely increased, by providing easily accessible illegal markets that connect collectors and traders directly with specialist buyers. Although plants are often advertised openly, the illegal trade is difficult to monitor owing to the diversity of platforms it occurs on, and the use of hidden forums and messages to complete transactions. This report makes key recommendations for monitoring the illegal online orchid trade.

Global picture of the ornamental orchid trade

The ornamental orchid trade involves thousands of species that are traded between vendors and buyers all over the world. The trade can be divided into two types. The first is the legal, mass-market trade in a small number of varieties of cheap pot plants aimed at non-specialist buyers, usually involving hybrid plants, such as *Phalaenopsis* or *Dendrobium*. Major exporting countries for this mass market are Taiwan, Thailand and the Netherlands. Live orchid plants and cut flowers of this type are consistently listed as among the most popular products in the global horticultural trade. Growers usually need no special equipment or expertise to keep these plants, and consumers tend to buy these orchids based solely on their attractiveness as ornamental plants.

The second type is the specialist ornamental trade, which involves many more species and hybrids. The consumers in this market are specialist growers, who take orchid growing seriously, who have the expertise to grow several different types of orchids, and who tend to have collections, as opposed to buying one or two plants for decorative purposes. Rather than discrete groups of buyers, these are likely to be two points on a spectrum, but with considerable overlap between them. Whereas some specialists may be more likely to seek out wild plants deliberately, it is also possible that casual growers may purchase wild plants too, often without realizing the implications. For example, the latter may buy illegally collected plants if they are for sale at a similar price to artificially propagated plants in street markets or online.¹²

Most of the known, reported trade in live plants for ornamental purposes is in artificially propagated sources: according to CITES data on legal orchid trade, over 1 billion artificially propagated orchid plants were exported between 1996 and 2015, compared to around 1 million wild-sourced plants.¹³ However, outside of this formal trade there also exists an illegal and unsustainable trade in wild plants, the scale and nature of which is largely unknown.¹⁴ To date, no comprehensive study has been carried out into the global scale of this illegal trade, but wild harvesting for the commercial horticultural trade has been formally documented in at least 10 countries, and reported in several more.⁸

Globally, the number of species or plants involved is unknown, but one study in South East Asia found 347 species of orchids being collected from the wild for the ornamental plant trade. Some taxa are more threatened than others by this trade, with certain species and genera facing particularly intense demand from the specialist market. For example, the 106 species of tropical Asian slipper orchids (*Paphiopedilum* spp.) are highly sought after, with the demand for rarity meaning that the several new species described each year (seven new species were identified in 2017¹⁶) are at particularly high risk. New species, such as *Paphiopedilum canhii*, which was discovered in 2010 in Vietnam, have been reportedly collected to near extinction within a matter of months. As a result of over-collection of many species, all *Paphiopedilum* species are included on CITES Appendix I. However, despite this level of institutional protection, of the 85 species on the International Union for the Conservation of Nature (IUCN) Red List in 2015, 83 were recorded as being threatened by deliberate collection of wild plants.

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Trends in the online and offline orchid trade

Very little research has been carried out into the status, characteristics or networks of the offline or online illegal orchid trade, so conclusions about trends are difficult to draw.

Professional orchid growers in Europe report that international legal sales of ornamental orchids are decreasing, as a result of the rising cost of propagating orchids, coupled with the restrictions placed on the legal industry by CITES. Sales may also be significantly influenced by external factors. For example, in 2013 one Indonesian trader specializing in the collection of wild plants from all over South East Asia reported that he used to regularly send shipments of hundreds of wild-collected *Paphiopedilum* plants to the US and Europe, but that, after the global financial crisis of 2008, these orders declined dramatically.

Offline sales for the specialist market are restricted to personal connections, direct purchase from nurseries, or visits to international orchid shows, which often necessitates expensive international travel on the part of the buyer, and which therefore places constraints on the consumer market. Therefore, the internet has undoubtedly made it much easier for buyers looking for a specific type of plant to find it for sale. In particular, the large numbers of sole traders selling wild plants on social-media platforms are unlikely to have offline access to international consumers, with the main potential avenue for such sales being attendance at international orchid shows.

Reports from those involved in the orchid industry in the UK, Thailand,²⁰ Taiwan and several other Asian countries suggest that the internet trade for orchids is growing, although this does not always mean that offline markets are decreasing. In addition, increased facilitation by social-media platforms for online commerce²¹ is likely to mean that the use of these platforms by orchid traders is growing. Finally, illegal trade is certainly expanding out from traditional e-commerce platforms, such as eBay, where it has been observed for years, and appearing in places where it was not previously found, such as Instagram.

Both legal and illegal trading take place using similar methods and trade routes, and many of the traders and buyers are involved in both markets. The online trade operates through e-commerce websites, social media, personal websites and forums. The role of these online marketplaces in the orchid trade has grown substantially, and the speed at which they evolve makes it challenging to track and monitor. Several species have been found for sale online soon after their discovery, including documented evidence of CITES Appendix I Paphiopedilum sales occurring on multiple online platforms.²² In the case of P. canhii, the rapid collection of more than 99% of all known plants within just six months of the species' discovery was linked directly to the internet. In

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In the case of online illegal orchid trade, types of sellers can be broadly grouped into a small number of categories, albeit with some overlaps between these groups. They may participate in the legal trade to differing degrees, although, at the same time, there are many legal businesses selling online that do not involve themselves in the illicit orchid trade.

particular, the spread of pictures on social media fuelled this intense demand

and allowed collectors to locate wild populations.²³

- Formal businesses usually plant nurseries trading under a business name, often with the facilities to produce orchids of a marketable state, either through propagation or by growing wild plants until they are ready for sale. Of all the categories, these are the ones most likely to operate in the legal trade too, and so often have well-established supply chains and distribution networks. They use formal business websites, as well as social-media and e-commerce sites.
- Sole traders individuals who sell orchids illegally as their main source of income but who trade as individuals, and not as a business. They collect from the wild and sell the plants directly, or they may sell

- plants that they have grown in their own gardens or greenhouses. In many cases, sole traders use online platforms that require limited maintenance, such as social-media sites or blogs.
- Hobbyists do not sell professionally but may sell or trade their surplus plants with others in the community, either on social media, forums or on informal platforms, such as blogs.

Legal framework

As the categories above indicate, because many online sellers and buyers participate in both the legal and illegal trades simultaneously, it presents a considerable barrier to law enforcement. There is also some variation in the extent to which trading activity is visible. For example, sellers, prices and availability for sale on private business websites or e-commerce platforms are publicly viewable, but details about buyers are not. Likewise, in forums and on social-media platforms, the entire transaction may be carried out by means of direct messaging or closed networks. In addition, it is often not the species that makes the sale illegal, but a combination of whether the plant was cultivated or harvested, whether it crosses international borders, or whether the vendor has used the proper bureaucratic channels.

The domestic legislation governing the harvesting of and trade in wild orchids varies considerably from country to country. Whereas in some countries it may be illegal to harvest any wild plant for trade, in others the harvest of certain species may be permitted, although permits may be required. In cases where harvesting orchids for commercial trade is legal, their collection in certain places, such as protected areas, may not be. The situation is made more complex by the fact that it is often difficult to access information about the regulations governing harvesting and trade, and, in many places, these laws are enforced inconsistently.

On an international scale, the issue of legality is more clearly defined, however. All orchids are listed by CITES, and the more than 29 000 orchid taxa currently described dominate the appendices, accounting for more than 70% of all CITES-listed species. The majority of the species are listed in Appendix II, meaning that wild-harvested material may be traded internationally with permits in certain circumstances. However, *Dendrobium cruentum*, *Laelia jongheana*, *L. lobata*, *Peristeria elata* and *Renanthera imschootiana*, and all species of *Paphiopedilum* and *Phragmipedium*, are listed on Appendix I, meaning that trade in wild-sourced material is prohibited.²⁴

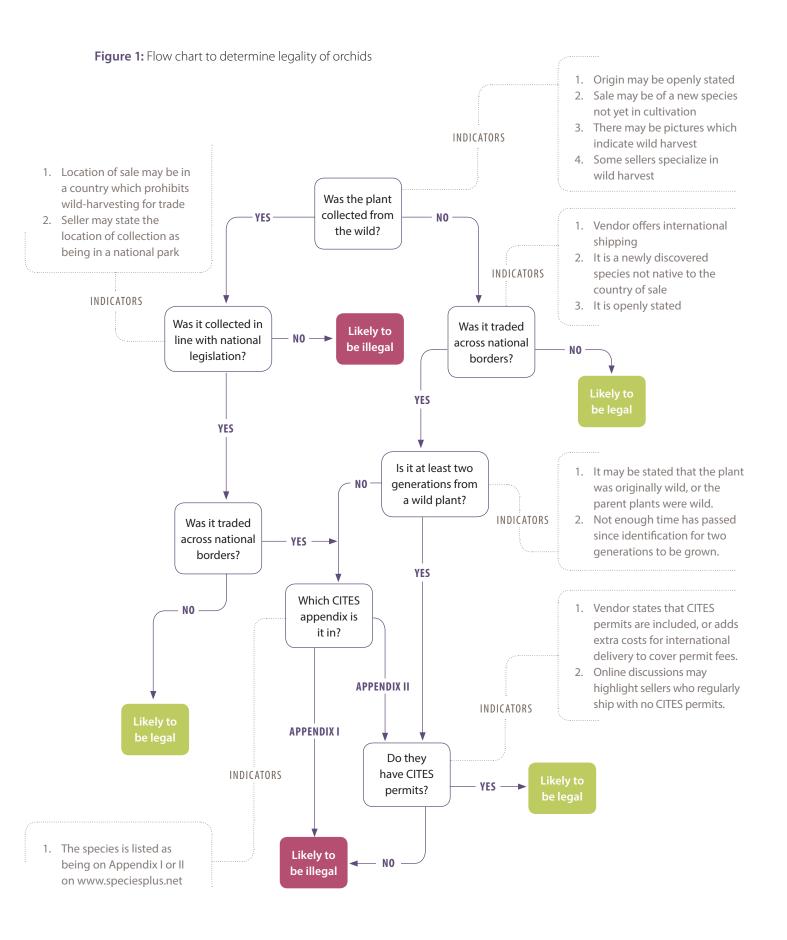
The decision to make a family-level CITES listing was taken because identifying orchids to species level when not in flower is challenging,²⁵ so listing only the species threatened by trade would have been too difficult to enforce. Given that between 300 and 500 new species are described each year,²⁶ this listing also means that new orchid species are automatically included in the appendices, without any further action being required.²⁷

Taking into account these factors, the international illegal trade in orchids may be defined in several different ways:

- International trade in any wild-harvested orchids, where harvesting was not in compliance with domestic legislation
- International commercial trade in wild-harvested plants of CITES Appendix I species
- International commercial trade in wild-harvested plants of Appendix II species without appropriate CITES permits
- International shipment of any non-exempt orchid product, either wild or artificially propagated, without the appropriate CITES paperwork

In summary, the legal framework is complex, and because it is difficult to identify whether trade is illegal or not, it is also difficult to enforce. Figure 1 is a flow chart designed to help determine legality.





Identifying plants illegally traded online

Nevertheless, despite the complexity surrounding the question of legality, there are clear indicators that can help to identify proscribed sales (see Table 1). Identifying provenance may be a challenge, although some vendors state this openly, or provide photographs of plants in the wild or immediately after collection, especially on social-media platforms. If not, then photographs of plants can be checked for signs of whether they were harvested in the wild, including broken or damaged roots, signs of natural substrate still attached to the plant, or leaves and flowers that show signs of pests.²⁸

If no photographs of the plant for sale exist (e.g. if the advertisement includes a stock photograph of the plant), but the plant is a newly described species, then it may also be possible to determine its origin based on the amount of time it takes to grow a legal plant. This has been shown to be the case for Paphiopedilum, which take a minimum of 22 months to produce a plant that meets the CITES definition of artificially propagated, with some species taking up to 66 months.²⁹ Several new species have been observed for sale within months, or even weeks, of description and, this method allows us to say with confidence that these plants could not have been legally produced in this time.

Where an instance of wild harvesting has been determined, identifying the species can determine legality. Many sellers openly state the name of the species for sale but, in some cases, especially with sole traders who collect plants that they cannot identify, these names may be vague (e.g. genus level only) or incorrect. In these cases, orchid experts may be consulted to help with identification, especially if the photograph or information about the location of collection is good quality. Once identified, the species or even genus can be used to determine the legality of harvesting or trade by checking it against national legislation (where available). If it has not been harvested legally for trade, then both the domestic and international trade will be prohibited. Where harvesting is legal at a domestic level, or where the legality is unknown, international trade in the plant may still be prohibited, and this can be determined by consulting the CITES appendix in which the species is listed. The clearest indicator of illegal international trade is the absence of CITES permits accompanying cross-border sales of orchids (unless they carry one of the few exemptions). The absence of permits may be stated in the item description or the shipping details, or it may be reported by buyers in forums after the sale has taken place.

Despite the complexity surrounding the question of legality, there are clear indicators that can help to identify proscribed sales.

Table 1: Indicators of illegal activity

Description type	Method	Example	Most often used	Reliability as indicator of wild or illegal trade
Item description	Direct mention	'Wild-collected Paphiopedilum'; #wildorchid	Social media; e-commerce	Good – sometimes consumer preference for wild plants could lead to mislabelling
	Keywords	'Rare';'new species'	All	Moderate – preference for rarity means that 'rare' is a good keyword to sell any plant
	Hints	'Native variety'	E-commerce; private business websites	Poor/moderate – sometimes similar phrases can be used to sell legal plants
Photographs	Direct evidence of collection from wild	Plant in process of being collected/plant in the wild	Social media; informal private websites	Very good
	Plant with wild appearance	Broken roots; roots still attached to natural substrate	All	Good/moderate – some plants grown in shade houses in tropical countries may exhibit some of these characteristics too
Shipping information	Direct mention	Mentions international shipping options for a wild plant	All	Very good

Fraud

It is difficult to judge the scale of fraud in the online orchid trade, but it does exist. Fraud is discussed openly by buyers in forums, often with warnings to others to avoid specific vendors. The main types of fraud discussed in these cases involve plants that are not delivered, arrive damaged or dead, or are different from those that had been advertised.

In some cases, buyers have reported that plants arrived without the necessary CITES paperwork, or that they had clearly been wild-collected even though they had not been described as such. This may suggest that some buyers are unwitting participants in the illegal trade.

A common form of fraud aimed at casual buyers is the sale on platforms such as eBay and Amazon of seeds of popular species, such as the monkey-face orchid (*Dracula simia*). The advertising often claims to sell 10 or 20 orchid seeds, and may include pictures of large seeds alongside pictures of the flowering plant. However, in reality, orchid seed is dust-like and can be very difficult to grow without the right conditions and expertise. This kind of fraud may not be of concern from a conservation point of view, but the persistence of such vendors and the high feedback scores they often have suggest that consumers are regularly taken in by such dishonesty.

Platforms used in the online orchid trade

The spread and diversity of platforms used for the online orchid trade indicate the fragmented nature of online markets, underscoring the limitation of focusing on any single platform's policy as a means of enforcement. Despite the variations in the platforms that are used, and their locations, seller and buyer types, there are also some notable similarities, even between countries and languages. For example, Facebook is significant among Indonesian and Vietnamese traders but is not accessible in mainland China, where websites such as Alibaba are used instead. Table 2 shows the characteristics of trade across different types of platforms.

Table 2: Relationships between internet platforms, sellers and buyers

Platform type	Example	Type of sellers (in order of importance)	Primary buyers	Likelihood of finding evidence of illegal trade
Formal business website	Nursery website	Nurseries	Casual, specialist	Low/medium
Informal personal website	Blogs	Sole traders; hobbyists	Unknown	Medium
E-commerce websites	eBay; Taobao	All	Casual; specialist	Medium/high
Social media	Facebook; Instagram;	Sole traders; nurseries	Casual; specialist	High
Forums	Hobbyist forums	Hobbyists	Specialist	Medium

Social media

Using internet platforms for the purposes of commercial trade was unofficial for many years, but this function has grown in popularity, leading to the introduction of dedicated selling spaces, such as Facebook's 'For Sale' feature for groups, which was introduced in 2015. Although the growth of social-media commerce has been of great benefit to small legal orchid businesses, which can now reach consumers all over the world, it has simultaneously allowed illegal traders to sell wild plants to buyers. A study of a large, global social-media platform in 2014 found that orchid selling was taking place in 46% of the 150 orchid-related groups, and that trading was being conducted in at least five languages.³⁰

In the same study, 22–46% of all orchid trade found to be occurring in orchid groups was in wild-collected plants, including illegal trade in protected species. Where the species is not protected, it is difficult to ascertain whether such trade is illegal or not, unless the plants are clearly being sold internationally. As transactions usually take place in private messages either on or off the platform, this is often unclear, but it can be determined in instances where

international buyers can be identified – for example, when they comment on sales posts, expressing an interest in these plants. International trade in wild plants can also be identified when sellers advertise in groups outside of their country, such as Indonesian sellers posting in groups for Australian growers.

Nurseries, sole traders and hobbyists all sell orchids on social-media platforms, usually posting photographs of the plants for sale accompanied by short descriptions, which may include accurate species names, information about origin, prices, number of plants available and contact details. In some cases, the picture may be indicative of the plants for sale, and not a picture of the product itself; for example, advertisements for wholesale plants will sometimes picture one plant and then note in the item description how many plants or kilogrammes of plants are available for sale.

Online advertising of wild plants is often done so openly that determining illegality can be quite an easy task for an investigator, especially if international trade can be inferred. For example, traders may post photographs of themselves in the process of collecting plants, or may openly tag their sales posts using hashtags (e.g. #Paphiopedilum #orchidforsale #jungleorchid) to advertise the plant to buyers outside of the seller's network who may be searching for certain products. One example of this was the sale on Instagram in 2017 of a newly discovered species, *Paphiopedilum bungebelangi*,³¹ which used hashtags of the species name as well as these generic terms relating to the orchid trade.

The fact that traders make little or no effort to conceal illegal marketing would suggest that they see social media as platforms on which they can openly carry out this trade with little danger of prosecution. This may be due to a perception that these platforms offer privacy. However, if ethical clearance permits it, it is often easy for an investigator to identify and find the location of illegal sellers, as many post their phone numbers, email addresses and the physical address of their businesses. However, despite the ease with which illegal marketing can be identified on social-media websites, trading occurs in open groups that are accessible to anybody,³² suggesting that sellers and buyers know that there is little risk of their activities being detected by law-enforcement bodies.

E-commerce

Figure 2 shows screenshots of an orchid being marketed on an e-commerce platform, depicting a clearly labelled wild plant of a CITES Appendix I listed species available for worldwide shipping.

Figure 2: Mock-up of a typical orchid advertisement on an e-commerce platform. 'New species', 'very rare' and worldwide shipping are indicators of illegal activity.





The international marketing of wild orchids, including wild-collected CITES Appendix I *Paphiopedilum* species, has been formally recorded on e-commerce websites, such as eBay. There is also substantial trade in orchid seeds on Amazon and eBay, although much of this is fraudulent and does not involve authentic orchid seeds, or even real species.

Although not as widespread as orchid sales on social media, the overt selling of wild-collected plants, and plants that are shipped internationally without CITES permits, takes place regularly on e-commerce websites. This is despite policies that are clearly stated on such websites – including eBay – prohibiting the 'sale of endangered plants globally' and allowing only 'plants or seeds that aren't on any restricted list'.³³

Orchid sellers that use e-commerce platforms include nurseries, sole traders and hobbyists. There are many examples of items that are marketed with generic descriptions (e.g. 'rare orchid'), which non-specialist buyers would find using simple search terms. However, specialist growers also use these platforms to find new and rare plants for sale by sellers whom they trust, or to search for genus or specific species names if they want to add a certain plant to their collection. This way, e-commerce platforms present traders with access to a broad group of global consumers.

An investigator trying to identify illegal orchid trading on an e-commerce website may be able to search for wild orchids directly, as some traders openly advertise plants as wild-collected in the item description (e.g. 'Paphiopedilum rothschildianum seedling 1 x wild growth'). However, this is relatively rare on the major platforms and, unlike the case with marketing on social media, photographs of clearly wild-collected plants are infrequently provided on the major platforms, such as eBay. Often the best way for an investigator to identify illegal trade on these platforms is in the information related to shipping and delivery. Here some sellers state that no CITES permits will be included with plants, and that the buyer must accept the risk that plants may be seized by customs. Other less direct methods of signalling include keywords or phrases such as 'rare' or 'new species' in the item description, although these are also often used to advertise legally traded plants, given the strong preferences for rarity among orchid buyers.

The feedback and seller-rating systems in place on eBay and other e-commerce platforms mean that any dishonesty or poor service is quickly flagged by buyers. Furthermore, buyers often use other platforms, such as Facebook groups or specialist forums, to draw attention to sellers who have not sent plants or have sent plants that do not match their descriptions. Occasionally, buyers also report cases where a seller has sent plants that appear to have been wild harvested or shipped without the appropriate permits. Certain sellers therefore become known in buying communities as traders of wild plants, meaning that even without clear labelling of wild products on the e-commerce platform, buyers will still know where to look if they want to buy wild plants.

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Private business websites

Whereas some smaller nurseries may trade only informally on social media or e-commerce websites, more established orchid businesses – ones that also participate in the legal orchid trade – often have their own dedicated websites to advertise and sell their products. These websites have become widespread: in 2018 Orchidwire.com listed 849 nurseries in its global directory. Although many of these nurseries sell only hybrid plants for the mass market, a 2012 study of orchid nursery websites in South East Asia found that 44 nursery websites in seven countries were selling 1859 orchid taxa.³⁴

Such websites are accessible to anybody and can be easily traced to the businesses that run them. Much of the trade generated by these websites is likely to be legal, because they are easily linked to business entities and individuals, but sellers may be willing to take the risk of selling illegal plants too because it allows them to take advantage of their existing brand and customer base. However, for this reason, illegal sales may be concealed, or

at least not advertised directly. This means that, in many cases, the legality of the plants is very difficult to establish, especially as the photographs used in listings may be generic pictures rather than the actual plant for sale.

For an investigator trying to determine whether the trade is legal or not, wider contextual information about the range of the species, when it was discovered and whether it is known to be in cultivation would be needed. For example, the legality of certain newly discovered species can be determined if one has an understanding of the plant's growing times (discussed above), or the legal export records. For example, in a study of South East Asian nursery websites, the majority of endemic species for sale outside of their country of origin had no CITES records of legal export into the countries of sale, suggesting that these plants may not have been acquired legally. Further information could be gathered by checking whether the business also sells on social-media or e-commerce websites, where the same plants may be advertised more openly as having been collected from the wild.

Websites run by individuals

In some cases, privately owned websites (i.e. run by individuals, as opposed to entities) or blogs may be used, often by hobbyists selling a small number of plants from their collections. These websites are usually fairly rudimentary and act as advertising spaces. Plants offered for sale are often a mix of artificially propagated and wild-harvested, usually sold in small numbers, with payment arrangements communicated by email or private messaging.

Although legality is sometimes mentioned by the sellers, it is likely that these platforms are not used strategically to avoid law enforcement, and many of these hobbyists may not realise that some of their trade is illegal. This may make it easier for an investigator to determine legality because plants of wild origin or a lack of CITES permits may not be concealed. Although transactions are often done in private, international trade may be inferred from the kind of language that is used, shipping options or pricing: for example, one seller in Malaysia lists prices in US dollars and provides species descriptions in English.

Forums

There are several online forums dedicated to orchid growing. Online directory Orchidwire.com currently lists 60 orchid forums, ranging from geographic groups, such as the Latvian orchid society forum, which has 250 members, Slippertalk.com for 2000 growers of slipper orchids, and general discussion boards for all orchid growers, such as Orchidtalk.com, which has almost 13 000 members. Most of the discussions that take place in orchid forums are not related to illegal behaviour, or even to trade, but instead to sharing growing tips, discussing collections, or sharing information about new species or hybrids that have entered the trade.

Yet, although not the primary focus of most forums, these platforms can host trade activity – both legal and illegal – and act as a place for feedback and discussion about trade taking place elsewhere. In some cases, there may be dedicated auction or e-commerce functionality built into a forum's platform, but often sales take place informally in posts in threads dedicated to buying and selling, with payments taking place outside of the forum. In some cases, businesses may post in a forum to advertise their plants, notify potential buyers that they will be selling at a certain orchid show, or place links to their products on other platforms. Small-scale trading may also take place between individuals on forums.

Legality is frequently discussed, and the anonymity and perceived privacy provided by a forum means that members will occasionally admit having broken CITES rules or having collected wild plants to sell, or they may name vendors who have sent plants ordered online with no phytosanitary or CITES paperwork. Posts about illegal behaviour are often followed by replies advising people to be more discreet to avoid detection, or replies from other members

expressing their disapproval of the illegal trade. The open nature of discussions on forums makes them a good place to gather information about trade happening elsewhere, and especially to identify more covert traders who sell plants illegally but who may not openly advertise them as such.

Prices

The lack of comprehensive research, together with the size and diversity of the ornamental orchid trade, both offline and online, makes it difficult to draw meaningful conclusions or comparisons about prices. Searches on eBay for Paphiopedilums reveal prices ranging from US\$3 to US\$120 for blooming-size plants of the same species, with prices varying depending on many factors, including the seller, the country of sale and the characteristics of the plant itself.

Discussions on forums sometimes note that wild plants sold online are cheaper than cultivated counterparts, making it possible to identify them but this is likely to vary between sellers and depends on the species in question. For example, new species sold online may fetch quite high prices – even more so if there are few sellers offering them – especially as some specialist buyers are willing to pay more for species that are rarely found for sale.³⁵

Plants sold without CITES paperwork may also be cheaper – a function of the savings the seller makes by not paying for expensive permits. In 2018, for example, the UK authorities required a fee of £74 per genus to import or export CITES-listed plants.³⁶ Although the price of permits varies greatly between countries, it is clear that sellers who do not pay for these permits can pass on the savings to their customers.

The highest reported prices for ornamental orchids, up to around US\$200 000, have been paid for hybrid orchids that are bred for particular features, such as regular blooming or unusual flowers.³⁷ Plants that have been bred from award-winning parents also fetch high prices. Awards at orchid shows are given to outstanding, well-grown plants and can be very lucrative for the grower who wins them.

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Current efforts to address the online orchid trade

To date, relatively little attention has been paid to the illegal orchid trade, with almost no efforts focused on the online element of the trade. Members of the IUCN Species Survival Commission Orchid Specialist Group's Global Trade Programme have been working on several aspects of the orchid trade since 2016, including efforts to monitor online trade and alert relevant bodies to illegal online sales.³⁸ In addition, Floraguard, a broader project established in 2017 focused on illegal online plant trade, has the aim of improving policing and monitoring of online trade in all plants, including orchids.³⁹

However, with the exception of these projects, and despite increasing attention given by NGOs, researchers and policymakers to the online illegal wildlife trade, very few initiatives directly address or even mention the online trade of threatened orchids. For example, a large international partnership of internet companies and NGOs, including Google, Baidu, TRAFFIC and the World Wide Fund for Nature, mention only animals in their description. Others may refer to 'animals and plants' in the introduction to their reports, yet focus their efforts entirely on the trade of charismatic megafauna.

In addition to international projects, there are some national-level activities that tackle wildlife cybercrime, such as Malaysia's Operation Taring, which also focused solely on animals.⁴¹ However, some focus on plants has been

reported: the Thai CITES authorities responsible for flora use their Facebook page to post warnings to growers about illegal plant trading, which includes information on which *Paphiopedilum* species cannot be exported. In 2018 some online advertisements for wild Paphiopedilums in Thailand were reportedly removed shortly after a warning was issued telling growers to stop selling wild-collected plants, as it was jeopardising the country's legal orchid industry.⁴²

Conclusions, implications and recommendations

The online illegal trade of orchids is taking place on multiple platforms, involving sellers and buyers from all over the world, many of whom are also involved in the legal trade. Although all international movement of orchid species is regulated by CITES, traders take advantage of the lack of monitoring of online sales, especially on social-media and e-commerce websites, to advertise wild-collected plants, sometimes of rare or protected species. In particular, the complexity of the overlapping legal and illegal markets makes it difficult to detect and monitor illicit sales, even though much illicit sales activity takes place in the open.

Current efforts to address the online wildlife trade have largely omitted plants, and little work has been done to develop monitoring or enforcement strategies that might reduce the impact that this trade is having on wild populations of orchid species. Even where wild-collected plants are not advertised as such, methods do exist to determine origin, such as the use of minimum growth timings to estimate when newly discovered species will be legal to trade. Improved monitoring and detection of illegal sales could be facilitated by research to document which species are being traded, where, and by who.

Additionally, as the illegal orchid trade happens openly online, this presents an opportunity to collect information that is hard to access in offline markets, such as the species for sale, the numbers that they are traded in, and how traders and buyers interact. Although overlapping legal and illegal markets may make monitoring the illegal trade more difficult, there are several potential actions that could be taken to improve the situation.

Identify which species are traded

Surprisingly, there is currently no single source for information about which orchid species are in commercial trade, and CITES Parties have said that this would be an important resource to develop. A database such as this could include information about legality of harvested plants in several countries, whether the species are currently available from legal sources, and the minimum growth period from seed to flowering size. CITES authorities and law-enforcement bodies could use this to identify and document illegal online sales, and process permits for exports. This information could be used to alert law enforcement to illegal sales as they occur, or it could be recorded for use as evidence in ongoing cases and prosecutions. If this were to incorporate information about the thresholds before which new species could not be traded, then it would allow easy identification of at-risk species that are not yet available from legal sources. Although this information is already available for *Paphiopedilum* species, it should be extended to other traded genera.

Monitor illegal sellers across platforms

Further work could build on this to develop a database of sellers who regularly trade illegally, to identify priorities for monitoring. As sellers may sell orchids both legally and illegally on different platforms, this information would allow monitoring to take place across platforms, where different information may be provided about the origin of plants or their destination. Although the ease with which vendors can open new social-media or e-commerce accounts would make it challenging to develop a static database, it would nevertheless provide a useful law-enforcement tool.

Identify countries that are hotspots of illegal trade

Many orchids are range-restricted, including several examples of newly described species that have become popular to trade, such as *P. canhii* which was originally known only in certain areas of Vietnam. Information on the wild distribution of new species in trade can be used to identify potential international routes that illegal trade is taking, especially where it can be shown that no CITES permits have been issued for it. One study using this method identified several countries in South East Asia where illegal trade was likely to be taking place. This can be used to highlight countries that may need increased capacity to address the loss of their species to the illegal trade.

Investigate the possibility of online consumer behaviour change

Given the visible nature of the trade on platforms such as social media, targeted efforts to reduce consumer demand for illegal or unsustainably collected wild plants may be effective in reducing these sales. Specialist online consumers have been found to have a preference for rare orchids, so highlighting rarity or conservation concerns may be more likely to encourage them to buy these plants. However, other messaging may be more effective, and further research into consumers could underpin behaviour-change endeavours to complement enforcement efforts.

Potential consequences of law enforcement

As with any illegal activity, it is highly likely that increased awareness of active enforcement will lead to illegal actors hiding their actions, probably by moving to trading platforms that offer greater privacy, for example from e-commerce websites to social media. Although this would prevent the open advertising of plants to casual buyers, the committed specialist buyer would most likely still have access through existing networks and, at the same time, monitoring them would become more difficult.

Sales may also continue using code words and other 'signalling' methods, as has been found in online ivory markets, where the terms 'ox bone' and 'faux ivory' were adopted by traders when e-commerce platforms such as eBay removed the sale of ivory products.⁴³ Another potential consequence is the risk that enforcement or tighter restrictions on the online trade could have a negative effect on the legal orchid trade, which is a source of income for many people. In addition, misidentification of legal online sales as illegal, due to the uncertainties that exist around identification of wild plants, may harm the reputation of legal sellers. The impact of this on legitimate businesses should also be taken into account, and the potential for it to undermine support for efforts to address the illegal online trade should not be underestimated.

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