THE WILD PLANT TRADE IN EUROPE

RESULTS OF A TRAFFIC EUROPE SURVEY OF EUROPEAN NURSERIES

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PREAMBLE

This report is based on field investigations carried out by TRAFFIC Europe in 1991 and 1992. The project was funded by WWF and the United Kingdom Department of the Environment. A more popular version of the report which also covers other aspects of the wild plant trade was published in 1992 by TRAFFIC Europe and WWF UK under the title *Wild Plants in Trade* by Martin Jenkins and Sara Oldfield.

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1. INTRODUCTION

The horticultural plant trade in Europe is an enormous business, worth in the Netherlands alone (the world's largest plant trading nation) some US$ 2400 million per annum, and encompassing literally thousands of millions of plants (over one thousand million chrysanthemum plants are produced by cuttings each year in the Netherlands). The overwhelming majority of this trade concerns mass-produced artificially-propagated plants and is totally independent of wild populations of the species concerned.

It is known, however, that commercial trade in wild-collected plants still exists, and that some of this trade concerns species considered threatened with extinction.

The aims of the current project were:

1. To determine the extent of trade in wild-collected plants for the horticultural market in Europe and identify the main groups concerned;

2. To determine patterns of trade in the plant groups identified above within Europe;

3. To determine the extent to which national and international legislation (chiefly CITES - the Convention on International Trade in Endangered Species) was effective in controlling such trade;

4. To determine the extent to which threatened species were artificially-propagated in Europe;

5. To make recommendations as to how controls in plant trade can be improved to benefit wild populations of threatened species.

Emphasis was placed on those species listed in Appendix I or II of CITES, but as much information as possible was gathered on other groups; in general, however, non-orchidaceous geophytes (bulbs, corms and tubers) were excluded from the study as these, particularly *Galanthus* (snowdrops) and *Cyclamen*, have been the focus of considerable attention elsewhere recently (e.g. Oldfield, 1990). The principal groups covered were: cacti and other succulents; orchids; carnivorous plants; cycads; bromeliads, particularly the genus *Tillandsia*. As patterns of trade differ considerably between these groups, each has been dealt with separately in this report.

1.2. METHODS

Most of the information contained in this report was obtained by visiting locations where plants in the groups identified above were known or thought likely to be on sale. This included nurseries, both wholesale and retail, garden centres, florists and other retail outlets, and plant shows and exhibitions. In all around 140 separate locations were visited during the course of the study.

Ground surveys were carried out in the following countries: Belgium, France, Germany, Italy, Netherlands, Spain (Canary Islands), Switzerland, United Kingdom. Information was gathered for other EC countries and for Austria by correspondence and personal communication with knowledgeable parties.

Visits were carried out by one or more of the following: Martin Jenkins, Blaise du Puy, Maurizio Sajeva, Andrea Cattabriga, sometimes accompanied by a representative of TRAFFIC Europe. Blaise du Puy was responsible for surveys in France, Maurizio Sajeva and Andrea Cattabriga for surveys of cactus and other succulent nurseries in Italy, and Martin Jenkins for the remainder.

A brief follow-up survey, funded by TRAFFIC Europe, was carried out by Andrea Cattabriga in June and July 1992 and entailed visits to cactus and succulent nurseries in Austria, Czechoslovakia, Hungary and Germany. Results from this have been incorporated into the present report.

In the majority of cases, visits were made unannounced with the investigators posing as interested amateurs. In some cases, based generally on recommendations made by various authorities consulted in the course of the study, visits were arranged beforehand and the purpose of the study was explained. In other cases, where the investigators were able to conclude on the basis of their observations that the nurserymen or traders were likely to be *bona fide*, the purpose of the study was revealed in general terms during the course of a visit; in these cases much valuable additional information was often obtained. Where possible catalogues and price lists were also obtained. These were also obtained from a number of nurseries not visited on the ground.

Nurseries and other locations to be visited were selected on a variety of criteria: on the basis of advertisements in specialist journals; on the basis of displays at plant shows and exhibitions; on the recommendation of experts.

Much valuable additional information was obtained by consultation with a variety of experts, including CITES Management and Scientific Authorities, the CITES plants officer, customs officers, TRAFFIC offices, plant traders, horticultural and botanical experts.

CITES trade statistics obtained from the Wildlife Trade Monitoring Unit of the World Conservation Monitoring Centre (WCMC) were used to provide background information; the Plants Unit of WCMC provided information on the conservation status and distribution of some of the species concerned.

It is difficult to assess accurately the completeness of the survey: plants in the groups in question are sold in literally hundreds of thousands of outlets throughout Europe. Although the vast majority of these are general retail outlets which will be insignificant in the context of trade in wild-collected plants, this cannot be guaranteed. The presence of wild-collected Appendix I cacti in unexpected retail outlets in the Netherlands demonstrates this (see p. 19). Further, an increasing proportion of imports of wild-collected plants, particularly those of rare species where such trade is of most conservation concern, appears to be small-scale and covert and does not enter the established horticultural trade. It is extremely difficult to establish the size and nature of this trade in a project of this type.

Some generalisations can be made, however, on the basis of knowledge acquired during the execution of the project. Of the countries covered, nursery coverage has been least complete in the United Kingdom and Germany. The situation in the U.K. is relatively well-known, however, and this is not considered a serious omission. In Germany, it was unfortunately not possible to visit two or three nurseries considered important in the cactus trade, and four or five nurseries significant in the orchid trade during the main study. Fortunately the follow-up study by A. Cattabriga in 1992 visited all except one of the remaining important cactus nurseries in Germany. His findings confirmed those of the main study, indicating that a reasonably detailed and accurate picture of the trade in the groups studied has emerged during the course of the survey.

2. CACTI AND OTHER SUCCULENTS

2.1. CACTACEAE

INTRODUCTION TO THE FAMILY

The family Cactaceae consists of upwards of 1500 species confined, with the exception of one or two species of the epiphytic genus *Rhipsalis*, to the Americas, although several species of *Opuntia* or prickly pear have been very widely naturalized elsewhere. The vast majority of cacti are inhabitants of xerophytic (arid or semi-arid) environments, but species are found in a wide range of habitats, including alpine regions and tropical rain-forests. Taxonomically the family is notoriously confused, in large measure because cacti have been intensively studied in cultivation away from their natural habitats. This had led to a great proliferation of names at generic, specific and infra-specific level. Concerted efforts are being made, notably by the International Organization for Succulent Plant Study (IOS), to rationalize cactus taxonomy, in the first instance by evolving a consensus list of cactus genera. The latest published revision of this (Hunt and Taylor, 1990) accepted 93 genera. However, there is still a need for field study of many groups of cacti to resolve outstanding taxonomic problems and also to determine the conservation status of many taxa. Many species of cacti are known to be under varying degrees of threat either through collection for the horticultural trade or habitat destruction, or both, but detailed information is lacking in the majority of cases.

CULTIVATION

As Oldfield (1985) points out, cacti have been widely grown in Europe for at least the past century. Current production of cacti in Europe is on an enormous scale, running into tens of millions of plants each year. The vast majority of this production is of small, artificially-propagated plants which are sold unnamed in the general horticultural trade; almost all this production is independent of wild-source material including seed.

As well as the general horticultural market, there is also a strong specialist market for cacti: the Cactaceae and the Orchidaceae are undoubtedly the two plant families with the most extensive hobbyist following, both in Europe and elsewhere. It is impossible to demarcate the dividing line between the 'specialist' and 'generalist' markets, although a reasonable definition of the specialist market could be one where the identity of the plant grown has become as important to the grower as its appearance.

The market for cacti in Europe therefore encompasses a range from the most casual supermarket purchaser to a hobbyist who specializes in one genus, or even one section of a genus, and who will aim to acquire a comprehensive collection of forms in his or her chosen speciality.

There are between 150 and 200 nurseries supplying the cactus trade in Europe. Between one third and one half of these, in the Netherlands, Spain, Italy and France are wholesale suppliers producing plants exclusively for the non-specialist mass market. Of the remainder, many are small concerns, often operating on a semi-amateur basis. There are 40-50 medium to large concerns which aim to provide plants for the specialist collector, as well as generally providing non-specialist plants.

SPECIES IN TRADE

It is extremely difficult to quantify the number of species of cacti in trade. This is principally because growers and traders use a very wide range of specific and varietal names, recognizing far more species than most botanists. It is often very difficult to relate names used in trade to botanically 'acceptable' species; moreover, many of the largest traders to do not produce lists, and those that do often have additional species available in small quantity. Typically, the larger catalogues list between 600 and 800 'species', including forms listed as *sp. nova* with collectors' numbers; many of the species will be available in a number of forms. Seed of an even wider

number of named forms is available - one German company, which supplies probably the largest range of seed in Europe, both wholesale and retail, lists over 2000 'species'.

The great majority of cactus species are in cultivation in Europe - one collection alone, the Stätdische Sukkulenten-Sammlung in Zurich has virtually all species excluding the larger Opuntioideae. Most species are available in trade, although many from only one or two outlets in Europe; however there is little collectors' interest in some groups (again many of the Opuntioideae and the larger Cereoids). Fifty to one hundred species are widely available in garden centres, florists and other general horticultural outlets, although many of these are hybrid forms in cultivation for many years and bearing very little resemblance to any wild populations.

THE SIZE OF THE MARKET

The casual market for cacti in Europe is enormous, as demonstrated by wholesale production figures. Many million households in Europe will own one or two, often moribund, cacti. The collectors' market is much smaller, although is undoubtedly considerably larger than for orchids. There are estimated to be 5000-7000 collectors in Belgium and the Netherlands, around 3000 in Italy, probably 10,000 to 15,000 in Germany, perhaps 10,000 in the U.K., around 5000 in Czechoslovakia, a significant number in Hungary and relatively few enthusiasts elsewhere in Europe. There are therefore perhaps upwards of 40,000 collectors in Europe, although the great majority of these will have only small, general collections and still buy plants more for their appearance than their rarity or provenance. Nevertheless, a significant proportion of these will have some interest in acquiring the best-known and most fashionable species, such as *Ariocarpus* (q.v.). Dedicated collectors' interest in particular groups will be far smaller and for most will run only into the tens or hundreds of individuals in Europe. There is an impression in Europe that the market is stagnant or even declining; the exception to this is Italy, where interest continues to increase.

PROPAGATION AND WILD-COLLECTION

Cacti are propagated on a commercial scale in two ways: by seed and by vegetative propagation. Raising most cacti from seed is relatively straightforward and this is undoubtedly the commonest form of propagation, both for the non-specialist and specialist markets. Propagation by cuttings is practised for several species, particularly epiphytic cacti such as the 'epiphyllums' of commerce and the popular *Schlumbergera* species. Slow-growing and difficult forms are also often vegetatively propagated by grafting onto more robust rootstock. This form of propagation is also used for the various colour mutations, particularly of *Gymnocalycium* and *Echinopsis (Chamaecereus)*, which are sold in enormous numbers in general retail outlets and are mostly imported from the Far East. Grafting has proved a reliable means of propagating some of the most sought-after and difficult cacti discussed below. Grafting is not universally popular amongst collectors, however, as many prefer to have plants growing on their own roots where possible.

Availability of seed, while generally not a problem, is a limiting factor in the propagation of some of the rarer and more desirable species, particularly those relatively recently introduced to cultivation.

Although the majority of the requirements of all sectors of the market can be met through artificially-propagated stock, there remains a widespread potential demand for wild-collected stock.

In the non-specialist market, large, specimen-sized plants remain in strong demand as prestige house plants, for display in office and hospital foyers, restaurants and other public and semi-public areas, and, in southern Europe, for landscaping out-of-doors. Plants popular for this include large columnar species such as the Saguaro *Carnegiea gigantea, Cereus* spp., *Oreocereus* spp. and *Cleistocactus* spp. as well as spherical forms such as the ubiquitous 'golden barrel' *Echinocactus grusonii* and the large *Ferocactus* spp. The great majority of the European demand for these plants is satisfied by production

in the Canary Islands (qv) and the Mediterranean region, especially Morocco, where large, uniform plants of these species can be produced in a relatively short time; however some, including *Carnegiea* and *Ferocactus* spp. from the U.S.A., are still imported as wild plants. These very large cacti are expensive (e.g. a 40-year-old double-headed *Echinocactus grusonii* imported from a Moroccan nursery to the Netherlands was priced at 5000 dfl (US$2600) and overall demand in Europe is relatively low.

In the specialist market, demand for wild-collected plants still exists, particularly in Germany and Italy, although most informants believe it is slowly waning. This demand persists for a number of reasons.

First is the perceived kudos associated with possessing a plant collected from its natural habitat; although still important, this has definitely waned in the past ten or twenty years, with many collectors, and increasingly, traders, subscribing to the viewpoint that it is actually undesirable to have wild-collected plants in a collection. Amongst serious, highly specialized collectors, this desire for wild plants is often a manifestation of a distrust of nursery-raised stock as contaminated by hybridization, that is they only seek plants which they know are 'true to type'. This desire can, however, be met from wild-collected seed as well as from actual plants.

Second is the desire to own mature, often large plants; this persists amongst many collectors and is perhaps the strongest incentive to buy wild-collected plants of many slow-growing species where artificially-propagated plants may take many years to resemble mature habitat plants, if they ever do so. This explains the persistent demand for wild-collected plants of the Mexican genera *Ariocarpus, Aztekium, Obregonia, Pelecyphora* and *Strombocactus*, all dwarf, very slow-growing species, as well as for *Backebergia militaris*, where the principal reason for collecting the plant - its distinctive bushy cephalium - is only known to develop on mature, arborescent plants.

Third is a combination of the competitive collectors' instinct and the vicissitudes of fashion - new groups of species may rapidly become popular, often as a result of the discovery of new species and/or the production of publications covering particular taxa or geographical areas. When this occurs, collectors compete with each other to obtain plants as rapidly as possible; generally the species concerned are not well-established in cultivation, and the only source is of wild-collected plants. This phenomenon is perhaps most clearly demonstrated amongst cacti in the influx of plants of the South American genera *Copiapoa, Uebelmannia, Melocactus* and *Discocactus* into Europe in the 1970s and early 1980s. Many thousands of plants of these newly-popular genera were imported at the time and, because cultivation techniques were not well-established, a very high proportion died. Since then, cultivation has improved considerably and artificially-propagated plants of good quality of virtually all species are readily available. This has undoubtedly led to a decrease in demand for wild-collected plants, although this demand still persists, particularly in newer markets such as Italy.

In summary, four problem or possible problem areas in trade in wild-collected cacti can be identified:

i. A small group of slow-growing plants almost entirely endemic to Mexico, most importantly *Ariocarpus*, but also *Aztekium, Obregonia, Pelecyphora* and *Strombocactus*. These plants are very well-known and highly sought-after by cactus hobbyists, most of whom regard them as the most prestigious plants in their collections. Wild-collected plants of these genera, all of which are now included in Appendix I of CITES (although three species of *Ariocarpus* were in Appendix II at the time of the survey), are still relatively widely available in trade in Europe, though not generally in large numbers.

ii. A number of genera which may become temporarily fashionable amongst collectors and in demand as wild-collected plants. The most recent examples are the South American genera *Copiapoa, Uebelmannia, Melocactus* and *Discocactus*. Generally demand is increasingly satisfied by artificially-

propagated stock and the species become less sought-after with time, although a residual demand for wild-collected plants often persists.

iii. The existence of small numbers of highly dedicated collectors who specialize in groups of plants which are often not particularly sought-after by more general hobbyists. These collectors will often themselves collect plants or propagative material from the wild to be exchanged with or sold directly to fellow enthusiasts. These plants do not generally enter the commercial trade to any significant extent, although some of these enthusiasts operate on a semi-professional basis. It is not possible to gauge the extent of this 'trade' from nursery visits and very difficult to judge the impact it may have on wild populations of plants - in general only small numbers of plants of any given species are likely to be involved although as some taxa are very localized, any collection at all may pose a serious threat to survival of the species in the wild. In the family Cactaceae, virtually all groups will have some adherents, but notable groups (i.e. those where there may be some problem owing to the rarity of some species) include the North American genera *Coryphantha, Pediocactus* and *Sclerocactus* along with some *Mammillaria* and the South American *Notocactus* (= *Parodia*).

iv. The possibility of wild-collected plants entering the general horticultural trade. Very little evidence of this was found during the survey (although see section on the Netherlands below). Some very large cacti which are sold in general outlets may be wild-collected, but the number involved is undoubtedly small and is not known to involve any threatened species.

PRINCIPAL SPECIES AND GENERA OF CACTI OF CONCERN IN TRADE

ANCISTROCACTUS

A genus of two not clearly distinguishable species, *A. tobuschii* and *A. scheeri*, from Mexico and southern U.S.A., probably not distinguishable from *Sclerocactus*. *A. tobuschii* is included in Appendix I of CITES. Dealers also list two other names, *A. brevihamatus* and *A. megarhizus*.

Seed and artificially-propagated specimens (both grafted and seedlings) of both species are relatively widely available, although the genus is not particularly sought-after. No wild collected specimens of either species have been seen offered for sale, although one Italian nursery known to import a large number of habitat plants offers *A. scheeri* at 55,000-80,000 lire (US$45-65). As plants of this genus normally sell for no more than US$5-6 (i.e. the normal price for small, nursery-raised cacti), this high price strongly indicates habitat origin.

ARIOCARPUS

A highly distinctive genus of six species of slow-growing cacti virtually endemic to Mexico (one species, *A. fissuratus*, extends into the southern U.S.A.). Three species, *A. agavoides, A. scaphirostris* and *A. trigonus*, have been included in Appendix I of CITES since the early 1980s, the remainder (*A. fissuratus, A. kotschoubeyanus* and *A. retusus*) were transferred to Appendix I from Appendix II at the eighth meeting of the Conference of the Parties, effective as of 11 June 1992. Plants are often named as *Roseocactus* or *Neogomezia* by traders.

The genus *Ariocarpus* is undoubtedly one of the most sought-after of all cactus genera. All species are relatively easy to propagate, but are generally slow from seed (although *A. agavoides* has flowered at six years from seed in cultivation). There remains a widespread and persistent demand for mature, that is almost invariably wild-collected, specimens, particularly in Germany and Italy. Wild-collected plants have been seen offered for sale at nurseries and other trade outlets in Belgium, Italy, Germany and the Netherlands during the course of the survey, with *A. kotschoubeyanus* and *A. retusus* the most widely available species. In general, however, wild *Ariocarpus* have been much less widely seen on open sale than in 1984. Prices are very variable, with

some nurseries charging very high prices for plants (up to 500,000 lire (US$400) in Italy) and others offering them at very low prices (300-400 belgian francs (US$8.8-11.75)).

Seedlings of all species are relatively widely available at low prices (e.g. 4-year-old *Ariocarpus agavoides* at £3.00 (US$5.25) in the U.K., 2/3-year-old *A. trigonus* at 15 dm (US$9) in Germany). Large, artificially propagated *Ariocarpus* plants are reportedly available from South African nurseries and from nurseries in Eastern Europe, particularly Czechoslovakia. However there is concern that these will not be able to support demand.

ASTROPHYTUM

A Mexican genus of six species, of which one, *Astrophytum asterias* is included in Appendix I of CITES.

Astrophytum is a popular and easy genus in cultivation, with two species, *A. myriostigma* and *A. ornatum*, very widely available as supermarket cacti. *A. asterias* is available from virtually all specialist dealers, either as seedlings or as grafted stock. No wild-collected plants of this species were seen offered for sale in 1991, and there would appear to be little demand for them in Europe although a small number were seen in one German nursery in 1992. Large plants of other species in the genus, especially *A. myriostigma*, are in demand and plants smuggled from Mexico have been confiscated in the past few years. A large number of apparently wild-collected plants were seen in one German nursery in 1992. Demand is generally met, however, by plants propagated in the field in nurseries in the Canary Islands, Morocco and South Africa. Plants 40-50 cm high and 25-30 years old imported from Morocco are available in at least one Dutch nursery priced at around 800 dfl (US$420). These plants could easily be mistaken for wild-collected specimens but are certainly artificially-propagated.

AZTEKIUM RITTERI

An extremely slow-growing monotypic genus with a very restricted distribution in Mexico. It is included in Appendix I of CITES.

Aztekium is highly sought-after by collectors, but was not widely seen offered in 1991, either as wild-collected or artificially-propagated stock. However, 30 wild-collected plants were seen observed on sale in Italy, priced at 125,000-170,000 lire (US$100-140). However, in 1992 a significant number of wild-collected plants were reportedly imported into Belgium, with plants being re-sold to at least one trader in Germany. Artificially-propagated plants (almost always grafted) are available in Italy, the Netherlands, the U.K., Germany, Hungary and Czechoslovakia and seed is offered by at least one German dealer.

BACKEBERGIA MILITARIS

A monotypic genus (sometimes included within *Pachycereus*) with a very restricted distribution in Mexico, listed in Appendix I of CITES and classified as Indeterminate by IUCN. Plants are arborescent and when mature form highly distinctive cephalia on the ends of the branches. The topcuts of branches with cephalia are collected and sold.

Wild-collected plants are present in many collections but have not been seen offered for sale during the present survey. Artificially-propagated plants are available from a wholesale nursery in the Canary Islands; however, to date, artificially-propagated stock has never produced cephalia, without which the plants have very limited interest. Plants with cephalia are said to be among the most sought-after of all cacti at present. In 1992 it was reported that a large number of plants had been imported to the Netherlands from Mexico four years ago. These had immediately sold out.

CARNEGIEA

A monotypic genus, the Saguaro *Carnegiea gigantea* of the south-west U.S.A. and Mexico is one of the largest and best-known of all cacti. It is also slow-growing and much in demand for landscaping in the U.S.A. and elsewhere. Small numbers of wild-collected plants have been seen in the Netherlands and Italy; however, the number exported to Europe, and in international trade generally, is likely to be insignificant compared with domestic demand in the U.S.A.

COPIAPOA

A Chilean genus of over fifteen species in need of taxonomic revision. *Copiapoa* has been a popular genus for the past decade and considerable numbers of wild-collected plants have been imported into Europe, many via Peru. Artificially-propagated plants and seed of most species are now readily available; a few wild-collected plants have been seen during the course of the survey, in Italy and the Netherlands, but generally far fewer in number than when a similar survey was carried out in 1985. They do however undoubtedly remain in demand, particularly in Italy where several hundred are believed to have been imported in the past two years.

CORYPHANTHA

A genus of small globose or cylindrical plants from Mexico and the south-west states of the U.S.A. Several of the species are now included in *Escobaria*. Fifteen Mexican species are considered either threatened or possibly threatened by IUCN, and 16 U.S. taxa are classified as endangered or threatened under the U.S. Endangered Species Act. The Mexican *C. werdermannii* and the U.S. *C. (=Escobaria) minima* and *C. (=Escobaria) sneedii* are included in Appendix I of CITES.

Plants and seeds of *Coryphantha* and *Escobaria*, including the three Appendix I species, are fairly widely available from specialist dealers. However the genera are not particularly highly sought-after, although they do appeal to growers, especially German, of so-called 'winter-hardy' cacti. Plants can be raised quite readily from seed and there is no evidence of widespread demand for wild-collected specimens.

DISCOCACTUS

A recently-reviewed genus of eight species of which seven are confined to Brazil, with the eighth occurring in Brazil, Paraguay and Bolivia. Six of the species are apparently of very limited distribution. The genus was included in Appendix I of CITES in 1992, the listing coming into effect on 11 June 1992.

Plants were heavily collected during the 1970s and early 1980s but proved difficult in cultivation and losses were very high. Since then cultivation techniques for the genus have improved considerably, and artificially-propagated plants are starting to become more widely available. This applies particularly to *Discocactus horstii*, the most sought-after species, and known only from one site in the wild. Grafted plants, some imported from Japan, are now relatively widely obtainable. Propagation of other species is now in progress, and one Dutch nursery offers seedlings or grafted plants of all species except *D. buenekeri*, under a large number of different names. This nursery also had a number of wild-collected plants in the genus for sale, although these did not appear to be recent imports. *Discocactus* plants were not widely seen in Italy during the survey, although there is some concern that demand for this genus could increase there.

ECHINOCEREUS

A genus of around 40 species from south-west U.S.A. and Mexico. Two taxa, *Echinocereus lindsayi*, generally considered a subspecies of *E. ferreirianus*, and *Echinocereus schmollii* (formerly *Wilcoxia schmollii)* are included in Appendix I of CITES. The former was feared extinct in the wild as a result of over-collecting following its discovery in 1975, although was rediscovered

in 1987. It is artificially-propagated in the Canary Islands for sale in Germany, and a few plants have been seen in Italy, but it is otherwise not widely available. Artificially-propagated plants of *E. schmollii* are reasonably widely obtainable in trade. There is no evidence of any demand for wild-collected plants of this species.

ECHINOMASTUS

Two species from the U.S.A. and Mexico, *E. erectocentrus* and *E. mariposensis*, are listed in Appendix I of CITES. These species are generally now included in *Sclerocactus* (q.v.), and sometimes in *Neolloydia*.

Seed of *E. erectocentrus* is available from at least one German supplier. There is no evidence of any European trade in wild-collected plants of these species.

LEUCHTENBERGIA PRINCIPIS

A highly distinctive monotypic genus from Mexico with a localized distribution, classified as Vulnerable by IUCN. The species is listed in Appendix I of CITES.

This species is extremely widely available in trade and is the commonest CITES Appendix I cactus in cultivation in Europe. One Dutch producer stated he had been forced to destroy 40,000 seedlings in 1990 owing to overproduction. As well as seedlings, many thousand larger artificially-propagated plants are imported annually from the Canary Islands to mainland Europe for sale. Five wild-collected plants were confiscated from an Italian nursery early in 1991. Other than these, there is no evidence of extensive trade in wild-collected plants of *Leuchtenbergia*.

MAMMILLARIA

One of the largest genera of cacti, with around 180 species distributed from the U.S.A. to northern South America. The genus is popular with collectors, many of whom specialize in it. Three species, *M. pectinifera*, *M. plumosa* and *M. solisioides* are listed in Appendix I of CITES.

Demand for wild-collected *Mammillaria*, both Appendix I and Appendix II species, appears to be low. Artificially-propagated plants of all three Appendix I species are readily available. *M. plumosa* is the most widely available Appendix I cactus after *Leuchtenbergia principis*, often grafted onto *Opuntia* rootstock. Plants 15 cm in diameter can easily be produced in a few years, and there is no demand for wild plants. Some wild collection of rarer *Mammillaria* species is probably carried out by enthusiasts, but in general these plants do not appear in commercial trade although small numbers were seen in one German nursery in 1991 and 1992.

MELOCACTUS

A widespread genus in Central and South America and the Caribbean recently revised by Taylor (1991), who accepts 31 species. Mature plants are easily recognizable because of the presence of a woolly cephalium on the top of the plant, a feature otherwise found in globular cacti only in *Discocactus*. Four Brazilian species, *M. conoideus*, *M. deinacanthus*, *M. glaucescens* and *M. paucispinus*, were listed in Appendix I of CITES in 1992, the listing coming into effect on 11 June 1992.

Melocactus has become a popular genus in cultivation in the 1980s, although cultivation initially proved difficult. Mature plants (i.e. those with cephalia) are particularly sought-after, and there was an extensive trade in wild-collected plants up to around 1986. However, plants are now produced in large quantity in the Canary Islands (including *M. conoideus*), and can form cephalia in three to four years. These plants are much more amenable to cultivation than wild-collected stock, and appear to satisfy much of the

demand for the genus. Few wild-collected plants were seen for sale during the course of the survey; one Dutch nursery had several plants for sale, although these did not appear to be recent imports. This nursery offers artificially-propagated stock of *M. glaucescens* and *M. paucispinus*.

NOPALXOCHIA

A genus of three species of epiphytic cacti, including *N. phyllanthoides*, a parent of the 'epiphyllum' cacti of commerce. One species, *N. macdougallii*, formerly included in a monotypic genus *Lobeira*, is included in Appendix I of CITES. The genus has recently been lumped with *Disocactus*.

This plant is not known to be in commerce; there would appear to be very little demand for it in trade. Like most other epiphytic cacti, it is probably very easy to propagate by cuttings, and any demand that may exist could almost certainly be met by propagated stock.

OBREGONIA DENEGRII

A highly distinctive monotypic genus endemic to Mexico, classified by IUCN as Vulnerable. Listed in Appendix I of CITES.

O. denegrii is another highly sought-after, slow-growing plant. It is relatively easy to propagate from seed, and artificially-propagated stock, usually on its own roots, is fairly widely available. Wild-collected plants remain in demand, and have been seen for sale in Belgium and Italy.

PEDIOCACTUS

A genus, closely related to *Sclerocactus*, of 8-10 species of miniature North American cacti, many with very restricted distributions. Eight species are listed in Appendix I of CITES (*P. bradyi, P. despainii, P. knowltonii, P. papyracanthus, P. paradinei, P. peeblesianus, P. sileri* and *P. winkleri*). Many of the species have a wide range of pseudonyms, and are variously included in the genera *Echinocactus, Sclerocactus, Toumeya, Navahoa, Utahia* and *Pilocanthus*.

With the exception of *P. simpsonii*, the genus is notoriously difficult in cultivation and is not widely sought-after, although the larger dealers generally offer seeds or plants of one or two species. The genus does, however, have strong appeal to a small group of specialist collectors, particularly in Germany, who grow 'winter-hardy' cacti, especially those from North America. One German hobbyist who also sells plants has what appears to be a virtually comprehensive collection of *Sclerocactus* and *Pediocactus* species (q.v.), including significant numbers of wild-collected plants; however, only artificially-propagated stock (generally grafted) or seed is offered for sale.

PELECYPHORA

A genus of two species of localized Mexican endemics, *P. aselliformis* and *P. strobiliformis*, both included in Appendix I of CITES.

Pelecyphora is a highly sought-after genus. Propagated plants, generally grafted, are relatively widely available in the specialist trade, but as plants are slow-growing, wild-collected specimens are still strongly in demand. Wild-collected plants, chiefly of *P. aselliformis*, have been seen in the Netherlands, Belgium, Germany and Italy, with maximum quoted prices, in Italy, of 175,000 lire (US$142). Although numbers seen have not been large, trade in this genus evidently remains a significant problem.

SCLEROCACTUS

A genus of 8 small North American species, some with very limited distributions, of which four (*S. glaucus, S. mesae-verdae, S. pubispinus* and *S. wrightiae*) are included in Appendix I of CITES. These species have been variously included in *Echinocactus, Neolloydia, Coloradoa* and *Pediocactus*.

As with *Pediocactus*, the genus is notoriously difficult in cultivation and is not widely sought-after, although the larger dealers generally offer seeds or plants of one or two species. The genus does, however, have strong appeal to the same small group of collectors who specialize in *Pediocactus* and *Coryphantha*. One German hobbyist who also sells plants has what appears to be a virtually comprehensive collection of *Sclerocactus* and *Pediocactus* species (q.v.), including significant numbers of wild-collected plants; however, only artificially-propagated stock (generally grafted) or seed is offered for sale.

STROMBOCACTUS DISCIFORMIS

A monotypic genus endemic to Mexico, classified by IUCN as Vulnerable. The species is listed in Appendix I of CITES.

S. disciformis is an extremely slow-growing, much sought-after plant. Artificially-propagated plants, either seedlings or grafted stock, are fairly widely available, having been seen in the U.K., Belgium, Italy, the Netherlands, Germany, Czechoslovakia and Hungary. However, there is undoubtedly still a demand for wild-collected plants, with around 80 recorded in Italy during the survey, priced at up to 270,000 lire (US$220).

TURBINICARPUS

A genus endemic to Mexico. Taxonomy of *Turbinicarpus* has been the subject of much confusion; the genus is often included in *Neolloydia* although more recently has been interpreted as including all species formerly included in *Gymnocactus*, thereby comprising around 20 species, many with restricted distributions. Six species, comprising the original, more narrowly-defined concept of *Turbinicarpus*, have been included in Appendix I of CITES since 1983. The remainder of the more widely-defined genus was transferred from Appendix II to Appendix I at the 8th meeting of the Conference of the Parties in 1992, effective as of 11 June 1992.

The genus *Turbinicarpus* is popular with collectors and substantial numbers of plants have been collected for sale. However, it is an easy and quick genus to propagate from seed with plants often reaching flowering size in two years. Propagated stock, often grafted, is thus easily and cheaply available, leading to relatively little demand for wild plants; nevertheless one or two wild-collected plants have been seen on sale.

UEBELMANNIA

A Brazilian genus of four species with limited distributions one of which (*U. buiningii*) is reported to be on the verge of extinction in the wild. The genus was listed in Appendix I of CITES in 1992, effective as of 11 June 1992.

Two species, *U. gummifera* and *U. buiningii*, are reportedly very intractable in cultivation; the latter was not seen in trade in the course of the survey. The two other species, *U. pectinifera* and *U. flavispina*, can be propagated relatively easily by grafting, and grafted plants are now fairly readily available. Substantial imports of wild-collected plants of all species were made into Europe in the mid-1980s, but the number of wild-collected plants in trade appears to have decreased considerably since then. Some wild-collected plants were seen in a Dutch nursery, and in some Italian nurseries, although the former at least did not appear to be recent collections. Wild-collected plants certainly remain in demand, however, and, in Italy at least, reportedly sell out rapidly after their arrival at a nursery.

2.2. OTHER SUCCULENTS

There is no clear-cut definition of the term 'succulent' - virtually any plant adapted to periods of water-shortage through a water-storing capacity in its leaves, stems or roots can be classified as a succulent. Such plants occur in a very wide range of families, and in many different habitats. Jacobsen, in his classic Lexicon of Succulent Plants (English edition, 1974) lists around 8600 species and subspecific taxa in over 360 genera and 50 families. The single most important other family is the Aizoaceae, whose 2500-odd species are virtually all undoubted succulents. Other families with a significant number of species of horticultural interest include the Agavaceae, Asclepiadaceae, Crassulaceae, Euphorbiaceae and Liliaceae. Many orchid species can strictly be defined as succulents; this family is dealt with separately in this report.

A wide variety of succulent plants are produced in very large numbers for the general horticultural trade, particularly members of the genera *Crassula, Sedum, Kalanchoe, Agave, Aloe, Euphorbia, Pachypodium, Nolina* and *Yucca*. The vast majority of plants in these genera are artificially-propagated, although for several of the genera wild plants do sometimes reach the general market (see below).

In general specialist interest in cacti is considerably greater than that in other succulent plants. A notable exception to this at present is caudiciform or swollen-stemmed plants. Interest in these plants, which occur in a wide range of families and genera, was initially centred in the United Kingdom, but is now probably stronger on the continent. During the 1980s many of these plants became popular as unusual house-plants bought by non-specialists, and plants in a number of genera, including *Kedrostis, Raphionacme, Pachypodium, Euphorbia, Cyphostemma, Dioscorea, Adenium, Jatropha, Myrmecodia* and *Fockea* may appear in general horticultural outlets as well as in more specialist suppliers. Many of the species are slow-growing in cultivation, and wild-collected plants are regularly offered, although others are almost always artificially-propagated. The percentage of artificially-propagated plants on the market appears to be increasing; at the same time widespread interest in these plants is said to have waned somewhat in the past two or three years, at least in Germany which had previously been the most important market. However, this undoubtedly remains a potential source of concern for several species, particularly in view of the lack of information on the status of many such species in the wild.

Collectors' interest in non-cactus succulents tends to be concentrated on plants from South Africa and Madagascar, both of which have diverse succulent floras including many caudiciforms. As well as caudiciforms, interest is relatively strong in the Aizoaceae, particularly *Conophytum* and *Lithops*, *Haworthia* (Liliaceae), *Euphorbia* (Euphorbiaceae) and many of the Asclepiadaceae, including *Caralluma, Stapelia, Hoodia* and *Huernia* as well as caudiciform genera such as *Brachystelma, Raphionacme* and *Sarcostemma*.

The vast majority of non-caudiciform plants in these genera available in Europe are artificially-propagated, from seeds or cuttings, but some of the rarer species are sold in small quantities as wild-collected plants.

Although most cactus nurseries offer a range of non-cactus succulents, there are very few nurseries in Europe which specialize in these plants. Of these, only one deals extensively in wild-collected plants. This nursery is known to supply other nurseries in Europe as well as selling directly to the public. One other trader, exclusively a wholesaler, is known to have imported large numbers of wild-collected Madagascan plants. Other nurseries are known to have imported wild-collected plants directly from nurseries in South Africa.

PRINCIPAL GENERA OF POSSIBLE CONCERN IN TRADE

ADENIUM (APOCYNACEAE)

A genus of 5 or so species found in tropical and sub-tropical Africa and Arabia. One species, *A. obesum*, is widely cultivated as an ornamental. This plant is easy to propagate and quick-growing under the right conditions and the great majority of plants seen for sale are undoubtedly artificially-propagated. Some very large specimens may be wild-collected; however, the species is widespread, occurring from East Africa to Saudi Arabia, and would appear to be under no threat from this trade.

AGAVE (AGAVACEAE)

An American genus of around 300 species, in many ways the New World equivalent of the African *Aloe*. Two species, *A. arizonica* from the U.S.A. and *A. parviflora* from the U.S.A. and Mexico, are listed in Appendix I of CITES and one, the Mexican *A. victoria-reginae*, in Appendix II.

Although there is little collector interest in the genus at present, several species are widely-grown as ornamentals, of which *A. victoria-reginae* is probably the most popular. It is a slow-growing plant, and large specimens are expensive; however these almost all appear to be nursery-grown stock from the Canary Islands or Mediterranean region, and no evidence of trade in wild-collected specimens was found. *A. parviflora* is easy to propagate; one nursery on the Canary Islands had 1500 plants raised to flowering size in three years from seed. There would appear to be no demand for wild-collected plants of this species. *A. arizonica* was not seen.

ALLUAUDIA (DIDIEREACEAE)

The six species of *Alluaudia* are all endemic to Madagascar and are all considered 'Insufficiently Known' except for *Alluaudia procera* which is not threatened. As part of the family Didiereaceae, all species are included in Appendix II of CITES.

As with *Didierea*, large numbers of wild-collected plants were exported from Madagascar in the mid-1980s, mostly to Germany. Few plants of this genus were seen during the survey. Small artificially-propagated plants of several of the species are reasonably widely available but are not in great demand.

ALOE (ALOACEAE)

The genus *Aloe* is one of the largest and most familiar of succulent genera, comprising around 360 species in Africa, Arabia and Madagascar. Several forms have become naturalized virtually throughout the tropics and sub-tropics. Many species are widely cultivated as ornamentals, including *A. ferox*, *A. humilis* and *A. variegata*, all of which are entirely in trade as artificially-propagated stock. Five South African species are listed in Appendix I of CITES. with the remainder of the genus in Appendix II.

There is some collector interest in the genus particularly in the rarer South African and Madagascan species, although the genus is not particularly fashionable at present. Wild-collected plants of *A. dichotoma* were seen in Italy, and of *A. kniphofioides*, a dwarf South African species, in Germany. Specimen-sized plants of *A. marlothii* are offered by one Dutch nursery at 125 dfl (US$66). These are very likely to be wild-collected. Artificially-propagated plants of the 'Vulnerable' Madagascan *A. susannae* were seen in France.

CALIBANUS (AGAVACEAE)

Calibanus hookeri, a caudiciform with grass-like leaves, is the only member of the genus. Formerly considered extremely rare, it is now known to be relatively abundant in the wild. The plant is relatively easy to grow and

propagate and most plants sold are nursery-raised, although a few wild-collected specimens were seen in Italy.

CEROPEGIA (ASCLEPIADACEAE)

An Old World genus of around 160 species with one species reaching Australia. The entire genus is listed in Appendix II of CITES. Plants show a variety of growth-forms, although most are twining climbers with more-or-less thickened leaves; many species have thickened tubers and some are leafless or virtually leafless *Stapelia*-like stem succulents.

One species, *Ceropegia woodii*, is very widely cultivated as a house-plant; all plants are artificially-propagated. Two other species, *Ceropegia armandii* and *Ceropegia volubilis* are also fairly widely available in the general horticultural trade and are artificially-propagated. The other species are much less commonly seen, although the genus attracts a fair amount of collectors' interest. Most climbing species are easily propagated by stem cuttings, and are often offered as such; wild collection of these species is unlikely to be a cause of concern. However, some of the dwarf, caudex-rooted forms from South Africa and Madagascar are sought-after by collectors and traded as wild-collected plants; numbers in trade are small, and more information is needed on the status of these species in the wild before any assessment of the impact of trade on wild populations can be made.

CYPHOSTEMMA (VITACEAE)

A genus of around 150 species, closely related to *Cissus*. Several species have distinctive swollen trunks and one , the south-west African *C. juttae* (also listed as *Cissus juttae*) is fairly widely sold as a curiosity. Large plants of this are produced in the Canary Islands (60 cm tall, 8 years old) and sold wholesale for around 120 dm (US$70) on the European market. There is unlikely to be any significant trade in wild-collected plants of this species. However, one specialist nursery lists five other species which are sold as wild-collected plants at prices up to 380 dm (US$240). Total numbers of plants involved are likely to be small; more information is required on their wild status before it is possible to state whether this trade poses a significant threat.

DIDIEREA (DIDIEREACEAE)

The two species of *Didierea* are both endemic to Madagascar, and have IUCN classifications of 'Insufficiently Known'. The entire family Didiereaceae is listed on CITES Appendix II.

Large numbers of plants have been exported from Madagascar in the past (a maximum of 20,000 in 1985); these will virtually all have been wild-collected plants. Wild plants are still available - one Dutch nursery had around 150 plants ca 1.5 m tall of *D. madagascariensis* which were a recent import. Artificially-propagated plants of both species are available, although are not in great demand.

DIOSCOREA (DIOSCOREACEAE)

A very large pan-tropical genus, comprising around 600 species of tuberous-rooted plants with annual stems, including many edible species (yams and sweet potatoes).

One species, *Dioscorea elephantipes*, the South African Elephant's-foot, is widely sold as an ornamental. Some large plants offered for sale are probably wild-collected, but plants with 20-30 cm tubers can be grown in five or six years in the Canary Islands and can probably meet most of the demand. The plant is used for food in its native South Africa, and this undoubtedly places far more pressure on wild populations than collecting for export. One German firm offers four other species as wild collected plants, although trade in these is only likely to be in small numbers.

EUPHORBIA (EUPHORBIACEAE)

The genus *Euphorbia* is the second largest genus of vascular plants, with around 1600 species. The genus is cosmopolitan and shows extremely wide variation in growth form and habit, with a large number of succulent species, many of which closely resemble cacti. Nine Madagascan species of *Euphorbia* are included in Appendix I of CITES, all other succulent species are included in Appendix II.

Several succulent *Euphorbia* species are propagated in very large numbers for the European horticultural trade. Chief among these are *E. ingens*, *E. trigona*, *E. lophogona*, *E. lactea* and *E. milii*. Production of all these is entirely independent of wild stock. Several smaller species which appeal to the collectors' market are also artificially-propagated, most notably the South African *E. obesa* which is nursery-raised in Europe and imported in quantity from Japan.

However, many of the smaller species, particularly those from Madagascar, are very slow-growing and are sold as wild-collected plants. In particular, many thousands of individuals of *E. cap-saintmariensis*, *E. cylindrifolia*, *E. moratii* and *E. primulifolia* were imported into Europe (notably Germany) from Madagascar in the mid-1980s and were released into the general horticultural trade in the same way as the *Pachypodium* species. In response to this several species were placed in Appendix I of CITES effective from 18 January 1990.

Wild plants of all Appendix I species have been seen on sale during the survey, with several species widely available (e.g. *E. cylindrifolia* offered in the Netherlands, Germany, France and Italy) in moderate numbers (one French nursery had ca 350 *E. primulifolia*). Turnover of these species is relatively slow, and at least some of them are likely to have been imported before Appendix I listing. Artificially-propagated stock of all species is available, but from few outlets - the slow growth rate of most of these species means that wild plants are likely to remain in demand. In addition to these dwarf forms, several large plants of the Madagascan *E. stenoclada* have been seen on sale in garden centres in the Netherlands, priced at up to 750 dfl (US$400). It is likely that these plants are wild-collected. Small artificially-propagated plants of this species are also available.

As well as these species at least two specialist nurseries offer a wider range of succulent species, mostly from southern and eastern Africa and Madagascar. One of these, which deals in a large proportion of wild-collected stock, lists around 80 species in its catalogue, including at least one undescribed species from Madagascar, offered as a wild plant. The other, which only deals in artificially-propagated stock, lists around 130 species. Demand for the great majority of these species is low.

JATROPHA (EUPHORBIACEAE)

A genus of around 170 American species. One species from Central America, *Jatropha podagrica*, which produces swollen stems and attractive red flowers is very widely sold as a house-plant. It is very easy to propagate, and all plants sold are artificially cultivated. One specialist firm offers several other species, some probably as wild-collected plants, although demand is not large.

KEDROSTIS (CUCURBITACEAE)

One species in this Old World genus, *K. africana*, is fairly widely available as a caudiciform plant. The origin of these plants is unclear, although some at least are likely to be wild-collected. One specialist nursery offers two species as wild-collected plants.

MYRMECODIA (RUBIACEAE)

A genus of around 45 species occurring from Malaysia to Fiji. The plants are epiphytic and have swollen stems, in the wild generally inhabited by ants. One species, *Myrmecodia echinata*, has recently been introduced to the mass market. These originate from a single plant from Amsterdam Botanical Garden given to a Dutch nurseryman in the early 1980s. Production now runs into tens of thousands each year and plants are available at 7-10 dfl (US$3.5-5) retail. No other species appears to be commercially available in Europe.

NOLINA (AGAVACEAE)

A genus of around 30 species from the southern part of North America. *Beaucarnea* is an often-used synonym. One species, *N. interrata*, is included in Appendix I of CITES.

One species, *N. recurvata*, with a distinctive swollen base to the trunk, is a very widespread house-plant. The vast majority of plants available in trade are artificially-propagated; however large specimen-sized plants are also widely available and likely to be of wild or semi-wild origin.

OPERCULICARYA (ANACARDIACEAE)

The genus comprises three species of dwarf, semi-caudiciform shrubs from Madagascar. One species, *O. decaryi*, is reasonably widely offered (often as a form of bonsai), mostly as wild-collected plants at up to 160 dm (US$100), although small artificially-propagated plants are also available. The wild status of this species should be investigated.

PACHYPODIUM (APOCYNACEAE)

A genus of around 13 Madagascan and South African species of pachycaul plants, ranging from small tree-like forms to dwarf, mound-forming species, most having attractive flowers. The South African *P. namaquanum* has been included in Appendix I of CITES since 1981, and three Madagascan species, *P. baronii*, *P. brevicaule* and *P. decaryi* were placed in Appendix I in 1989. The rest of the genus is listed in Appendix II.

Pachypodium species are very popular plants in both the general and specialist trade at present. Two Madagascan species, *P. geayi* and *P. lamerei*, are very well established in cultivation, with annual European production (chiefly in Denmark, the Netherlands and the Canary Islands) of well over 1,000,000 plants. Many of the other species have been represented on the European market by a high percentage of wild-collected stock, although increasingly artificially-propagated plants are available. Most important is *P. brevicaule*, which was imported in the tens of thousands from Madagascar to Germany in 1985 and 1986 and widely sold in general horticultural outlets. These plants were claimed to be artificially-propagated but subsequent investigation has demonstrated that all were wild-collected. Few *P. brevicaule* were seen during the present survey; however the plant is reportedly now being propagated in reasonable numbers in the Canary Islands, where flowering-sized plants can be produced from seed in three to four years.

Wild-collected plants of the South African *P. bispinosum* have been widely seen, although good-sized artificially-propagated plants (six to seven years old) are available from the Canary Islands. A large proportion of the habitat plants are likely to be part of a consignment of around 3000 plants exported by a South African nursery in 1989.

Small numbers of wild *P. baroni* and *P. decaryi* have been seen for sale; it is likely that these represent stock imported before Appendix I listing. Artificially-propagated *P. decaryi* are becoming quite widely available.

Very little evidence for trade in wild *P. namaquanum* was seen, although one apparently wild-collected topcut was found offered for sale. This species is being propagated in reasonable numbers, with seedlings seen in Italy, Germany and the Canary Islands.

P. rosulatum is still present in trade as wild-collected plants; one Dutch nursery had several hundred plants for sale. This species is also being propagated, although nursery-raised plants tend to differ in appearance from wild plants more markedly than some of the other species.

PELARGONIUM (GERANIACEAE)

A large genus, comprising ca 280 species, including the familiar horticultural 'geraniums'. Most species are found in South Africa and several have succulent stems; a number of these are sought-after by collectors and are sold as wild-collected plants. One specialist nursery offers ten species, at least eight of these as wild-collected stock.

RAPHIONACME (ASCLEPIADACEAE)

A genus of around 30 species. Plants produce large tubers and are relatively widely sold as caudiciforms. Artificially-propagated plants do not produce single large tubers, but rather a series of smaller ones; all plants offered for sale are thus wild-collected. There is little information on the status of species in the wild, and it is thus impossible to tell whether the trade that exists is significant or not.

SARCOCAULON (GERANIACEAE)

A South African genus of 14 species closely related to *Pelargonium*, also sought-after by collectors and largely available as wild-collected stock; one nursery offers six species, all wild-collected.

YUCCA (AGAVACEAE)

This North American genus of around 40 species includes *Yucca elephantipes*, one of the most ubiquitous of all house-plants. Although some of the largest specimens seen for sale may be of wild or semi-wild (i.e. naturalized) origin, the plant can be propagated so easily and grows so rapidly that trade is extremely unlikely to be problematic.

Of more possible concern is trade in some other species. In particular, wild-collected specimen plants of *Yucca rostrata* imported from Mexico have been relatively widely seen; this species is evidently sought-after at present, and the possible effects of this trade on wild populations should be investigated. Other species which are available as large plants and which may be wild-collected are: *Y. thompsoniana, Y. rigida, Y. brevifolia* (the Joshua Tree), *Y. elata* and *Y. fauxiana*.

2.3. TRADE IN INDIVIDUAL COUNTRIES

AUSTRIA

Austria was not visited during the main part of the survey, nor is it a member of the EC. However, it is widely held to be, or to have been until recently, a major source of wild-collected plants, particularly Mexican cacti, for the European market. A brief survey in 1992 was inconclusive, but indicated that Austria has ceased to be a major source of wild-collected plants, reportedly because CITES was now better enforced in the country. However, it was not possible to visit one nursery which had reportedly supplied wild Appendix I species to Italian dealers and collectors in 1991 and it is possible that this nursery is still a source of such plants.

BELGIUM

There are few specialist cactus and succulent nurseries in Belgium, most collectors travelling to the Netherlands and Germany to obtain plants. Two nurseries were visited during the survey. One deals only in artificially-propagated stock, supplying plants to collectors and to florists and

supermarkets. The other is a specialist nursery well known in Europe which deals almost entirely in cacti, both plants and seed, and does not produce lists or sell plants by mail-order. Most of the stock on sale comprises artificially-propagated plants, but reasonable numbers (20-30) of wild-collected *Ariocarpus* (both Appendix I and Appendix II species) and *Pelecyphora* were on sale, as well as three mature *Obregonia denegrii*. This nursery now appears to be one of the major importers, if not the major importer, of wild-collected Appendix-I Mexican cacti in Europe. Reports indicate that the nursery has imported a large consignment of *Aztekium ritteri* in 1992 which have been sold at the nursery and to other dealers in Europe, particularly Germany. The prices of these plants are far lower than elsewhere (250-400 belgian francs (US$7-12)).

CZECHOSLOVAKIA

One nursery was visited in 1992. This had a very large collection of artificially propagated *Ariocarpus* species, some of them mature plants over 30 years old, which may well serve as a source for western European markets, although there is concern that the stock may rapidly become exhausted. There is fairly strong interest in cacti in Czechoslovakia, with perhaps 5000 collectors.

DENMARK

One nursery in Denmark produces large numbers of artificially-propagated cacti and other succulents for the general horticultural trade. There is not believed to be any specialist commercial supplier of plants for hobbyists, and collectors reportedly travel to Germany and elsewhere in Europe to obtain their plants.

FRANCE

Commercial wholesale production of cacti and other succulents is well-established in the Côte du Midi, with nurseries supplying the local market and exporting plants to the northern European market. The specialist market is much less developed, with only two nurseries aiming to supply a wide range of plants to the collector's market. Similarly, the market is not extensive, with perhaps only 200-300 serious collectors in France. No evidence was found of wild-collected cacti on sale during the survey, although wild-collected imports of other succulents including *Yucca rostrata*, *Pachypodium bispinosum* (CITES Appendix II) and *Euphorbia cylindrifolia* (CITES Appendix I) were fairly widely obtainable, albeit in small numbers. However early in 1992, a number of wild-collected cacti including *Ariocarpus* species and *Strombocactus disciformis* were seized from a shop in Paris. France is believed to have served as point-of-entry into Europe for significant numbers of wild-collected Madagascan succulents, mostly destined for re-export to Germany and the Netherlands. Little evidence for this was found during the course of the survey; one nursery in the south which had formerly acted as a staging-post for these plants on behalf of a German wholesaler had reportedly ceased doing so, although it is thought that the latter is still importing Madagascan plants *via* France. In 1992 a number of Madagascan plants were seized from a dealer on the Côte d'Azur.

GERMANY

Germany remains probably the largest specialist market in Europe for cacti and other succulents, and one where there is still a significant demand for wild-collected plants. There are a large number of producers of cacti and succulents (with 57 listed in a 1990 publication produced by the 'Europäische Länderkonferenz'), but most of these are small-scale, often semi-amateur growers.

Oldfield (1985) noted a significant number of wild-collected plants of Appendix I and other rare cacti on sale in German nurseries. Unfortunately it was not possible to visit one of the major nurseries involved in this trade during the present survey; indications are, however, that the trade continues although on a smaller scale and less overtly than before. One nursery visited

still had a notable number of wild-collected cacti on sale, especially *Ariocarpus*, although most plants were artificially-propagated, reputedly imported from the U.S.A. This nursery has a large area not open to the public, and it seems likely that more wild-collected plants were available here. This nursery still has a reputation for dealing in wild-collected plants. In a follow-up survey in 1992, this nursery was the only one of 12 cactus nurseries visited in Germany which had significant numbers of wild-collected cacti (recently imported Mexican species). One other nursery which had previously sold large numbers of wild-collected plants, including Appendix I species, now reportedly deals almost entirely in artificially-propagated stock, although still sells some wild-collected non-cactus succulents. This was confirmed in 1992, when a visit revealed no wild-collected cacti for sale. In 1992 two small nurseries had some wild-collected plants for sale, including the Appendix-I species *Aztekium ritteri*. In one case these were bought from a Belgian dealer, in the other they had reportedly been brought in personal luggage by German nationals.

Of particular note are the two major importers in Europe of wild-collected non-cactus succulents, especially Madagascan and South African species. One of these is exclusively a wholesaler with connections in France and, reputedly, Spain and the Netherlands. It was not possible to visit this nursery. The other is the major dealer in wild-collected non-cactus succulents for specialists in Europe and offers a very wide range of species, particularly caudiciforms, many of which are not listed on the CITES Appendices. As well as selling directly to the public, this nursery supplies other traders in Europe, particularly in Italy and Germany. The nursery area is small and it seems very likely that this wholesale trade does not pass through it. This nursery is increasingly engaged in artificial propagation and was not seen to offer any wild-collected Appendix I plants, although the proprietor expressed his intention to continue trading in wild-collected plants of some plant species where there were particular reasons to do so. Much of the parent stock has reportedly been sent to California for propagation purposes. In 1992 the proprietor declared that he no longer sold wild-collected plants, although this was disputed by some informants, and wild-collected plants were seen on sale in the nursery. A third dealer was also located in 1992. He specialises in the importation of Kenyan plants, particularly caudiciforms and succulent *Euphorbia* species which are sold wholesale to other nurseries. Several tons a year are reportedly imported. In general there is said to be increasing interest in non-cactus succulents amongst collectors in Germany.

Several informants noted that there was a perceptible change in Germany amongst collectors away from wild-collected plants, although this change was much slower to take effect than in the U.K. and the Benelux countries.

GREECE

Greece was not visited during the survey. However, brief investigations indicate that while cacti and succulents are widely grown as ornamental plants, there is no significant specialist market for these plants, nor is there believed to be any import of wild-collected plants.

HUNGARY

Although not visited during the main part of the survey, two nurseries in Hungary were visited in 1992. From these it appears that, owing to past economic and political conditions, there has been no opportunity for collectors in Hungary and elsewhere in the former Eastern Europe to obtain significant numbers of wild-collected plants. Interest in cacti is strong, however, and growers and nurserymen have succeeded in artificially propagating large numbers of Appendix-I species, including difficult plants such as *Sclerocactus* and *Pediocactus* species. These are being sold in increasing numbers to collectors from western Europe, particularly Germany.

ITALY

In recent years Italy has become an increasingly important market for specialist cacti and other succulents, dating in particular from the founding of the Italian society for succulent collectors (AIAS). Italy also has a number of nurseries, chiefly in Liguria, producing very large numbers of cacti and other succulents for the mass-market.

Of 29 nurseries visited during the survey, at least 12 dealt entirely or almost entirely in artificially-propagated plants, with 10 others selling a significant number of wild plants. Only 2 nurseries had their main business dealing in wild-collected plants. A significant number of wild-collected Appendix I cacti have been seen offered for sale, almost all of Mexican genera (*Ariocarpus, Aztekium, Obregonia, Pelecyphora, Strombocactus*). In addition, wild-collected plants of *Copiapoa, Uebelmannia, Discocactus* and *Melocactus* are also in demand. These plants apparently sell out very rapidly once imported, with knowledge of recent imports spreading by word of mouth. In 1990 one nursery reportedly sold over 200 wild-collected *Uebelmannia* and *Discocactus* in a few days. Of non-cactus succulents, caudiciforms are becoming increasingly popular, but there is little interest in other succulents. Of genera listed in CITES Appendix I, only *Pachypodium* and *Euphorbia* have been seen as wild-collected plants; demand for these remains high.

Italian dealers apparently obtain wild plants from a wide variety of sources, both directly from countries of origin and *via* other European countries, notably Austria, Germany and the Netherlands.

LUXEMBOURG

There are apparently no nurseries producing cacti and succulents in Luxembourg, and collectors presumably obtain plants from nurseries in neighbouring countries.

NETHERLANDS

The Netherlands is a major producer of mixed, non-specific artificially-propagated cacti and other succulents for the general horticultural trade. Production is well over 20 million plants per year, with a significant proportion of these sold at auction for the export market. The largest firm sells between 16 and 18 million plants each year, a large proportion of which are supplied by a number of smaller Dutch growers. Plants are also imported in bulk from other countries including Morocco, Korea, Japan, Spain, Italy, the U.S.A. and Israel. In particular, larger plants are imported in bulk from nurseries in the Canary Islands and Morocco.

In addition there are a small number (8-10) of nurseries catering for specialists. Two nurseries in particular are known to have dealt in a large number of wild-collected plants. One, largely a wholesaler, is probably the largest dealer in specimen-sized cacti in Europe and still deals in a significant proportion of wild-collected stock. When visited in 1991, however, the bulk of the stock appeared to be artificially-propagated and imported from the Canary Islands, Israel and Japan; wild-collected plants of North American Appendix II cacti (notably large *Ferocactus*) and Madagascan succulents (*Didierea madagascariensis, Pachypodium rosulatum*) were observed. In contrast to 1985, no wild-collected Appendix I plants were seen. The other nursery known to have dealt in large numbers of wild plants specializes in South American cacti. When visited in 1991, however, the vast majority of plants on sale were artificially-propagated, mostly as seedlings; some 200-300 wild-collected plants in the genera *Melocactus, Discocactus, Uebelmannia, Notocactus* and *Gymnocalycium* were also on sale. These were almost all well-established and, judging from the collection dates on the labels (pre-1986), were not recent imports. A small number of other wild-collected succulents were on sale. This nursery is propagating plants, especially *Discocactus* and *Melocactus*, in the Canary Islands and indications are it has moved away from large-scale import of wild-collected stock.

None of the other nurseries visited dealt in significant numbers of wild-collected plants. One, which has one of the largest ranges of non-cactus succulents in Europe, specializing in the Asclepiadaceae, Euphorbiaceae and Mesembryanthemaceae, has not sold wild-collected plants for over 15 years; another, smaller-scale concern, specializes in propagation of Appendix I cacti by grafting and also does not sell any wild plants. Of the two largest wholesale firms, one, the largest, was not visited. This firm does not produce its own plants, but buys in from a number of smaller Dutch suppliers as well as importing from the Canary Islands, Brazil and Japan; the other, which also sells directly to amateurs, produces around 300 varieties of cacti and other succulents as well as buying in plants from a number of smaller local producers. Plants are also imported from the Canary Islands, Italy, and Morocco, this last being a source of very large artificially-propagated plants including *Astrophytum* spp. and *Echinocactus*.

Of concern, however, is the presence of wild-collected plants, including some Appendix I species, in what appear to be non-specialist outlets. Small numbers of wild-collected *Ariocarpus, Lophophora, Pelecyphora* and *Turbinicarpus*, as well as *Euphorbia, Raphionacme* and other caudiciforms have been seen offered for sale at garden centres in Den Haag and retail outlets in Amsterdam. Prices charged for these (up to 120 dfl (US$65) for a mature *Ariocarpus retusus*) indicate that the retailers were well aware of the value of these plants. It seems likely that with the improved enforcement of regulations in the last few years, and a general move away from the sale of wild-collected plants amongst established nurserymen, these outlets may be increasingly important in the sale of such plants. These plants are rumoured to originate with an importer who is not part of the established cactus and succulent trade in the Netherlands.

In general there is said to have been a move amongst collectors away from wild-collected plants in the Netherlands in the past ten years or so.

PORTUGAL

Portugal was not visited during the survey and little information was gathered on the trade in cacti and succulents in that country. However, there is unlikely to be an extensive specialist market for habitat-collected plants in the country, and there are no nurseries there with an international reputation.

SPAIN

Both mainland Spain and the Canary Islands are important producers of cacti and other succulents for the wholesale market, although there is little evidence that there is an important specialist market for cacti or other succulents in the country. The Canary Islands in particular are now the major source of larger plants for the wholesale market in northern Europe. The bulk of production comes from one nursery, with one other nursery which previously only supplied a nursery run by the same owner in Germany having recently entered the general market. There are at least two other smaller concerns with connections in the Netherlands and Germany as well as one concern which previously supplied plants to the European market but is now concentrating on a public 'cactus garden' in Tenerife.

The major supplier deals in a large number of species and varieties both for the specialist and general markets, having exported around 1000 in the past 3 years; 50% of export is in only 20 varieties, of which *Echinocactus grusonii* is the single most important accounting for 20% of sales alone, with *Euphorbia ingens* the most important non-cactus succulent. Growth rates of plants in the Canary Islands are very high, and large plants of many species, including *Melocactus* and *Discocactus* as well as succulents such *Pachypodium geayi, Cyphostemma juttae, Adenium* and *Adenia* spp. can be produced in relatively few years. This has certainly reduced the general demand for wild-collected stock of these species and has allowed large plants to become widely available at low prices. Some concern has been expressed, however, about the quality of

these plants: although they are generally of healthy and uniform appearance, the rapid growth rates in the Canary Islands can apparently leave plants susceptible to rotting when they are imported to northern Europe; in addition, some plants may be affected by hybridization and species may not be true to type, thus significantly reducing their appeal to serious collectors.

It has been suggested that nurseries in the Canary Islands may be used to 'launder' wild-collected plants prior to their import into mainland Europe. No evidence for this was found in the course of investigations.

SWITZERLAND

The specialist market in Switzerland for cacti and succulents is small. One nursery sold several wild-collected Appendix I cacti in the early 1980s, including *Backebergia militaris*, *Obregonia denegrii* and *Ariocarpus trigonus*. Since then, however, cactus and succulent imports into Switzerland have been carefully controlled and there does not appear to be any significant sale of wild-collected plants.

3. ORCHIDS

INTRODUCTION

The family Orchidaceae is the largest vascular plant family; estimates for the number of extant species vary from 17,500 to 30,000, in approximately 750 genera. The family is cosmopolitan in its distribution although the great majority of species are found in the tropics, with highest diversity in montane regions. Many species are localized in their distribution, and are threatened by a combination of habitat destruction and overcollection, although the conservation status of the great majority of species in the family has never been adequately reviewed.

CULTIVATION

A BRIEF HISTORY

Orchids have been cultivated in Europe since the 18th century, although large-scale cultivation did not begin until the 19th century. At this time orchid collection and cultivation was centred in the United Kingdom where most of the early advances in horticultural technique were made, including the development of hybrids, first successfully carried out in the 1850s. The latter half of the nineteenth century was a period of intense activity in orchid cultivation in Europe, and enormous quantities of wild plants were collected for import by the major firms of the day, many of whom had professional collectors operating in various parts of the tropics. Rivalry between collectors and firms was often intense, and the trade was fuelled by an apparently insatiable demand for new species and varieties, which continued to be discovered in large numbers. By the early part of the twentieth century, many of the more accessible sites for orchids had been virtually collected out, and the supply of novelties largely dried up. As a result of this, and the increasing popularity of artificially propagated hybrids, large-scale professional orchid collection by Europeans had virtually ceased by the end of the World War I.

EUROPEAN PRODUCTION OF ORCHIDS

Since that time, the cultivation of orchids has been overwhelmingly dominated, in numerical terms, by artificially propagated hybrids, largely for the cut flower trade. It is estimated that 5.3 million orchids are produced by micropropagation techniques in Western Europe each year; a large but unknown number are also propagated by division. The bulk of production is confined to hybrids of relatively few genera, namely: *Dendrobium, Paphiopedilum, Cymbidium, Odontoglossum, Oncidium, Vanda, Miltonia, Cattleya, Laelia, Epidendrum* and *Phalaenopsis*. Of the 3.5 million orchids produced in the Netherlands each year, 1.5 million are *Cymbidium* hybrids.

Amongst collectors, interest is also dominated by hybrids. To date over 60,000 grexes have been formally registered with the number increasing annually. However, a substantial interest still remains in species or 'botanical' orchids, which sustains significant demand for wild-collected plants. There is no doubt that this trade, both legal and illegal, poses an important threat to some species.

Based on advertisements in specialist journals, and firms showing at orchid exhibitions, between 80 and 100 nurseries in western Europe grow orchids for sale to collectors (as opposed to exclusively supplying the cut-flower and non-specialist florist trade). Of these, fewer than 20 deal in substantial numbers of species plants, and very few deal with species to the exclusion of hybrids. Germany and the Netherlands are undoubtedly the two most important countries. The United Kingdom, historically the centre of the European orchid trade, still has a relatively large number of orchid nurseries (around 30), but most of these are relatively small and do not appear to deal in large numbers of imported species. Most other European countries have only a small number of orchid nurseries with at the most only one or two which deal extensively in botanical species.

Orchid nurseries which deal with species may be divided into three main categories:

1. Traders who specialize in importation of plants, often on a large-scale; most of these are based in the Netherlands, and may deal in very large numbers of species (up to 800 listed in some catalogues).

2. Orchid nurseries with a mixed business of hybrids and species, with plants generally raised on site, although with some (generally relatively small) proportion imported. These are the most abundant nurseries and generally deal in a limited number of species (fewer than 200).

3. "Collector-dealers", who have often developed their business as an extension of a personal hobby; these will often deal in large numbers of species and will import a wide range, although generally in small numbers, and will generally propagate plants before sale.

In addition, two other forms of trade are prominent:

4. Importers who do not have nursery facilities but who import for direct sale at orchid shows.

5. Amateur "rings", who will import plants in small numbers for exchange and sale amongst themselves.

Regional, national and international orchid shows are generally regarded as important occasions for the sale of plants. As well as the small number of traders who only import for sale at shows, others will buy in or import plants immediately before shows to supplement their stock.

Most traders assert that growing and dealing in large numbers of botanical species orchids is an economically marginal activity, and virtually all specialist traders supplement their income in other ways, usually by dealing in hybrid plants.

The trade in hardy orchids shows relatively little overlap with trade in tropical or sub-tropical species, and is mainly dealt with by a few specialist traders and some alpine plant and bulb traders.

SPECIES IN TRADE

It is extremely difficult to estimate the number of species of orchid in cultivation or even in trade in Europe. Hofmann (1976) surveyed 55 European orchid collections, including both botanical gardens and private collections, and listed a total of just over 5000 species, subspecies and varieties in cultivation. This survey excluded the largest public collections (notably the Royal Botanical Gardens at Kew), indicating that the true number in cultivation is considerably higher than this. Bechtel *et al.* (1986) list around 1200 species in their *Manual of Cultivated Orchids*. Some of the major private collections claim to contain 3000-4000 species or subspecific taxa. As specialist collectors will often try to collect all species in their particular area of interest, and as many different groups of orchid have collectors who specialize in them, it is consequently difficult even to place a limit on the number of species cultivated.

Of the many thousand orchid species in cultivation in Europe, only a small number - fewer than 200 - are widely available in the commercial trade. Perhaps a further 1000-1200 are regularly available from one or more specialist suppliers, that is are listed in catalogues, although only a proportion are likely to be in stock at any given time. The largest number of species listed in an individual catalogue is 858 with most specialist dealers listing between 300 and 600 (and with the caveat that traders generally recognize more species than most taxonomists). An indeterminate further number will be available on an irregular basis and generally in very small numbers - it is impossible to list or enumerate these because new species are constantly being brought onto the market, often supplied by dealers who do not produce catalogues. The collector's market is largely

driven by novelty and rarity, and newly discovered species, or populations of species previously unobtainable for some time, will often be in particular demand.

As with all specialist markets, the orchid collectors' world is also susceptible to fashion, with different groups, both taxonomic and geographic, changing in popularity over time. Vermeulen (pers. comm) notes that in general cool-house plants, such as many *Odontoglossum* and *Oncidium* species are less popular than they have been in the past, as most orchid growers now prefer species which grow in warm or intermediate conditions. An exception to this is *Masdevallia* and related genera of South and Central American Pleurothalid orchids such as *Dracula* and *Dryadella*, which attract a sizeable specialist interest at present.

Other groups which have recently become collectable include the Oxyglossum *Dendrobium* species from New Guinea, Angraecoid species from Madagascar (chiefly *Angraecum*) and hardy orchids, especially *Cypripedium*.

Other genera remain perennially popular, such as *Paphiopedilum, Phalaenopsis, Cattleya* and *Laelia*, all these being extensively used by amateurs and professionals alike for hybridising, as well as being in demand as botanical species.

The most important genera will be dealt with individually below.

THE SIZE OF THE MARKET

The casual market for orchid plants in Europe is extremely large, as evinced by the annual production figures cited above. Virtually all sales of plants from non-specialist outlets such as supermarkets, florists and garden centres, is in hybrids of the genera *Phalaenopsis, Paphiopedilum, Miltonia* and *Cymbidium*, as well as intergeneric hybrids such as *Vuylstekeara* (*Odontoglossum* x *Cochlioda* x *Miltonia*). These plants are bought as more-or-less disposable flowering house plants.

The specialist market (where the identity of the plant concerned is of importance to the buyer) is far smaller, and may be reasonably well gauged by the size of the orchid societies in the various countries. Germany is undoubtedly the largest single market in Europe at present, with around 7000 members of the main German orchid society, although the great majority of these will only have small general collections. It is estimated that fewer than 1000 of these are 'serious' collectors who will go to considerable lengths to obtain particular species within their field of interest. Similarly, in Belgium there are thought to be fewer than 100 serious collectors, in Switzerland between 50 and 100, and in Italy no more than 200-300, although interest is said to be growing. In total, therefore, there are almost certainly fewer than 20,000 growers in Western Europe with more than one or two plants, and fewer than 2000 with substantial collections. A significant proportion of the last category will obtain many of their plants by direct imports and through personal contacts and exchange, rather than from commercial sources.

ORIGIN OF SPECIES ORCHIDS IN CULTIVATION

Orchids not native to Europe have three sources of origin:

1. They are wild-collected;

2. They are artificially propagated in their countries of origin or elsewhere outside Europe;

3. They are artificially propagated within Europe;

ARTIFICIAL PROPAGATION

Orchids may be propagated by seed, by meristem culture and by traditional vegetative techniques.

Seed propagation

Propagation by seed is almost invariably carried out *in vitro*, a technique developed in the early years of the century. This requires access to aseptic conditions, although these can be relatively simple. Raising orchids from seed is a labour-intensive and often slow process. Pollination is carried out by hand and pods of some forms may take up to 18 months to mature, although in most cases the period is 4-6 months. Seed - which may be extremely abundant - is then sown in flasks of culture medium for germination; plants are raised in flasks (generally transplanted at least once) for up to nine months before being planted out in community pots for growing on prior to individual potting. Although some forms, such as many *Phalaenopsis*, may flower in as little as eighteen months from seed, others may take several years to reach flowering size, with most species taking 3-4 years. Many small-scale orchid nurserymen use professional flasking services for the initial stages of seed raising.

Meristem culture

Conditions required for meristem culture are similar to those for seed propagation. This technique is generally only used where very large numbers of uniform plants are required, for the cut-flower or mass pot-plant trade. Meristem culture produces large numbers of genetically identical plants of very uniform appearance, which are easily distinguished in bulk from wild collected plants.

Vegetative Propagation

Vegetative propagation generally entails division, or in some cases, particularly species of *Phalaenopsis* and *Vanda*, the removal of small plants (keikis) which develop on the flower spikes. The rate of increase of stock is much lower than with seed or meristem culture, but plants generally reach flowering size more quickly.

Vegetative propagation still remains the most widespread form of propagation for species orchids both amongst collectors and commercial dealers. Amongst the latter it is common practice for imported, often wild-collected, plants to be split into a number of smaller plants prior to sale, although this form of propagation does not satisfy the CITES criteria for artificial propagation. Increasingly, however, dealers retain their mother plants from which smaller divisions are removed for growing on or redivision before sale.

WILD COLLECTION

All orchids in cultivation ultimately have their origin as wild plants. For many artificial hybrids, and some species, this origin may be many generations and over a century ago. Propagation of these forms is now divorced from wild populations.

However, there is no doubt that the great majority of species of orchids currently offered in trade have a far more recent origin as wild plants, that is are sold directly as wild-collected plants, or are divisions of relatively recently collected wild plants, with division either carried out in the country of origin or after import into Europe.

Preliminary results of the European Nurseries Artificially Propagated Orchids Species Source Book indicates that no more than 150 species are regularly produced by seed or meristem by more than 3 nurseries.

TRENDS AND ATTITUDES

As with cacti, wild-collected orchids exist in trade for a variety of reasons. First, and significantly unlike cacti, is price: artificial propagation of many orchid species, and particularly raising from seed, is labour-intensive and time-consuming and therefore expensive. Moreover a large number of species take several years to reach maturity, and collectors are often only interested in flowering-size plants. These problems are overcome with hybrids through economies of scale (i.e. mass production substantially cutting down the unit cost) and because hybrids are generally selected for ease and rapidity of growth. Demand for most species orchids is on a small scale and economies of scale cannot operate. It therefore remains substantially cheaper in the vast majority of cases to import wild plants than to propagate them.

Other reasons contribute to the demand for wild-collected plants. There is still kudos attached to possessing collected plants amongst some sectors of the orchid-growing community - those interested in growing 'botanical' orchids are precisely those growers where this attitude is liable to persist. Even where the desire for wild-collected plants *per se* is not particularly strong, the competitive collector's instinct will often play a part as new discoveries will be avidly collected before artificially propagated stock becomes available. The most notable example of this in recent years is undoubtedly the heavy trade in the newly-discovered Chinese *Paphiopedilum* spp. during the 1980s.

There is a widespread perception that, despite these pressures, the nature of the botanical orchid trade is changing, with a move away from large-scale imports of wild-collected plants towards artificial propagation within Europe. Many of the dealers spoken to stated that it was becoming increasingly difficult to import wild plants, both because of CITES regulations and increasingly strict national legislation in exporting countries. The Dutch General Inspection Agency (AID) noted that four or five years ago, around 75% of consignments of orchids imported into the Netherlands contained at least some wild collected stock, but that there had been a dramatic decrease since then. Dealers in most countries considered that soon it would be virtually impossible to import legally any significant quantities of wild plants. In response to this, several of the nurseries visited in the course of the survey had either recently installed or were in the process of installing laboratory facilities for raising seedlings. There is also evidence that a further response to this is a drive to import as wide a range of species as possible before this becomes impossible. A notable example of this is the import of plants from Thailand. Early in 1991 the orchid world became aware of the impending ban on plant exports from Thailand, resulting in a surge of imports from that country, with one nursery alone reported to have imported a shipment of 20,000 plants.

Although there is undoubtedly a significant move away from large scale importation of plants, there is a strong sense that this movement is a result of pressure from legislation rather than a markedly increased sympathy to the aims of CITES and other forms of trade control and regulation. Attitudes of most traders to these regulations vary from grudging acceptance to outright hostility. This is not because traders are not in general broadly sympathetic to the principles of conservation, but rather because they regard trade regulations as punitive and inflexible rather than constructive. There is a widespread belief that CITES regulations penalise those who adhere to them, implicitly benefitting those prepared to flout them. This is exacerbated by a general perception of a lack of expertise and consistency in those responsible for the administering and enforcement of the regulations.

ILLEGAL TRADE

Illegal importation of orchids into Europe is undoubtedly widespread, although mostly not on a very large scale. Most illegal trade concerns importation of Appendix II species rather than Appendix I, with the exception of *Paphiopedilum*, and generally takes the form of import of wild-collected plants

from countries where the export of these is banned. Illegal import may take the form of inaccurate declarations on CITES permits and phytosanitary certificates, with wild-collected plants declared as artificially propagated, or may involve smuggling of plants with no certificates at all, often in hand luggage, through the post, or hidden in consignments of other plants (one dealer stated that plants from Suriname were smuggled out in consignments of vegetables).

Most people knowledgeable about the orchid trade in Europe consider that there is one major smuggler on the continent at present, who has connections with various German, Dutch and French dealers. Most other dealers in species orchids are said to have contravened regulations at some time or another, although most on a relatively small scale. A large proportion of the illegal trade is said to be carried out by private collectors and therefore comprises plants which never appear in the formal orchid trade.

3.1 COUNTRIES OF ORIGIN

Although members of the family Orchidaceae grow in virtually all countries of the world, relatively few of these are of importance in the trade. In large measure the number of countries supplying plants (both wild-collected and artificially propagated) is limited by the scarcity of reliable suppliers, as well as, increasingly, by restrictive legislation. European importers often rely on personal contacts with suppliers in countries of origin, maintained through visits to the countries concerned.

I. ASIA AND AUSTRALASIA

AUSTRALIA

Australia exports both native and non-native species to Europe, although generally in small quantities; most exports appear to be of artificially propagated stock and are not considered to be a problem.

HONG KONG

Hong Kong is known to be a major re-exporter of orchids originating in China, although little direct evidence of import from Hong Kong was seen during the course of the survey. However, some wild-collected Chinese plants were seen (e.g. *Cymbidium forrestii* and *Paphiopedilum malipoense*) either reported or assumed to have been exported via Hong Kong. Chinese *Cypripedium* and *Pleione* are also said to be exported via Hong Kong.

INDIA

Indian orchids have been exported in considerable quantity to Europe in the past. Although many of these are declared as artificially-propagated, it is thought likely that a significant proportion is wild-collected, although export of wild orchids from India is banned (Kumar *in litt.*, 2.1.92). In particular, one nursery in the north-east is currently advertising 2-3 growth local *Paphiopedilum* species for export under the name *Cypripedium*. It seems likely that these are wild-collected. This requires further investigation.

INDONESIA

Indonesia theoretically bans the export of wild-collected plants; however, plants originating in Indonesia have been seen offered for sale or listed in catalogues, and commercial collection of wild orchids for export is known to have been taking place in 1991 (e.g. in Kalimantan, Flores and Komodo). These plants are most likely to have been exported via Thailand, Singapore and Japan.

MALAYSIA

Orchids are known to be exported from Sarawak to Europe, although the extent of this trade is unclear.

PAPUA NEW GUINEA

Plants from Papua New Guinea (P.N.G.) are generally not widely obtainable, although many are sought-after (e.g. *Paphiopedilum* and *Dendrobium* sect. *oxyglossum* species). One U.K. firm specialises in flasked seedlings of P.N.G. species, many apparently unobtainable elsewhere. Export of wild-collected orchids was banned from September 1990, although scientific institutions may be granted export authorisations.

PHILIPPINES

Wild-collected orchids have definitely been exported from the Philippines to Europe in recent years (see account for *Paphiopedilum*); it seems likely that the Philippines may become more important as a source of plants following the ban on Thai imports.

SINGAPORE

Singapore produces artificially propagated orchids for the cut flower and pot plant trade, but is also believed to operate as a staging post for the export of wild-collected Indonesian plants, often sent through the post.

SRI LANKA

One importer stated that he had previously imported plants from Sri Lanka but that this was no longer possible owing to the politicial situation there.

TAIWAN

Taiwan is a major supplier of orchids in trade, including very large numbers of *Cattleya*, *Cymbidium* and *Phalaenopsis* which are evidently artificially propagated. Large numbers of plants in other genera, particularly *Calanthe*, *Pleione*, *Cypripedium* and *Paphiopedilum* are also exported to Europe and there has been considerable controversy over the extent to which plants in these genera have been artificially propagated, this applying particularly to *Paphiopedilum* species where it has been suspected that the country serves as a conduit for wild plants collected in mainland China. However, recent investigations indicate that a considerable amount of artificial propagation of these genera is taking place in Taiwan, including several highly threatened *Paphiopedilum* species (see account for that genus), although this does not, of course, preclude wild-collected plants appearing in the trade.

THAILAND

Thailand has undoubtedly been the largest supplier to Europe of wild-collected orchids, but is also a major exporter of artificially propagated orchid plants and cut flowers. Virtually all nurseries visited which import plants had species from Thailand, which exports plants originating in neighbouring countries (Laos, Myanmar and Malaysia) as well as natives. As noted above, the ban on imports of plants from Thailand was well-known in advance, at least in the Netherlands and Germany, the two major importing nations, and apparently led to a surge in imports in the summer of 1991.

II. AFRICA AND MADAGASCAR

MADAGASCAR

Madagascan plants are popular in cultivation at present, with exports made to France, the Netherlands and Germany. There are no artificial propagation facilities in Madagascar, and all exports are in wild-collected plants, although some species, such as *Angraecum sesquipedale* are widely propagated within Europe. Export of wild plants from Madagascar is legal, provided plants are declared as such. However, there is no evidence that non-detriment findings in accordance with Article IV of CITES have been established for any

Madagascan orchid species, and the impact of this trade on wild populations needs to be examined.

RÉUNION

Plants from Réunion, including apparently wild-collected specimens of protected species, have been seen for sale in France.

MAINLAND AFRICA

Orchids from mainland Africa are in general not widely obtainable, although imports from **Ghana**, **Kenya** and **South Africa** take place. The lack of availability of African species is reputedly because reliable suppliers are difficult to find; plants that are offered for sale are often apparently collected by amateurs or European traders themselves on trips.

III. LATIN AMERICA

BRAZIL

Brazil is the major exporter of Latin American orchids to Europe. This is mainly because of the presence there of large, well-established orchid nurseries with strong European connections. Export of wild-collected plants from Brazil is permitted if 40% of the stock is retained within Brazil to serve as parent plants for further propagation. However, this system has generally not been used; instead, wild-collected plants have been routinely exported as artificially propagated stock. Enforcement of regulations has, however, been considerably improved recently. One dealer who has exported plants from Brazil for many years stated that in the past it had been relatively easy for him to include some wild plants in consignments of artificially propagated plants obtained by him for export from the large orchid nurseries, but that this was no longer the case, as the nurseries themselves carefully checked the contents of the consignments as they were packed, aware that export permits were likely to be refused and nursery licences revoked if any wild plants were present.

Nevertheless, export of wild plants does continue, with one German dealer and one Brazilian amateur offering wild plants from Brazil at the 9th European Orchid Congress in Rome in April 1991.

COSTA RICA

Only one orchid nursery in Costa Rica is authorized to export plants, which should be artificially-propagated. Imports to Europe from Costa Rica certainly take place; one Dutch nursery is said to have received a consignment of several thousand plants in autumn 1991, although it is not clear whether these were wild-collected or not.

HONDURAS

One Dutch dealer, in the process of winding down his business, had been a major importer of wild-collected plants from Honduras, exported by a Swiss national. He claimed to be the only orchid trader in Europe who had imported from Honduras, but stated that the country had now banned the export of wild plants.

PERU

Peru only authorizes the export of artificially propagated orchids for commercial purposes. Wild-collected orchids may only be exported for scientific purposes, and the collecting of such plants is strictly regulated (CITES notification to Parties, 6 46, 28 August 1991).

SURINAME

Wild plants from Suriname have been exported, some illegally, into the Netherlands, with a consignment seized in September 1991 because it lacked

export documents. However, import from Suriname to Europe is not believed to be on a large scale at present. The Suriname authorities have a quota system for the export of orchids.

3.2.IMPORTANT ORCHID GENERA IN TRADE

ANGRAECUM

Angraecum is a large genus, comprising some 200 species, widely distributed in tropical and southern Africa, Madagascar and adjacent islands. Some species, particularly those from Madagascar, are popular in cultivation, although fewer than 20 appear with any regularity in trade. *Angraecum sesquipedale* is a spectacular and well-known species, widely available as an artificially-propagated plant. Other species in trade are mostly available as wild-collected plants, although the following species at least are also artificially-propagated: *Angraecum birrimense, A. bosseri, A. calceolus, A. compactum, A. curvicalcar, A. rutenbergianum, A. stolzii.*

CATTLEYA

A genus conservatively estimated to comprise around 30 species found in the tropics of Central and South America (the World Conservation Monitoring Centre plant database recognizes around 50 species). The genus is closely related to *Laelia, Encyclia* and *Epidendrum.* The conservation status of the genus has not been comprehensively reviewed, and only three species have been assigned formal IUCN threatened species categories (*C. bowringiana* from Belize and Guatemala - R; *C. granulosa* whose distribution is given as Guatemala and Brazil - R; *C. iricolor* from Ecuador and Peru - E/V). However, several of the coastal forest species from Brazil are now considered very rare, and four Venezuelan endemics (*C. gaskelliana, C. lueddemanniana, C. mossiae* and *C. percivaliana*) were considered amongst the six most threatened Venezuelan orchids in an assessment by the Venezuelan national herbarium.

Two species are included in CITES Appendix I: *C. trianae* endemic to Colombia, and *C. skinneri*, widespread in Central America.

The genus *Cattleya* produces some of the showiest of all orchid flowers, and is extremely popular in cultivation. It has been very widely used in hybridisation, either on its own, or to form intergeneric hybrids, particularly with *Laelia* and *Brassavola*. Species are also popular and most have been in cultivation for at least the past century. A large number of species have suffered considerably from over-collection, both to supply domestic markets in Latin America, and for export.

Selected cultivated forms and varieties of most species, including all those mentioned above as possibly of conservation concern with the exception of *C. iricolor, C. trianae* and *C. gaskelliana*, are widely available in trade and there do not appear to be large numbers of wild-collected plants presently in trade in Europe, although wild-collected *C. dormanniana* from Brazil were offered for sale at the 9th European Orchid Congress in Rome, and what appeared to be wild-collected plants of several species (*C. porphyroglossa, C. schilleriana, C. elongata*) were seen in various French nurseries. One Dutch nursery also advertises what are probably wild-collected *C. rex, C. maxima* and *C. guttata.*

C. iricolor, C. trianae and *C. gaskelliana* have not been seen, nor seen advertised; the absence of *C. trianae* is somewhat surprising, as this species was included by Hofmann (1976) in his list of 100 most widely cultivated orchids in a survey of European collections.

DENDROBIUM

The genus *Dendrobium* is one of the largest genera of orchids, with at least 900 species, occurring from India eastward through South-East Asia and eastern Asia to Australasia and the Pacific islands. The genus is taxonomically one

of the most problematic in the family, and has not been comprehensively reviewed since 1910; consequently a large number of invalid names and synonyms are in use. The conservation status of members of the genus has also not been systematically reviewed, and only 35 or so species have been assigned global IUCN threatened species categories, although the true number of threatened species is certainly much higher. Fifteen of the species with categories are Australian.

The genus contains a large number of attractive species and is popular in cultivation, although it does not appear to attract a sizeable "collector" following - that is, most orchid growers will have some plants in their collections, though few will specialize in the genus. Hybridization within the genus has been carried out since the nineteenth century, and hybrids are grown in the Far East for the cut flower trade. Although good hybrids are currently being produced, notably in Japan (mainly of *D.nobile*), Singapore, Thailand, Hawaii and Australia, in general species are more widely grown than hybrids by hobbyists.

Dendrobium species are mainly propagated by division of the plants, or from young plantlets produced in the nodes of the stems.

According to CITES statistics, the genus *Dendrobium* is the most heavily traded orchid genus. This is undoubtedly in large measure a reflection of the size of the genus.

Species widely obtainable at European nurseries include:

D. aggregatum, D. chrysotoxum, D. parishii and *D. thyrsiflorum* (widespread Southeast Asian species exported in large quantities from Thailand); *D. formosum* (another widespread species exported from Thailand, but also reportedly artificially-propagated in Taiwan); *D. kingianum* (an Australian species almost certainly entirely artificially-propagated); *D. nobile* (widespread in Southeast Asia and India, exports from India and Thailand said to be artificially-propagated); *D. miyakei* (occurring in the Philippines and Taiwan with Taiwanese exports said to be artificially-propagated); *D. speciosum* (a species from Australia not apparently generally artificially-propagated); *D. victoria-reginae* (a Philippines species, obtainable from at least one nursery as artificially-propagated, but probably also available as wild imports.

Of these, *D. aggregatum, D. chrysotoxum, D. parishii, D. thyrsiflorum, D. kingianum* and *D. nobile* were included in a 1975 list of widely cultivated species, based on a survey of 55 orchid collections. Also included were *D. densiflorum, D. loddigesii, D. phalaenopsis (=D. bigibbum),* and *D. pierardii* (Hofmann, 1976).

At least 180 named species are offered by European nurseries. The majority of these are likely to be habitat plants, or small scale divisions from habitat plants, although one U.K. nursery offers around 60 species as flasked seedlings; these are chiefly from New Guinea and the majority do not appear to be regularly offered by continental nurseries. One German nursery which apparently only deals in artificially propagated stock offers around 25 generally widely available species including *D. aggregatum, D. chrysotoxum, D. thrysiflorum,* and *D. parishii,* all of which also feature as exports from Thailand.

Australasian species such as *D. bigibbum* and *D. kingianum* appear to be in general artificially propagated, as do most *D. nobile,* probably the most widely available species. However, *D. speciosum* appears to be generally wild-collected.

Of species considered globally threatened by IUCN, *D. alexandrae* (Papua New Guinea - R) is offered as flasked seedlings by one U.K. company; *D. bigibbum* (Australia - V) is available from at least two outlets, one almost certainly as nursery-raised stock, the other as import, although these are unlikely to be wild collected; *D, falcorostrum* (Australia - R) is obtainable from at least three sources, again almost certainly as artificially propagated stock;

D. fleckeri (Australia - E) and *D. tenuissimum* (Australia - R) are both obtainable from one source, almost certainly as imported plants. although the small number of CITES recorded exports of these species from Australia are declared as artificially propagated; *D. munificum* is available from three sources, again almost certainly as artificially propagated although it is also reportedly collected in quantity in New Caledonia for export to France.

In addition, concern has been expressed about other species such as *Dendrobium harveyanum* from Thailand and Myanmar. Until the recent discovery of a new population, this species had not been seen in trade since the 19th century; it has reappeared on the market with plants offered by at least 2 Dutch and one German nursery at prices of 35-40 dfl (US$18-20) or 25-30 dm (US$15-18).

Species in the section Oxyglossum, chiefly from New Guinea, have also given rise to some concern. These species were relatively little-known until around 20 years ago, but are now becoming increasingly popular, although wild-collected plants are reputedly difficult to maintain for any length of time in cultivation. Notable species include *D. cuthbertsoni, D. subacaule* and *D. hellwigianum*. The first of these in particular is very variable in colour, and concern has been expressed that large numbers may be collected in pursuit of good colour forms, with less desirable plants being discarded. Twelve New Guinea species in this section including the above three, as well as the Fijian *D. prasinum* are offered as flasked seedlings by a U.K. supplier. *D. prasinum* is offered by at least one Dutch nursery, and one German nursery offers the New Guinean *D. hellwigianum* (at 50 dm (US$30)) and *D. vexillarius* (55-60 dm (US$33-36)), almost certainly as wild-collected plants or as divisions from wild-collected stock.

DRACULA

This genus, formerly included in *Masdevallia*, is highly collectable at present, although not widely offered. One Dutch firm offers nine species, mostly as divisions, including *D. vampira* at 100 dfl (US$50), this being amongst the highest prices of any orchid listed; this species appears to be one of the most sought-after orchids at present. One species (*D. bella*) is offered as a flasked seedling by a U.K. company.

LAELIA

A genus of around 50 species widely distributed in Central and South America and the West Indies, closely related to *Cattleya*. Only seven species have been assigned IUCN conservation categories. Of these, two (*L. anceps* from Honduras and Mexico, and *L. rubescens*, widespread in Central America) are considered not threatened; the other five are all Mexican endemics, one of which (*L. gouldiana*) is regarded as Endangered, with the other four (*L. albida, L. autumnalis, L. furfuracea*, and *L. speciosa*) all Vulnerable. Many species, particularly rupicolous forms from Brazil, have suffered considerably from over-collection.

Two species, *L. jongheana* and *L. lobata* are included in Appendix I of CITES.

Laelia plants are popular in cultivation, although somewhat less so than the generally larger-flowered *Cattleya*. They have been extensively used in hybridising, but generally in conjunction with other genera, and species, or natural varieties, are more widely collected than hybrids. Some, particularly various named forms of the Brazilian *Laelia purpurata*, are highly sought-after.

Artificially-propagated plants of a wide variety of species have been found to be available in Europe, including the CITES Appendix I *L. jongheana*, and *L. lobata* and all those identified as threatened by IUCN with the exception of *L. speciosa*.

However, wild-collected plants of a range of species have also been observed, including both CITES Appendix I species (50 plants seen in one French

nursery); other species seen as wild-collected plants include: *L. purpurata 'carnea'*, *L. praestans*, *L. perrini*, *L. grandis*, *L. kettieana*, *L mantiqueirae* and *L. milleri*.

MASDEVALLIA and its allies

Masdevallia is a large genus, comprising 250 or so species, widely distributed in central and south America. They are small to medium-sized epiphytic or lithophytic herbs which grow from a creeping rhizome, rather than having pseudobulbs. Several species formerly included in the genus are now included in the genera *Dracula* (qv) , *Dryadella*, *Andreetaea* and *Trisetella*.

The conservation status of the genus has not been comprehensively reviewed although 14 species have been assigned global IUCN threatened species categories.

There is currently strong and probably growing collectors' interest in *Masdevallia* and its allies, in part doubtless stimulated by the production of a serial monograph on the genus. The group has relatively specialized horticultural requirements (cool temperatures, high humidity and good ventilation), and is in general not particularly easily accommodated in a general orchid collection. Only one species, *Masdevallia rolfeana*, was listed by Hofmann in 1976 in his list of widely-grown orchids, and this species was only represented in 19 out of 55 collections surveyed. A wide range of hybrids, chiefly using *M. veitchiana*, was produced at the turn of the century by Veitch and Sons, although many of these are no longer in cultivation.

Several nurseries offer a selection of species, with nearly 50 listed in one catalogue; often species are offered in small quantity and are not listed in published catalogues. One German nursery specializes in these plants, but was not visited during the course of the survey. Some plants are seed-raised, with hybrids and cultivars being produced in increasing numbers, but most species almost certainly originate as wild-collected plants, often grown on and increased by division before sale.

Of species with IUCN categories, *M. attenuata* (Costa Rica and Panama - E) is offered by one Dutch nursery as a division and by one French nursery almost certainly as artificially propagated stock:, *M. calura* (Costa Rica - V) is offered by the same Dutch nursery, probably as a direct import; *M. rolfeana* (Costa Rica - V) is relatively widely available, largely as artificially propagated stock; *M. strobelli* (Ecuador - V) is offered by two Dutch nurseries, one as a division, the other probably as an import.

Most trade in Masdevallias recorded under CITES is recorded at generic level, with a global average of just under 4000 plants per year from 1983 to 1989; in addition small numbers of nearly 300 species have been recorded in trade, with *M. infracta* recorded in largest numbers (average of 309 plants per year for 1983-89).

ONCIDIUM

Oncidium is one of the largest orchid genera, comprising over 400 species widely distributed in subtropical and tropical regions of the Americas. Many species are localized, and to date 24 have been assigned IUCN threatened species categories, although the genus has not been comprehensively reviewed. The genus is also in need of taxonomic revision.

Several species are widespread in cultivation, particularly *O. flexuosum* and *O. papilio*; the former in particular is well-known as a 'beginner's' plant and is one of the most widely available species orchids. Only 50-60 species are regularly advertised in Europe of which about half appear to be largely available as artificially-propagated stock.

Five of the 24 species with IUCN threatened species categories have been seen advertised; at least four of these (*O. flavovirens*, *O. leucochilum*, *O. stramineum* and *O. rigrinum*) are available as artificially-propagated stock, although it is possible that some wild-collected plants are imported.

PAPHIOPEDILUM

The genus *Paphiopedilum* consists of about 70 mostly terrestrial species with a distribution from India eastward through southern China to the Philippines and throughout South-East Asia and the Malay Archipelago to New Guinea and the Solomon Islands. The genus was monographed by Cribb (1987), who recognized 60 species. Since then at least six new species have been named, although the validity of some is questioned. Dealers and growers also regard as full species many forms treated by Cribb as varieties. The number of names appearing in growers' lists therefore considerably exceeds 60. Many of the species are calcicole, often being found growing on limestone outcrops, and many have very localized distributions.

Twenty-eight species of *Paphiopedilum* have been given IUCN threatened species categories, including the Vietnamese *P. delenatii*, not collected since 1922 and classified as Extinct in the wild, although it is possible that populations still survive; *P. druryi* from the Western Ghats in southern India is classified as Extinct/Endangered in the wild, and seven other species are considered Endangered.

Cultivation and trade

Paphiopedilum plants have been in cultivation in Europe since the early years of the 19th century and the first known successful hybrid in the genus was recorded in 1869. Hybrids and species have remained very widely cultivated since then and at the turn of the century the genus was the most popular of all orchid genera. This popularity subsequently waned somewhat, but interest was rekindled in the early 1960s, probably as the result of the discovery of a new species, *P. sukhakulii*, in Thailand. Since then, some 25 new species have been described and interest has burgeoned, receiving a particular boost in the early 1980s through the discovery of a number of remarkable new species in China, notably *P. armeniacum*, *P. emersonii*, *P. micranthum* and *P. malipoense*. The high levels of import to the European, U.S. and Japanese markets of wild-collected plants of these, and other, species, became an increasing cause of concern and the entire genus was placed on CITES Appendix I, effective from 18th January 1990.

Paphiopedilum plants, including species, primary and complex hybrids are still widely available. A large percentage of *Paphiopedilum* species plants seen are considered to be artificially propagated, but considerable numbers of wild-collected plants have also been observed.

Availability of species

Fifty-four of the 60 species recognized by Cribb (1987) have either been seen offered for sale or are included in at least one current catalogue, as have two subsequently described species (*P. hainanense* and *P. henryanum*). Wild-collected plants of at least 12 species have been seen offered for sale. Some of these have almost certainly entered Europe since the beginning of 1990, that is been illegally imported.

Of note are a number of species from the Philippines; a consignment of around 1000 plants, labelled as *P. argus*, *P. adductum*, *P. haynaldianum* and *P. philippinense* was observed in a French nursery in April 1991, strongly bearing the appearance of having been recently removed from habitat. These plants were subsequently seized by the French authorities when the nurseryman proved unable to produce valid import certificates. In August, small numbers of *P. philippinense* var *roebelenii* and *P. hennisianum* bearing the appearance of wild-collected plants were observed in a Dutch nursery.

In addition, one French and one Dutch nursery had plants, considered wild-collected, of *P. glanduliferum* (labelled as *P. gardneri* in both cases), with the Dutch plants priced at 375 dfl(US$200); this species, from New Guinea (both Irian Jaya and Papua New Guinea) and adjacent islands is rare in cultivation; it seems likely that the plants originated from the same source.

Other notable species seen are *P. stonei*, a highly prized and localized species from Sarawak, and *P. supardii*, from Kalimantan (Indonesian Borneo).

All four recently-described Chinese species (*P. armeniacum, P. emersonii, P. micranthum* and *P. malipoense*) have been seen offered for sale, with *P. armeniacum* and *P. malipoense* being widely available. Most plants were artificially propagated, generally as seedlings or small divisions from suckering, with some larger divisions of *P. emersonii* and *P. micranthum* seen.

At least 40 species are available as artificially propagated plants, most of these (30) offered as de-flasked seedlings by one U.K. nursery; included amongst these are several rarely obtainable species from Borneo and Australasia, such as *P. bougainvilleanum, P. dayanum, P. glanduliferum* (as *P. gardneri*), *P. kolopakingii, P. papuanum* (as *P. zieckianum*), *P. sanderianum* and *P. supardii*.

Species not seen offered for sale or listed in catalogues are: *P. druryi* from India, *P. liemianum* from northern Sumatra (Indonesia), *P. randsii* from Mindanao (Philippines), *P. victoria-mariae* from Sumatra, *P. violascens* from New Guinea (Indonesia and Papua New Guinea) and *P. wentworthianum* from Bougainville and Guadalcanal (Papua New Guinea and Solomon Islands).

In general, traders are fully aware of the present restrictions on trade in *Paphiopedilum* and there is a marked trend away from open sale of wild-collected imports.

PHALAENOPSIS

The genus *Phalaenopsis* comprises around 45 species and occurs in Asia from the eastern Himalaya east through South East Asia to the Philippines and northern Australia. The closely related genus *Paraphalaenopsis*, sometimes included within *Phalaenopsis* consists of four species found in western Borneo. Six species have been given global IUCN threatened species categories: *Phalaenopsis amboinensis* (Moluccas & Sulawesi - R); *P. cochlearis* (Sarawak - E); *P. fimbriata* (Java and Sumatra - E); *P. gigantea* (Borneo - I); *P. javanica* (Java - E); *P. modesta* (Sabah - E); in addition, *P. aphrodite* is considered threatened in China and Taiwan, although its status in the Philippines is unknown.

Phalaenopsis grow quickly and easily from seed, and hybrids are extremely popular in the cut flower and pot-plant trade. Large numbers are grown in East and South East Asia, particularly Taiwan, for export both as plants and cut flowers, with fairly high production in Europe. *Phalaenopsis* hybrids are probably the most cheaply and widely available orchid plants in Europe at present.

Several species of *Phalaenopsis* are widely available in the specialist trade, of which the best known is *P. schilleriana* from the Philippines. Other commonly available species include *P. amabilis, P. amboinensis, P. cornu-cervi, P. lueddemanniana* and *P. violacea*. *P. cornu-cervi* is reported as exported in relatively large numbers from Thailand, and is likely to be sold as wild-collected plants. *P. aphrodite* which is not at present very widely advertised in Europe has been exported in considerable numbers recently from Taiwan, recorded as artificially propagated stock (12856 plants exported in 1989). Hofmann (1976) noted that the commonest *Phalaenopsis* in the collections he surveyed were *P. amabilis, P. esmeralda, P. mannii* and *P. schilleriana*.

P. gigantea, a species which has reportedly been virtually collected out at its known localities in Borneo is relatively widely offered, often at a range of prices (25-95 dfl (US$13-50)); it seems possible that larger plants are wild-collected although it is also reportedly artificially propagated in quantity in the U.S.A.

One German nursery specializes in *Phalaenopsis* species and offers around 40, some in several different forms, including all species with IUCN categories

except *P. cochlearis*; in addition *P. tetraspis* is advertised as a rarity at 100-130 dm (US$60-80). This nursery carries out artificial propagation, both by seedlings and "keikis" (plantlets which form on the nodes of the flower stems) but also has a large number of wild-collected plants.

PHRAGMIPEDIUM

The genus *Phragmipedium* is closely related to *Paphiopedilum*, and is distributed through central and South America from Mexico south to Peru and Brazil. As with many orchid genera, there is considerable disagreement over the number of species in the genus, with from 12 to 25 generally recognized. The genus has most recently been reviewed by McCook who recognizes 12 species. Some species, such as the Mexican *P. exstaminodium* and *P. xerophyticum*, are very localized. Populations of many species have been severely depleted by overcollection, although there is little definite information on the overall status of most of the species in the wild.

In view of the extensive trade in wild-collected plants, and concern about the wild status of many species, the genus was placed on Appendix I of CITES at the seventh Conference of Parties, the listing taking effect from 18th January 1990.

Cultivation and Trade

The genus *Phragmipedium* has been popular in cultivation for over a century. However, collectors' interest at present appears to be centred in the U.S.A., and species are generally much less widely obtainable, or apparently sought-after, in Europe than *Paphiopedilum*, in large measure because plants tend to grow much larger than most *Paphiopedilum* spp. This applies equally to hybrids and true species. The recently-described, and spectacular, *P. besseae* is an exception to this. Wild-collected plants of this species are widespread in collections, although not generally offered for sale; however, one Dutch nursery lists the species at 225 dfl (US$120), with a German nursery offering the plant at 300 dm (US$180). Most European plants are said have originated in a consignment of several hundred imported in 1989 (i.e. pre-CITES Appendix I listing), but some plants definitely imported since Appendix I listing were seen in Italy. Seedlings of *P. besseae* were reportedly available in the U.K. in late 1991.

Plants in the genus can generally be easily propagated by division, and most plants offered for sale appear to be divisions rather than wild-collected plants. Plants which appear to have been of recent wild origin of *P. boissierianum* (named as *P. reticulatum*), and *P. lindleyanum* (with plants labelled both as this and *P. sargentianum*) were seen at one Dutch nursery. These two species appear to be the most widely available in trade. In addition, around 40 plants of the artificial hybrid *P.* 'Sedenii', raised by division, were seen at a German nursery.

3.3. TRADE IN EUROPEAN COUNTRIES

BELGIUM

There is one major dealer in species orchids in Belgium, which was visited during the survey. This business has grown out of a personal hobby. A wide range of plants is sold, largely as divisions or seedlings of parent stock. Micropropagation facilities were in the process of being installed during July 1991; previously seed had been sent to a professional flasking service. Plants have been imported from a number of countries, including Australia, Colombia and Jamaica, with the proprietors noting that finding reliable, legal suppliers in most countries was a major problem in the trade.

The market for species orchids in Belgium is small, with only around 100 serious collectors; many of these were said to import their own plants, often illegally.

DENMARK

Denmark was not visited during the survey. According to the Danish Plant Protection Service, there are two nurseries specializing in botanical species orchids, one dealing with hardy orchids, the other with tropical species. The former operates on a semi-amateur basis, and is attempting to propagate species; the latter has imported wild plants over the years as parent stock, but has a good reputation for propagation.

Denmark, which is a major European producer of pot plants and cut flowers, has a sophisticated nursery registration and inspection system.

FRANCE

Orchid cultivation is well-established in France, with several nurseries with a long-established international reputation, although there are fewer nurseries than in the United Kingdom, Germany or the Netherlands. Seven tropical orchid nurseries were visited during the survey, as well as two nurseries supplying hardy orchids.

There are several national amateur specialist groups, notably L'Association Française de Culture et Protection des Orchidées, la Société Française d'Orchidophilie and la Fédération Française des Amateurs d'Orchidées. These societies appear to be developing a strong conservation ethos, and are concerned with native orchids as well the cultivation of exotics. The SFO established a seed bank in 1986, while the FFAO has operated a plant exchange system since 1989. As well as buying plants within France, collectors are known to travel to Belgium and the Netherlands.

Of the nurseries dealing with tropical plants, only one appears to exist exclusively on imported plants, many of habitat origin, with no evidence of propagation; of the others, one was not regarded as a viable concern, two were small concerns with a relatively large proportion of imported plants, some regarded as of habitat origin, but both showing evidence of increasing on-site propagation. Three of the others were large concerns carrying out artificial propagation of hybrids and species on site; two had some apparently wild-collected imports (in one instance including recently imported *Paphiopedilum)* although these represented only a small proportion of the plants offered for sale. Plants have been seen in French nurseries imported from Thailand, the Philippines, Guatemala, Guadeloupe, Brazil, Mexico, Réunion and Malaysia (Sarawak); in addition it is known that substantial imports from Madagascar have taken place in the past.

Of the nurseries offering hardy orchids, one offers a small number of non-native species (chiefly *Pleione* and *Calypso bulbosa*), of which *Calypso* is likely to be wild-collected and some of the *Pleione* may be. The other nursery offers a large selection of native French orchids and is strongly believed to be trading in wild, locally collected, plants.

GERMANY

Germany is the largest market for species orchids in Europe, and, along with the U.K., has the largest number of orchid nurseries, with around 30 advertising regularly in orchid journals. Four nurseries dealing with tropical orchids were visited during the survey; five others were seen at the European Orchid Congress in Rome. Attempts were also made to visit four traders dealing with hardy orchids; three of these proved abortive.

Few nurseries - five or six - deal in extensive numbers of species, although with one probable exception (not visited) they deal with considerably fewer species than the main Dutch importers.

Of the nurseries visited, two were large concerns, one dealing largely with hybrids, the other with a mixed collection of species and hybrids, all propagated on site; the other two were small concerns, one dealing largely with Latin American plants, the other with South East Asian species, especially *Phalaenopsis*. Both imported plants, included wild-collected

specimens, but in general appeared to propagate these, by division and by seed, before sale.

As in much of the rest of Europe, there are a number of wealthy private collectors in Germany who import plants personally and have little to do with the commercial trade.

In addition, attempts were made to visit four premises which had advertised hardy orchids. All visits proved more-or-less abortive. One was a hardy plant nursery specializing in 'botanical rarities' including a number of hardy orchids, but was shut for the summer; no evidence of artificial propagation facilities was seen. The three others all proved to be private addresses with no evidence of nursery facilities. At one the investigator was informed that the business had ceased; no-one was present at the other two. This trade requires further investigation, particularly in view of the fact that one of those visited was arrested in 1992 charged with illegal collection of 85 Giant Rattlesnake Orchids *Goodyera oblongifolia* in Michigan, U.S.A. It seems certain that these were intended for export to Germany and probably for sale.

GREECE

Greece was not visited during the course of the survey. According to the Hellenic Society for the Protection of Nature, Greece imports orchid cut flowers mostly from the Netherlands, and there is not believed to be any commercial trade in exotic wild orchids.

IRELAND

Ireland was not visited during the survey. There is not believed to be any substantial trade in wild-collected orchids in the country.

ITALY

Four orchid nurseries in Italy were visited during the study as was the 9th European Orchid Congress in Rome in April 1991.

Cultivation of orchids is a relatively small-scale hobby in Italy, with perhaps 500-600 collectors; interest is believed to be stable or growing slowly, and is concentrated in the Lombardy region in the north, where there is a thriving orchid society, the Associagone Lombarda Amatori Orchidee.

There appear to be only two nurseries in Italy specializing in species orchids; one of these is a concern which has grown out of a personal hobby and comprises a large collection of species. Plants sold are offspring from mother plants in the collection, generally seedlings with a small amount of vegetative propagation. Wild-collected plants are imported for the collection, particularly from South America (often by post), with some Appendix I plants imported via Turin.

One other nursery visited was a large concern dealing with a variety of species and hybrids; some plants appeared wild-collected, including some *Paphiopedilum* but did not appear to be recent imports. This nursery was in the process of installing a laboratory for micropropagation when visited in May 1991. Of the other nurseries visited, one dealt only in hybrids for the cut-flower trade, while the other, which sold a fairly wide range of species and hybrids appeared to served as a retail centre for plants from nurseries in northern Italy as well as some direct imports from Thailand, and perhaps elsewhere. There was no evidence of propagation on site.

Amateurs displaying plants at the 9th European Orchid Congress in Rome showed a wide range of species plants, many almost certainly of wild origin, including a large number of *Paphiopedilum* spp. It is believed that, as in other European countries, much importing of wild plants is carried out by amateurs who then exchange plants amongst themselves.

There is widespread awareness of CITES regulations, and in particular of the listing of *Paphiopedilum* and *Phragmipedium* on Appendix I, and, as elsewhere in Europe, there is a sense that the future of orchid trade lies with artificial propagation.

NETHERLANDS

The Netherlands is undoubtedly the largest producer, and largest importer, of orchids in Europe, although it has fewer specialist nurseries (i.e. those supplying hobbyists rather than solely the cut-flower and florist trade) than either Germany or the United Kingdom. Five specialist nurseries were visited during the survey; another four advertise regularly in orchid journals.

All five nurseries visited appeared to rely heavily on imported plants. One, which was in the process of closing down, had trading very largely in wild-collected plants and specialized in large, undivided specimen plants, mainly from Latin America; the other nurseries visited had a mixture of wild-collected and artificially propagated plants. Only one had evidence of micropropagation facilities on site. Two of those visited offer what is almost certainly the largest range of species available in Europe; both had small numbers of what appeared to be recently imported wild-collected Appendix I species. Dutch orchid nurseries are known to import from Australia, Indonesia, Thailand, Brazil, Ghana, Honduras, Costa Rica, Hong Kong, Suriname, Mexico. It is believed that increasingly, imports come through other European countries, chiefly Belgium and France, rather than directly into the Netherlands, as controls are stricter in the Netherlands.

PORTUGAL

Portugal was not visited during the survey. There is not known to be any extensive trade in exotic orchids in Portugal.

SPAIN

Mainland Spain was not visited during the course of the survey. There is not known to be any extensive trade in wild exotic orchids in Spain. One orchid nursery in Tenerife in the Canary Islands was visited. This dealt entirely with hybrids. There is one other orchid nursery on Tenerife which is also believed to deal only with hybrids (principally *Phalaenopsis*).

SWITZERLAND

Although not part of the EC, Switzerland was visited as part of the survey. According to Swiss Orchid Society, there are 11 orchid nurseries in Switzerland. These are almost all small concerns, although some are known to import plants. Three of these were visited during the course of the survey. One dealt only with hybrids for the cut-flower and casual pot-plant trade. One was a well-established business which did a considerable amount of artificial propagation of both species and hybrids, although also appeared to import a number of plants (chiefly *Calanthe*). This nursery had a stock of mother plants of several wild-collected *Paphiopedilum* and *Phragmipedium* species. At least some of these had been deposited by the Swiss CITES Management Authorities. The third was a smaller nursery with a mixture of species and hybrids. Amongst the former were a number of Madagascan species, chiefly *Angraecum*, some wild collected, and a large selection of *Paphiopedilum* species, although in general these did not appear to be recent wild imports. There were no micropropagation facilities. The market for species orchids in Switzerland is said to be small, with perhaps 50-100 serious collectors; in general these reportedly have little to do with commercial trade.

UNITED KINGDOM

For many years during the 19th and early 20th centuries, the United Kingdom was the centre of the orchid trade. The cultivation of orchids is still a relatively popular pursuit in the U.K. and there are still a considerable number of specialist nurseries, but the country is no longer of major importance, either globally or in Europe.

Most U.K. nurseries are relatively small concerns, and only two are known to deal in significant numbers of species orchids. One, which specializes in plants from Papua New Guinea and *Paphiopedilum* species, offers only artificially-propagated stock (deflasked seedlings) of around 200 species, many apparently virtually unobtainable elsewhere; the other, which offers around 120 species on a regular basis, also apparently only or very largely deals in artificially-propagated stock, as no evidence of sale of wild-collected plants has been discovered.

Some smaller traders, whom it has not been possible to visit, are believed to import wild-collected plants. Such plants certainly enter the U.K. market, as evinced by the presence of wild-collected *Paphiopedilum* species on exhibition at a recent orchid show. U.K. collectors are known to travel to Europe, mainly the Netherlands and Germany, to buy plants.

4. CARNIVOROUS PLANTS

Carnivorous plants are those which derive some part of their nutrition from animal (usually insect) prey, trapped either actively or passively. At least fifteen genera of carnivorous plants are known in seven families, comprising several hundred species in total. The genera are: *Heliamphora, Sarracenia* and *Darlingtonia* in the Sarraceniaceae; *Cephalotus* in the monotypic family the Cephalotaceae; *Byblis* in the Byblidaceae; *Genlisea, Polypompholyx, Pinguicula* and *Utricularia* in the Lentibulariaceae; *Nepenthes* in the Nepenthaceae; *Aldrovanda, Dionaea, Drosera* and *Drosophyllum* in the Droseraceae; and *Triphyophyllum* in the Dioncophyllaceae.

One other genus, *Brocchinia* in the Bromeliaceae, may possibly also be carnivorous and is grown by carnivorous plant enthusiasts. It will therefore be considered briefly here.

CULTIVATION

Carnivorous plants have considerable appeal as botanical curiosities and several species are widely available, with the most commonly sold genera being *Dionaea, Sarracenia, Drosera* and *Pinguicula*, of which the first is by far the most abundant in trade. There are relatively few specialist collectors, with interest in Europe reportedly concentrated in the United Kingdom, Germany and France. Each of these countries has a society devoted to the study and cultivation of carnivorous plants. Some species (*Dionaea, Drosera* spp., *Pinguicula* spp.) are in demand from the medicinal plant trade; this is outside the scope of this report.

Large-scale production of carnivorous plants is carried out by very few nurseries. One nursery in the Netherlands dominates the European wholesale market, with a large specialist nursery in the United Kingdom and two nurseries in France also offering a wide range. There are a number of suppliers in Germany, with six specialist nurseries listed in the Pflanzen Einkaufsführer, and one or two others advertising in the German Carnivorous Plant Journal, but none of these is believed to be very large. Most of these suppliers are believed to be only semi-professional.

Each of the genera will be considered below in turn.

ALDROVANDA

The single species, *Aldrovanda vesiculosa*, is a rootless aquatic, widespread in the Old World from central Europe to Africa and eastward to Japan and Australia.

The plant is reportedly exacting in its requirements in cultivation and is not widely grown, although it is offered for sale by a few nurseries. Plants sold in France are apparently of Italian provenance. The species can be propagated by cuttings and there is no reason to assume that commercial collection poses any threat to the plant in the wild.

BROCCHINIA

A genus of 21 mostly terrestrial bromeliads from northern South America. Several of the species are found in similar areas to *Heliamphora*. A few species, such as *B. reducta, B. tatei* and *B. acuminata*, have been collected and are offered for sale by carnivorous plant nurseries, as artificially-propagated plants, generally seedlings. Plants of this genus are not highly sought-after by non-specialists, and trade in them gives no cause for concern.

BYBLIS

Two species of *Byblis* are known, *Byblis liniflora*, an annual or short-lived perennial from northern Australia and New Guinea, and the shrubby, perennial *Byblis gigantea* from Western Australia. *Byblis* spp. are listed on CITES Appendix II.

Both species, but especially the former, are relatively difficult in cultivation, and are not generally available, even from specialist nurseries. Seeds of both, however, are offered for sale, with *B. liniflora* being generally more widely available than *B. gigantea*.

No international trade in *Byblis* species has been recorded by CITES in the period 1983-89.

CEPHALOTUS

The single species in the genus, *Cephalotus follicularis*, has a limited distribution in extreme south-western Australia. It is listed on CITES Appendix II.

This attractive plant appears in small numbers in general horticultural outlets; however, it is difficult to grow successfully and considered to have little commercial potential outside the specialist trade, where it is relatively widely available. It may be propagated by tissue culture, division, root cuttings or leaf cuttings and all plants seen for sale are considered to have been artificially propagated.

A total of 1630 have been recorded in international trade from 1983 to 1989, almost all since 1986 and most being exports from Australia to Europe. Around 300 plants, all declared as artificially propagated, were exported from Australia to the U.K. in 1986 and in 1989, just over 1000 plants, all declared as artificially propagated, were exported from Australia to the Netherlands.

DARLINGTONIA

The single species, *Darlingtonia californica*, known as the Cobra Lily, is confined to Oregon and northern California in the U.S.A. It is listed on CITES Appendix II.

Darlingtonia has fairly specialist horticultural requirements and many carnivorous plant nurseries do not offer it for sale. It is occasionally listed in bulb-merchants catalogues as a rhizome rather than a growing plant. It is possible that these plants are wild-collected, although export of wild-collected *Darlingtonia* from the U.S.A. is not at present permitted.

The only significant trade in *Darlingtonia* reported in CITES statistics for the period 1984-89 is of 200 imported by the U.K. from the U.S.A. in 1985 and 2500 imported by the Netherlands from the U.S.A. in 1988; all plants were declared as artificially propagated.

DIONAEA

Dionaea is a monotypic genus in the family Droseraceae confined in the wild to the states of North Carolina and South Carolina in the U.S.A. Concern has been expressed for the species as populations are apparently declining through habitat loss and overcollection. It is not currently listed on the CITES appendices, although a proposal has been submitted to the 8th CITES Conference of Parties in March 1992 for listing on Appendix II.

The Venus Fly-trap dominates the carnivorous plant trade in Europe and is offered for sale in a very wide variety of retail outlets; the major producer of these plants in Europe stated that over 90% of the carnivorous plant market consisted of *Dionaea*. Most plants are bought as curiosities and are believed to suffer very high post-purchase mortality, helping to sustain the market. Plants are supplied as dormant "bulbs" (in reality plants with the leaves removed), growing plants and, on a small scale, *in vitro* for growing on.

Judging by export figures from North Carolina and information from the single Dutch nursery which dominates the bulk market in carnivorous plants, the European trade amounts to well over 1,000,000 plants per annum. An unknown but undoubtedly significant proportion of this is in wild-collected plants.

Export figures from North Carolina (Table 1) indicate that Europe is by far the most important export market for *Dionaea*. The size of the domestic U.S. market is not known, although in 1981 it was estimated that 1.4-4.5 million plants were sold annually within the U.S. Most exports from the U.S.A. are believed to be in wild-collected plants. Within Europe the Netherlands is the principal importer, with Germany also importing significant quantities in 1989 and 1990.

Dionaea can be propagated in high volume, by seed, tissue culture and from leaf cuttings. The major grower in the Netherlands produced 300,000 plants in 1991, chiefly from leaf cuttings, and stated he was intending to increase production considerably in 1992. Plants are generally grown on for around fourteen months before being sold, although some are kept for longer. However, wild-collected plants can still be imported to Europe more cheaply than large nursery-grown plants can be produced. This producer stated he was importing 40,000 plants in 1991 in order to be able to compete economically with other importers.

Country Year	1989	1990	1991*	Total
Netherlands	**373,000**	**798,000**	**166,000**	**1,337,000**
Germany	**221,000**	**246,000**	**10,000**	**477,000**
United Kingdom	**52,000**	**20,900**	**21,000**	**93,900**
France	**-**	**6,500**	**6,000**	**12,500**
Belgium	**-**	**300**	**-**	**300**
Italy	**-**	**4**	**-**	**4**
Japan	-	31,000	87,002	118,002
Canada	14,520	18,323	8,500	41,343
Australia	-	10,000	-	10,000
Taiwan	-	6,000	-	6,000
Mexico	1,000	-	700	1,700
Tahiti	-	200	-	200
Total EC	**646,000**	**1,071,704**	**203,000**	**1,920,704**
Total	661,520	1,137,227	299,202	2,097,949

* figures for the period January - May only

EC figures are shown in bold.

DROSERA

The genus *Drosera* is large, containing around 90 described species, and almost cosmopolitan, although concentrated in the southern hemisphere. Three species are found wild in Europe: *Drosera anglica*, *D. rotundifolia* and *D. intermedia*. No species are listed on the CITES Appendices.

Several forms are reasonably widely available, with the smaller varieties such as the natural hybrid *D.* 'Lake Badgerup', *D. aliciae*, *D. spathulata*, and *D. pulchella* second only to *Dionaea* in abundance. Larger forms, such as the Australian fork-leaved *Drosera binata* varieties and the South African *Drosera capensis* are becoming increasingly widely available. The widely available

forms are easily propagated by seeds and leaf cuttings, with root cuttings also used for the larger forms. *D. pulchella* and other Australian pygmy sundews such as *D. pygmaea* and *D. nitidula* may also be propagated by asexual gemmae.

There is no evidence that any of the widely-sold forms are available as wild-collected plants.

Specialist nurseries may sell over 50 named forms of *Drosera*; many of these are hybrids or selected forms of variable species. Recently several Australian tuberous-rooted species have become available in Europe, including *D. auriculata, D. erythrorhiza, D. macrantha, D. menziesii, D. stolonifera,* and *D. ramellosa*. These have been offered at prices of 8-15 dm (US$5-9) in Germany or £7.60-9.75 (US$14-17) in the U.K. The U.K. plants are offered by a nursery which claims to deal only in nursery-raised plants. However some concern has been expressed that tuberous-rooted *Drosera* may be wild-collected in considerable numbers in Australia. Overall demand in Europe appears to be very limited at present and would not seem to represent any major threat. These plants have specialised horticultural requirements, including a controlled dry season, and it seems unlikely that they will enter the general horticultural trade. Further information on the status of these plants in the wild and the amount of field-collection would be desirable.

DROSOPHYLLUM

The single species, *Drosophyllum lusitanicum*, occurs wild in Portugal, Spain and Morocco. It is not listed on the CITES Appendices.

This species is also reputedly difficult in cultivation and appears to have little commercial potential. A small number of artificially propagated plants were seen at one Dutch nursery and a few German nurseries offer the plants. Seeds are also obtainable.

GENLISEA

An aquatic genus with around 16 variable and apparently ill-defined species found in tropical America, southern Africa and Madagascar. Slack (1988) noted that none of the species appeared to be in cultivation, but two (*G. hispidula* and *G. roraimensis*) are now offered by two German nurseries and seem very likely to represent recent collections of wild material, although it seems unlikely that plants sold will be directly wild-collected.

HELIAMPHORA

The genus *Heliamphora* is considered perhaps the most primitive of the pitcher plants. The six described species are all localized, occurring in montane regions in Venezuela, generally in isolated granitic outcrops or tepuis in the south of the country. Three species are commercially available in Europe: *Heliamphora minor* from Auyan-Tepui, *H. nutans* from Mount Roraima and *H. heterodoxa* from Ptari-Tepui. No species are listed on the CITES Appendices.

The genus has proved problematic in cultivation and is considered to have little potential for large scale commercialization, although Slack (1988) notes that cultivation is less difficult than has been supposed provided that an appropriate regime is followed. At present plants are expensive (e.g. *Heliamphora nutans* £29.00 (US$50) in the U.K., *H. minor* 650 francs (US$115) in France, *H. heterodoxa* 29 dm (US$17) in Germany) and their cultivation is confined to specialist collectors and botanical gardens. Only small numbers have been seen, all in specialist nurseries. Field-collection of plants has certainly taken place in the last few years, and some concern has been expressed that plants could be over-collected as they have very localized distributions. However, the areas where the plants grow are very inaccessible (some were only explored for the first time in the 1950s) and expensive to reach and this is believed to offer adequate natural protection against over-

collection, although one source has stated that up to 80 plants may be collected annually. Collection on the tepuis apparently requires permits from the Venezuelan government, which should allow effective control. Further information on the status of these species in the wild is required. At present it seems that most plants offered for sale in Europe have been artificially propagated, generally by division of the rhizome, although some propagation by seed is also carried out.

SARRACENIA

Eight species of *Sarracenia* are currently recognized, growing in eastern North America in the U.S.A. with one species (*S. purpurea*) extending into Canada. Many cultivars and hybrids, both natural and artificial, exist with some growers recognizing over 100 varieties. *Sarracenia purpurea* has been naturalized in sphagnum bogs in the west of Ireland, England and Switzerland.

Three taxa are currently listed on CITES Appendix I: *Sarracenia alabamensis alabamensis* (more usually considered as *S. rubra alabamensis*), *S. jonesii* (also usually considered to be a subspecies of *S. rubra*) and *Sarracenia oreophila*. The remainder of the genus is listed on CITES Appendix II.

Sarracenia species are relatively widely available in non-specialist outlets. Species commonly sold are *S. alata*, *S. leucophylla*, *S. flava* and *S. purpurea*. The last two of these are hardy and are offered by some bulb companies, presumably as rhizomes. It seems possible that these are wild-collected.

Sarracenia plants are artificially propagated, mainly by division, at specialist nurseries, and growing plants offered for sale at garden centres and other outlets are most likely to have been artificially propagated. The major producer of carnivorous plants in the Netherlands stated that he had not imported any wild-collected plants for the past seven years. Although CITES figures indicate several imports to the Netherlands of *Sarracenia* from the U.S. over the past few years, the numbers involved (some thousands) are well within the limit of artificial production by licensed U.S. exporters.

	1987	1988	1989	Total
S. alata	1230	2822	140	4192
S. flava	4295	5126	1248	1246
S. leucophylla	8849	9903	10079	28831
S. purpurea	336	4320	432	5088
S. various	174	687	3030	3891

Table 2. Sales of *Sarracenia* at the Aalsmeer plant auction 1987-1989.

Appendix I Sarracenia

S. rubra jonesii (= *S. jonesii*) is offered by one nursery in the U.K. as artificially propagated stock at £14.50 (US$25) per plant.

S. rubra alabamensis (= *S. alabamensis alabamensis*) is offered by one nursery in the Netherlands at 12.00 dfl (US$7).

S. oreophila is offered by at least two German nurseries and by one Dutch nursery at 20.00 dfl (US$12).

It seems likely that the last two are also artificially propagated.

NEPENTHES

The genus *Nepenthes* comprises around 70 species distributed from Madagascar and the Seychelles eastward through South and South East Asia to northern Australia and New Caledonia. Several species are highly localized. Two species, the Indian *Nepenthes khasiana* and the Bornean *N. rajah*, are listed in CITES Appendix I; the rest of the genus is listed in Appendix II.

Nepenthes require very high constant humidity and, for most species, high temperatures, to grow. In Europe, therefore, they can only be grown successfully in stove-houses or warm greenhouses, or, for some of the smaller varieties, in terraria. Demand is therefore relatively limited, although there are a number of specialist collectors; in addition orchid-growers will often grow one or two plants and large horticultural outlets will sometimes offer a few small plants (generally cultivars) for sale to the general public. These last are produced by one or two wholesale producers in the Netherlands and Belgium. The major supplier in the Netherlands raises stock from seed produced by mother plants at the nursery; the plants produced are virtually all hybrids, with annual production being dictated by seed availability and varying from 3000 to 20,000. Plants are sold chiefly in mixed lots of carnivorous plants at wholesale plant auctions.

Outside Europe, demand is particularly high in Japan and the U.S.A.; stocks of wild plants have been depleted to supply these markets.

Specialist dealers in Europe offer a number of named forms (up to 30), some of which are species, others varieties or interspecific hybrids. Prices may be relatively high for rare forms (e.g. 100 dm (US$65) for *N. eymaiae, N. spectabilis* and *N. "Kondo Pecinata"* in one German catalogue, with up to £120 (US$215) reported for some species). It is unclear whether any of those offered for sale in Europe are wild-collected. Plants may be propagated by seed or cuttings, although seed propagation, especially for some of the rarer species, is hampered by a lack of availability, a rapid loss of viability and a low establishment rate for seedlings (Cheek *et al.*, 1991). Increasingly micropropagation techniques are used.

Appendix I Nepenthes

Plants of *Nepenthes khasiana* are offered for sale as artificially propagated stock by one British nursery at £10-15 (US$16-25)and *in vitro* by one French nursery at 50 francs (US$9) per plant; it is also offered for sale by at least two German nurseries. It is reportedly easy to propagate from seed, of which there is a plentiful supply. *N. rajah* does not appear to be commercially available in Europe.

PINGUICULA

The genus, which comprises 48 or so species, has a wide distribution in the Northern Hemisphere, with 3 species found in South America. Twelve species are found wild in Europe.

Many *Pinguicula* species have attractive flowers and some, such as *P. caudata*, are relatively widely offered as house plants. In addition, specialist nurseries offer a range of other species (the German Pflanzen Einkaufsführer lists 30 although it is not clear how many of these may be considered true species). Propagation is by seed, leaf cuttings, or by gemmae. Most species are very intolerant of root disturbance when in active growth; wild-collected plants would therefore be expected to suffer considerable mortality. It is unlikely that any large scale commercial collection for the horticultural plant trade takes place.

POLYPOMPHOLYX

This genus consists of two species of Australian annuals, *P. multifida* and *P. tenella*, closely related to *Utricularia*. *P. multifida* is reported to come

easily from seed (Slack, 1988). It has not been seen offered for sale, but *P. tenella* is offered, presumably as seed, by two German nurseries.

TRIPHYOPHYLLUM

The only known species *Triphyophyllum peltatum* is a tropical woody climber native to the rain forests of Sierra Leone, Liberia and Cote d'Ivoire. The plant is carnivorous in its younger stages, although this has only recently been demonstrated. It is believed threatened by forest destruction. The plant is barely in cultivation, and is not commercially available in Europe.

UTRICULARIA

Utricularia is the largest genus of carnivorous plants with just over 200 species generally recognized. It is cosmopolitan, and the majority of species are aquatic, although there are also terrestrial species, epiphytes and climbers. The six European species are all aquatic. No species is listed on the CITES Appendices.

Several species (up to 30) have been offered recently by specialist nurseries. One or two of the smaller terrestrial species, notably the Australian *U. laterifolia*, are more widely available, with the large-leaved *U. reniformis* popular in specialist collections (seen or advertised at four nurseries). Some wild-collection of South American *Utricularia* has been reported, including species such as *U. aslplundii*, *U. quelchii* and *U. humboldtii* from the same regions as *Heliamphora*,. These are listed by at least one nursery catalogue. However, most *Utricularia* species appear to be relatively easily propagated by division and demand for these species is likely to be limited to a very small collectors' market.

5. CYCADS

Currently 180 species of cycad are recognized (Stevenson and Osborne, 1991) in three families - the Cycadaceae, Stangeriaceae and Zamiaceae. The Cycadaceae consists of one genus, *Cycas*, comprising 33 species occurring from east Africa (*C. thouarsii*) eastward to Australia and the western Pacific. The Stangeriaceae is a monotypic family, with the single species, *Stangeria eriopus*, confined to South Africa and Swaziland. The Zamiaceae is the largest family with nine currently recognized genera - *Bowenia* (2 spp.), *Ceratozamia* (10 spp.), *Chigua* (2 spp.), *Dioon* (10 spp.), *Encephalartos* (52 spp.), *Lepidozamia* (2 spp.), *Macrozamia* (14 spp.), *Microcycas* (1 sp.) and *Zamia* (53 spp.). The family is widely distributed in tropical and sub-tropical parts of the Americas, Africa and Australia.

Cycad species are slow-growing and many have low reproductive rates in the wild. A number of species also have very limited distributions. Several species are used for food, especially for producing sago (notably *Cycas circinalis*, but also other species of *Cycas* and *Encephalartos*); cycads are also highly desired as ornamentals and many populations, particularly in Mexico and southern Africa, have been severely depleted by over-collection. This, combined with habitat destruction, and, in South Africa at least, collection of bark for use in herbal remedies (a relatively recent phenomenon) has led to a number of species, particularly in the genus *Encephalartos*, becoming highly endangered.

The species *Cycas beddomei*, *Stangeria eriopus*, *Microcycas calocoma* and the genera *Chigua*, *Ceratozamia* and *Encephalartos* are listed in Appendix I of CITES, all remaining cycads are listed in Appendix II. Cycad seed was formerly included in the CITES Appendices, unlike that of most other plants, but was de-listed at the 7th Conference of Parties in 1989.

CULTIVATION AND TRADE

Cycads are popular plants in cultivation and appeal both to specialist collectors and to the more general market. In temperate areas, including most of Europe, they are not hardy and are valued as specimen plants in homes and conservatories. In the Mediterranean and in other parts of the world with subtropical or tropical climates they are used for garden landscaping. Because they are slow-growing, large specimens even of the common species fetch high prices and are almost always wild or semi-wild (see below) in origin. Large plants are generally shipped by sea in containers as bare trunks, with leaves and roots removed. This makes identification of species virtually impossible until the plants are established and producing leaves, generally in the following season.

The specialist collectors market for cycads appears to be centred in the U.S.A. and in South Africa, and concentrates on the southern African *Encephalartos* and central American (especially Mexican) cycads notably in the genera *Dioon*, *Ceratozamia* and *Zamia*. Cycads from Asia and Australia appear to be less under threat from collecting for the specialist market.

Cycads have shown a resurgence in popularity throughout Europe in recent years. The great majority of this interest is in cycads as ornamentals, but there also indications of a small specialist collectors market.

CYCAS REVOLUTA

The vast majority of plants seen comprise one species, *Cycas revoluta*, which is also the species recorded most frequently in CITES annual reports. This species is very widely available is sizes ranging from seedlings (with the seed still visible) to, in one instance, plants with 3-m stems. Small plants are generally inexpensive (seedlings seen priced at 6.75 dfl (US$3.50), but prices increase dramatically with increasing size and age, with plants over 40 cm stem height priced at over 500 dfl (US$260) and very large plants reaching as much as 20,000 dfl (US$10,500). Bare stems up to 20 cm in height are also sold for rooting; these appear to be nursery grown but are probably imported from outside Europe.

Cycas revoluta is nursery-raised in Europe from seed, both under glass and in the open. Most seed is generally imported, according to the CITES statistics from a range of countries; at least one nursery in Sicily is producing its own although in quantities insignificant in the context of overall European trade.

However, in common with other cycads, this species is slow-growing and plants of any size (with stems of over ca 40 cm) are very likely to have originated outside Europe. The natural range of the species is China and the Ryukyu islands of Japan but it has been in cultivation for several centuries and has been widely naturalized, or semi-naturalized, in many parts of the world. It seems that a significant proportion of large plants entering the trade originate in South America, chiefly Brazil, Venezuela and possibly also Uruguay. In Brazil they are reportedly collected from old estates. Most of the trade in large plants appears to go to southern Europe for use in landscaping. One nursery in Sicily had a stock of over 500 plants of over 1.5 m in height, apparently imported in the last few years.

OTHER APPENDIX II CYCADS

Species of *Lepidozamia*, *Macrozamia*, *Dioon* and *Zamia* along with *Cycas circinalis* are relatively widely available, although in small quantities. All *Lepidozamia* and *Macrozamia* seen appear to have been artificially propagated, although some large field-collected and presumably wild *Zamia* and *Dioon* have been seen offered for sale. *Zamia* is propagated in relatively small quantities (ca 2000 in stock at any one time) by one nursery visited in Tenerife.

APPENDIX I CYCADS

Encephalartos species are seen with similar frequency to other cycads. The majority of those seen in general retail outlets are likely to have been artifically propagated. A nursery in Tenerife has raised *Encephalartos* seedlings in some quantity (1500 or so in stock); these were sold at 4-5 years old in mainland Spain, and the proprietor stated that he did not intend producing any more. One specialist French nursery offers 10 species; at least some of these appear to be wild-collected. In late 1991 this nursery was found to have around 400 *Encephalartos* in stock, a large proportion of which appeared wild-collected. Several nurseries in Italy have what appear to be wild-collected *Encephalartos*; plants in one nursery in Sicily were seized by the Italian management authority in 1991 but despite this the nursery has apparently shown interest in importing more plants. It has also been reported that *Encephalartos*, possibly wild collected, have been entering the Netherlands from Thailand; this needs further investigation.

One specimen of *Ceratozamia mexicana* was seen for sale in France; although the plant appear to be wild-collected, the nurseryman stated that it had been in his possession for four years. It is quite likely therefore that the plant was a pre-Appendix I listing.

DISCUSSION

The bulk trade in *Cycas revoluta* is not in itself any cause for concern as there is no evidence that native populations of this species are being depleted to supply the European market. However it seems likely that the resurgence in interest in cycads, particularly in southern Europe where they may be grown outdoors, is leading to a growth in interest in other species which may well be threatened by overcollection, particularly the South African *Encephalartos*. The fact that plants are often shipped in the bare-trunk state causes considerable problems for enforcement agencies as identification of species is extremely difficult. Imports into Italy in particular would appear to require careful monitoring.

Distinguishing wild (or field) collected plants from artificially propagated stock may also be problematic, although several indicators can be used:

1. In wild plants old leaves undergo complete abscission, leaving a characteristic scar on the trunk which is relatively smooth; nursery-grown plants often have old leaves cut off before the abscission process is complete, leaving the leaf base attached permanently to the trunk.

2. Wild plants of any age are very likely to have burn-marks on the trunk; these are impossible to remove and a certain indicator of field-collected stock.

3. Plants generally only produce one set of leaves per season; they may therefore be aged by counting the rings of leaf-bases or scars, arranged spirally around the trunk (taking care to exclude the scars formed by the bases of the reproductive cones, which may be confused with leaf-base scars). Plants ten years or more old are very likely to have been field-collected.

6. BROMELIADS

The family Bromelaiceae, is, with the exception of one species, confined to the Americas and comprises around 2000 species in 46 genera. A number of species in various genera, including *Aechmea, Billbergia, Cryptanthus, Guzmania, Neoregelia, Tillandsia* and *Vriesea*, are well-established as ornamentals and are mainstays of the house-plant industry in Europe. During the 1980s interest has grown in the grey-leaved or atmospheric *Tillandsia* species, which had previously only attracted the interest of a few specialists.

There are just over 400 species of *Tillandsia*, the larger proportion of which are grey-leaved species. They are generally epiphytic or lithophytic and are unusual in their ability to derive water and nutrition directly from the atmosphere, with the roots serving merely to anchor the plant to its support. These have been heavily promoted as ornamental house-plants, often in mixed arrangements on pieces of wood, coral or sea-shells and are very widely available in retail outlets. Around 140 species are available in the specialist market.

Imports into Europe comprise several million plants per year. The majority originate in Guatemala from where in 1988 alone approximately 120 tonnes, comprising around 13 million plants, were exported to Germany and the Netherlands. Plants are also imported in smaller quantities from other Latin American countries, including Argentina, Brazil, Costa Rica, Colombia, Paraguay and Peru. There are several nurseries in Latin America which supply Tillandsias for export. However, considerable controversy surrounds the extent to which these nurseries actually propagate the plants sent for export. The Tillandsias in the bulk trade are on the whole relatively easy to propagate, either by seed or by offsets from mother plants. However, neither method is particularly fast: air plants are slow growing and most species take four or five years from seed before they reach saleable size. Offsets take less time, but are produced in smaller quantities. Because of this, it is still cheaper to collect mature plants from the wild than to propagate them in nurseries and it is widely accepted that a significant proportion of Latin American exports are in fact wild collected plants - one investigation in 1988 concluded that 50-70% of the exports from Guatemala were of wild-collected plants, the remainder consisting largely of offshoots produced on wild-collected mother stock which would itself need periodic replacement from the wild.

The effect this trade is having on wild populations of Tillandsias remains largely unknown. The bulk trade concerns fewer than twenty species and is dominated by one, *Tillandsia ionantha*, which comprises, for example, 80% of the sales in the U.K. market. These species are generally widespread and abundant in their natural habitats and there is no reason to believe that they are threatened with extinction at present. However there is evidence of local over-collection in some areas, with all plants stripped from accessible sites. There are reports that, as areas of Guatemala are depleted of stocks, commercial collectors are moving into neighbouring areas in Mexico, Honduras and El Salvador.

Of more concern are the large number of rare and localised species of Tillandsia. These appeal to the growing band of Tillandsia specialists, concentrated in Germany and the U.S.A. at present, and some are definitely under threat. They include *Tillandsia sucrei* from Rio de Janeiro in Brazil and *Tillandsia xerographica*, a spectacular slow-growing silvery species from Guatemala, Mexico and El Salvador which may take eighteen years to mature. This is one of the most sought-after of all Tillandsias, and one Guatemalan nursery has reportedly exported up to 40,000 each year, the great majority, if not all of which, are wild collected. Other species from the Sierra de Orgaos in southern Brazil and mountainous areas in southern Mexico and Peru are also believed threatened by collectors.

There is also concern that difficulties in identification may have resulted in rare species being inadvertantly collected and exported in shipments of commoner species.

In recognition of these problems, seven species of Tillandsia thought to be particularly at risk from trade were placed on Appendix II of CITES in March 1992. These are: *T. harrisii, T. kammii, T. kautskyi, T. mauryana, T. sprengeliana, T. sucrei, T. xerographica.*

The specialist trade continues in Europe at a steady level but there is some indication that the mass demand may have already peaked, with sales in the U.K. falling by an estimated 50% from 1988 to 1989. There are also encouraging signs that demand is moving towards artificially-propagated plants which are generally of higher and more uniform quality that wild-collected plants. Increasingly this improved quality is seen as offsetting the higher prices that have to be charged for nursery-raised stock. In the United Kingdom, around half the plants sold in 1989 were artificially propagated within the U.K. from imported parent stock and the proportion was expected to increase in the future. Previously all the plants sold had been imported.

7. LEGISLATION AND CONTROLS ON PLANT TRADE IN EUROPE

The two principal controls on the international movement of plants in Europe are CITES regulations and phytosanitary controls. CITES is essentially enforced throughout the EC by Council Regulation (EEC) No. 3626/82 which came into force on 1st January 1984. With the exception of Greece and Ireland, all EC member states are also parties to CITES, as are the two non-EC countries considered in this report, Switzerland and Austria. Regulation No. 3626/82 along with subsequent amendments determines the manner in which CITES is implemented within the EC; it also includes a list of species (Annex C) which are given special treatment by the EC, with controls extending beyond the present CITES listing. With respect to plants, Annex C lists 106 species of European orchid (see Annex 2 of this report) and four species of *Cyclamen* (not considered in this report), all of which are effectively treated as if they were on Appendix I of CITES.

Although CITES is theoretically enforced at EC level each member state still enacts the convention according to its own domestic legislation; this leads to a considerable amount of inconsistency in the way that CITES is enforced throughout the EC. The application of CITES in the EC is discussed in detail in a report prepared by the World Conservation Monitoring Centre and IUCN Environmental Law Centre (1988) and it is not proposed to duplicate this here. However, an overview of the enforcement of CITES legislation, and control of plant trade in each country is given below.

Denmark

Denmark operates the most comprehensive nursery inspection system in Europe. The Plant Health Inspectorate, which is responsible for the inspection system, controls CITES plants. Trade in plants is controlled at import, at the nursery and at export. Since 1980 900 greenhouse nurseries have been visited each year by the plant health inspectorate, who visit each nursery between one and forty times each year without announcing their visits. Nurseries are divided into two categories:

1. 'Supermarket' nurseries, which comprise all bar one of the nurseries visited. These produce pot-plants for the domestic market and for export. Export of CITES-listed species (mainly cacti) is carried out using the phytosanitary certificate, with no separate CITES certificate required.

2. Specialist nurseries. One Danish nursery deals in orchids and has imported wild-collected plants. It specialises in breeding *Paphiopedilum*. Mother plants in the nursery are all registered and all reductions in stock must be accounted for. The number of artificially-propagated plants produced by the nursery is also recorded. Exports are all carried out using CITES export permits or certificates.

This system operates effectively because nurseries are inspected frequently for phytosanitary purposes, and because only one nursery deals to any extent with wild-collected CITES-listed plant species.

Italy

The Ministero Agricoltura e Foreste acts as the CITES Management Authority in Italy. Until recently control of plant imports received scant attention. However, the situation has improved considerably in the past few years, particularly for succulents, with the appointment in 1991 of a succulent expert as a Scientific Authority for CITES. In 1990 and 1991 there have been seizures of Appendix I cacti and cycads at nurseries in Italy. Nursery inspections are not frequent but are generally of good quality, with the Management Authority ensuring that an independent expert is present to determine whether plants have been wild-collected or are artificially-propagated.

Major problems with the enforcement of CITES for plants are the large number of ports of entry for plants in Italy, coupled with a shortage of qualified

personel to control import, and the absence of any legislation setting penalties for the infraction of CITES. This last means that unless an importer can be found to have violated some other law, the only measure open to the authorities is confiscation of the plants.

Italy and the Benelux countries have recently signed an agreement that phytosanitary certificates are no longer required for live plants being transported between them. This implies that artificially-propagated Appendix II plants can be moved between these countries with effectively no controls at all. As Italy is known to import plants, including wild-collected Appendix I species, from a variety of sources, notably across the border from Austria, by sea to Naples and by air, then this could be potentially an important route for the import of plants into the rest of Europe.

France

The Management Authority for CITES is part of the Direction de la Protection de la Nature (DPN) in the Ministère de l'Environnement. The Scientific Authority has been the Secretariat de la Faune et de la Flore, Muséum national d'histoire naturelle (MNHN), although the present situation is unclear. The Scientific Authority apparently has never been asked about plants.

There are 55 ports of entry into France for material requiring CITES certificates. It is thought that species requiring documentation are often imported through smaller customs posts where customs officers are unaware or unsure of the status of the import. It is also thought that only around half of all imports of material listed on the CITES Appendices is actually furnished with certificates, the rest being imported without documentation. Customs have made some attempt to control CITES-listed material, with the Laboratoire de Phanerogamie of the MNHM having been consulted three to five times over the past three years to give advice to customs officers regarding the importation of plants from the Netherlands and Madagascar.

Until 1991, however, there had been no cases of enforcement of legislation concerning plant imports into France, although there had been problems over a major importation of cycads in 1989 (q.v.). In 1991 as a result of surveys carried out for this report, a consignment of wild-collected orchids without certificiates was confiscated from a French nursery.

Netherlands

The Netherlands is the world's largest exporter of horticultural produce, including very large numbers of artificially-propagated CITES-listed plants. The groups concerned are: *Alocasia* hybrids, *Aloe* species on Appendix II, *Araucaria araucana*, cactus species on Appendix II, *Ceropegia woodii*, *Chrysalidocarpus lutescens*, *Cycas revoluta*, *Cyclamen persicum* succulent *Euphorbia* species on Appendix II, orchid species on Appendix II and *Pachypodium lameri*. To facilitate export, licensing procedures for export of these plants have been streamlined as much as possible, and, for Appendix II species, are the responsibility of the Plant Health Service. A phytosanitary certificate with a special declaration on propagation stating "artificially-propagated as defined by CITES" is regarded as adequate to comply with the convention. In view of the enormous volume of export trade, and the dynamic nature of that trade, effective controls on export of plants from the Netherlands are minimal. This applies particularly to exports to the other Benelux countries and to Italy, as no phytosanitary certificate is now required for such exports, meaning that there is no control at all for trade in artificially-propagated CITES Appendix II species.

The emphasis on implementing CITES for plants is therefore placed heavily on imports. Responsibility for this implementation effectively rests with three agencies: the Directorate of Nature, Forest, Landscape and Fauna of the Ministry of Agriculture, Nature Management and Fisheries which acts as the principal CITES management authority, the General Inspection Agency (Algemene Inspectiedienst or AID) of the same ministry, and Customs.

For imports, as with exports, trade in artificially-propagated plants in the groups listed above has been streamlined as much as possible. For CITES Appendix II species, the importer may fill in an import certificate himeslf, but must have a CITES export certificate from the exporting country. For other plants, and for wild-collected stock, the certificate must be issued by the CITES management authority and is only done so on production of an export certificate from the exporting country. Customs officers check the documents on import of the plants, and make sample checks of the consignments.

It is generally accepted that enforcement of CITES regulations has improved considerably in recent years, but that considerable amounts of illegal trade still occur. A major problem in effective enforcement of the regulations is the absence of any powers of seizure of plants once they are beyond customs control. Once plants have entered the Netherlands, they can be freely displayed and sold without hindrance. Their re-export theoretically requires proof that they have been legally obtained, by the submission either of a copy of the import permit or of an EC-certificate for intra-community trade in CITES specimens. However, as discussed above, controls on private individuals moving plants around the continental EC are effectively non-existent.

Greece

Greece is not a Party to CITES, but implements the provisions of the Convention through the EC CITES Regulation. According to the Hellenic Society for the Protection of Nature, there is no commercial trade in exotic wild-collected orchids or cacti. No permits have been issued for such imports and nurseries reportedly sell only cultivated specimens.

Germany

Germany has the most comprehensive legislation dealing with CITES of all EC countries. Most notable, perhaps, is that proof of legal possession of Appendix I species may be demanded by the authorities, although exception may be made in the case of personal effects; in contrast to the Netherlands, therefore, wild-collected Appendix I plants in commercial nurseries may be seized, and heavy fines imposed, if such proof is not forthcoming.

Germany operates on the federal system, and some responsibility for the control of trade in CITES-listed species rests with individual Lander authorities. However, import and export of Appendix I and EC Annex C1 species is under the control of the Federal authorities, as is the export of Appendix II and III species. The Scientific Authority works in close cooperation with the Management Authority and has a full-time botanist employed at present; this has undoubtedly served to improve the enforcement of CITES with respect to plants in Germany.

Import of Appendix II species does not require the issuing of a CITES permit by the Management Authority; an import certificate signed by customs serves as the permit. For exports, an export permit or re-export certificate issued by the Federal Management Authority is required.

In Germany if a multiple shipment is subdivided and transported or sold, a separate certificate is required for each transaction; thus, for example, every specimen of an imported Appendix II orchid which is sold should theoretically have its own certificate issued. Issuing of these is the responsibility of the individual Länder authorities who vary considerably in the way they carry this out; the Länder are also responsible for the issuing of certificates for artificially-propapagated plants, except for Appendix I species. As there is often a lack of technical expertise within the Länder, particularly those in the old East Germany, there is the strong possibility of evasion of controls.

United Kingdom

The principal Management Authority in the United Kingdom is the Department of the Environment (DoE). The Royal Botanic Gardens at Kew serve as the Scientific Authority for plants, and may recommend to the DoE that import

licences be refused; they may require an inspection of plant permits on or afte arrival in the U.K.. Import licences for Appendix II species do not necessarily have to be obtained in advance; instead, customs may issue an import permit on production of a valid export permit from the exporting country. In addition, individuals may import CITES controlled plants as personal effects without an import licence. Export permits have to be obtained in advance, although some nurseries have an informal arrangement whereby they are allowed to use bulk export permits for artificially-propagated Appendix I and II plants. Nurseries may also be granted exemptions to sell artificially-propagated Appendix I species within the U.K.

Belgium

The Plant Protection Service within the Ministry of Agriculture acts as the Management Authority with respect to plants in Belgium. As with most European countries, control of export of artificially-propagated Appendix II plants is effectively a formality, with routinely-issued phytosanitary certificates serving as export documents. The Benelux countries and Italy now form a Phytosanitary Unit, with no controls at all on plant trade between the four countries. Theoretically, however, within the Benelux countries at least, there is an exemption for wild Appendix I/Annex C1 specimens which may not be traded or exhibited for commercial purposes. This survey has demonstrated that this is regularly flouted, at least in Belgium and the Netherlands.

8. OVERALL PATTERNS OF TRADE

To a large extent the contiguous mainland European members of the EC already act *de facto* as a single market. The number of nurseries supplying a wide range of specialist plants to the dedicated collector in Europe is relatively small, and many of them have an international reputation; collectors travel across Europe to visit these nurseries, or visit specialist fairs where these firms congregate. Customs controls, at least for private cars, passing across country borders between EC states are negligible. Virtually all nurserymen when inteviewed stated that there was no problem in private purchasers moving CITES-listed plants from one country to another, and that generally they did not bother to obtain CITES permits for this purpose. The movement of plants across borders into and out of the EC could potentially be more problematic, as there was the possibility of customs control. However, it has been widely reported that Austria serves as an important entry point into the EC for wild-collected plants, including CITES Appendix I species (notably cacti); these are apparently imported into Italy with relative ease and a proportion are likely to make their way to other EC countries, particularly Germany.

The United Kingdom serves as a notable exception to this and several traders commented that they did little formal business with the U.K. as the paperwork was too time-consuming and permits were difficult to obtain. However, collectng interest in most of the plant groups discussed in this report is strong in the U.K., and many collectors from the U.K. regularly travel to Europe, particularly to Belgium, the Netherlands and Germany, to buy plants.

More formal movement of CITES-listed plants in Europe can be more problematic. Most nurseries which sell plants by mail-order make additional charges for obtaining CITES-certificates; several nurseries, particularly in the U.K., will not undertake exports of CITES-listed plants, and others will only do so for large orders, maintaining that the paperwork necessary for small orders makes this unecnomical. Other nurseries will routinely export CITES Appendix II and non-CITES species, but will not undertake export of any CITES Appendix I species, even if artificially-propagated, for the same reason.

One major wholesale supplier of cacti and other succulents, who relies almost entirely on export, stated that he was no longer prepared to undertake the commercial propagation of any CITES Appendix I species for supply to the European market. Clearly under some circumstances, listing on Appendix I of CITES acts as a disincentive to commercial artificial propagation; it should be noted, however, that in most cases commercially desirable Appendix I plants are freely and widely available as artificially-propagated specimens.

Many growers who deal in artificially-propagated plants are in favour of a complete ban on the sale of wild-collected plants; they feel that there is no justification for the sale of such plants, and that, in many cases, they actually undermine their own efforts to sell artificially-propagated stock as collected plants can often be sold at a cheaper price. However, it is also strongly felt that there should be provision made for the controlled importation under licence of small numbers of wild-collected plants to act as parent stock.

9. CONCLUSIONS AND RECOMMENDATIONS

The survey has demonstrated conclusively that trade in wild-collected plants still persists within Europe. This trade can be divided into three major, though overalapping, categories.

1. Mass importation for the general or 'supermarket' trade. This concerns *Dionaea muscipula* (the Venus Fly-trap), *Tillandsia* spp. ('airplants') and several geophytes (notably *Trillium, Galanthus* and *Cyclamen* spp.) not considered in this report. Import of wild-collected plants of these groups runs into at least the hundreds of thousands, and often millions, each year. Artificially propagated plants of all these groups are available, but evidence indicates at present that wild-collected plants predominate in trade.

2. Importation of prestige 'specimen' plants for the non-specialist trade. This may involve large, wild-collected plants of species which are also widely available as artificially-propagated plants, such as *Cycas revoluta* (although these are from naturalized rather than native wild populations), *Encephalartos* spp., *Nolina recurvata, Yucca rostrata, Carnegiea gigantea, Ferocactus* spp. as well as a number of species which become temporarily fashionable, notably many caudiciforms (e.g. species of *Raphionacme, Cyphostemma, Kedrostis, Dioscorea, Pachypodium* and *Euphorbia*) which are represented by a high proportion of wild-collected plants. Import of some of these may reach tens of thousands a year, but is generally much lower.

3. Importation of plants for the specialist collector. This trade involves a large, indeed unquantifiable, number of species. At present, orchids are undoubtedly the single most important group, both in terms of number of species and number of plants involved, followed by non-cactus succulents, especially caudiciforms, and finally cacti. Plants in this group range from those with widespread appeal amongst hobbyists (e.g. *Ariocarpus* spp. amongst cacti, *Paphiopedilum* spp. amongst orchids) to plants which appeal to very small groups of collectors (e.g. *Pediocactus* amongst cacit, many pleurothalline orchids). Most of thes species concerned will be involved in trade as wild-collected plants in very low numbers (although these numbers may have signficant impact on wild populations of rare species).

Most of the trade concerns plant species which are either not listed on CITES or which are included on CITES Appendix II, and for which trade is theoretically legal under CITES, although there is very little evidence that in any case has Article IV of the convention been followed (that is that trade in wild-collected specimens can be shown not to be detrimental to the survival of the species concerned). However, a significant proportion of the trade, notably in orchids, is likely to originate in countries which have banned export of wild-collected specimens for commercial purposes under their own national legislation. Much of this trade will have been routed through countries which either do not have or do not apply such legislation (until mid-1991 most notably Thailand), or will have been misdeclared as artificially-propagated in the country of origin (e.g. exports from Madagascar in the early 1980s, or of orchids from Brazil up to 1990). For cacti, however, the evidence indicates that a significant proportion of trade in wild-collected plants concerns CITES Appendix I species, notably many of those endemic to Mexico.

In most sectors of the market there is a continuing, perceptible move away from wild-collected plants towards artificially-propagated stock. Reasons for this are variable, but are basically some combination of economic, ethical (an increased awareness of conservation issues), and legal (more effective enforcement of legislation, or introduction of new legislation in both importing and exporting countries). The rate, and effectiveness, of this change varies from country to country, and from specialists in one group of plants to another. Geographically, demand for wild-collected plants persists most strongly in Germany and Italy, although there is evidence that attitudes are improving in both these countries.

The change to artificial propagation has been most marked recently amongst orchid-growers, with the majority of traders considering that large-scale import of habitat plants was about to cease, and more and more of them turning to artificial propagation of their stock. This change appears to have mostly taken place over the past two or three years. Amongst cactus growers the change appears to have occurred more gradually over the past ten years or so, and is still continuing, with most traders dealing in far fewer, if any, habitat plants now than four or five years ago. The state of the market for non-cactus succulents, particularly caudiciforms, is unclear at present, but gives some cause for concern, as substantial numbers of habitat plants are still traded.

In the bulk trade, *Tillandsia* remains controversial. It is widely reported that the mass market has slumped considerably in the past two or three years, and that demand is now increasingly for smaller quantities of higher quality plants. This should favour artificial propagation, although it seems that this is still not economically viable, at least when carried out in Europe. With *Dionaea*, control of the trade in wild-collected plants will be dependent on legislation in the country of origin, as economic factors continue to make it favourable to import wild plants.

RECOMMENDATIONS

1. Legislation controlling trade in plants, and in particular that enacting CITES, should be harmonised as far as possible in EC countries. At present inadequate legislation in several countries seriously hampers enforcement of CITES regulations (e.g. the inability to seize plants, including CITES Appendix-I species, in the Netherlands, the absence of any enabling legislation in Spain).

2. Further training should be given to customs officers and staff of other enforcement agencies in the identification of plant species included on the CITES Appendices and in distinguishing wild-collected from artificially-propagated plants. The development of intelligence-based monitoring should be encouraged (e.g. increased surveillance before important shows, use of information gathered in plant exporting countries).

3. A system of nursery registration or licensing should be introduced for nurseries dealing in CITES-listed plants. Processing of CITES documents, for CITES Appendix II species and for artificially-propagated CITES Appendix I species, should be facilitated as much as possible for such nurseries. Such nurseries should be subject to spot-checks and have their licences revoked if found to be dealing in illegal imports.

4. Plant health controls should be harmonized throughout the EC. The relationship these have with CITES controls should be carefully examined.

5. The possibility of limiting the number of ports of entry for plants should be examined. It is recognized that it may be difficult or undesirable in practice to limit in this way the large number of individuals who only import relatively small numbers of plants. This may be avoided by stipulating that control on ports of entry only applies to shipments over a certain size.

6. Further information is required on the wild status of most species in trade to determine whether present levels of trade pose a threat to the survival of the species in the wild or not.

7. A comprehensive review of the listing of species on the CITES Appendices should be encouraged. Consideration should be given to the de-listing of taxa not known to be in trade (e.g. *Didiciea cunninghamii, Nopalxochia macdougallii, Byblis* spp.), and to the down-listing of some species mass-produced in cultivation (*Leuchtenbergia principis, Mammillaria plumosa*). Conversely, several species or genera

known to be traded largely as wild plants (*Adenium, Raphionacme*) should be considered for inclusion in CITES Appendix II.

8. Links between botanical gardens and the horticultural trade should be encouraged. The former can serve as sources of stock for new species in trade and help alleviate pressure on wild populations.

9. Information should be disseminated informing the plant-buying public of the origin of plants in trade and of the regulations controlling import and sale of wild-collected plants. Such material should be standardized throughout the EC.

10. Specialist societies should be encouraged to develop codes of conduct regarding the collection and purchase of wild-collected plants. They should be discouraged from giving awards and prizes to wild-collected plants, particularly of species listed in Appendix I and should enforce codes of conduct regarding the exhibition and sale of wild-collected plants at shows and meetings.

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ANNEX 1

PLANT SPECIES LISTED IN CITES APPENDICES I AND II AS OF 11 JUNE 1992

	I	II
AGAVACEAE	*Agave arizonica* *Agave parviflora* *Nolina interrata*	*Agave victoriae-reginae* #1
AMARYLLIDACEAE		*Galanthus* spp. #1 *Sternbergia* spp. #1
APOCYNACEAE	*Pachypodium baronii* *Pachypodium brevicaule* *Pachypodium decaryi* *Pachypodium namaquanum*	*Pachypodium* spp.* #1 *Rauvolfia serpentina* #2
ARACEAE		*Alocasia sanderiana* #1
ARALIACEAE		*Panax quinquefolius* #3
ARAUCARIACEAE	*Araucaria araucana* ** +217	*Araucaria araucana** -113 #1
ASCLEPIADACEAE		*Ceropegia* spp. #1 *Frerea indica* #1
BERBERIDACEAE		*Podophyllum hexandrum* = 376 #2
BROMELIACEAE		¶*Tillandsia harrisii* #1 ¶*Tillandsia kammii* #1 ¶*Tillandsia kautskyi* #1 ¶*Tillandsia mauryana* #1 ¶*Tillandsia sprengeliana* #1 ¶*Tillandsia sucrei* #1 ¶*Tillandsia xerographica* #1
BYBLIDACEAE		*Byblis* spp. #1
CACTACEAE	§*Ariocarpus* spp. *Astrophytum asterias* =377 *Aztekium ritteri* *Coryphantha minima* =378 *Coryphantha sneedii* =378 *Coryphantha werdermannii* ¶*Discocactus* spp. *Disocactus macdougallii* =379 *Echinocereus ferreirianus* var. *lindsayi* =380 *Echinocereus schmollii* =381 *Leuchtenbergia principis* *Mammillaria pectinifera* =382 *Mammillaria plumosa* *Mammillaria solisioides* ¶*Melocactus conoideus* ¶*Melocactus deinacanthus* ¶*Melocactus glaucescens* ¶*Melocactus paucispinus* *Obregonia denegrii* *Pachycereus militaris* = 383 *Pediocactus bradyi* =384 *Pediocactus despainii* *Pediocactus knowltoni* =384 *Pediocactus papyracanthus* = 385 *Pediocactus paradinei* *Pediocactus peeblesianus* =384	CACTACEAE spp. *#4

	Pediocactus sileri *Pediocactus winkleri* *Pelecyphora* spp. *Sclerocactus brevihamaticus* =386 *Sclerocactus glaucus* *Sclerocactus erectocentrus* =387 *Sclerocactus mariposensis* =387 *Sclerocactus mesae-verdae* *Sclerocactus pubispinus* *Sclerocactus wrightiae* *Strombocactus disciformis* §*Turbinicarpus* spp. =388 ¶*Uebelmannia* spp.	
CARYOCARACEAE		*Caryocar costaricense* #1
CEPHALOTACEAE		*Cephalotus follicularis* #1
COMPOSITAE (ASTERACEAE)	*Saussurea costus* =389	
CRASSULACEAE	*Dudleya stolonifera* *Dudleya traskiae*	
CUPRESSACEAE	*Fitzroya cupressoides* *Pilgerodendron uviferum*	
CYATHEACEAE		CYATHEACEAE spp. #1
CYCADACEAE	*Cycas beddomei*	CYCADACEAE spp. " #1
DIAPENSIACEAE		*Shortia galacifolia* #1
DICKSONIACEAE		DICKONSIACEAE spp. #1
DIDIEREACEAE		DIDIEREACEAE spp. #1
DIOSCOREACEAE		*Dioscorea deltoidea* #1
DROSERACEAE		¶*Dionaea muscipula* #1
ERICACEAE		*Kalmia cuneata* #1
EUPHORBIACEAE	*Euphorbia ambovombensis* *Euphorbia cylindrifolia* *Euphorbia decaryi* *Euphorbia francoisii* *Euphorbia moratii* *Euphorbia parvicyathophora* *Euphorbia primulifolia* *Euphorbia quartziticola* *Euphorbia tulearensis*	*Euphorbia* spp. -114 #1
FOUQUIERIACEAE	*Fouquieria fasciculata* *Fouquieria purpusii*	*Fouquieria columnaris* #1
JUGLANDACEAE		*Oreomunnea pterocarpa* =390 #1
LEGUMINOSAE (FABACEAE)	¶*Dalbergia nigra*	¶*Pericopsis elata* #5 *Platymiscium pleiostachyum* #1
LILIACEAE	*Aloe albida* *Aloe pillansii* *Aloe polyphyila* *Aloe thorncroftii* *Aloe vossii*	*Aloe* spp. " #6

MELIACEAE		¶*Swietenia humilis* #1 ¶*Swietenia mahagoni* #5
NEPENTHACEAE	*Nepenthes khasiana* *Nepenthes rajah*	*Nepenthes* spp. * #1
ORCHIDACEAE	*Cattleya skinneri* *Cattleya trianae* *Didiciea cunninghamii* *Laelia jongheana* *Laelia lobata* *Lycaste skinneri* var. *alba* =392 *Paphiopedilum* spp. *Peristeria elata* *Phragmipedium* spp. *Renanthera imschootiana* *Vanda coerulea*	ORCHIDACEAE spp. * =391 #7
PALMAE (ARECACEAE)		*Chrysalidocarpus decipiens* #1 *Neodypsis decaryi* #1
PINACEAE	*Abies guatemalensis*	
PODOCARPACEAE	*Podocarpus parlatorei*	
PORTULACACEAE		*Anacampseros* spp. #1 *Lewisia cotyledon* #1 *Lewisia maguirei* #1 *Lewisia serrata* #1 *Lewisia tweedyi* #1
PRIMULACEAE		*Cyclamen* spp. #1
PROTEACEAE	*Orothamnus zeyheri* *Protea odorata*	
RUBIACEAE	*Balmea stormiae*	
SARRACENIACEAE	*Sarracenia alabamensis alabamensis* =393 *Sarracenia jonesii* =394 *Sarracenia oreophila*	*Darlingtonia californica*#1 *Sarracenia* spp. * #1
STANGERIACEAE	*Stangeria eriopus* =395	
THEACEAE		*Camellia chrysantha* #1
WELWITSCHIACEAE		*Welwitschia mirabilis* =395 #1
ZAMIACEAE	*Ceratozamia* spp. *Chigua* spp. *Encephalartos* spp. *Microcycas calacoma*	ZAMIACEAE spp. * #1
ZINGIBERACEAE		*Hedychium phillippinense* #1
ZYGOPHYLLACEAE		¶*Guaiacum officinale* #1 *Guaiacum sanctum* #1

NOTES

+217 Population of Chile

-114 All species that are not succulent

=376 Also referenced as *Podophyllum emodi*
=377 Also referenced in genus *Echinocactus*
=378 Also referenced in genus *Escobaria*
=379 Also referenced as *Lobeira macdougallii* or as *Nopalxochia macdougallii*
=380 Also referenced as *Echinocereus lindsayi*
=381 Also referenced as *Wilcoxia schmollii*
=382 Also referenced as *Solisia pectinata*
=383 Also referenced as *Backebergia militaris*
=384 Also referenced in genus *Toumeya*
=385 Also referenced in genus *Toumeya* or in genus *Sclerocactus*
=386 Also referenced as *Ancistrocactus tobuschii*
=387 Also referenced in genus *Neolloydia* or in genus *Echinomastus*
=388 Also referenced in genus *Neolloydia*
=389 Also referenced as *Saussurea lappa*
=390 Also referenced as *Engelhardia pterocarpa*
=391 Includes families Apostasiaceae and Cypripediaceae as subfamilies Apostasiodeae and Cypripedioideae
=392 Also referenced as *Lycaste virginalis* var. *alba*
=393 Also referenced as *Sarracenia rubra alabamensis*
=394 Also referenced as *Sarracenia rubra jonesii*
=395 Includes synonym *Stangeria paradoxa*
=396 Includes synonym *Welwitschia bainesii*

In accordance with Article 1, paragraph b, sub-paragraph (iii), of the Convention, the symbol (#) followed by a number placed against the name of a species or higher taxon included in Appendix II designates parts or derivatives which are specified in relation thereto for the purposes of the Convention as follows:

#1 Designates all parts and derivatives, except:
a) seeds, spores and pollen (including pollinia); and
b) tissue cultures and flasked seedling cultures

#2 Designates all parts and derivatives, except:
a) seeds and pollen;
b) tissue cultures and flasked seedling cultures; and
c) chemical derivatives

#3 Designates roots and readily recognisable parts thereof

#4 Designates all parts and derivatives, except:
a) seeds and pollen;
b) tissue culture and flasked seedling cultures;
c) fruits and parts and derivatives thereof of naturalized or artificially propagated plants; and
d) separate stem joints (pads) and parts and derivatives thereof of naturalized or artificially propagated plants of the genus *Opuntia* subgenus *Opuntia*

#5 Designates saw-logs, sawn wood and veneers

#6 Designates all parts and derivatives, except:
a) seeds and pollen;
b) tissue cultures and flasked seedling cultures; and
c) separate leaves and parts and derivatives thereof of naturalized or artificially propagated plants of the species *Aloe vera*

#7 Designates all parts and derivatives, except:
a) seeds and pollen (including pollinia);
b) tissue cultures and flasked seedling cultures;
c) cut flowers of artificially propagated plants; and
d) fruits and parts and derivatives thereof of artificially propagated plants of the genus *Vanilla*

¶ Taxa added to one of the Appendices, or transferred from Appendix II to Appendix I at the Eighth Conference of the Parties, Kyoto, 2-13th March 1992.

§ Genera amended at the Eighth Conference of the Parties, Kyoto, 2-13th March 1992 as follows:
Ariocarpus Formerly only *A. agavoides, A. scapharostrus* and *A. trigonus* were included in Appendix I. The whole genus is now included in Appendix I

Turbinicarpus Formerly only *T. laui, T. lophophoroides, T. pseudomacrochele, T. pseudopectinatus, T. schmiedickeanus* and *T. valdezianus* were included in Appendix I. The whole genus is now included in Appendix I

ANNEX 2 SPECIES OF ORCHID LISTED UNDER ANNEX C OF COMMISSION REGULATION (EEC) No 197/90, AMENDING COUNCIL REGULATION (EEC) No 3626/82

Cypripedium calceolus
Epipactis palustris
Epipactis helleborine
Epipactis leptochila
Epipactis muelleri
Epipactis dunensis
Epipactis purpurata
Epipactis phyllanthes
Epipactis atrorubens
Epipactis microphylla
Cephalanthera damasonium
Cephalanthera longifolia
Cephalanthera cucullata
Cephalanthera epipactoides
Cephalanthera rubra
Limodorum abortivum
Epipogium aphyllum
Neottia nidus-avis
Listera ovata
Listera cordata
Spiranthes spiralis
Spiranthes aestivalis
Spiranthes romanzoffiana
Goodyera repens
Gennaria diphylla
Herminium monorchis
Neottianthe cucullata
Platanthera bifolia
Platanthera chlorantha
Chamorchis alpina
Gymnadenia conopsea
Gymnadenia odoratissima
Pseudorchis albida
Pseudorchis frivaldii
Nigritella nigra
Coeloglossum viride
Dactylorhiza iberica
Dactylorhiza latifolia
Dactylorhiza romana
Dactylorhiza incarnata
Dactylorhiza fistulosa
Dactylorhiza cordigera
Dactylorhiza traunsteineri
Dactylorhiza russowii
Dactylorhiza elata
Dactylorhiza maculata
Dactylorhiza saccifera
Corallorhiza trifida
Liparis loeselii
Malaxis monophyllos
Hammarbya paludosa
Neotinea maculata
Traunsteinera globosa
Orchis papilionacea
Orchis boryi
Orchis morio
Orchis longicornu
Orchis coriophora
Orchis sancta
Orchis ustulata
Orchis tridentata
Orchis lactea
Orchis italica
Orchis simia
Orchis militaris
Orchis punctulata
Orchis purpurea
Orchis collina
Orchis patens
Orchis spitzelii
Orchis mascula
Orchis pallens
Orchis provincialis
Orchis anatolica
Orchis quadripunctata
Orchis laxiflora
Aceras anthropophorum
Himantoglossum hircinum
Barlia robertiana
Anacamptis pyramidalis
Serapias cordigera
Serapias neglecta
Serapias vomoracea
Serapias lingua
Serapias parviflora
Ophrys insectifera
Ophrys vernixia
Ophrys lutea
Ophrys fusca
Ophrys pallida
Ophrys sphegodes
Ophrys spruneri
Ophrys ferrum-equinum
Ophrys bertolonii
Ophrys lunulata
Ophrys argolica
Ophrys reinholdii
Ophrys doerfleri
Ophrys umbilicata
Ophrys scolopax
Ophrys holosericea
Ophrys arachnitiformis
Ophrys tenthredinifera
Ophrys apifera
Ophrys bombyliflora