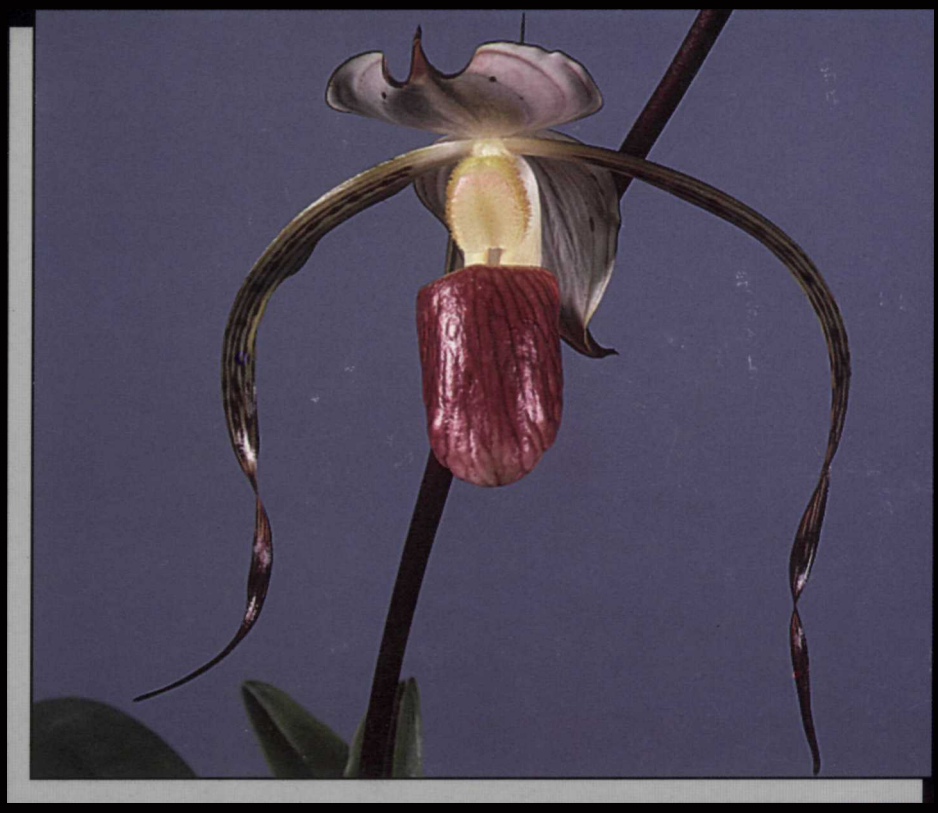
Status Survey and Conservation Action Plan

Orchids

Edited by Eric Hágsater and Vinciane Dumont

Compiled by Alec M. Pridgeon



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Chicago Zoological Society

WWF

ROYAL BOTANIC GARDENS KEW

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Foreword

The goal of this Action Plan is to document the diversity and suggest conservation strategies for orchids in general. We cannot protect all species of one of the largest plant families in the world, and this is not our intent. Our approach therefore is quite different from other Action Plans. We will not address the question of what the most endangered species are, but rather how to protect habitats with high diversity and important orchid populations. To do so, we asked experts from all over the world to contribute their knowledge and interpretations based on their particular circumstances. As a result, this Orchid Action Plan reflects very different opinions on orchid conservation strategies, making it a most useful and helpful document.

Eric Hágsater
Chair, IUCN/SSC Orchid Specialist Group
Mexico

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Eric Hágsater
Chair, IUCN/SSC Orchid Specialist Group
Mexico

Vinciane Dumont
Deputy Chair, IUCN/SSC Orchid Specialist Group
Switzerland

Executive Summary

For centuries orchids have gripped the imagination, inspiring mass-collection in the latter half of the nineteenth century and extending to certain genera such as *Paphiopedilum* in recent times. Although CITES legislation offers protection to the most endangered species by placing them on Appendix I, the remaining 20,000 or so orchid species are included in Appendix II either because they might become threatened by trade so monitoring is needed, or because they look like other orchid species listed in the Appendices. However, the greatest threat to orchid diversity is habitat loss; for orchids this can occur on a very small scale as a single tropical tree can bear hundreds of epiphytic orchid species. The scale of threat to orchid diversity then reaches frightening proportions as millions of hectares of habitat are lost annually to ranching, monocrop agriculture, mining, logging, and urban development. Even when fragments of the original habitat are left, gene flow and number of pollinators are significantly reduced. Biologists now agree that we are entering a period of extinction not experienced since the end of the Cretaceous Period. Although we have the technology to reverse most of the trends, the commitment to do so regardless of the costs involved simply is not there on a worldwide scale when the pressures caused by overpopulation command different priorities.

The Orchid Action Plan chronicles the threats to certain critical species, but more importantly to critical habitats that host extraordinarily high orchid diversity and endemicity. It explores and recommends specific ways that national and local government legislators, scientists, and orchid conservationists and growers can all help to reverse present trends. The facts and viewpoints presented in this comprehensive document update and supplement the information available to conservation organizations and agencies throughout the world so that they can lobby their appropriate government offices more effectively.

The first half of the Plan discusses 1) the unique biology of the orchid family; 2) threats posed by habitat loss and overcollecting; 3) *in situ* strategies of habitat conservation and management; 4) *ex situ* strategies of artificial propagation and seed banking; and 5) the desperate need for more research and education from the international level down to the local orchid society. The second half of the Plan details the present status of knowledge, diversity, threats, and case histories in many of those countries or regions richest in orchid species: Mexico, Costa Rica and Panama, Ecuador and neighbouring countries, the Guayana region, the United States and Canada, Caribbean Islands, Europe, North Africa, the Near East, North Asia and Japan, India, Africa, Madagascar and surrounding islands, Australia, south-east Asia, and the south-west Pacific islands.

This Action Plan advocates dual strategies to conserve orchid diversity: establishing *in situ* protection of natural habitats and promoting trade of artificially propagated plants and cut flowers. Among the specific priority actions recommended at the close of the Plan are the following:

- Preparation of global checklists of orchid species and identification of areas of high biodiversity;
- Legislation and funding to protect, research, and properly manage and monitor such areas;
- Availability of propagation material of rare and new species for commercial development, preferably in those countries where the species are native, thereby reducing demand for wild-collected plants;
- Responsible salvage of orchid plants from areas of deforestation where appropriate, followed by artificial propagation and distribution;
- Preparation of educational programmes on orchids and their role in biodiversity by orchid societies and botanical gardens for the general public;
- More active registration of *bona fide* herbaria and scientific institutions belonging to CITES party countries to enable freer movement of pressed and liquid-preserved plant materials for scientific purposes;
- Sharing of plants, seeds, and pollen among orchid growers and botanical gardens.

Alec Pridgeon, Royal Botanic Garden, Kew, UK

Résumé

Depuis toujours, les orchidées ont éveillé l'imagination, inspirant de grandes collections dês la seconde moitié du dix-neuvième siècle et perpétuant certaines espèces comme le *Paphiopedilum* jusqu'à nos jours. Alors que la réglementation de la CITES permet la protection de la plupart des espèces menacées en les plaçant en Annexe I, le reste des 20'000 espèces d'orchidées sont inscrites en Annexe II, soit parce qu'elles risquent d'être menacées par le commerce (rendant donc un contrôle nécessaire), soit parce qu'elles ressemblent à des espèces figurant dans ces annexes. Toutefois, la plus grande menace qui pèse sur la diversité des orchidées est la perte de leurs habitats. Ceci est vrai même à une très petite échelle puisqu'un seul arbre tropical peut contenir des centaines d'espèces d'orchidées épiphytes. L'impact de cette menace atteint des proportions effrayantes lorsque des millions d'hectares d'habitats disparaissent chaque année. En effet, la croissance démographique engendre le développement de l'élevage, de l'agriculture, de l'exploitation minière ou forestière et des villes. Même si quelques fragments de l'habitat original sont préservés, la diversité du patrimoine, les sources génétiques et les variétés de pollinisateurs sont sérieusement réduites. Les biologistes s'accordent actuellement pour dire que nous entrons dans une époque d'extinction, comme il n'en est plus arrivé depuis la période du Crétacé. Malgré le fait que nous maîtrisons la technologie pour inverser la plupart de ces processus, le budget nécessaire à l'échelon mondial n'est pas accordé, car les pressions causées par la surpopulation imposent d'autres priorités.

Le Plan d'Action des Orchidées répertorie certaines espèces menacées de façon critique, mais aussi ce qui est plus important, les habitats contenant des degrés de diversité et endémicité en orchidées extraordinairement élevés. Il recommande également des règles spécifiques aux représentants de gouvernements, locaux ou nationaux, aux scientifiques, et aux cultivateurs d'orchidées qui peuvent aider à renverser les tendances actuelles. Les faits et les points de vue énoncés dans ce document, accessible à tout un chacun, complètent et mettent à jour les informations disponibles pour les organisations de conservation et agences à travers le monde, de telle sorte qu' elles puissent aussi transmettre plus efficacement leurs connaissances à leur gouvernement respectif.

La première moitié du Plan détaille 1) la spécificité biologique de la famille des orchidées; 2) les menaces représentées par la perte de l'habitat et la surcollection; 3) les stratégies *in situ* de préservation et de gestion d'habitat; 4) les stratégies *ex situ* de propagation artificielle et de banque de graines; 5) le besoin urgent de recherches et d'éducation depuis le niveau national jusqu'aux sociétés d'orchidophiles.

La seconde moitié du Plan répertorie l'état des connaissances actuelles, de la diversité, des menaces, et les cas historiques de pays ou régions riches en espèces d'orchidées tels que: le Mexique, le Costa Rica et Panama, l'Equateur et les pays voisins, le bassin de l'Amazone et la Guyane, les Etats-Unis et le Canada, les Caraïbes, 1' Europe, l'Afrique du Nord, le Proche-Orient, le nord de l'Asie et le Japon, l'Inde, l'Afrique de l'ouest et de l'est, Madagascar et les îles environnantes, l'Australie, le sud de l'Asie et les îles du sud-ouest Pacifique.

Le Plan d'Action présente la dualité de la stratégie pour conserver la diversité des orchidées: 1) en préconisant la préservation des habitats naturels, 2) en promouvant la propagation artificielle et le commerce des plantes cultivées et des fleurs coupées. Les actions spécifiques prioritaires recommandées dans le Plan sont les suivantes:

- Préparation de listes d'inventaire des espèces d'orchidées et identification des régions à haute biodiversité;
- Réglementation et récolte de fonds pour la protection, la recherche et la gestion saine de tels espaces;
- Mise à disposition d'espèces rares ou nouvelles, pour la reproduction à but commercial, en favorisant les pays d'où ces espèces sont originaires, réduisant ainsi la demande de récoltes sauvages;
- Si approprié sauvetage efficace de plantes d'orchidées des aires de déforestation, puis propagation artificielle et distribution;
- Préparation de programmes d'éducation sur les orchidées et leur rôle dans la biodiversité par des sociétés orchidophiles et des jardins botaniques à l'intention du grand public;
- Enregistrement plus actif des herbiers et des institutions scientifiques de confiance des pays signataires de la CITES, afin de faciliter l'échange, à des fins scientifiques, de plantes conservées sous forme séchées ou dans du liquide;
- Partage de plantes, graines et pollens entre les cultivateurs d'orchidées et les jardins botaniques.

Trad. Madame Anne Taub, and Vinciane Dumont
Société Suisse d'orchidophilie, Switzerland

5.7 Europe, North Africa, and the Near East

This region of about 17,820,000 km^2 includes 54 countries and corresponds approximately to the Western Palearctic; it is bounded on the north by the Arctic Ocean, on the west by the Atlantic (Canary Islands, Madeira, Azores, Faeroes, and Iceland are included), on the south by the Sahara and the Arabian Desert, on the east by the Urals, the Caspian Sea, and the Iranian deserts. The vegetation of this area is extremely diverse. Five major floristic regions can be distinguished: Mediterranean, sub-Mediterranean, temperate, boreal, and arctic, which can be subdivided into Alpine, Atlantic, Caucasian, Macaronesian, and Pontic zones.

Major habitats for orchids in the area are evergreen sclerophyllous bush and scrub (e.g. 'garigue', 'matorral', 'phrygana')- These are dominant in the meridional and submeridional regions, dry calcareous grassland, wet grassland, bogs and marshes of the lowlands, hills and mountains of the temperate and boreal regions and of the Alpine zones (up to 3000 m above sea level), neutrophilous and calciphilous forests and woodlands of native coniferous or deciduous trees, particularly Mediterranean and supra-Mediterranean Scots pine, black pine and aleppo pine forests as well as beech forests dominated by *Fagus sylvatica* L. in medio-European, Atlantic, and mountains of the sub-Mediterranean zones. For a catalogue of recognisable communities formed by the Palearctic flora, see Devillers and Devillers-Terschuren (1994).

5.7.1 Present status of knowledge

Since ancient times, European orchids have captured the attention of scientists. Between 1753 and 1771, Linnaeus published 58 orchid names relating to taxa from the region (Baumann *et al.* 1989). Since that time, several comprehensive works have been devoted to relevant monographs and Floras (Reichenbach 1851; Camus and Camus 1921-1929; Keller *et al.* 1930-1940; Landwehr 1977). Some genera have been monographed: *Dactylorhiza* (Nelson 1976; Averyanov 1988), and *Ophrys* and *Serapias* by Nelson (1962, 1968) and Baumann and Künkele (1986, 1989).

Over the last 25 years the subject has been researched extensively, principally owing to associations of amateur botanists specifically interested in European orchids, who organise symposiums and publish journals. Numerous papers and some monographs devoted to a province or a country are now published every year, and catalogues are regularly produced (Willing and Willing 1977, 1985). Various field guides intended for an enthusiastic public have been published recently (Williams *et al.* 1978; Baumann and Künkele 1982, 1988a,b; Delforge and Tyteca 1984; Buttler 1986, 1991; Mossberg and Nilsson 1987; Davies *et al.* 1988) as well as numerous distribution maps drawn up for islands, provinces, or whole countries; an ambitious cartography of orchids in the Mediterranean basin, prepared by numerous contributors, has not yet been published (Baumann and Künkele 1980).

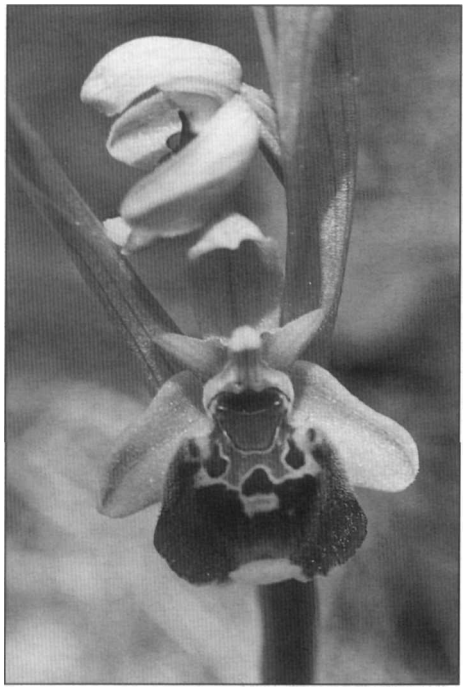
However, these recent investigations have led to the description of many new taxa, resulting in discrepancies in taxonomy and nomenclature as well as, paradoxically, confusion concerning the distribution and population dynamics of many species. In the case of the Mediterranean genus *Ophrys*, for example, it is only recently that mechanisms of pollinator attraction by sexual deception have been explained (Kullenberg 1961). Studies of specific bee pollinators (e.g. Paulus and Gack 1986, 1990a,b, 1992a,b) have shown that this genus comprises many taxa, sometimes cryptic, isolated by efficient pregamic mechanisms, so that what was regarded some time ago as one widespread species now turns out to be in fact a group of connected species, each existing in a limited area. *Ophrys arachnitiformis* Gren. & Philippe (Devillers-Terschuren and Devillers 1988), *O. bertolonii* Moretti (Delforge 1990), and *O. fusca* Link (Paulus 1988; Delforge 1994) are cases in point. As a result, the number of *Ophrys* species has quadrupled in 25 years. Several investigations have led to similar conclusions for *Dactylorhiza* and *Serapias*, *Nigritella*, and *Epipactis*. These taxonomic developments have been integrated in a new field guide (Delforge 1994). Such developments make the evaluation of the status of the rarer species of European orchids quite difficult, though an updated attempt at appraising their vulnerability has been made for the European Union by Devillers (1986). Therefore, the information conveyed in this paper should be considered as work in progress.

5.7.2 Diversity

The tribe Orchideae comprises the bulk of the European orchid flora in number of species and endemics (Table 5.7.1). The genus *Ophrys*, with more than 140 species, and the genus *Orchis*, with 55 species, include between them more than half of the species of the region.

The Mediterranean zone is by far the most species-rich. *Barlia*, *Ophrys*, *Serapias*, and *Limodorum* may be regarded as Mediterranean endemics. Most of the Orchideae and Epidendroideae are found primarily in the temperate region; the genera *Chamorchis* and *Nigritella* are Boreo-Alpine endemics.

The main centre of endemism seems to be in the eastern Mediterranean region, in the Aegean basin, with important secondary centres in the Alpine zones, Sicily, the Balkan peninsula, and the Caucasus. In fact, each



Max Thommen

Ophrys holoserica

large island, archipelago, and big massif possesses endemic orchids, but a comprehensive study delimiting the areas of endemism is still lacking.

5.7.3 Threats

Unfortunately, for historical reasons a large part of the European region must be regarded as an area at risk. Prehistoric humans followed the northward movement of the glaciers after the end of the last glaciation (10,000 B.C.) and contributed to the diversification of habitats by slow but omnipresent agro-pastoral activities, which resulted in semi-natural biotopes favourable to orchids. The dispersal and growth of may species depend on human activities, e.g. clearing for pastures, grazing of livestock on waste land and forests, and mowing of meadows.

In the course of two centuries, population growth, industrialisation, and urbanisation have strongly increased human domination over the landscape. The agricultural revolution altered the environment so quickly that the capacity of orchid species to adapt could not keep pace. At the same time, the decline in farming in some areas as well as the evolution of agricultural practices have reduced the area of the remaining semi-natural biotopes, many of them disappearing progressively, often as a consequence of spontaneous afforestation. However, this has not restored the diversity of the environment. Orchids growing in wet biotopes and thermophilous grasslands have particularly suffered (Table 5.7.2).

In north-western Europe the deterioration has begun to slow down due to appropriate legislation and to numerous initiatives with a view to creating nature reserves. The situation is more worrying in southern Europe and in the Mediterranean basin because of delayed awareness of problems of biodiversity conservation, progressive modernisation of agriculture, and especially to a widespread urbanisation of the seaboard for the sake of tourism, precisely in areas which are particularly rich in endemic species with very limited distribution. Moreover, serious damage is sometimes caused by plundering by horticulturists, both amateurs and professionals. In Turkey, Syria, and Lebanon, the situation is even more grim because tubers of many terrestrial orchids are used as food products (see Section 3.2.3 and case study (1) below).

All European orchids are terrestrials and need endotrophic mycorrhizae to germinate and grow. At this stage of technical development, cultivation of seedlings on asymbiotic media does not always yield satisfactory results, and *ex situ* conservation of endangered species is not often conceivable. It is thus necessary to protect habitats suitable for orchids by reinstituting traditional farming practices that have fallen into disuse or managing habitats to mimic traditional management methods; this necessity is now well understood and is finding expression in national legislation (Duvigneaud 1983; Devillers *et al.* 1990).

5.7.4 Case histories

1) *Comperia comperiana* - *Comperia comperiana* (Steven) Asch. & Graebn. was described in 1829. Its large flowers make it especially conspicuous. It is restricted to calcareous, thermophilous pinewoods, between 400 and 1800 m above sea level. It is mainly prevalent in southern Anatolia (Renz and Taubenheim 1984; Sezik 1984), although some isolated stations exist in Iraqi and Iranian Kurdistan, in Lebanon, and in four Eastern Aegean islands, where it is Endangered (IUCN 1983). Among 32 Anatolian localities published in the past, Taubenheim (1980) noticed that C. *comperiana* is now to be found virtually only in burial places; recent observations confirm this trend (Coulon 1992; Ettlinger unpubl.; Kajan *et al.* 1992; Rückbrodt *et al.* 1992). During a journey of 12,000 km in Anatolia in 1990, I did not observe more than seven plants in bloom in an old cemetery near Ibradi (Antalya) (Delforge 1994).

This catastrophic decline is principally caused by the gathering of tubers. The tubers, which are

dried and ground up for salep, were formerly used as aphrodisiacs or expectorants. Tubers are now removed from plants in flower, dried, and reduced to powder in order to prepare ice cream and stimulating milk drinks. They are harvested and converted by locals and sold to dealers and then wholesalers who market or export them. In Turkey, about 45 tons of salep are collected every year, out of which 15 tons can be exported later. It takes from 1000 to 4000 tubers to make 1 kg of salep (Sezik 1984, 1990); in Syria, the crop has been estimated at 1,500,000 orchids per annum (Arnold and Arnold 1985). The trade generates sizeable profits at each stage of the process, which makes it difficult to replace salep with a synthetic substitute.

The pressure exerted on orchids by such exploitation explains why C. *comperiana* is now virtually to be found only in some ancient cemeteries, where the harvest of tubers is viewed as baneful. This situation affects other rare terrestrial orchids as well.

2) Ophrys tardans - The case of *Ophrys tardans* O. & E. Danesch (pro. hybr.) exemplifies the emphasis that recent studies have put on species with limited distributions. Described as an occasional hybrid (Danesch and Danesch 1972), *O. tardans* is now recognised as a valid species, endemic to the area of Lecce (Apulia, Italy) (Baumann and Künkele 1988a,b; Liverani 1991; Delforge 1994). In 1970,418 specimens in bloom were counted on four sites (Danesch and Danesch 1972). In 1984, five new stations were reported, some including one hundred plants or so (Baumann and Künkele 1988a). In 1991, I was able to observe about 500 specimens in bloom, often grouped, on five sites. All sites seem to be situated in the suburbs of Lecce or a little to the south, on littoral fallow lands or grounds already completely enclosed by urbanised villages. The species is directly threatened today by illegal dumping and probably before long by the urban development of Lecce and the extension of coastal tourist facilities.

3) Goodyera ntacrophylla - *Goodyera macrophylla* Lowe is a Macaronesian relict species, an endemic of the island of Madeira and restricted to cliffs and ravines, growing in the shade of the hyper-humid evergreen acidiphilous laurel forest (laurisilvas) between 1000 m and 1400 m above sea level. Described as early as 1851, it was present in the north and north-west of the island. As it flowers very sporadically, it was not observed in bloom in recent times until 1973, at a time when the agricultural development of the island had already confined it to a few sites (Frey and Pickering 1975; Frey 1977). It is now located in only two inaccessible sites in the north of the island and in the Ribeiro Frio Botanical Garden (Rückbrodt and Rückbrodt 1990), where three specimens flowered in 1987 (Salkowski 1988), others in 1991 (Delforge 1994), and one in 1992 (Tyteca and Tyteca 1994). This species is regarded as Endangered (IUCN 1983).

Pierre Delforge, Section Orchidées d'Europe des Naturalistes Beiges, Belgium

Table 5.7.1 Subfamilies, subtribes, number of genera and species, and endemics in the European, North African, and Near Eastern orchid flora. Classification after Dressier (1981b), modified in Delforge (1994).

Taxon	Genera	Species	Endemics
Cypripedioideae	1	3	0
Neottioideae			
Limodorinae	4	48	36
Listerinae	2	3	0
Spiranthinae	1	4	1
Goodyerinae	1	2	1
Epidendroideae			
Corallorhizinae	2	2	0
Liparinae	3	3	0
Orchidoideae			
Gymnadeniinae	10	28	20
Serapiadinae	12	284	258
Total	36	377	316

Table 5.7.2 Most threatened European species and the nature of their threats. Classification after Delforge (1994). *Red Data Book* status (old categories) is indicated in square brackets.

Cypripedioideae

Cypripedium calceolus L. Populations decreasing, many populations extinct. Risk medium. Flower-pickers; collectors for horticulture. [vulnerable]

C. guttatum Sw. Populations decreasing, many populations extinct. Risk high. [endangered]

C. macranthos Sw. Populations decreasing, many populations extinct. Risk high. [endangered]

Neottioideae

Cephalanthera cucullata Renz & Taubenheim. Some populations with few plants known, restricted to three small areas. Risk high. Habitat destruction, critically low populations. [endangered]

C. kotschyana Renz & Taubenheim. About twenty populations very scattered known, with few plants. Risk high. Probably critically low populations.

Epipactis cretica Kalop. & Robatsch. Several populations with few plants, restricted to two small areas. Risk high. Habitat destruction, critically low populations.

E. danubialis Robatsch & Rydlo. Restricted to one area, poorly known. Risk medium.

E. dunensis (T. & T.A.Stephenson) Godfery. A few populations known, also taxonomically problematic. Risk medium. [rare]

E. leutei Robatsch. Single population known in a beech forest. Risk high. Forestry.

E. nordeniorum Robatsch. A few stations known in a riparian oak forest. Risk high. Agriculture.

E. renzii Robatsch. Some populations known, restricted to one small area. Risk medium.

E. troodii H. Lindb. Several populations, restricted to one area. Risk medium. [vulnerable]

E. youngiana A.J.Richards & A.F.Porter. Five populations known. Risk medium. Taxonomically problematic.

Goodyera macrophylla Lowe. Two small populations and about twenty plants in a botanic garden. Risk high. Critically low populations. [endangered]

Spiranthes romanzoffiana Cham. Several small populations known, restricted to two countries. Risk medium. Critically low populations. [rare]

Epidendroideae

Calypso bulbosa (L.) Oakes. Some populations known, scattered. Risk medium. [vulnerable]

Hammarbya paludosa (L.) Rich. Populations decreasing, many populations extinct. Risk medium. Land drainage and afforestation. [vulnerable]

Liparis loeselii (L.) Rich. Populations decreasing, many populations extinct. Risk medium. Land drainage and coastal urbanisation. [vulnerable]

Orchidoideae

Barlia metlescisiana W.P.Teschner. Some small populations known, restricted to one area. Risk high. Critically low populations.

Comperia comperiana (Steven) Asch. & Graebn. Some small populations known, very scattered. Risk high. Gathering of tubers for salep. [vulnerable]

Dactylorhiza ebudensis (Wiefelspütz) P.Delforge. Two large populations known, restricted to one area. Risk medium. Change in arable farming.

D. foliosa (Sol. ex Lowe) Soó. Some populations known, restricted to one area. Risk probably high. Collectors for horticulture. [neither rare nor threatened]

D. graeca H.Baumann. Some populations known, restricted to one area; also with taxonomic problems. Risk medium.

D. maculata (L.) Soó var. *elodes* (Griseb.) Hunt. Populations decreasing, many populations extinct; also with taxonomic problems. Risk high. Land drainage.

D.ochroleuca (Wüstnei ex Boll) Holub. Populations decreasing. Risk medium. Land drainage.

D. traunsteineri (Saut. ex Rchb.) Soó. Populations decreasing, also with taxonomic problems. Risk high. Land drainage.

H. affine (Boiss.) Schltr. Some small populations known, scattered. Risk high. Gathering of tubers for salep.

Table 5.7.2 cont.

H. formosum (Steven) K.Koch. Poorly known, not seen for many years. Probably extinct.
Neottianthe cucullata (L.) Schltr. Several populations known. Risk medium. Forestry. [rare]
Nigritella archiducis-joannis Teppner & E.Klein. Three populations with few plants known, restricted to one area. Risk medium. Critically low populations.
N. stiriaca (K.Rechinger) Teppner & E.Klein. Five populations known, restricted to one area. Risk medium. Critically low populations.
N. widderi Teppner & E.Klein. Some populations with few plants known, restricted to three small areas. Risk medium. Critically low populations.
Ophrys aegea Kalteisen & H.R.Reinhard. Some populations known, restricted to one area. Risk medium. Overgrazing, tourist development.
O. amanensis (E.Nelson ex Renz & Taubenheim) P. Delforge, Several populations known, restricted to one area. Risk probably high. Gathering of tubers for salep.
O. andria P.Delforge. Some populations known, restricted to one area. Risk medium. Overgrazing, coastal tourist development.
O. aurelia P.Delforge, J. & P.Devillers-Terschuren. Several populations known, restricted to two areas. Risk high. Coastal tourist development, urbanisation.
O. aveyronensis (J.J.Wood) P.Delforge. Some populations known, restricted to one area. Risk medium. Agriculture.
O. aymoninii (Breistr.) Buttler. Some populations known, restricted to one area. Risk medium. Agriculture.
O. balearica P.Delforge. Several populations known, restricted to one area. Risk high. Coastal tourist development.
O. basilissa Alibertis & H.R.Reinhard. Some populations known, restricted to two areas. Risk high. Overgrazing, agriculture.
O. benacensis (Reisigl) O.Danesch, E.Danesch & Ehrend. Several populations known, restricted to one area. Risk high. Inland tourist development, urbanisation.
O. carduchorum (Renz & Taubenheim) P.Delforge. Some populations known, scattered. Risk high. Gathering of tubers for salep.
O. castellana J. & P.Devillers-Terschuren. Some populations known, often small, restricted to three areas. Risk high. Land draining, agriculture.
O. cephalanica (H.Baumann & Künkele) J. & P.Devillers-Terschuren. Several small populations known, restricted to three areas. Risk high. Agriculture, tourist development.
O. chestermanii (J.J.Wood) Gölz & H.R.Reinhard. Some populations known, restricted to one area. Risk medium. Destruction of habitat.
O. dlicica H.Fleischm. & Soó. Some small populations known, restricted to one area. Risk high. Gathering of tubers for salep.
O. elegans (Renz) H.Baumann & Künkele. Some populations known, restricted to one area. Risk medium. Forestry, tourist development. [vulnerable]
O. flavicans Vis. Some populations known, restricted to one area. Actual status uncertain.
O. icariensis Hirth & Spaeth. Some populations known, restricted to one area. Risk medium. Overgrazing, coastal tourist development.
O. isaura Bornm. & H.Fleischm. Some small populations known, restricted to one area. Risk high. Gathering of tubers for salep.
O. khuzestanica (Renz & Taubenheim) P.Delforge. Some populations known, scattered. Risk high. Gathering of tubers for salep.
O. kotschyi H.Fleischm. & Soó. Several large populations known, restricted to one area. Risk medium. Tourist development, [vulnerable]
O. lacaitae Lojac. Some small populations known, very scattered. Risk probably high. Agriculture, collectors, critically low populations.
O. lesbis Gölz & H.R.Reinhard. Some populations known, restricted to one small area. Risk high. Overgrazing, tourist development.
O. lycia Renz & Taubenheim. A single large population known. Risk high. Overgrazing, gathering of tubers for salep.
O. mirabilis Geniez & Melki. Some small populations known, restricted to two areas. Risk high. Overgrazing, agriculture, critically low populations.

Table 5.7.2 cont.

O. montenegrina (H.Baumann & Künkele) J. & P.Devillers-Terschuren. Some populations known, restricted to one small area. Risk probably high.
O. pallida Raf. Some populations known, restricted to two areas. Risk medium.
O. parvimaculata (O. & E.Danesch) Paulus & Gack. Some populations known, restricted to two areas. Risk medium. Forestry.
O. saratoi E.G.Camus. Several populations known, restricted to one area. Risk high. Coastal tourist development, urbanisation.
O. schulzei Bornm. & H.Fleischm. Some populations known, scattered. Risk high. Gathering of tubers for salep.
O. sipontensis R.Lorenz & Gembardt. Some populations known, restricted to one area. Risk medium. Urbanisation, tourist development.
O. sitiaca Paulus & Alibertis. Some populations known, restricted to one area. Risk high. Overgrazing, forestry.
O. splendida Gölz & H.R.Reinhard. Several populations known, restricted to one area. Risk high. Tourist development, urbanisation.
O. tardans O. & E.Danesch. Some large populations known, restricted to one area. Risk high. Urbanisation, coastal tourist development.
Orchis brancifortii Biv. Some populations known, restricted to two areas. Risk medium.
O. israelitica H.Baumann & Dafni. Some large populations known, restricted to two areas. Risk medium.
O. ligustica Ruppert. A few populations known, restricted to one area. Risk high. Urbanisation.
O. patens Desf. Some populations known, restricted to two areas. Risk high in one area, uncertain for the moment in the other. Urbanisation.
O. prisca Hautz. Thirteen small populations known, restricted to three small areas. Risk high. Overgrazing, forestry. [vulnerable]
O. punctulata Steven ex Lindl. Some populations known, often small, scattered. Risk medium. Gathering of tubers for salep.
O. robusta (Stephenson) Gölz & H.R.Reinhard. A few populations known, restricted to three areas. Risk high. Agriculture.
O. scopulorum Summerh. Some populations known, restricted to one area. Risk medium. [endangered]
Platanthera azorica Schltr. Some populations known, rarer than *P. micrantha*. Risk medium.
P. micrantha (Hochst. ex Seub.) Schltr. Some populations known, restricted to one area. Risk medium. [vulnerable]
P. oligantha (Hochst. ex Seub.) Schltr. Some populations known. Risk medium. [vulnerable]
Serapias aphroditae P.Delforge. Some populations known, restricted to one area. Risk probably high. Overgrazing, tourist development.
S. ionica E. Nelson ex H.Baumann & Künkele. Some large populations known, restricted to three areas. Risk medium. Coastal tourism development.

5.8 North Asia and Japan

This region comprises eastern Siberia, Korean Peninsula, Japan Islands, Ryukyu Islands, and the eastern part of mainland China, roughly north of the Tropic of Cancer and east of the Qinghai-Xizang (Tibet) Plateau and Mongolia Plateau. Climatically it extends over cold, temperate, and subtropical zones. The annual precipitation ranges from 500 to 2000 mm, particularly in its subtropical zone, where many orchids, including some epiphytes, occur.

5.8.1 Present status of knowledge

The antiquity of civilisation in Eastern Asia is well known. Cultivation of orchids there has a long history, especially the cultivation of cymbidiums in China, Japan, and Korea. Since the *Flora of the U.S.S.R.* (Nevski 1935) and *Flora of Japan* (Ohwi 1978) were published, the orchid floras of eastern Siberia and Japan have become better known. Japan is rather rich in orchids, on which many important works have been published recently, such as those by Maekawa (1971) and Hashimoto (1987). Compared to Japan, the orchid flora of the Korean Peninsula is rather poor, estimated at less than 50 species. That of China is still poorly understood. The chief difficulty is that China is rich in orchids, but it has not been botanised thoroughly, particularly in its south-western parts, e.g. Sichuan, Guizhou, north-west Yunnan, and east Xizang (Tibet). T. Tang and F. T. Wang made a comprehensive study on Chinese orchids in the 1930s, visiting many European herbaria to examine the type specimens of Chinese orchids and publishing several articles after they returned to

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IUCN Communications Division
Rue Mauverney 28, CH-1196 Gland, Switzerland
Tel: ++41 22 999 00 01, Fax: ++41 22 999 00 10, E-mail: mail@hq.iucn.org

IUCN Publications Services Unit
219c Huntingdon Road, Cambridge, CB3 ODL, United Kingdom
Tel: ++44 1223-277894, Fax: ++44 1223-277175, E-mail: iucn-psu@wcmc.org.uk

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