

Published sources of information on wild plant species

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Introduction

Germplasm collectors need to be able to identify plants, to determine what their accepted names are and to understand something about where they grow, if they are to locate and recognize their target material and communicate their findings to others. This chapter's aim is to assist collectors by providing a guide to the world's taxonomic and ecological literature on vascular (especially flowering) plants. Also included are works on the identification of seeds and fruits, since this is how most germplasm is collected. A conservation theme is introduced as well. If genetic resources continue to dwindle as they are doing now, collectors of the 21st century may well find little left outside protected areas. Though this chapter deals with the printed literature, there are a box and an appendix on some relevant databases. There is more on information sources on other, in particular electronic, media in Chapters 13 and 14.

Instead of listing all the literature needed by all collectors of wild species – clearly a formidable task beyond the scope of just a single chapter of a book – a methodology is presented that should lead anyone to the relevant sources. This methodology begins with and is based on a number of 'Key works' and is supported by sections listing large-scale floristic, ecological and bibliographic works. The problem has been to reduce the literature available to a manageable but effective minimum. Thus, in general, anything pertaining to just one country or to just one group of plants has been omitted. Taxonomic works are thereby confined mainly to Floras with an international coverage (e.g. *Flora of Tropical East Africa*) although Floras of some very large countries (e.g. China) are also included. Similarly, ecological works comprise mainly those with a large national, international or even continental approach. Monographs, revisions, other national Floras and vegetation descriptions on

a smaller scale should be easy to locate via the key works or the works listed in the other sections. Throughout this chapter there is a leaning, reinforced by the unapologetic breaking of the selection criteria, towards works about botanically less well-known parts of the world, particularly the tropics.

Most of what is cited is fairly recent – 1980 or later. Time in the field is valuable and the collector needs to rely on the most up-to-date works available (Box 10.1). A new taxonomic revision, for example, may not only simplify the identification of species in a difficult group but also provide new insights into such matters as distribution, breeding system and ecology. Sometimes, however, an older work may still be the best or the only one available.

There are two unusual features of this chapter. One is the inclusion wherever possible or appropriate of the International Standard Book Number (ISBN) of the works cited. The other is a list of some international booksellers of botanical literature. Both should simplify the collector's task in acquiring literature.

Inevitably, this chapter reflects some personal bias. Just as there are some regions of the world which are reasonably well known to the author and others with which he is not so familiar, there must also be works which have been omitted but which would have been the choice of others. Nevertheless, whatever the subject of the collector's search, the hope is that this backbone of a bare minimum of publications will be as useful and relevant to the gingers (Zingiberaceae) as to the grasses (Poaceae), and to Thailand as to Togo.

Key works

The methodology begins with key works, those works considered essential to every collector and which act as 'signposts' to the rest of the relevant botanical literature.

First, however, it should not be overlooked that quicker than any search for relevant literature is the right answer from someone already well acquainted with the flora of the target collecting area. As well as pressed plant specimens, national and international herbaria also house taxonomists and other botanists. The eighth edition of *Index Herbariorum* (Holmgren *et al.*, 1990) lists the 7627 recorded staff members (and their botanical interests) of 2639 herbaria in 147 countries. There is an index to such specialists in a separate companion volume (Holmgren and Holmgren, 1992). In many cases, especially where there are major regional Floras in preparation, it is worth contacting specialists in the larger international herbaria as well as those working more locally (Chapter 14). The inclusion of the periodicals and serial works (such as Floras) published by each herbarium means that the collector can obtain updates of much of the information presented below. Full postal addresses, along (where appropriate) with telephone, fax and

Box 10.1**What to take to the field?**

Clearly, collectors cannot carry an entire library into the field. Depending on target species and areas, they should have at least a local Flora or copies of the relevant pages from a more regional one, however. Where there is a high chance of finding unrecorded species, it is also worthwhile having keys from Floras of adjacent areas. Collectors concentrating on specific taxonomic groups should take the relevant excerpts from Floras (keys, descriptions, illustrations, etc.), or the latest monograph. If one has not already been published, it is useful to develop annotated checklists of the taxa likely to be found in the target area, or simply of the target taxa.

The value of illustrated popular field guides should not be underestimated. The best of them are not only fine examples of how to condense the maximum amount of information into the minimum of space, but also confirm the dictum that 'a picture is worth a thousand words'. The pictures in even the most basic field guide can often stimulate helpful discussion on plant names, uses and localities with local people.

An ecological work, especially one identifying vegetation zones, is often more helpful in the field than simply a vegetation map.

Beyond this, it is perhaps preferable to be underburdened with literature than the opposite: burying one's head into the (not always reliable) printed word can take valuable field time away from the collector's main task – finding and gathering germplasm. The time for reading is at the planning stage.

Two examples may be instructive. During a recent seed-collecting trip in southern Madagascar aimed at 'useful' wild species in general, the only floristic literature taken to the field was the one-volume *Flore et Végétation de Madagascar* (Koechlin *et al.*, 1974), as opposed to the multivolume *Flore de Madagascar et de Comores*, and relevant extracts from White's (1983) *The Vegetation of Africa*. The sections of *Madagascar: Revue de la Conservation et des Aires Protégées* (Nicoll and Lagrand, 1989) relevant to the south of the country were also taken along. The book provides useful administrative as well as scientific information on nature reserves and other protected areas in Madagascar.

On a collecting mission for *Sesbania* spp. in Zambia, copies of the latest revision relevant to the area were taken to the field (Lewis, 1988), along with a number of different keys (e.g. to vegetative characters or pod characters only) produced by the KEY function of the Descriptor Language for Taxonomy (DELTA) computer package on the basis of descriptive data provided in the revision (Chapter 11). A small-scale vegetation map and extracts from White (1983) were also taken.

telex numbers, facilitate the collector's task in making the first steps towards acquiring the relevant botanical literature. Databases of botanical specialists are discussed in Chapter 14.

Although collectors need not be full-time taxonomists, they do need to be aware of recent taxonomic thinking, such as the describing of new species (about 2500 per year at present) and the changing names of others. Since 1893 the standard international reference has been *Index Kewensis* (Royal Botanic Gardens, Kew, 1893–). It lists the place of publication of new and changed names of seed-bearing plants from

family level downwards (before 1972, only genera and species). It appears in five-yearly supplements (the last, published in 1991, covering 1986–1990) and since 1986 in yearly volumes as *Kew Index*. It is available on microfiche (to 1975) and on CD-ROM. Since 1935, references to botanical illustrations have been incorporated in *Index Kewensis*, taking over the task of *Index Londinensis*.

The most comprehensive publication listing worldwide botanical literature is *The Kew Record of Taxonomic Literature*, an annual from 1971 to 1987 and, as the *Kew Record*, a quarterly since (Royal Botanic Gardens, Kew, 1971–). It now

lists references to all publications relating to the taxonomy of flowering plants, gymnosperms and ferns. In addition to sections on taxonomic groups, there are references on phytogeography, nomenclature, chromosome surveys, chemotaxonomy, Floras and botanical institutions; also papers of taxonomic interest in the fields of anatomy and morphology, palynology, embryology, and reproductive biology, and relevant bibliographies and biographies.

Of greatest potential interest to collectors is the floristics section. In the 1990 volume alone there are more than 800 references to books and journal articles. Their scope is broad, ranging from Volume 3 of the *Flora of Inner Mongolia*, to the vegetation of swamps in Côte d'Ivoire, the caatinga plants of Brazil and collections from islands of the South Pacific. Plant atlases and vegetation maps are also mentioned. References are listed under various geographic subdivisions of the world and within these by country and/or administrative unit. It is worth noting that the number of references cited for a country depends largely on its size (which may be anything from a continental mass to an oceanic atoll of a few square kilometres) and the extent to which it has been, and continues to be, studied botanically. Whereas some countries may have almost as many active taxonomists as species, others may have vast areas never visited by a single botanist. Whatever the relative impact and increase in knowledge made by a new publication (and this will be more for a poorly known area), the *Kew Record* is an invaluable publication in which individual countries can easily be scanned for all sorts of botanical works published since 1971. *Kew Record* is computerized from 1982 onwards, but for internal (Kew) use only.

If there is any work which expands to book length what is presented here, it is that of Davis *et al.* (1986). Produced primarily for conservationists, it addresses the questions: 'Where can I find out about the flora of any country, which species in that flora are threatened, and who may be trying to save them?' Data sources are presented for each country and island group in the world, with the sections on floristics, vegetation, checklists and Floras, and field guides being of greatest value here. Other sections contain lists of voluntary organizations and useful addresses and there is an appendix with a comprehensive bibliography of general and regional references.

For a discursive, in-depth and more retrospective compilation of Floras alone, the indispensable source is the handbook of Frodin (1984). With a cut-off date of 1980, it covers

all of the most generally useful and/or comprehensive Floras, enumerations, lists, and related works for different parts of the world in an approximately uniform fashion within a single, not too bulky volume. References to more specialized or extensive bibliographies, guides, and indices are provided throughout the work for the use of persons with interests in a particular geographic unit or units, thus enabling it also to act as a bibliography of bibliographies.

The latter is also a good statement of this chapter's aim. References are easily located either by author or by geography in two separate indexes and an appendix lists more than 500 (largely) biological journals (this list is itself an invaluable pointer to taxonomic journals worldwide). A revised edition of Frodin's *Guide* is in preparation (D. Frodin, pers. comm.). The thoroughness of the present edition is what has made it possible to omit from the list presented here virtually all Floras completed before 1980. Increasingly, computerized Floras and checklists are being produced. There is no overall guide to these yet, but the subject is introduced in Appendix 10.1.

It is fortunate that the tropics, where unquestionably most botanical and genetic resources work still needs to be done, have been specifically addressed by the compilation of Campbell and Hammond (1989). Forty-two of the book's chapters each covers a tropical country or region (e.g. Thailand, Equatorial Africa) for which there is given a brief vegetation description, a list of vegetation maps and an assessment of the extent of past, and the need for future, collecting. This brings up to date works such as Hedberg and Hedberg's (1968) compilation. While all chapters have useful references, some (e.g. those on Fiji by J. Ash and S. Vodonaivalu and on eastern, extra-Amazonian Brazil by S.A. Mori) have very extensive bibliographies whose coverage of ecological as well as taxonomic works complements and updates that provided by Frodin (1984). Collecting methods (e.g. of tropical germplasm and palm specimens) are also reviewed.

Ecological literature has no formal equivalent to what Frodin (1984) has provided for Floras but there are two outstanding works which none the less fulfil such a role, one globally and one for Africa alone. Takhtajan (1986) is the most modern synthesis and classification of world plant geography. The vegetation and endemic families of the areas covered by the different levels of classification are described, starting with kingdom (e.g. the Neotropical) and descending through subkingdom and region to province (e.g. the West Indian). At every step there are numerous references, providing an entry to the world's ecological literature. White (1983), on the other hand, deals only, but indispensably, with Africa and its offshore islands. Each of the continent's floristic regions is described in terms of geographic position and area, geology and physiography,

climate and flora (e.g. number of endemic families and species), but the bulk of the work is devoted to descriptions of the vegetation types within the regions. The amount of information in this work is prodigious, including a list of about 2000 references. Mainly ecological, they can be accessed either by author or by country or floristic region. That few of them are dated later than 1980 does not detract from the immense value of this work to the collector in Africa. There is also a species index.

Highly diverse areas are likely to be special priorities for germplasm collectors. Different approaches to the definition of areas of high biodiversity have been developed, e.g. by National Academy of Science (1980), Myers (1988) and Mittermeier and Werner (1990), but the initiative by the World Wide Fund for Nature and the World Conservation Union (IUCN) to produce a guide to such regions is particularly to be welcomed. A publication called *Centres of Plant Diversity: A Guide and Strategy for their Conservation* is being produced (WWF and IUCN, in prep.). This directory will contain data sheets on each of about 250 critical sites. There will also be regional overviews. For each site there will be data on: geography, vegetation, flora, useful plants, social and environmental values, economic assessment, threats and conservation. The critical requirement for inclusion of a site is that it should have a high total number of species and/or high endemism. Consideration was also given to whether candidate sites are threatened by destruction or contain important plant gene pools, a diverse range of habitats or unique edaphic conditions. A volume on Europe, the Middle East and southwest Asia was published in 1994 and the final two volumes are planned for 1995.

By the very nature of the work, every germplasm collector is, and should be, a conservationist too. For literature on conservation the main access is the bibliography made by the Royal Botanic Gardens, Kew and the Threatened Plants Unit, World Conservation Monitoring Centre (1990). Its 10,500 references, mostly dating from 1970 onwards, span a broad range of scale, from papers on an individual threatened species, to floristic and vegetation accounts of centres of plant diversity, and to directories on protected areas in various global regions. As well as information on how quickly habitats, vegetation and species are disappearing, the collector can also get a good idea of the conservation 'climate' of a country: for example, whether a Plant Red Data Book (based on the format of Lucas and Syngé's (1978) world overview) or threatened species list has been produced. For more on the World Conservation Monitoring Centre (WCMC), see Box 10.2. For forestry species, the Food and Agriculture Organization (FAO) is also a useful source of information on conservation: National Research Council (1991) provides a list of forestry species reported as threatened, mainly in the *IUCN Plant Red Data Book* and various FAO publications.

These key works refer directly or indirectly to much of the literature listed later. It is appropriate, however, to mention four other works of value in a different sense, works of a more general, reference nature. A

Box 10.2**The World Conservation Monitoring Centre (WCMC) databases**

Information on the conservation status of species and ecosystems is crucial to the germplasm collector: the threat of genetic erosion is one of the prime motivators of collecting, and will continue to be as long as the threats of desertification, deforestation and global warming persist. A primary source of information on the world's biological diversity and the disparate threats it is facing is WCMC, a joint undertaking of IUCN, the United Nations Environment Programme (UNEP) and the World Wide Fund for Nature based in the UK (for address, see Appendix 10.1). Information from 'published literature, unpublished reports and government reports, conservation organizations, and a wide network of contacts and correspondents throughout the developing world' (McNeely *et al.*, 1990) is maintained by WCMC in a set of databases on:

- the distribution, ecology and status (e.g., population size, threats, conservation category and occurrence in captivity or in cultivation) of species whose conservation situation is causing concern (about 52,000 plants);
- key sites of high biodiversity (in particular tropical forest sites but also wetlands and coral reefs) which, given adequate protection, would ensure the survival of a significant percentage of the world's plants;
- the location, history, conservation importance and management of the 16,000 or so protected areas of the world;
- the international trade in the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES)-listed species.

There is also a Global Biodiversity Database of mapped digital data. The user interface, the Biodiversity Map Library, allows users to browse the database, which holds data on moist tropical forests, protected areas, mangroves, wetlands, coral reefs, Antarctica and biogeography.

Excerpts, digests and analyses of the information in these databases are also available in printed form. For example, in early 1995 WCMC will publish the first comprehensive global list of threatened plants, based on data in the first of the databases listed above. This will attempt to incorporate all national Red Data Books and Red Data Lists, and will supersede the *IUCN Plant Red Data Book*. Data from the protected areas databases contribute to the *Conservation Atlases of Tropical Forests* and data from the critical sites database to the *Centres of Plant Diversity* project. The information in the protected areas database is published periodically in the *United Nations List of Protected Areas* and the *IUCN Register of Threatened Protected Areas of the World* as well as in more detailed regional IUCN directories (a list of these and other relevant IUCN publications is given in this chapter).

WCMC works closely with the Species Survival Commission (SSC), one of six volunteer commissions of IUCN. *Biodiversity in Sub-Saharan Africa and its Islands* is the first of a series of regional studies by the SSC (a study of South America is planned for publication). WCMC, IUCN and national institutions are also collaborating on a project to develop a database cataloguing all sources of biodiversity information on East Africa, both within and outside the region. If successful, this pilot project, which started in 1993, will be extended to other geographic regions.

A major new publication by WCMC is *Global Biodiversity: Status of the Earth's Living Resources* (1991). In the wake of the UN Conference on Environment and Development (UNCED), WCMC is also playing a catalytic role in the production of more detailed, national-level biodiversity country studies. Article 6 of the Convention on Biological Diversity calls on contracting parties to develop national biodiversity strategies and action plans, and the UNEP Country Study Programme is the mechanism for this.

theoretical background to flowering plant classification, such as that proposed by Cronquist (1988), would provide the collector with a useful framework for understanding and identifying species in an unfamiliar flora. On the other hand, when confronted by a strange name rather than plant, the collector can do no better than turn to Mabberley (1989). Based on Cronquist's system of classification, it lists all generic and family names of vascular plants, giving data on features such as floral and fruit structure, economic uses and geographic distribution. Its predecessor, in scope, style and inspiration, was Willis (1973), which, although outdated and largely based on the Englerian system, is still a useful complement to Mabberley, not least because of its inclusion of numerous synonyms. The latest in this line of publications is Brummitt (1992), which is 'a listing of the genera of vascular plants of the world according to their families, as recognized in the Kew Herbarium, with an analysis of relationships of the flowering plant families according to eight systems of classification'. In addition, there is a section in which all accepted generic names are listed family by family - a unique feature in modern botanical literature.

Full citations of the chosen key works are given below.

- Brummitt, R.K. (comp.) (1992) *Vascular Plant Families and Genera*. Royal Botanic Gardens, Kew. 0947643435.
- Campbell, D.G. and H.D. Hammond (eds) (1989) *Floristic Inventory of Tropical Countries*. New York Botanical Garden, Bronx. 0893273333.
- Cronquist, A. (1988) *The Evolution and Classification of Flowering Plants*. New York Botanical Garden, Bronx. 0893273325.
- Davis, S.D., S.J.M. Droop, P. Gregerson, L. Henson, C.J. Leon, J.L. Villa-Lobos, H. Synge and J. Zantovska (1986) *Plants in Danger - What Do We Know?* IUCN, Gland. 2880327075.
- Frodin, D.G. (1984) *Guide to Standard Floras of the World*. Cambridge University Press, Cambridge. 0521236886.
- Holmgren, P.K. and N.H. Holmgren (1992) Plant specialists index. *Regnum Vegetabile* 124:1-394.
- Holmgren, P.K., N.H. Holmgren and L.C. Barnett (1990) *Index Herbariorum. Part 1: The Herbaria of the World*. International Association for Plant Taxonomy by New York Botanical Garden, Bronx. 0893273589.
- Mabberley, D.J. (1989) *The Plant-Book. A Portable Dictionary of the Higher Plants*. Cambridge University Press, Cambridge. 0521340608.
- Royal Botanic Gardens, Kew (1971-) *The Kew Record of Taxonomic Literature*. Her Majesty's Stationery Office, London. Annual to 1986, quarterly since 1987.
- Royal Botanic Gardens, Kew (1893-) *Index Kewensis. Names of Seed-bearing Plants at the Rank of Family and Below*. Oxford University Press, Oxford. (Davies, R.A. and R.M. Lloyd (eds) (1991) Supplement 19: 1986-1990. 0198546769). Available on CD-ROM.
- Royal Botanic Gardens, Kew, and Threatened Plants Unit, World Conservation Monitoring Centre (1990) *World Plant Conservation Bibliography*. Threatened Plants Unit, World Conservation Monitoring Centre and Royal Botanic Gardens, Kew. 0947643249.
- Takhtajan, A. (1986) *Floristic Regions of the World*. Translated by Theodore J. Crovello with the assistance and collaboration of the author and under the editorship of Arthur Cronquist. California University Press, Berkeley. 0520040279.

- White, F. (1983) *The Vegetation of Africa. A Descriptive Memoir to Accompany the Unesco/AETFAT/UNSO Vegetation Map of Africa*. Unesco, Paris. 9231019554.
- Willis, J.H. (1973) *A Dictionary of the Flowering Plants and Ferns*. 8th edition, revised by H.K. Airy Shaw. Cambridge University Press, Cambridge.
- WWF and IUCN (in prep.) *Centres of Plant Diversity: A Guide and Strategy for Their Conservation*. Edited by S.D. Davis, V.H. Heywood and O. Herrera-MacBryde. WWF and IUCN.

The following publications have also been referred to in this section.

- Hedberg, I. and O. Hedberg (eds) (1968) *Conservation of Vegetation in Africa South of the Sahara*. Acta Phytogeographica Suecica 54, Uppsala.
- Koechlin, J., J.L. Guillaumet and P. Morat (1974) *Flore et Végétation de Madagascar*. Cramer, Vaduz.
- Lewis, G.P. (1988) *Sesbania* Adans. in the Flora Zambesiaca region. *Kirkia* 13:11-51.
- Lucas, G. and H. Synge (comps) (1978) *The IUCN Plant Red Data Book*. IUCN, Morges (Threatened Plants Committee, c/o Royal Botanic Gardens, Kew). 2880322022.
- McNeely, J.A., K.R. Miller, W. Reid, R.A. Mittermeier and T. Werner (1990) *Conserving the World's Biological Diversity*. WRI, IUCN, Conservation International and World Bank, Washington DC and Gland.
- Mittermeier, R.A. and T.B. Werner (1990) Wealth of plants and animals unites 'megadiversity' countries. *Tropicus* 4:1-15.
- Myers, N. (1988) Threatened biotas: 'hotspots' in tropical forests. *Environmentalist* 8:1-20.
- National Academy of Science (1980) *Research Priorities in Tropical Biology*. Committee on Research Priorities in Tropical Biology, National Academy of Science, Washington DC.
- National Research Council (1991) *Managing Global Genetic Resources. Forest Trees*. National Academy Press, Washington DC. 0309040345.
- Nicoll, M.E. and O. Lagrand (1989) *Madagascar: Revue de la Conservation et des Aires Protégées*. WWF, Gland. 2880850274.
- WCMC (1992) *Global Biodiversity: Status of the Earth's Living Resources*. Chapman & Hall, London. 0412472406.

International, regional and large national Floras and floristic works

Figure 10.1 outlines the regions covered by the following works (listed by title) and by older works which have yet to be replaced (e.g. *Flora of West Tropical Africa*). Editors' or authors' names have only been included when they are consistent throughout the appearance of the relevant publication.

- Circumpolar Arctic Flora*. Polunin, N. (1959) Oxford University Press, Oxford.
- Flora Europaea*. Tutin, T.G., V.H. Heywood, N.A. Burges, D.H. Valentine, S.M. Walters and D.A. Webb (eds) (1964-1980) Cambridge University Press, Cambridge. 2nd edition of Vol. 1 in preparation.
- Flora Iranica*. Rechinger, K.H. (ed.) (1963-) Akademischer Druk und Verlagsanstalt, Graz. 168 of c. 175 parts published by 1991. Completion due before 2000.

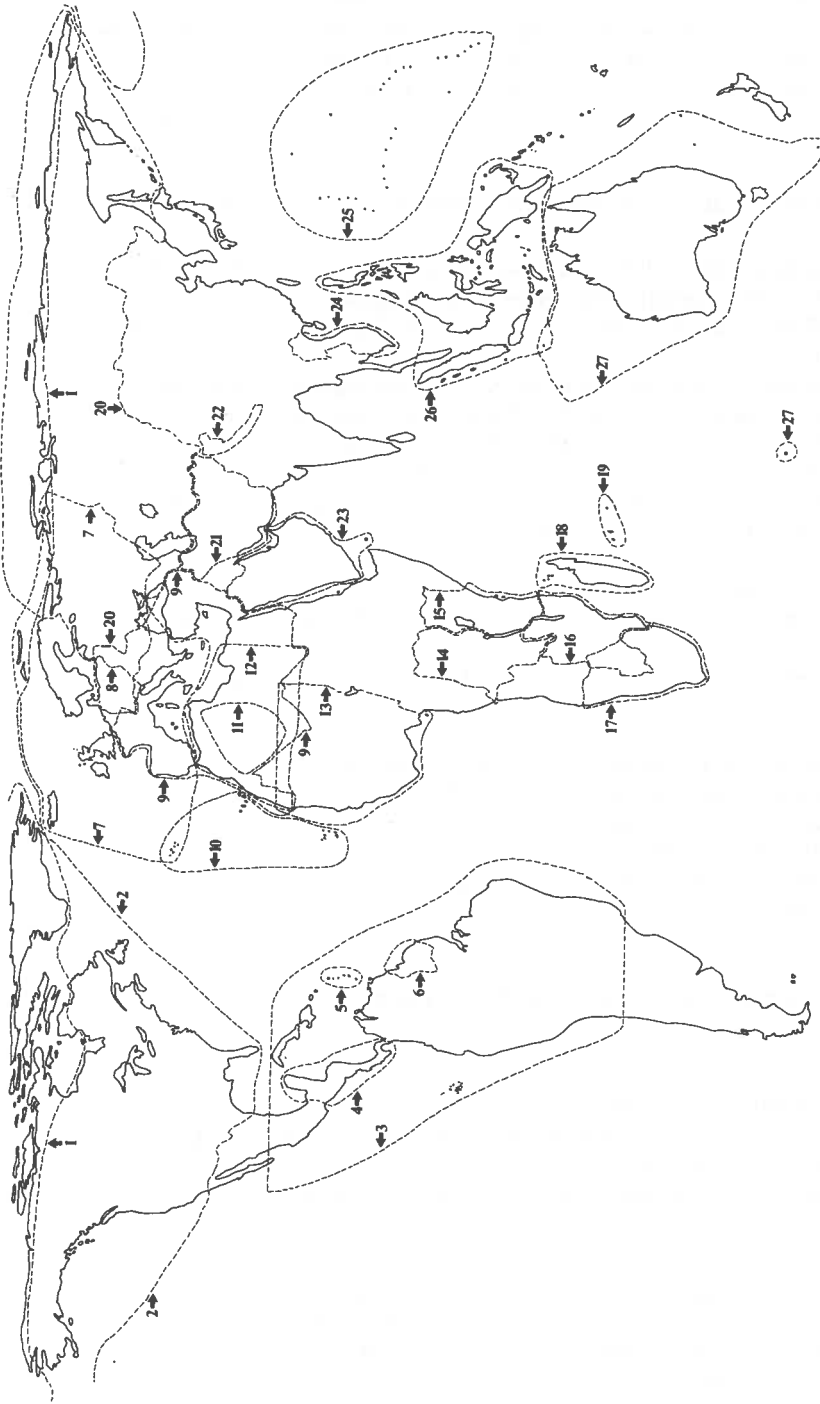


Fig. 10.1. World map (based on the Peters Equal Area Projection) showing boundaries of regions covered by international Floras and floristic works. 1, Circumpolar Arctic Flora; 2, Flora of North America; 3, Flora Neotropica; 4, Flora Mesoamericana; 5, Flora of the Lesser Antilles, Leeward and Windward Islands; 6, Flora of the Guianas; 7, Flora Europaea; 8, *Illustrierte Flora von Mitteleuropa*; 9, *Med-checklist*; 10, Flora of Macronesia; 11, *Flore du Sahara*; 12, *Flore de l'Afrique du Nord*; 13, Flora of West Tropical Africa¹; 14, *Flore d'Afrique Centrale*; 15, Flora of Tropical East Africa; 16, Flora Zambesiaca; 17, Flora of Southern Africa; 18, *Flore de Madagascar et des Comores*; 19, *Flore des Mascareignes: La Réunion, Maurice, Rodrigues*; 20, Flora of the USSR²; 21, Flora Iranica; 22, *Flowers of the Himalaya*; 23, Flora of the Arabian Peninsula; 24, *Flore du Cambodge, du Laos et du Vietnam*; 25, Flora of Micronesia; 26, Flora Malesiana; 27, Flora of Australia.

¹Hutchinson, J. and J.M. Dalziel (1954-1972) Revised edition edited by F.N. Hepper. Crown Agents for Overseas Governments and Administrations, London.

²For discussion of boundary changes during production of this Flora see Bobrov, E.G. (1965) *Nature* 205:1046-1049. Changes occurred to the western boundary in Vols 11 and 12 and to both the western and eastern (Pacific islands) boundaries in Vols 14 and 15. Boundaries on this map are those for Vols 14 and 15 onwards.

- Flora Malesiana*. (1948-) Nijhoff, The Hague; then Kluwer Academic Publishers, Dordrecht; from July 1991 Rijksherbarium, Leiden. Eight volumes on flowering plants (Series I) and two volumes on pteridophytes (Series II) wholly or partially published by 1991. Completion date uncertain (but distant).
- Flora Mesoamericana*. (1992-) Missouri Botanical Garden; Instituto de Biología, Universidad Nacional Autónoma de México; British Museum (Natural History). Two of seven volumes in press. Completion due c. 2000.
- Flora Neotropica*. (1968-) Hafner Publishing Co., New York (monographs 1-14); then New York Botanical Garden, Bronx, for Organization for Flora Neotropica. 57 volumes published by early 1992.
- Flora of the Arabian Peninsula*. Miller, A.N. *et al.* (1994-) Edinburgh University Press, Edinburgh. Five volumes to be published, the first in 1994. Completion due c. 2000.
- Flora of Australia*. (1981-) Australian Government Publishing Service, Canberra. 12 of 50 volumes (two cover oceanic islands) on the vascular flora published by 1992. Completion due c 2001-2005.
- Flora of the Guianas*. (1985-) Koeltz Scientific, Königstein. Ten fascicles on phanerogams (Series A) and one on ferns and fern allies (Series B) published by 1991. Completion not due before 2000.
- Flora of the Lesser Antilles. Leeward and Windward Islands*. Howard, R.A. (ed.) (1974-) Arnold Arboretum, Harvard University, Jamaica Plain. Six volumes published by 1989.
- Flora of North America*. Morin, N. (convening ed.) (1993) Oxford University Press, Oxford. First two volumes appeared in 1993.
- Flora of Macronesia. Checklist of vascular plants*. 3rd edition Hansen, A. and P. Sunding (1985) *Sommerfeltia* 1:1-167. 8299052768.
- Flora of Micronesia*. Fosberg, F.R. and M.-H. Sachet (1975-) Smithsonian, Washington DC. Four fascicles published by 1985 and a fifth one in press.
- Flora of Southern Africa*. (1963-) Government Printer for Botanical Research Institute, Pretoria. All or parts of 15 volumes on flowering plants out of a total of 33 planned volumes published by 1991. A few more should appear in the current format but beyond them revisions are likely to be in other journals or series.
- Flora of Tropical East Africa*. (1949-) Balkema, Rotterdam. *Circa* 7500 of 11,000 species covered by 1991. Completion due 2000.
- Flora of the USSR*. (1963-) Translation of *Flora URSS* (Komarov, V.L. and B.K. Shishkin, 1933-1964). Israel Program for Scientific Translations, Jerusalem. 22 (1-21, 24) of 30 volumes published by 1979. Also: Shishkin, B.K. (ed.) (1990) Vol. 25. Bishen Singh Mahendra Pal Singh, Dehra Dun. 8121100488.
- Flora Zambesiaca*. (1960-) Flora Zambesiaca Managing Committee, London. 3867 of c 9889 species published by March 1991 (and 2100 written but unpublished). Completion due by 2000.
- Flore d'Afrique Centrale (Zaire-Rwanda-Burundi)*. (1948-) Jardin Botanique National de Belgique, Meise. *Circa* 158 of 203 families of spermatophytes and 12 of 39 pteridophyte families wholly or partially published by 1989. Three more spermatophyte families in press.
- Flore de l'Afrique du Nord*. Maire, R. (1952-) Éditions Lechevalier, Paris. 16 volumes published by 1987. (For index of volumes 1-16 see Carazo-Montijano, M. and C. Fernandez-Lopez (1990). Murillo, Jaen. 8460075451.)
- Flore de Madagascar et des Comores*. (1936-) Muséum National d'Histoire Naturelle, Paris. *Circa* 148 of 189 families wholly or partially published by 1991 (but some treatments very old).

- Flore des Mascareignes: La Réunion, Maurice, Rodrigues.* (1976–) Sugar Industry Research Institute, Mauritius; l'Office de la Recherche Scientifique et Technique Outre-mer, Paris; Royal Botanic Gardens, Kew. *Circa* 2100 of 3000 species written up (and 93 of 203 families published) by 1991.
- Flore du Cambodge, du Laos et du Vietnam.* (1960–) Muséum National d'Histoire Naturelle, Paris. 25 parts published by 1990.
- Flore et Végétation du Sahara.* Ozenda, P. (1983) 2nd edition. Centre National de la Recherche Scientifique, Paris. 2222046149.
- Flowers of the Himalaya.* Polunin, O. and A. Stainton (1984) Oxford University Press, Oxford.
- Flowers of the Himalaya. A Supplement.* Stainton, A. (1988) Oxford University Press, Delhi. 0192177567.
- Illustrierte Flora von Mitteleuropa.* Hegi, G. (1966–) Parey, Berlin. Many fascicles of 3rd edition published.
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International booksellers

Many collectors will have access to a library containing at least some of the works cited above; many others, however, will not. It is clearly of limited value to know about a work but not be able to see it, so a short list (provided by the Library of the Royal Botanic Gardens, Kew) is appended here of some international booksellers of both in-print and out-of-print works. The regular bulletins or catalogues published by some of these booksellers (e.g. the Natural History Book Service) are well worth receiving since they can keep collectors in touch with new and recent titles, in much the same way as does the *Kew Record*.

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APPENDIX 10.1

Plant diversity databases

International Organization for Plant Information (IOPI)

In the past few years, botanical and other biodiversity databases have proliferated. In developing countries, institutions involved in such work have often received support from outside agencies and institutions. For example, the Nature Conservancy in the US has helped to establish a network of 85 national and subnational computer-based biodiversity information centres in the Americas. Intergraph Corporation and Costa Rica's National Biodiversity Institute (INBio) have jointly developed a computerized Biodiversity Information Management System. The Missouri Botanical Garden, the Muséum National d'Histoire Naturelle in Paris and two herbaria in Madagascar are collaborating on producing an electronic *Conspectus* of the Vascular Plants of Madagascar. Conservation International, World Wide Fund for Nature (WWF) and WCMC have also been active in this field.

Numerous plant databases (listing locally accepted names and synonyms, some distributional data, perhaps ethnobotanical information such as local names and uses) now exist or are in preparation, usually at herbaria, universities, conservation bodies, biodiversity centres or similar institutions. They use a variety of management software and also vary widely in structure and content. They may cover anything from a single protected area to the whole country, and the whole flora or selected taxa. Often based on actual herbarium specimens, they may or may not be taxonomically reliable on a wider scale.

The databases listed below are the principal large plant databases in usable form at present and are nomenclaturally reliable across regions. The International Organization for Plant Information (IOPI) has established a register of plant databases at the Royal Botanic Garden, Edinburgh which it updates as information becomes available. Contact may be made through R.J. Pankhurst (see below) for more information. IUCN and WCMC are collaborating on the development of regional listings of biodiversity databases and other data sets, starting in East Africa. The International Union of Biological Sciences Commission on Taxonomic Databases (TDWG) is developing guidelines and standards for botanical databases (Chapters 14 and 19).

IOPI is itself preparing a world nomenclatural database of all vascular plants, the *Global Plant Checklist*, which will be taxonomically edited to ensure comparability throughout the world. This will act as a core module to which other information will be added. The first version is planned for 1997. Further information can be obtained from the Secretary:

Alex George
18 Barclay Road
Kardinya
WA 6163
Australia
Fax: +61 9 3371655
E-mail: iopi@cjb.unige.ch

For more information on IOPI and to register for its electronic news service, contact David Green (david.gree@anu.edu.au).

1. Name: BONAP
Address: Department of Biology
University of North Carolina
Chapel Hill
NC 27599-3280
USA
Tel: +1 919 9620578
Fax: +1 910 9621625
Contact: John T. Karteaz
Content: Nomenclature and distribution of plants of the USA and neighbouring areas
2. Name: ERIN (Environmental Resources Information Network)
Address: GPO Box 636
Canberra
ACT 2601
Australia
Contact: Arthur Chapman
E-mail: arthur@erin.gov.au
Content: Biodiversity of Australia, including plant taxonomic data
3. Name: ESFEDS (European Science Foundation European Documentation System)
Address: Royal Botanic Garden
Edinburgh EH3 5LR
UK
Tel: +44 131 5520382
Fax: +44 131 5527171
Contact: R.J. Pankhurst
E-mail: rjp@castle.ed.ac.uk
Content: Nomenclature, distribution and bibliography of the Flora Europaea
4. Name: Grass Genera of the World
Address: Taxonomy Unit
Research School of Biological Sciences
Australian National University
GPO Box 475
Canberra, ACT 2601
Australia

- Contact: L. Watson
Content: Nomenclature, morphology, anatomy, distribution etc. of 778 grass genera worldwide
5. Name: (a) IK (Index Kewensis)
(b) Cactaceae checklist
Address: Royal Botanic Gardens, Kew
Richmond
Surrey TW9 3AB
UK
Tel: +44 181 9401171
Fax: +44 181 9481197
Contact: Bill Loader
E-mail: vxxloadr@cms.am.rdg.ac.uk
Content: (a) Nomenclature and place of publication of world angiosperms
(b) World checklist of Cactaceae (David Hunt)
6. Name: ILDIS (International Legume Database and Information Service)
Address: Department of Biology
University of Southampton
Bassett Crescent East
Southampton SO9 3TU
UK
Tel: +44 1703 59444
Fax: +44 1703 594269
Contact: Frank Bisby
Content: Nomenclature, bibliography, distribution and biodiversity data on Leguminosae worldwide
7. Name: ING (Index Nominum Genericorum)
Address: Department of Botany
Smithsonian Institution
Washington DC 20560
USA
Tel: +1 202 3574362
Fax: +1 202 7862563
Contact: Ellen Farr
E-mail: mnhbo001@sivm.si.edu
Content: All plant genera names with authorities and publication data
8. Name: MED-CHECKLIST
Address: Conservatoire et Jardin Botaniques
CP 60
CH-1292 Chambesey
Geneva
Switzerland
Tel: +41 22 7326969
Fax: +41 22 7384597
Contact: Catherine Zellweger
E-mail: zellweger@cjb.unige.ch
Content: Checklist of vascular plants for countries around the Mediterranean

- 9. Name:** Flora Mesoamericana
Address: Missouri Botanical Garden
PO Box 299
St Louis
Missouri 63166-299
USA
Tel: +1 202 3574362
Fax: +1 202 7862563
Contact: Doug Stevens
Content: Nomenclature, distribution and bibliography for American countries; also specimen data for Missouri Botanical Garden
- 10. Name:** Conspectus Florae Orientalis
Address: Herbarium
Botany Department
Hebrew University
Jerusalem 91904
Israel
Contact: Clara Heyn
Content: Nomenclature, distribution and bibliography for Near East
- 11. Name:** PRECIS (Pretoria Computerized Information System)
Address: Botanical Research Institute
Private Bag X101
Pretoria
South Africa
Tel: +27 12 861164
Fax: +27 12 861194
Contact: T.H. Arnold
Content: Herbarium catalogue and biodiversity of plants of southern Africa; a by-product, the Plants of Southern Africa Database, is available on diskette
- 12. Name:** USDA (US Department of Agriculture) Families and Genera
Address: Agricultural Research Service
Beltsville Agriculture Research Center
Beltsville
MD 20705-2350
USA
Contact: Joseph H. Kirkbride, Jr.
E-mail: jkirkbride@asrr.arsusda.gov
Content: World list for flowering plants
- 13. Name:** Czerepanov List from Flora USSR
Address: Komarov Botanical Institution
Russian Academy of Sciences
Prof. Popov St. 2
St Petersburg 197376
Russia
Contact: Dimitri Geltman
Content: Nomenclature of plants from ex-USSR

14. Name: WCMC

Address: World Conservation Monitoring Centre

219c Huntingdon Road

Cambridge CB3 0DL

UK

Tel: +44 1223 277314

Fax: +44 1223 277136

E-mail: info@wcmc.org

Contact: Harriet Gillett

Content: Nomenclature, distribution and bibliography of threatened and useful plants worldwide