TAXONOMY AND PLANT CONSERVATION

The Cornerstone of the Conservation and the Sustainable Use of Plants

This book illustrates the key role played by taxonomy in the conservation and sustainable utilisation of plant biodiversity. Divided into four parts, the book opens with an overview of the place of taxonomy in science and in implementing the Convention on Biological Diversity. Part II outlines what taxonomy is, how it is done, its theoretical basis and why the results of taxonomy are a measure of diversity. The third part explains how taxonomy is used to establish priorities and to identify the necessary conservation action. The concluding part illustrates taxonomy in the practice and measurement of effective conservation action. The book contains authoritative contributions by taxonomists and users of taxonomy who have spent their working lives addressing these issues. These contributions together demonstrate the crucial importance of supporting the Global Taxonomy Initiative and the importance of taxonomy in implementing the targets in the Global Strategy for Plant Conservation.

The volume is a tribute to Professor Vernon Heywood who has done so much to highlight the importance of sound scholarship, training and collaboration for plant conservation. The chapters draw on and develop the unique and significant contribution that he has made to the field, resulting in a comprehensive overview of its present status, suitable for advanced students, researchers and conservation professionals.

ETELKA LEADLAY is Head of Research and Membership Services with Botanic Gardens Conservation International, whose mission is to encourage botanic gardens to work together for plant conservation and sustainable development.

STEPHEN JURY is Herbarium Curator for the University of Reading and Principal Research Fellow with responsibilities including herbarium curation, research and teaching.

TAXONOMY AND PLANT CONSERVATION

The Cornerstone of the Conservation and the Sustainable Use of Plants

Edited by

ETELKA LEADLAY
STEPHEN JURY

CAMBRIDGE UNIVERSITY PRESS

CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo

Cambridge University Press
The Edinburgh Building, Cambridge CB2 2RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org
Information on this title: www.cambridge.org/9780521845068

First published 2006

Printed in the United Kingdom at the University Press, Cambridge

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication data
Taxonomy and plant conservation : the cornerstone of the conservation and the sustainable use of plants / Etelka Leadlay & Stephen Jury (ed.).
p. cm.
Includes bibliographical references and index.
ISBN 0-521-84506-8 (hardback : alk. paper) – ISBN 0-521-60720-5 (pbk. : alk. paper)
1. Plants – Classification. 2. Plant conservation. I. Leadlay, Etelka, 1947– II. Jury, Stephen L. III. Title.
QK95.T373 2005 580′.12 – dc22 2005006465

ISBN-13 978-0-521-84506-9 hardback
ISBN-10 0-521-84506-8 hardback

ISBN-13 978-0-521-60720-9 paperback
ISBN-10 0-521-60720-5 paperback

This book is a tribute to the work of Vernon Hilton Heywood, following the occasion of his 75th birthday, 24th December 2002. Professor V. H. Heywood (born 1927) has made a unique contribution to plant taxonomy and the conservation of plants. This collection of papers builds on Professor Heywood's seminal work, *Principles of Angiosperm Taxonomy* (Davis & Heywood, 1965) to his present work with the DIVERSITAS Programme. Professor Heywood was an inspiring teacher encompassing undergraduate, M.Sc. and Ph.D. students as well as post-doctoral research fellows from many countries. He has formally supervised, or helped to supervise over 60 doctoral theses. He has left a wonderful trained legacy. His alumni have been given a deep respect for rigorous science and thought, plus the fundamental importance of communication and cooperation between all sectors and at all levels. Papers were invited not only from Professor Heywood's colleagues and former students but other international experts in the field.

Professor Crane's paper under the title of 'Science and the future of plant diversity' was given at Reading University on 16th December, 2002 to celebrate Professor Heywood's actual 75th birthday.

Contents

Notes on contributors

John R. Akeroyd, Lawn Cottage, West Tisbury, Salisbury, Wiltshire SP3 6SG, UK.

John Akeroyd is a freelance writer and botanist, and an Associate Editor of *Plant Talk*, which he founded with Hugh Synge in 1995. He has a Ph.D. in plant genecology and was principal researcher for the revision of the first volume of *Flora Europaea* (1993). Author of *Seeds of Destruction: Non-native Wildflower Seed and British Floral Biodiversity* (1994) for Plantlife, he has promoted the use of local or native seed in habitat restoration.

Stephen Blackmore, Regius Keeper, Royal Botanic Garden Edinburgh, Royal Botanic Garden Edinburgh, 20a Inverleith Row, Edinburgh EH3 5LR, UK.

Stephen Blackmore is Regius Keeper of the Royal Botanic Garden Edinburgh. He has held visiting professorships at the universities of Edinburgh, Glasgow and Reading, and at the Kunming Institute of Botany; he has written over 100 papers on taxonomy and palynology. Since working at the Royal Society Aldabra Research Station in the 1970s he has promoted the importance of research stations in long-term biodiversity research and has been involved in establishing the Las Cuevas Research Station in Belize and the Jade Dragon Field Station near Lijiang in China. He was one of the contributors to the Gran Canaria Declaration and is a member of the international coordinating group for the Global Plant Conservation Strategy.

David Bramwell, Director, Jardín Botánico Viera y Clavijo, El Palmeral 15, Tafira Alta, Las Palmas de Gran Canaria, Spain.

David Bramwell is Director of the Jardín Botánico Viera y Clavijo, Gran Canaria. David has written or co-authored 10 books and more than 110 papers on plant taxonomy, biogeography, conservation and the modern role of botanical gardens. He is an authority on the plants of the Canary Islands and island plants in general,

and is one of the founders of the Gran Canaria Group, which carried forward the initiative to prepare the Global Strategy for Plant Conservation on behalf of the Convention on Biological Diversity (CBD) Secretariat. He is also a member of the World Conservation Union's Plant Conservation Committee and is on the International Advisory Council of Botanic Gardens Conservation International. He has been awarded an MBE.

R. K. Brummitt, The Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, UK.

R. K. (Dick) Brummitt gained his Ph.D. at Liverpool University in 1963 under the supervision of V. H. Heywood. After obtaining his Ph.D. he has worked as a higher plant taxonomist in the Herbarium at the Royal Botanic Gardens, Kew and as a retired Research Associate since 1999. His work and field experience have covered many parts of the world, but his main interests have been in tropical Africa. At the Nomenclature Sessions of the 1969 International Botanical Congress he was elected to the Committee for Spermatophyta, and in 1975 he was appointed as its Secretary, a position he has held ever since. In 1995 he was appointed Convenor of the Species Plantarum Project set up to compile a new Flora of the world, and is currently its Secretary.

Santiago Castroviejo, Real Jardín Botánico, Consejo Superior Investigaciones Científicas, Plaza de Murillo, 2, 28014 Madrid, Spain.

Santiago Castroviejo is a Research Professor of the Consejo Superior de Investigaciones Científicas (CSIC) at the Real Jardín Botánico, Madrid, Spain. Professor Castroviejo was Director, Real Jardín Botánico, Madrid from 1984 to 1994. He is the General Co-ordinator of the *Flora Iberica* Project (Flora of the vascular plants of the Iberian Peninsula and Balearic Islands) and a member of the Steering Committee of the Species Plantarum Project. He has published numerous papers and books on his main research interests of plant taxonomy, ecology and chorology in the Mediterranean and neotropics.

Peter R. Crane, Director, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, UK.

Peter Crane has been the Director of The Royal Botanic Gardens, Kew, UK since 1999. He was elected a Fellow of the Royal Society in 1988 and currently serves on their Council. He is also a Foreign Associate of the US National Academy of Sciences, a Foreign Member of The Royal Swedish Academy of Sciences and a Member of the German Academy Leopoldina. Professor Crane joined the Field Museum in Chicago in 1982 as Assistant Curator in the Department of Geology, and

from 1992 to 1999 served as Director with overall responsibility for the Museum's scientific programmes. Professor Crane's main research interests integrate studies of living and fossil plants to understand large-scale patterns and processes of plant evolution and increasingly he is also engaged in a variety of initiatives focused on the conservation of plant diversity. He is the author of more than 100 scientific publications, including several books on plant evolution. He was knighted in 2004.

Alastair Culham, School of Plant Sciences, The University of Reading, Whiteknights, PO Box 221, Reading RG6 6AS, UK.

Alastair Culham is lecturer in Plant Systematics in the School of Plant Sciences at The University of Reading, UK with a special focus on the use of molecular phylogenies in the study of plant diversification. He has a long-term interest in evolutionary radiations, in particular those in physical and habitat islands. Research projects have included the diversification of *Pelargonium* in the Cape region of South Africa, the evolution of *Echium* on the Canary Islands, the phylogenetics of the Ranunculaceae, genetic diversity and conservation – especially in *Cyclamen* – and a monographic study of the sundew family Droseraceae. Currently he is working on a major project to integrate taxonomic information to better understand patterns of plant diversification. He has published more than 50 scientific papers and many popular articles.

J. Cullen, Stanley Smith (UK) Horticultural Trust, PO Box 365, Cambridge CB2 1HR, UK.

James Cullen is Director of the Stanley Smith (UK) Horticultural Trust. He trained at the University of Liverpool but worked for a considerable period in Edinburgh, first in the University's Department of Botany (working on P. H. Davis's *Flora of Turkey*), later at the Royal Botanic Garden Edinburgh where, as Assistant Keeper, he edited *The European Garden Flora*. His main interest is in the maintenance and development of scientific collections of living plants.

Kate Davis, Conventions and Policy Section Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, UK.

Kate Davis is CBD Implementation Officer, Conventions and Policy Section, Royal Botanic Gardens, Kew, working to facilitate communication between scientists and policymakers. She is a co-author with China Williams of *The* CBD *for Botanists*, a plain-language guide to the CBD and its practical implementation. Kate is a UK delegate to the meetings of the CBD. Kate has undergraduate and post-graduate qualifications in zoology and extensive experience in conservation, education and museum/herbarium curation.

John Dransfield, The Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, UK.

John Dransfield has worked in the Herbarium of the Royal Botanic Gardens, Kew, UK since 1975 and currently leads Kew's palm research team. John Dransfield is widely acknowledged as the world expert on the biology and systematics of the palm family. He is the author of more than 200 scientific papers, 8 books and numerous floristic treatments and technical reports. His name is attached to 287 taxonomic names, the majority of which are palms, but he has also made an exceptional contribution to palm biology and tropical botany as a whole.

Doug Evans, European Topic Centre on Nature Protection and Biodiversity (European Environment Agency), Muséum National d'Histoire Naturelle, 57 rue Cuvier, 75231, Paris Cedex 05, France.

Doug Evans joined Scottish Natural Heritage in 1993 and has been on secondment to the European Topic Centre on Nature Protection and Biodiversity (Paris) since 1999. He has been involved in implementing the EU Habitats Directive since 1994, at first in the Scottish Highlands and Islands and more recently at the EU level, giving scientific advice and assistance to Environmental Director General of the European Commission, particularly for issues relating to plants and habitats. He is a graduate of Stirling and Aberdeen universities, where he studied plant ecology and has also worked for the UK Institute of Terrestrial Ecology and the French l'Institut National de la Recherche Agronomique.

Renée J. Grayer, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, UK.

Renée Grayer has been employed as a senior scientific officer at the Royal Botanic Gardens, Kew, UK since 1994, where she does phytochemical research in the Biological Interactions Section. Previously she worked at The universities of Reading, UK and Leiden, the Netherlands. Her current research covers the chemosystematics of the plant family Lamiaceae and the isolation of bioactive plant constituents. Dr Grayer is the author or co-author of 66 research or review articles and 14 books or book chapters. She was also a major contributor to *The Phytochemical Dictionary* and *The Handbook of Flavonoids* edited by J. B. Harborne and H. Baxter.

Chris J. Humphries, Department of Botany, The Natural History Museum, Cromwell Road, London SW7 5BD, UK.

Chris Humphries has been working as a biologist since 1966 and from 1972 as a taxonomist in the Department of Botany at the Natural History Museum, London. Chris has had three sabbatical trips – two to the University of Melbourne during

1979–80 and 1986 and six months at the Wissenschaftskolleg zu Berlin in 1994. Professor Humphries' areas of interest include the systematics of angiosperms and historical biogeography, both in theory and practice and he has done some of his best work on conservation using complementarity techniques. Professor Humphries' main publications can be seen at http://www.chrishumphries.com/cjh/publications.html. His awards include the Bicentenary Medal of the Linnean Society (1980), the Gold Medal of the Linnean Society (2001), and an Honorary Fellow of the American Association for the Advancement of Science (2002).

Christopher B. Johnson, Department of Natural Products and Biotechnology, Mediterranean Agronomic Institute, PO Box 85, 73100 Chania, Greece.

Christopher Johnson is a Senior Research Associate in the Department of Natural Products and Biotechnology, Mediterranean Agronomic Institute at Chania, Greece. Formerly, he was a lecturer in Plant Physiology and Biochemistry at The University of Reading, UK. He specialised extensively in the environmental and nutritional control of plant development, especially developmental effects of light; most recently he has concentrated on environmental and nutritional factors affecting secondary-product formation, particularly essential oils, in aromatic plants.

Stephen L. Jury, School of Plant Sciences, The University of Reading, Whiteknights, PO Box 221, Reading RG6 6AS, UK.

Stephen Jury is Herbarium Curator and Principal Research Fellow in the School of Plant Sciences at The University of Reading, UK. He completed a thesis on the Umbelliferae, supervised by Vernon Heywood in the 1970s. His teaching and research interests cover systematics, European and Mediterranean (especially Morocco) floristics, cultivated-plant nomenclature and conservation issues. At present he continues to coordinate and develop Euro+Med PlantBase, an Internet database providing plant information for Europe and the Mediterranean area.

Etelka Leadlay, Botanic Gardens Conservation International, Descanso House, 199 Kew Road, Richmond, Surrey, TW9 3BW, UK.

Etelka Leadlay is Head of Research and Membership Services for Botanic Gardens Conservation International (BGCI), UK. She has worked for BGCI since 1987 and has a Ph.D. in the systematics of the genus *Coincya* (Cruciferae) from The University of Reading, UK supervised by Vernon Heywood in the 1970s.

H. Noel McGough, Conventions and Policy Section, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, UK.

Noel McGough is Head of the Conventions and Policy Section at the Royal Botanic Gardens, Kew, coordinating Kew's role of UK CITES Scientific Authority for Plants

and Kew's policy and implementation of its commitments under the Biodiversity Convention. Noel joined Kew in 1988 after working as an ecologist at the Wildlife Service Ireland, where he co-authored the *Irish Plant Red Book*. Noel is Co-Chair of the CITES Nomenclature Committee and a member of EU CITES Scientific Review Group and UK delegations to the CITES Conference of the Parties, Technical Committees and EU negotiations. Noel has published a range of papers and books on CITES and plant-trade-related matters, most recently as lead author on two CITES reference works in French, Spanish and English: *CITES and Plants* and also *CITES and Succulents*.

David S. Paterson, Royal Botanic Garden Edinburgh, 20a Inverleith Row, Edinburgh EH3 5LR, UK.

David Paterson is Deputy Director of Horticulture at the Royal Botanic Garden Edinburgh and Honorary Director of Horticulture at the Kunming Institute of Botany. He holds an Honours Diploma in Horticulture and was awarded a Master of Arboriculture degree by the Royal Forestry Society. He has participated in numerous field trips to the mountainous regions of southwest China. He has facilitated plant repatriation programmes in Sichuan and Guizhou Provinces and has managed a number of capacity-building projects in China. He proposed the development of the Jade Dragon Field Station near Lijiang in China and is now Project Manager for the facility. He is senior consultant to the Lijiang Botanic Garden project that is being developed adjacent to the field station.

Alan Paton, Conventions and Policy Section, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, UK.

Alan Paton is Assistant Keeper of the Herbarium, Royal Botanic Gardens, Kew, responsible for the collection, and management and research into the major dicotyledon plant families within the Herbarium. He is an author of 70 scientific papers with an interest and extensive experience in making information held within the Herbarium collections more accessible and relevant to the implementation of the CBD. Alan is currently a member of the Coordinating Mechanism of the Global Taxonomy Initiative and involved in the facilitation of Target 1 of the Global Strategy for Plant Conservation: a widely accessible list of known plant species.

Laura J. Pleasants, Directorate, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, UK.

Laura Pleasants is working at the Royal Botanic Gardens, Kew, as the Research Assistant to the Director, Professor Sir Peter Crane. Laura has a degree in Biology from the University of Southampton and an M.Sc. in Plant Diversity (Taxonomy and Evolution) from The University of Reading.

Ghillean T. Prance, c/o School of Plant Sciences, The University of Reading, Whiteknights, PO Box 221, Reading RG6 6AS, UK.

Ghillean Prance is Scientific Director of the Eden Project in Cornwall and Visiting Professor at The University of Reading. He was Director of the Royal Botanic Gardens, Kew from 1988 to 1999. His exploration of Amazonia included 15 expeditions in which he collected more than 350 new plant species. He is author of 19 books and has published 475 scientific and general papers in taxonomy, ethnobotany, economic botany, conservation and ecology. He has received numerous awards and honours – including election as a Fellow of the Royal Society – was knighted in 1995 and received the International Cosmos Prize in 1994.

T. C. G. Rich, Department of Biodiversity and Systematic Biology, National Museums and Galleries of Wales, Cathays Park, Cardiff CF10 3NP, UK.

Tim Rich holds an Ecology B.Sc. from Lancaster University and a Plant Physiology Ph.D. from Leicester University. He is currently Head of Vascular Plants at the Department of Biodiversity and Systematic Biology, National Museums and Galleries of Wales. His interests span taxonomy (e.g. *Sorbus*, Brassicaceae), rare-plant conservation, vegetation, plant physiology, environmental impact assessment and monitoring, with special reference to the flora of the British Isles. He has written numerous papers and books including the Botanical Society of the British Isles' *Crucifers of Great Britain and Ireland* Handbook and Plant Crib (1998).

Dominique Richard, European Topic Centre on Nature Protection and Biodiversity (European Environment Agency), Muséum National d'Histoire Naturelle, 57 rue Cuvier, 75231, Paris Cedex 05, France.

Dominique Richard is a graduate of Grenoble University, France where she studied Applied Ecology. She started her professional career in the French Alps within an agricultural State Department dealing with protected areas. She joined the National Museum of Natural History (Paris) in 1989 where she led a national project on sites of ecological interest on behalf of the French Ministry of the Environment until she was appointed in 1994 as Deputy Manager of the European Topic Centre on Nature Protection and Biodiversity (Paris), a branch of the European Environment Agency. In this position she has been acting at the interface between science, policy and communication, being responsible for reporting on biodiversity states and trends at European level in support of different policy processes, as well as for capacity building for biodiversity monitoring.

Melpomeni Skoula, Department of Natural Products and Biotechnology, Mediterranean Agronomic Institute, PO Box 85, 73100 Chania, Greece.

Melpomeni Skoula is a Senior Research Associate at the Department of Natural Products and Biotechnology, Mediterranean Agronomic Institute of Chania, Greece. Her work has concentrated on the biology and taxonomy of aromatic plants as well as ethnobotany and sustainable use of biodiversity. Recently her research has been centred on the phytochemistry and genetics of essential oils and flavonoids.

Paul P. Smith, Royal Botanic Gardens, Kew, Seed Conservation Department, Wakehurst Place, Ardingly, West Sussex, RH17 6TN, UK.

Paul Smith is International Coordinator Millennium Seed Bank Project (Southern Africa and Madagascar), Royal Botanic Gardens, Wakehurst Place, UK. Paul is a specialist in ecology and plant diversity in southern, central and eastern Africa. He has extensive experience in ecological surveying, botanical inventory, vegetation mapping and monitoring, including the use of geographic information systems and remote-sensing techniques.

Tod F. Stuessy, Department of Higher Plant Systematics and Evolution, Institute of Botany, University of Vienna, Rennweg 14, A-1030, Vienna, Austria.

Tod Stuessy is a Professor in the Department of Higher Plant Systematics and Evolution, Institute of Botany, University of Vienna, Austria. He has also worked in South America and Asia and been a productive and influential botanist with particular impact in plant systematics. His contributions include monographic studies in the Asteraceae, with over 200 publications including 9 edited or single-authored books. The highlight of the latter was his 1990 book, *Plant Taxonomy: the Systematic Evaluation of Comparative Data*. He has been President of the American Society of Plant Taxonomists and has held offices in many other societies.

S. Max Walters, c/o Cambridge University Botanic Garden, Cory Lodge, Bateman Street, Cambridge CB2 1JF, UK.

Max Walters has followed a distinguished career as researcher, teacher, *Flora Europaea* editor, popular writer and persistent advocate of close botanical and social links with continental Europe. Dr Walters was a Lecturer and Curator of the Herbarium at Cambridge University from 1949 until his appointment as the Director of the Cambridge University Botanic Garden in 1973; he has continued working in research, writing and advocacy in his retirement.

China Williams, Conventions and Policy Section, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, UK.

China Williams is CBD Education Officer, Conventions and Policy Section, Royal Botanic Gardens, Kew working to facilitate communication between scientists and policymakers, and to ensure that Kew's scientific work is in line with national

legislation implementing the CBD. China develops teaching modules on the CBD and its implementation for Kew staff, students and international partners. She has a degree in History and is a Barrister at Law. China is co-author with Kate Davis of *The CBD for Botanists*, a plain-language guide to the CBD and its practical implementation.

Julia Willison, Botanic Gardens Conservation International, Descanso House, 199 Kew Road, Richmond, Surrey, TW9 3BW, UK.

Julia Willison is Head of Education at Botanic Gardens Conservation International (BGCI). Since joining BGCI, Julia has created an education network of over 400 botanic gardens. She co-edits the BGCI education review, *Roots,* and is responsible for publishing educational policy documents such as *Environmental Education in Botanic Gardens: Guidelines for Developing Individual Strategies* and the *Education for Sustainable Development: Guidelines for Action in Botanic Gardens*. Julia has organised international education congresses in the Netherlands, United States, India and Sydney, and has run training courses and projects in many other countries. She was also instrumental in establishing the International Diploma Course in Botanic Garden Education. Julia is committed to the idea that environmental education is crucial for a sustainable future.

Peter Wyse Jackson, Botanic Gardens Conservation International, Descanso House, 199 Kew Road, Richmond, Surrey, TW9 3BW, UK.

Peter Wyse Jackson has been Secretary General of Botanic Gardens Conservation International since 1994, joining in 1987 when it was known as IUCN Botanic Gardens Conservation Secretariat. He is author of over 250 scientific papers and articles on plant conservation, plant taxonomy, gardening and horticulture, Irish floristics and systematics, botanic garden development and management, and the conservation of endangered island floras; and is author, co-author or editor of 9 books. He is an adviser to botanic gardens in more than 30 countries and a leading contributor to the development, coordination and implementation of the Global Strategy for Plant Conservation adopted by the CBD in 2002. He is also Chairman (from February 2004) of the Global Partnership for Plant Conservation.

Preface

The objective of the book is to demonstrate the critical importance of taxonomy for the conservation and sustainable use of plant biodiversity.

All conventions, initiatives, strategies and programmes for plant conservation highlight the need for taxonomy. These initiatives assume that everyone understands why taxonomy is important but this is not the case and the work of conservation biologists, biodiversity management agencies and users of biodiversity is often compromised through failure to ensure an adequate taxonomic basis. To some extent taxonomy is the victim of its own success; quite simply, scientists and the public take it for granted and think 'it has been done'. This view leads some scientists to think that taxonomy has no value and is an unnecessary complication. Scientists are not always aware of its rigorous and painstaking base and do not fully understand that taxonomy is a continuous process of incorporating new information. Furthermore, taxonomists appear to work in isolation and are criticised for not collaborating more closely with conservation agencies or making their taxonomic work and expertise easily available for conservationists. This book attempts to bridge the gap between taxonomists and conservation practitioners.

Plants are universally recognised as a vital part of the world's biological diversity and an essential resource for the planet. At present we do not have a complete inventory of the plants of the world, but estimates are in the order of 250 000 to 400 000 species. Of particular concern is the fact that many of these species are in danger of extinction, threatened by habitat transformation, over-exploitation, alien invasive species, pollution and climate change. According to the 1997 *IUCN Red List of Threatened Plants* nearly 34 000 plant species, or 12.5% of the world's vascular flora, are threatened with extinction (Walter & Gillett, 1998). However, the reduction in abundance and range of many numerous and widespread species is also an expression of overall biodiversity loss. The disappearance of such vital and large amounts of biodiversity sets one of the greatest challenges for the world

community: to halt the destruction of the plant diversity that is so essential to meet the present and future needs of humankind.

It was growing concern over the effects of biodiversity loss on progress towards sustainable development that led to the establishment of the Convention on Biological Diversity (CBD) in 1992 (UNEP, 1992). The identification of the 'taxonomic impediment' on our ability to manage and use our biological diversity led to the Global Taxonomy Initiative (GTI) to increase capacity in taxonomy (UNEP, 2002a). Concern that insufficient resources were being directed towards plant conservation led to the Global Strategy for Plant Conservation (GSPC) which has set targets that are to be met by 2010 with the object of halting 'the current and continuing loss of plant diversity' (UNEP, 2002b). Furthermore, it is thought that biodiversity loss, together with other forms of environmental degradation, has the potential to undermine progress towards the achievement of the Millennium Development Goals, to be achieved by 2015 (www.undp.org/mdg); in particular Goal 1 to eradicate poverty and hunger, Goals 4 and 5 to improve health and Goal 7 to ensure environmental sustainability. Biodiversity contributes to poverty reduction in five key areas: food security, health improvement, income generation, reduced vulnerability to unpredictable events (e.g. access to food and environmental risks) and ecosystem services (e.g. generation of water, prevention of erosion) (Koziell & McNeill, 2002). The CBD and thematic programmes of the CBD (GTI and GSPC) and the Millennium Development Goals show that it is more important than ever to identify and conserve biodiversity for the sustainable development of the planet.

This book addresses this issue by describing and illustrating the importance of taxonomy in conservation. The Introduction (Part I) provides an overview of the place of taxonomy in science and in implementing the CBD (UNEP, 1992); the introduction also outlines areas of taxonomy that will be of particular importance in the future. Part II describes taxonomy and the work of taxonomists, and shows how a taxonomist makes decisions and why their outputs are valuable. Part III shows how taxonomy is essential in measuring and analysing plant diversity to establish priorities and develop plans for conservation. Part IV demonstrates how taxonomy is used in the practice and measurement of effective conservation action. These chapters cover the problems of: island floras, critical vascular plants and reintroduction of plants into the wild; the sustainable development and use of plants; *ex situ* and *in situ* approaches; legislation and the importance of conservation networks.

This book endeavours to show that sound taxonomy underpins conservation and that there is an urgent need for taxonomists to work in partnership with the managers of diversity for the conservation and the sustainable use of plants.

References

UNEP (1992). *Convention on Biological Diversity (CBD): Text and Annexes*. Geneva, Switzerland: CBD Interim Secretariat. www.biodiv.org.

(2002a). *Global Taxonomy Initiative (GTI)*. Decision VI/8, UNEP/CBD/COP/6/20. Montreal, Canada: CBD Secretariat. www.biodiv.org/programmes/cross-cutting/taxonomy/default.asp.

(2002b). *Global Strategy for Plant Conservation (GSPC)*. Decision VI/9, UNEP/CBD/COP/6/20. Montreal, Canada: CBD Secretariat. (Available in hard copy in English, Spanish and Chinese from the Secretariat.) www.biodiv.org/programmes/cross-cutting/plant/.

Koziell, I. & McNeill, C. I. (2002). *Building on Hidden Opportunities to Achieve the Millennium Goals: Poverty Reduction Through Conservation and Sustainable Use of Biodiversity*. New York: The Equator Initiative (UNDP).

Walter, K. S. & Gillett, H. J. eds. (1998). *1997 IUCN Red List of Threatened Plants*. Cambridge, UK: World Conservation Monitoring Centre and Gland, Switzerland: IUCN.

Acknowledgements

We are very grateful to everyone who has given advice on this book. We would like to thank Barbara Pickersgill, Chris Humphries, Hugh Synge and Alastair Culham for help in developing the scope of the book; and all those who have read chapters and given their comments and help, in particular Dick Brummitt and David Moore. We would also like to thank family and friends who have been supportive, especially John Davey. Above all, we would like to thank our authors who have been so willing to write these excellent chapters to illustrate the importance of taxonomy.