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ORCHID CONSERVATION IN MEXICO

ERIC HÁGSATER* AND MIGUEL ANGEL SOTO ARENAS

Herbario AMO, Apartado Postal 53-123, México D.F. 11320, MEXICO

ABSTRACT. Knowledge of orchid diversity has greatly expanded in the last 30 years. Some 1,150 identified species are recognized in Mexico with an additional 100 species still unidentified. Some 250 localities have been surveyed with "hot spots" of orchid diversity identified. Cloud forests contain almost 60% of known species in only 2% of territory; this is the most endangered biome. A map of priority regions for conservation is available. A federal list of endangered or threatened species has been published. Official development policies have changed from massive clearing to biodiversity conservation. Demographic and genetic surveys have taken place in particularly threatened and economically important species like *Laelia speciosa* and *Vanilla.* Cases of conflicting interests in horticulture oppose orchid growers with in situ conservation. Ex situ conservation of *Laelia anceps* subsp. *dawsonii, L. gouldiana, Paphiopedilum xerophyticum* and *P. exstaminodium* results in commercial gain. A National Plan for Orchid Conservation focusing on immediate actions is underway. Various projects of in situ conservation are ongoing with legal support. A realistic assessment of commercial possibilities of local species is essential to avoid exaggerated expectations. Interaction of local groups, government and NGO's with local communities is essential to biodiversity conservation.

Orchid conservation is a tremendous task in tropical countries with high diversity. The origin of the problem is an increasing human population demanding progressively larger amounts of resources. Since most tropical countries face severe economic problems and usually have a multi-ethnic population with different ideas and traditions in the use of natural resources, it becomes very difficult to plan the use of land, and then to maintain a surveillance of the plans. The first step is to recognize that the problem is extremely complex and that it requires the understanding and capabilities of the very different people that must become involved in orchid use and preservation.

In Mexico, it soon became obvious that the following points were important, and many efforts have been conducted to understand or fulfill them: 1) The lack of floristic knowledge and accurate information on the distribution of orchid diversity; 2) the lack of precise information about the conservation status of the species; 3) the historical policy of opening wild land to agriculture and development and consequently, the lack of a public awareness of conservation of the biota; 4) the importance of basic research on how to preserve; 5) the importance of horticulture as a threat and as a strategy for ex situ conservation; 6) the importance of collaboration with government and non-government authorities (NGO's); 7) that conservation in situ is much more important than conservation ex situ; 8) that orchids are a natural resource of the country that can be exploited, preferably by local people in a sustainable way.

* Author for correspondence.

THE LACK OF FLORISTIC KNOWLEDGE AND OF ACCURATE INFORMATION ON THE DISTRIBUTION OF ORCHID DIVERSITY. Compared with other tropical countries the orchid flora of Mexico is very well-known. Many collectors visited the country, especially in the 19th century. As a result of the collections of Henri Galeotti in 1840, Mexico was then considered the richest country in orchid diversity in the world, with some 460 recorded species. Rudolf Schlechter (1918) credited Mexico with 628 species, and Williams (1951) included about 600 species in his "Orchidaceae of Mexico." Soto Arenas (1988) listed 918 species, and Soto, Salazar & Hágsater include about 1,150 species in their unpublished "Synopsis of Mexican Orchidaceae," with an additional 100 species still unidentified or undescribed. This means that the number of known species has doubled from that recorded 30 years ago, thanks in large part to the systematic efforts of the group associated with the AMO Herbarium, although Mexico was considered well-collected and well-botanized. Recent examples of revisions that have greatly increased the number of registered taxa are those on *Stelis* by Solano (1993) and *Lepanthes* by Salazar and Soto (1996). Since the discovery of novelties has drastically fallen in the last few years, we expect the total orchid flora of Mexico to be about 1300–1400 species.

The distribution of the Mexican orchids is at present much better understood than 30 years ago. All the significant areas of every physiographic province, especially those with more humid conditions, have been systematically botanized. This can be easily seen in the distribution maps of our Icones Orchidacearum, where the Mexican species have many more stations, and

in many cases almost continuous distributions, while the maps in the Icones from other countries usually show many fewer stations.

A database of the orchid flora of some 250 localities, including all the large natural reserves are continually updated, and the information is based mostly on direct field work. This has permitted us to highlight where orchid diversity "hot spots" are, and also recognize the differences in composition between the various floristic provinces. Endemism in each one of the 19 floristic provinces has been assessed, and it can be as high as 25% at the species level in the Sierra Madre del Sur.

Orchid diversity is also very unevenly distributed in the different habitats with almost 60% of the known species dwelling in the cloud forests that occupy only about 2% of the territory. Many of the Mexican cloud forests are not protected, and this is one of the most endangered of the Mexican biomes (Toledo & Ordoñez 1993, Rzedowski 1996).

These inventories led us to propose a prioritized list of the habitats and sites for the conservation of a high proportion of species with minimal extension of land. All of the regions recognized as important orchid centers of diversity have been included in the Priority Regions for Conservation, a list prepared by the Mexican Government and NGOs (CONABIO, etc. 1996).

THE LACK OF PRECISE INFORMATION ABOUT THE CONSERVATION STATUS OF SPECIES. Precise information on the conservation status of native orchids was necessary in order to dedicate the appropriate efforts to critical taxa and not waste them on species not truly endangered or threatened. Previous orchid lists were prepared by people not familiar with the orchids in the wild and without access to recent herbarium information. This kind of information is difficult to collect, because it must be gathered in the field by people thoroughly acquainted with the orchids throughout their distribution range, and with some knowledge of the species' biology and pressures the orchid populations are facing. They must also be acquainted with information already published or deposited in museums. In any case, the conclusions are subjective.

We did a survey of the conservation status of all known orchids in Mexico (Soto and Hágsater 1990) that served as a basis for the compilation of the official list currently in use (NOM-059-ECOL-1994); this list will be amended as new information becomes available.

THE HISTORICAL POLICY OF OPENING WILD LAND TO AGRICULTURE AND DEVELOPMENT, AND CONSEQUENTLY, THE LACK OF PUBLIC AWARENESS OF CONSERVATION OF THE BIOTA. For 450 years the policy had been to open up more land to agriculture, livestock grazing, urban development, and other economic activities. For centuries the country was a new land to conquer, mostly from a crowded and overpopulated Spain and a local population with a high growth rate. This policy culminated with the "Plan Nacional de Desmontes" (National Clearing Program) during the 1970's when large areas of the tropical rain forest of the southeast (Uxpanapa, Las Choapas, southern Campeche, and the Selva Lacandona) were opened to farmland and cattle grazing. In the northwest, eleven large rivers were dammed to irrigate the coastal plains of Sonora and Sinaloa, in order to establish modern agricultural areas for export produce, like tomatoes and other vegetables.

It was not until the catastrophic failure of the programs in the southeast that the public attitude changed and awareness of importance of nature conservation started. From that point, the government policy was to reforest, to avoid erosion, to increase the productivity in already existing farmlands; and more recently, since the end of the 1980's, to maintain biodiversity. Although nature conservation has become a public concern, there was no experience to face the problem. In the last few years the idea of sustainable development has gained popularity, but very few programs of this type have been successfully established.

Although large areas of tropical forests in Mexico have disappeared completely, most of these areas, fortunately, were in the relatively flat lowlands that apparently used to support a rather poor orchid flora. The diverse, humid forests at the foot of the mountains, usually in rugged terrain, have survived; and large tracts of lowland and mountain rain forests that house most of the orchid diversity of the country remain almost intact.

THE IMPORTANCE OF BASIC RESEARCH ON HOW TO PRESERVE. A more or less complete inventory of the orchids is just a part of what we need to know. There is surprisingly very little information on how to preserve tropical orchids in situ. Many orchids are dwellers of transitory habitats, like many of the terrestrial European species that require special disturbance regimes for the recruitment of individuals and maintenance of populations. We have seen the necessity of studying species that require these specific disturbance episodes (Hágsater 1991, Soto 1994), since the preservation of the habitat, without some kind of management does not secure the survival of a particular species.

Gathering orchids is part of the culture of the

Mexican people, a practice difficult to eradicate. We have studied the demographic impact of this activity and its consequences on the conservation of selected species. This aspect is particularly important, since orchid flower gathering can be one of the alternative uses of forests that in other aspects are unproductive. Hernández (1992) described the demography of exploited and unexploited populations of *Laelia speciosa,* and she concluded that the present practice of removing almost all flowers from natural populations means a null recruitment of new individuals. However, she also suggests alternative management strategies to exploit natural populations ensuring their maintenance.

Other detailed studies are being conducted on the Mexican vanillas: the genetic variation of both plantation and wild populations of *Vanilla planifolia,* the only non-ornamental orchid of world economic importance in Mexico. These studies are necessary for the future management of vanillas to ensure the genetic diversity in wild populations and as a source of desirable traits for crop improvement programs.

Further basic research and development of management programs must be encouraged in the future. We need to know much more about the biology of orchids, especially genetics and the effects of habitat fragmentation, to be able to propose successful plans for the conservation of orchid diversity.

THE IMPORTANCE OF HORTICULTURE AS A THREAT AND AS AN EX SITU CONSERVATION STRATEGY. To attribute the loss of the original habitats of the orchid species as the only threat can be a big mistake. No biome of the Mexican landscape has disappeared or is so severely reduced by human activity to have put orchid species on the verge of extinction. The twenty Mexican endangered orchid species are plants with horticultural importance, and their very selective over-collecting threatens them more than anything else. However, the disappearance of many populations (not the species) is a common problem for many Mexican taxa.

How is a conservationist approach instilled within ordinary people and orchid growers? Curiously, this is one of the most difficult tasks and one of the most neglected. Many orchid growers continue to visit public markets to buy specimens of selected species collected in the wild, at very cheap prices. They can choose plants with outstanding horticultural traits from among hundreds of wild-collected specimens. In addition any limitation to the right of orchid growers to collect without limitations is taboo. Orchid growers continue to see themselves as "orchid rescuers," where a desirable plant will only survive from certain death in their greenhouse! Orchid growers deny that they increase the demand of wild specimens or endanger wild populations. It is incredible that it should be so difficult to change the attitudes of educated people. There is nearly unanimous opposition of amateur orchid growers to this aspect of conservation.

Other people, not particularly interested in orchid growing, buy flowers for decoration, especially during religious festivities: *Laelias, Barkerias, Oncidiums, Cypripedium* and some *Encyclias* are the favorites.

However, the role of horticulture in ex situ conservation must also be recognized. *Laelia anceps* subsp. *dawsonii* and *Laelia gouldiana* are known at present only because they have been cultivated for centuries in Indian villages.

More recently, it has been considered that ex situ preservation is the only alternative to maintain some extremely endangered species. *Laelia anceps* subsp. *dawsonii* has been extensively propagated by Mexican nurseries, and hundreds of clones are under cultivation despite the fact that only twelve specimens are known in the wild (Soto Arenas 1993).

Paphiopedilum (=*Mexipedium*) *xerophyticum* is in the same situation. Of the original seven large clones (some of them very large) found in 1988 (Soto *et al.* 1990), a half dozen cuttings were removed and distributed, and the plant is now available from commercial growers. Two were sent to Lucille McCook who at the time was a postdoctoral fellow with the Smithsonian Institution in Washington DC, where she worked on *Phragmipedium* (That was before the genus was transfered to Appendix I of CITES in 1989. The plants were sent as scientific exchange between two institutions with CITES registration. AMO was granted CITES registration in 1981 long before Mexico ratified the treaty.) We asked McCook to share the live material with growers who might be successful in reproducing it to insure that it became available to institutions and amateur growers from the few plants collected originally. She shared divisions of her plant with Marilyn Ledoux who was at the Missouri Botanical Garden and who cultivated the plant successfully and recently wrote on its culture (Ledoux 1996). Dr. McCook sent a part of one division to Louis Hegedus in Fort Collins, Colorado, a specialist grower of the genus, who later provided leaf samples for DNA extraction to Victor A. Albert at the University of North Carolina (Albert & Chase 1992). The division shared with Marilyn Ledoux flowered and was propagated, and has been traded commercially receiving approval from the US Department of the Interior as artificially propagated specimens. Another was shared with Vivero Río Verde in

Temascaltepec, Mexico and grew well vegetatively, but rarely flowered and has only been propagated by division. The strategy proved correct, as the last survey of the population revealed that two clones have been completely removed from their habitat and the surroundings have suffered from severe impact. No other stations have been reported (Salazar & Hágsater in prep.).

The other species of Mexican *Paphiopedilum, P.* (=*Phragmipedium*) *exstaminodium* is also facing severe conservation problems, and it is believed that some of the 30 known individuals have been lost in the last few years, both to commercial collectors and habitat destruction; there is a Zapatista camp next to one of the known populations. In this case, hundreds of seedlings are being grown in the Botanic Garden of the National University.

The Mexican Orchid Society, by selecting horticulturally desirable specimens and granting them horticultural awards, hopes one day of having artificially propagated plants (descendants of prized specimens) that will be inexpensive, widely available, and much more showy than wild specimens of the same species. For some species like *Laelia anceps,* this is already becoming true.

THE IMPORTANCE OF COLLABORATION WITH GOVERNMENT AUTHORITIES AND NGO'S. Government authorities responsible for the protection of wildlife need the advice of specialists to fulfill their responsibilities. Orchids, orchid trade, and orchid protection are specialized topics, and every effort must be made to guide those that make decisions regarding them.

After the publication of the IUCN orchid conservation action plan (IUCN/SSC Orchid Specialist Group 1996), Mexican authorities asked the commercial orchid growers, the Mexican Orchid Association and AMO Herbarium to prepare a "National Plan for Orchid Conservation" based on the guidelines already indicated by SSC Orchid Specialist Group, but specifically for the Mexican case focusing on immediate actions.

Although this National Plan for Orchid Conservation is still being developed, some of the recommendations have been implemented. These recommendations include the closing of nurseries that trade in wild-collected plants as if they were artificially propagated. The first case with all its legal difficulties, is already underway in the state of Veracruz. It implies the canceling of a nursery license which had been granted several years before. Several inspections of independent experts have to be made to certify that plants exported are actually wild-collected, and not produced by the nursery from their seed flasking operation. The nursery has applied for judicial protection to continue their business, and legal procedures may take several years. For the time being, only CITES certificates may be withheld.

In order to carry out a precise diagnosis of the orchids as a natural resource, it is necessary to assess both the actual and potential markets, and the profile of the different types of growers: traditional (usually Indian) growers, cut-flower producers, and nurseries oriented towards species and primary hybrids. These guidelines are necessary because there is a myth that orchids can be a much more profitable business than they actually are, and a correct estimate of the resource can guide developers in search of sustainable programs.

Environmental authorities are preparing posters for the general public which are to be displayed in market places (the traditional selling sites) explaining that buying wild-collected orchids is forbidden and that this activity threatens the future survival of these species. Care must be taken, however, to permit the sale of those species which are available from semi-cultivated plants and which constitute a valid sustainable use.

The plan includes other very specific points, such as lists of species that could be collected by authorized nurseries as mother plants for vegetative reproduction. These include *Pleurothallids, Scaphyglottis,* many *Epidendrums* and *Encyclias,* and other small-flowered orchids of little horticultural interest, in which seed propagation is uneconomical because of the reduced size of the potential market as well as the large number of individual plants found on a single tree in the wild.

CONSERVATION IN SITU. Conservation can only be achieved locally. Local communities, NGO's and local governments must also be involved in the actual setting up and management of conservation areas. Several NGO projects, mainly in Chiapas, Oaxaca, Veracruz and the Yucatan Peninsula, have been established with varying results. Unfortunately, few of these are located in areas of high orchid diversity. Only one, the Cerro Huitepec protected area owned and managed by PRONATURA, is in cloud forest, but the area is too small to be very meaningful. It was established to develop ownership and management strategies for protected areas. There are projects in Veracruz, supported by the orchid societies of Xalapa and Córdova, to protect orchids on private lands and in the canyons that run down from the Cofre de Perote.

Federally protected areas with high diversity seem successful in Chiapas in the Montes Azu-

les and El Triunfo reserves, as well as Omiltemi in Guerrero. However, there are few in cloud forests, and many are needed in northern Oaxaca.

There is one interesting experience in the Chimalapas region of Oaxaca. The area was purchased by the local Indian community from the King of Spain in the 18th century. Most of the vegetation of the area has remained unexploited. It sits on the Isthmus of Tehuantepec, at the very end of Central America, and covers an altitudinal range of 200 to 2,300 m. A recent census (Salazar & Hágsater in prep.) has recorded 92 genera and 300 species of orchids, including 11 species new to science and 3 genera previously not registered for Mexico. There is an ongoing effort by a group of conservationist organizations to maintain management in the hands of the Indian community, with recognition from the federal and state governments and support from the scientific community. Unfortunately, lumbering interests, road construction, drug cartels and population pressure from neighboring communities are all encroaching on the area. Again, the issue is how to assure the local community better living conditions through alternative sustainable use.

A realistic assessment of the commercial possibilities of local species must be given early on, so that grandiose plans are not established with the hope of providing economic results to those participating. In most cases sustainable use is confined to eco-tourism, especially birding. There are very few species which can be propagated and cropped in semi-cultivation to give the local community a sustained, albeit marginal, income.

Emphasis must now be placed on learning how to use and conserve the natural areas of high diversity. We are convinced that this will only be achieved through the interaction of local groups focused on a holistic view of conservation, supported with information from groups knowledgeable about specific species and sustainable use, and other groups with management know-how in cooperation with local, state and national government. The local community living in or having used the area must be included. It is here that we need many diverse experiences to set up successful alternatives. If biodiversity does not increase the life standards of the local populaton, it is probable that it will not survive in the next decades.

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