

Cambridge University Press

978-0-521-15366-9 - Flora Europaea, Volume 1: Psilotaceae to Platanaceae - Second Edition

Edited by T. G. Tutin, N. A. Burges, A. O. Chater, J. R. Edmondson, V. H. Heywood, D. M. Moore, D. H. Valentine, S. M. Walters and D. A. Webb

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# FLORA EUROPAEA

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VOLUME 1

PSILOTACEAE TO PLATANACEAE

SECOND EDITION

EDITED BY

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## PREFACE

On 4 September 1977, a meeting was held in Cambridge of many of those associated with the *Flora Europaea* project to mark the completion of the work and to hand formally to the Cambridge University Press the manuscript of the final volume. During this meeting there were discussions on the need for revisions, for corrigenda and addenda, for a possible second edition and on the future of the Flora Europaea Organization as a whole. There was a strong feeling, particularly amongst our continental colleagues, that some way of continuing the links which had been built up through the Flora Europaea Organization, should be maintained. It was generally agreed that neither the Editorial Committee nor the Flora Europaea Organization should be disbanded but, for the time being, would go into abeyance.

After the proofs of Volume 5 had been checked and the other responsibilities completed, the Editorial Committee arranged for the papers associated with the Flora Europaea Organization and with the preparation of the manuscripts to be deposited in the Library of the University of Reading under the care of the University Archivist. Arrangements had already been made for the royalties from the sale of the volumes of *Flora Europaea* and associated publications to be paid into a special Trust Fund administered by the Linnean Society of London. The Editorial Committee would like to record its thanks to the Linnean Society for so ably administering the Trust Fund and for the continuing support which the Society has given in so many ways.

Since Volume 5 was published, many informal discussions have taken place between members of the Editorial Committee regarding the production of indices and taxonomic publications closely associated with *Flora Europaea* and, particularly, about the continually accumulating *addenda* and *corrigenda*, which were being assembled by Professors Heywood and Moore at the University of Reading. In October 1981, the Editorial Committee reassembled on a formal basis and has continued to meet at regular intervals. There was a general feeling among the members of the Committee that, if any revision were to be attempted, it would be particularly necessary for Volume 1. This was, in part, because it was the most out of date, but also because the Committee believed it to contain more errors than did later volumes. Many of these arose from the fact that the technique of making the critical synthesis, at which the Flora aimed, took some time to learn, and also from the necessity of meeting an acceptable time-schedule, which meant that some parts of the volume were written or edited in more haste than the Editorial Committee would have wished.

At a meeting in June 1983, the Editorial Committee discussed detailed papers prepared by members of the Committee on proposals for the revision of Volume 1. It was agreed that the Committee should undertake the responsibility itself and an outline of the procedures to be followed was agreed. The accumulated royalties in the Flora Europaea Trust Fund made it possible for the Committee to appoint an experienced full-time research worker to carry out the revision under the direction of the Committee. Dr J. R. Akeroyd was appointed, taking up his duties on 1 October 1983. His previous experience with the taxonomy and evolution of British and Mediterranean plants was, in the view of the Editorial Committee, particularly appropriate. Later, a further appointment was made, and Dr M. E. Newton began work on the Flora in February 1990.

Since the publication of Volume 5, Mr A. O. Chater of the Natural History Museum, London, and Dr J. R. Edmondson of the National Museums & Galleries on Merseyside, Liverpool, have

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joined the Editorial Committee. It was with great regret that the members of the Organization learnt of the deaths of Professor D. H. Valentine on 10 April 1987 and Professor T. G. Tutin, F.R.S. on 7 October 1987. These colleagues both played major rôles in the inception, development and subsequent successful conclusion of the Flora Europaea project.

Following the death of Professor Tutin, Dr N. A. Burges was appointed Chairman of the Committee, whilst Professor V. H. Heywood, who had so very ably carried out the duties of Secretary since the formation of the Committee in January 1956, was succeeded by Professor D. M. Moore in November 1986 and he, in October 1989, by Dr J. R. Edmondson. Professors Heywood and Moore both remain as members of the Committee.

With the limited resources available it was impossible to continue the formal continent-wide consultation and the circulation of manuscripts in various stages of completion, valued almost as much by our European colleagues as by ourselves in the preparation of the first edition. However, many colleagues throughout Europe have significantly assisted in the revision of this volume. Throughout the revision, the Committee for Mapping the Flora of Europe, in Helsinki, has also made available a great deal of manuscript information which has proved invaluable.

Virtually every genus has been critically examined, and the accounts of most genera have been substantially revised. The relative amount of work undertaken by the authors involved in the revisions varies greatly and it has not been easy to indicate this succinctly in the text. The compromise decided on by the Editorial Committee has been to limit the attribution of authorship to three categories: (i) where the original author is deceased, inaccessible or did not wish to be associated with the revised account, the account is shown as 'original author (edition 1) revised by new contributor (edition 2)'; (ii) where a major revision has been undertaken by a new contributor with the approval of the original author, it is shown as 'original author revised by new contributor'; and (iii) where the revision has been made in collaboration with the original author, the names of both contributors are given with no reference to edition.

The Editorial Committee realizes that the restriction to only three categories may lead to an oversimplification of the variation in the amount of work undertaken by different contributors, but it believes this is preferable to attempting to provide a more detailed quantitative assessment which would be difficult to do with any precision. There have been instances where the Editorial Committee has found it necessary to take firm editorial action to achieve the consistency of treatment which has been such a fundamental feature of *Flora Europaea* since its inception and which experience has shown has been valued by the users of the Flora. As throughout the Flora, the Editorial Committee accepts responsibility for the accounts as published.

Since publication of the first edition of Volume 1 in 1964, some 250 species and 150 subspecies belonging to families in Volume 1 have been described from Europe as new to science. In addition to these, 25 species, known elsewhere, have been recorded as occurring as natives in Europe, while around 40 additional alien species have been reported as being naturalized in Europe. A critical assessment of these in accordance with the principles used throughout *Flora Europaea* has led us to include some 350 extra taxa in the new edition. At the same time, further information has enabled us to clarify many of the doubts raised in the first edition and has resulted in the deletion of about 20 taxa. Changes in taxonomy and nomenclature have been made only when there seemed to be general agreement as to their correctness by those who had studied the problem. When reasonable doubt remained, we thought it better to make no change. Although the main burden of the work in revising Volume 1 has fallen on Dr Akeroyd, the Editorial Committee has maintained a close supervision throughout.

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In the preparation of the second edition of Volume 1 we have attempted to meet one of the most widely voiced criticisms of the first edition; that text synonymy was too often inadequate, many synonyms being restricted to the index alone. All synonyms are now cited in the text.

In the first edition, separate lists were given of what were regarded as Basic Floras and Standard Floras. The inclusion of synonyms in the text and the appearance of newer works has made the distinction no longer of value. Accordingly, there is now a single list of Standard Floras which gives an indication of the source of synonyms and of the most up-to-date Floras of the various areas covered by *Flora Europaea*.

The publication of a revised Volume 1 naturally raises the issue as to what revisions, if any, should be made of the other volumes. At the moment no decision has been taken but the matter is under active review by the Editorial Committee, the Secretariat of which is now based in the Department of Botany at Liverpool Museum, part of the National Museums & Galleries on Merseyside.

June 1991

## ACKNOWLEDGEMENTS

The Editorial Committee gratefully acknowledges the support of the Linnean Society of London, whose Flora Europaea Trust Fund provided £120,000 towards the cost of revising this volume. It has financed the employment of two full-time Research Officers, J. R. Akeroyd (1983–1988) and M. E. Newton (1990–), and has met other expenses of the Secretariat. This was helped over a difficult period by a loan from the Royal Society's scientific publications fund. Financial assistance in the form of a legacy from the estate of the late Miss M. S. Campbell is also greatly appreciated, having provided an opportunity to commission illustrations for a new series of Notulae.

In undertaking the revision of Volume 1 of *Flora Europaea* the Committee has enjoyed continued assistance and encouragement from many colleagues throughout Europe. We wish to thank them for their willing and generous co-operation. Their help has been given in many ways, some of them botanical and others technical, but all of them vital to the success of our project.

We are deeply appreciative of the assistance of R. R. Mill, who compiled and checked the Appendices, and Mrs L. Walters, who transferred synonymy to the text and drew up the index. Our special thanks are due to Mrs M. Hart for typing the manuscript so diligently.

In addition to the authors of individual accounts, we have received advice on particular groups from many people: J. Cullen (*Alyssum*, *Aurinia*), C. R. Fraser-Jenkins (*Polypodium*), H. Freitag (Chenopodiaceae), I. C. Hedge (Chenopodiaceae), M. V. Kasakova (*Schivereckia*), R. D. Meikle (Salicaceae), C. N. Page (*Equisetum*), J. R. Press (*Rumex*, Subgen. *Platypodium*), C. D. Preston (Aizoaceae), K. H. Rechinger (*Rumex*), T. C. G. Rich (Cruciferae), L.-P. Ronse Decraene (*Polygonum*), F. Rose (*Salicornia*), G. D. Rowley (Aizoaceae, Crassulaceae), D. Tzanoudakis (*Paeonia*), P. Uotila (*Chenopodium*) and S. D. Webster (*Ranunculus*, Subgen. *Batrachium*). P. W. Ball, as well as editing Cruciferae, critically read many of the manuscripts, and A. C. Jermy and Miss A. M. Paul carefully checked Pteridophyta.

More general comment and advice for which we are grateful was received from: H. J. M. Bowen, R. K. Brummitt, G. Buzas, E. J. Clement, D. V. Geltman, A. Hansen, J. Jalas, C. E. Jarvis, S. L. Jury, D. H. Kent, Miss C. Leon, Mrs B. Molesworth Allen, D. Nicolson, Miss E. Powell, R. W. Rutherford, P. D. Sell, C. A. Stace, J. Suominen and M. F. Watson. The Editorial Committee is also most grateful to members of the Committee for Mapping the Flora of Europe for their generosity in allowing us to consult unpublished typescripts from the *Atlas Florae Europaeae* project.

The Committee acknowledges a debt of gratitude to the Directors of many Museums and Herbaria. We thank them all but wish particularly to mention the University of Cambridge; Trinity College, Dublin; the Royal Botanic Garden, Edinburgh; the National Museums & Galleries on Merseyside, Liverpool; the Natural History Museum, London; and the University of Reading, the institutions whose facilities we have enjoyed for the greater part of our work.

June 1991

## PREFACE TO THE FIRST EDITION

Europe, where scientific taxonomy was developed, and whose taxonomists have participated, for more than a century, in the preparation of Floras for other continents, does not possess a Flora of its own. Many hundreds of national and regional Floras exist, together covering almost every part of Europe, but there is no modern work which deals with the area as a whole.

There are obvious historical and political reasons which explain the lack of such a Flora. It is, however, becoming increasingly important, as in all other fields of science, that a work synthesizing the accumulated data from the various regions should be produced. For one thing, the channels of distribution of information are being choked by the accumulation of unassimilated or neglected data and if these channels can be cleared, and the data sifted, collected and arranged, botanical science will be stimulated. Equally important, good taxonomy is the basis for many kinds of scientific research, but this taxonomy must be broadly based and well considered and must transcend national boundaries. To the biosystematist and the phytogeographer, for example, local taxonomy can be misleading, whereas a wider treatment, on a continental scale, can correct misconceptions and reveal problems that had not been previously suspected. A new, synthetic Flora of Europe will be useful, not only to specialists, but also to biologists of many kinds. It should make it easier for them to give a plant an accurate name, which we regard as one of the primary aims of a Flora, and it should also direct their attention to literature in which further information can be found.

The problems which face those attempting to write a Flora of Europe are formidable. The materials available are of various kinds: there are some outdated catalogues of European plants (such as Nyman's *Conspectus Florae Europaeae*), some important regional Floras, such as those by Hegi and Komarov (see p. xxix), and many excellent national Floras. In addition, there is a vast accumulation of literature, published in many places and in a variety of languages, much of which is relatively inaccessible and virtually unknown outside its country of origin. The writers of a European Flora must be prepared to seek out this literature and review it critically, in addition to studying for themselves in the herbarium and the field the plants about which they propose to write.

This, then, is the background against which any decision to write a Flora of Europe has to be taken. Mention must be made of the *Flora Europaea* projected by Werner Rothmaler in the 1940s which was to cover not only Europe but also the Caucasus, Transjordan and parts of North Africa. Owing to the conditions of wartime this scheme was abandoned. The question was reopened in a discussion on 'Progress of Work in the European Flora' at a session of the 8th International Botanical Congress held at Paris in 1954. Although no formal decision to write a Flora was taken, further discussions between a number of European botanists followed, and eventually an informal committee came into being, which held its first meeting at Leicester in January 1956. This committee (the constitution of which is given on p. vii), has remained in being, and, with few modifications, has become the executive committee in charge of the project. It was realized from the start that, while it was obviously advantageous to have a central organization in one part of Europe (the British Isles), the project could only succeed with continuous and substantial advice and help from every part of Europe. Accordingly, invitations to a number of distinguished European botanists to act as Advisory Editors (p. vii) were issued; the prompt acceptance of these invitations and the approval and support received encouraged the committee to proceed.



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## PREFACE TO THE FIRST EDITION

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The next step was to plan the Flora in detail. As a result of much discussion a booklet entitled *The Presentation of Taxonomic Information: A Short Guide for Contributors to Flora Europaea* was prepared and published in 1958, and it then became possible to begin the writing of the Flora. Editors for each family were appointed from the Editorial Committee, and accounts of individual families or genera were obtained from botanists in all parts of Europe. The list of contributors to volume I is given on p. xi. Details of the style and form of the Flora are given below (p. xxi).

It should be emphasized that it has been, and remains, the intention of the Editorial Committee to produce a concise and complete Flora in the shortest possible time. Consequently, the principle has been adopted that publication of the Flora cannot be delayed for an indefinite period to allow the lengthy and detailed research required for a complete solution of all the problems that arise during its preparation. The committee believes that it is more valuable to have a complete Flora, representing a synthesis of available information, than a series of detailed monographs where completion could not be foreseen. It is planned to complete the Flora in four volumes over the next eight years.

It is important to emphasize that full collaboration with taxonomists in every part of Europe has been sought and obtained at every stage during the writing of the Flora. A panel of Regional Advisers was organized (the full list is given above). All manuscripts were circulated to these Advisers, and their comments on them, based on their specialized knowledge of both taxonomy and local distributions, have been invaluable and constitute an integral part of the organization of the Flora.

Arising out of the contacts established in this way, Symposia have been held, at Vienna in 1959, and at Genoa in 1961, to which all the Advisers of the Flora were invited, and at which topics of common interest were discussed. These Symposia have been important in establishing international collaboration on a firm basis, and in making it possible to plan the future progress of the Flora with confidence. A further Symposium was held in 1963 in Romania.

The names of the authors primarily responsible for writing the accounts of the various families and genera are given in footnotes in the text. In preparing the first volume of the Flora for the press, much trouble has been taken by the editors to produce a self-consistent manuscript, in a fairly standardized form, incorporating such revision and alteration of taxonomy, nomenclature and distribution as has been necessary. It should therefore be made clear that the Editorial Committee takes full responsibility for the form in which the text is published.

Acknowledgement is made below to the many people and organizations who have given help, financial and otherwise, in the preparation of the Flora. We should, however, record here our special gratitude to the Department of Scientific and Industrial Research in London which, by granting the Committee large sums of money over a period of several years, has made it possible to set up and maintain a permanent secretariat at the University of Liverpool, and to undertake the many ancillary activities which have arisen. It is in the prospect of their continuing support that we are now proceeding with the second volume.

October 1963

Cambridge University Press

978-0-521-15366-9 - Flora Europaea, Volume 1: Psilotaceae to Platanaceae - Second Edition

Edited by T. G. Tutin, N. A. Burges, A. O. Chater, J. R. Edmondson, V. H. Heywood, D. M. Moore, D. H. Valentine, S. M. Walters and D. A. Webb

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## ACKNOWLEDGEMENTS TO THE FIRST EDITION

The Flora Europaea project received in its early stages several valuable *ad hoc* grants without which no substantial progress could have been made; these were from the Royal Society, the Botanical Research Fund, the Royal Horticultural Society, and Miss M. S. Campbell. A loan from Mr and Mrs J. E. Raven tidied the Committee over a difficult period. In 1959 a successful application was made by the Organizing Committee to the Department of Scientific and Industrial Research for a three-year grant which has now been extended for a further three years. The total amount of the grant for the period 1959–1965 is £32,000. This has permitted adequate finance of the Secretariat and its services, and the appointment of a number of full-time Research Assistants: Miss A. B. Mowat (1959–1960), Dr P. W. Ball (1959–) and Mr A. O. Chater (1960–). Dr Ball previously held a Leverhulme Research Fellowship at the University of Liverpool to work on the project. The Committee gratefully acknowledges all this generous support.

In addition to this main grant from British sources, the project received direct and indirect financial help from several countries, among which should be mentioned a grant for secretarial printing from the Instituto de Alta Cultura, Lisbon, and grants from the Ministries of Education in Austria and Italy, and from the International Union of Biological Sciences, towards the Symposia held in Vienna and Genoa. The third Symposium which was held in Romania was generously subsidized by the Academy of the Romanian People's Republic. We gratefully acknowledge the sponsorship of our project by the Linnean Society of London.

Acknowledgement is also due to the Universities of Cambridge, Dublin, Durham, Leicester and Liverpool for their support in making facilities available to the members of the Editorial Committee and their assistants. In particular the University of Liverpool has provided accommodation in the Hartley Botanical Laboratories for the Secretariat since 1957.

We are also grateful to the Directors of the various Museums and Herbaria who have provided the Editorial Committee and Regional Advisers with facilities to study their collections and utilize their libraries. Amongst these must be mentioned the Herbarium and Library, Royal Botanic Gardens, Kew; the Department of Botany, British Museum (Natural History), London; the Naturhistorisches Museum, Vienna; and the Herbarium of the Istituto Botanico, Florence. The Trinity College Dublin Trust has made a substantial grant towards the provision of microfilm and a reader.

A very large number of individual botanists have assisted us in various ways. The following deserve special mention: P. Aellen (Basel), Miss P. Edwards (London), A. Hansen (København), E. K. Horwood (Leicester), A. C. Jermy (London), N. Y. Sandwith (Kew). P. D. Sell (Cambridge), as well as assisting in several other ways, undertook the laborious task of preparing the index for the press.

The staff of the Secretariat, Mrs R. Seddon, Mrs J. Beck and Mrs T. Donnelly, deserve our special gratitude for their great efficiency and loyalty even during times of almost overwhelming pressure.

October 1963

## INTRODUCTION

The aim of the Flora is in general diagnostic, and the descriptions, while brief, are as far as possible comparable for related species. The Standard Floras listed on p. xxviii, and the monographs or revisions given when appropriate after the descriptions of families and genera, may assist the reader in obtaining more detailed information. Other references to published work are occasionally given in cases of special taxonomic difficulty.

All available evidence, morphological, geographical, ecological and cytogenetical, has been taken into consideration in delimiting species and subspecies, but they are in all cases definable in morphological terms. (Taxa below the rank of subspecies are not normally included.)

The delimitation of genera is often controversial and the solution adopted in the Flora may on occasion be a somewhat arbitrary choice between conflicting opinions. We have endeavoured to weigh as fairly as possible the various opinions available, but there has been no consistent policy of 'lumping' or 'splitting' genera (or, for that matter, species). The order and circumscription of the Dicotyledones in the second edition follows that of the first edition, which was largely based on that of Engler-Diels, *Syllabus der Pflanzenfamilien* ed. 11 (1936). It therefore differs in certain points from that of Melchior in Engler, *Syllabus der Pflanzenfamilien* ed. 12 (1964). The order of the Pteridophyta follows Derrick, Jermy and Paul, *Sommerfeltia* 6: 1–94 (1987).

All descriptions of taxa refer only to their representatives in Europe. In practice, we have relaxed this rule slightly for families and genera to avoid giving taxonomically misleading information, particularly in those cases where a large family or genus has only one or few, perhaps atypical, members in Europe. In such cases we have occasionally added 'in European members' or a similar phrase to emphasize the atypical representation. In no case, however, should it be assumed that the description is valid for all the non-European representatives of these taxa.

Often a short note follows the description of a species or, occasionally, a genus, containing additional information of various kinds.

### (a) *Choice of language*

Much thought was given to the question of the best language for the Flora. There were many reasons in favour of English, but the alternative of Latin also had much to commend it. After consulting the Regional Advisers, we decided in favour of English. Opinion in Europe was fairly evenly divided, but it seemed likely that whereas in some European countries the professional taxonomist might prefer Latin, the general botanist and other biologists would prefer English. It was also clear that outside Europe English would be preferred. As we were anxious to make the Flora available to as wide a circle of readers as possible, we felt that these considerations were decisive.

We have tried, however, to bear in mind throughout the writing and editing of the work that it will be used by many readers whose knowledge of English is very imperfect. For this reason we have restricted ourselves to a much smaller technical vocabulary than is usual, believing that the gain in ease of understanding would offset the small loss of precision sometimes involved. For the same reason, in most cases where there are two English words with the same meaning, we have preferred the one derived from a Latin root. A glossary has been added, whose purpose is not the



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usual one of explaining technical terms in simple language (which is impracticable on an international basis), but of giving a Latin equivalent of those English words which are important for an understanding of the text, and which differ substantially from their Latin equivalents. We have also provided a short list of English definitions of those terms which experience has shown to be open to misconstruction.

Place-names used in the summary of geographical distribution have been given in their English form when they refer to independent States or to such geographical features of Europe as transcend national boundaries. All other place-names are given in the language of the country concerned. Thus we write *Sweden*, *Ukraine*, *Danube*, *Alps*, *Mediterranean*, but *Corse*, *Kriti*, *Rodopi Planina*, *Abvenanmaa*. *Macedonia* is written in its English form if reference is intended to the whole of the region that has traditionally been known by that name; but the Yugoslav and Greek administrative units are referred to as *Makedonija* and *Makedbonia* respectively.

In transliteration from Cyrillic characters we have, as far as place-names and titles of publications are concerned, followed the ISO system recommended in the UNESCO *Bulletin for Libraries* 10: 136–137 (1956). This is almost identical with the system recommended by Paclt in *Taxon* 2: 159 (1953). Both are based essentially on the conventions of Serbo-Croat and, although the number of diacritical signs which they require is an undoubted disadvantage, they are the only systems which have any real claim to be considered international, all others in current use being based frankly on the acceptance of German or English conventions of pronunciation. With personal names, however, we have been influenced by the fact that Russian botanists, in transliterating their own names, usually follow German conventions; we have therefore followed the list of transliterations given in the index-volume (1962) to *Not. Syst. (Leningrad)/Botaničeskie Materialy*, and have transliterated personal names which do not occur in this list according to the same conventions.

In transliterating place-names from Greek characters we have, except for omitting the accents, followed *The Times Atlas of the World, Mid-Century Edition*, vol. 4 (London, 1956).

### (b) *Delimitation of Europe*

We have tried as far as possible to interpret 'Europe' for the purposes of this Flora in its traditional sense. There is no doubt that phytogeographically a more natural unit would be a 'Greater Europe', bounded by the Sahara desert and the great deserts of Asia, and including, therefore, North Africa and much of south-west Asia. But to have attempted to cover this area would have more than doubled our task and would have meant the inclusion of a disproportionately large number of plants whose status and identity are very uncertain. Europe in its traditional sense, however, is completely covered by Floras which, although they vary widely in competence and modernity, reduce the unsolved problems of taxonomy and distribution to a more reasonable compass.

In framing a precise definition of Europe in this traditional sense three questions arose: where the boundary with Asia was to be drawn in eastern Russia and Kazakhstan; where it was to be drawn in the Aegean region; and which islands in the Mediterranean Sea and the Atlantic and Arctic Oceans were to be included.

Some confusion may be caused by apparent differences in geographical distribution in the former territories of the U.S.S.R. between our data and those of the invaluable *Flora Partis europaeae URSS*. In a few cases they arise from differences of taxonomic opinion, or of judgements as to the status of a plant (casual, naturalized or native), but in most cases they can be attributed to the fact that the

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**INTRODUCTION**


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divisions used in that Flora are, though very similar to ours, not quite identical. This is because Fedorov, in the map published in the first volume of his Flora, very sensibly made his boundaries follow the lines of administrative divisions, whereas we had perforce to follow the not very precisely indicated boundaries of Komarov's divisions, which were ecologically and floristically based and paid no attention to administrative boundaries. The most important divergences are in northern Ukraine, southern Ural, and the region north-east of St Petersburg. These are included by Fedorov in his western (Zapad), eastern (Vostok) and northern (Sever) divisions respectively, whereas for us they all fall into Rs(C). There is also a divergence in the line delimiting Europe in the cis-Caucasian region: Fedorov includes a large part of the Stavropol plateau, which we exclude from Europe.

It will be seen that, in the Arctic, Franz Joseph Land (Zemlja Franca Josifa) and Novaja Zemlja are excluded, but the islands of Kolguev and Vajgač are included; that the boundary is then defined by the crest of the Ural Mountains (with a small deviation eastwards near Sverdlovsk) and the Ural River to the Caspian Sea (thus including in Europe a small portion of W. Kazakhstan); and that the whole of the Caucasus is excluded.

In the Aegean region we have drawn our boundary along the deep-water channel which separates the Sporadhes and the islands lying close to the mainland of Anatolia from those of the C. and W. Aegean. The only large islands under Greek sovereignty which are excluded from Europe are the Sporadhes, Khios, Lesvos and Rodhos. The only island under Turkish sovereignty which is included in Europe is Imroz; Bozcaada (Tenedos) and all the islands in the Sea of Marmara are excluded. Cyprus is also excluded.

All other islands in the Mediterranean (except those administered from Africa) are included in Europe, as are also the Açores, Færøer, Iceland, Jan Mayen, Björnöya (Bear Island) and Svalbard (Spitsbergen).

(c) *Keys*

Artificial dichotomous keys are provided within families and genera, and, where necessary, within species. A general key to families is also given (p. xxxiii), which includes all the families in the European flora, not only those described in this volume. The keys have been designed to be practical, and do not in general use characters which are difficult to observe, even if important taxonomically; they have also been kept as brief as possible. We have tried to give characters useful both in the herbarium and in the field, though this has often been difficult because of the lack of information about field characters in certain areas, notably S.E. Europe.

The choice of the indented key was made only after thorough discussion of the advantages and disadvantages of the many possible types of key. Briefly, the advantage of the indented key is that it may also act to some extent as a conspectus; in *Papaver*, for example, it separates the scapose species of the section *Meconella* from the rest of the genus. In this way similar species are often grouped together in the key, and identification of an unknown plant is facilitated. On the other hand, we have not hesitated to key out more than once certain taxa in which the relevant characters are variable.

(d) *Citation and synonymy*

The use of abbreviations for author and place of publication has been standardized as far as possible, and lists of these abbreviations are given in Appendices I, II and III.

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It is important to note that no attempt has been made to give a complete synonymy. Even at the binomial level, the number of names for European plants is four or five times the number of accepted species, and to include all these would be impracticable. Synonyms, whether full or partial, are given only when they are used or included in one of the Standard Floras or when they are necessary to prevent confusion. Synonyms (or the basionym) are also usually given when the combination has not previously been used in a Flora or monograph, or when the nomenclature is unfamiliar or in need of explanation. Where the name of a familiar species has been changed, an explanation has usually been published as a Notula (see Section (*j*)).

### (*e*) *Species descriptions*

In order to save space and facilitate identification, descriptions may take the form of a comparison with another description. The conventional way of setting this out is, to give an example (p. 212):

**131. *Silene dioica* (L.) Clairv ... Like 129 but ...**

This implies that the description with which it is being compared (in this example 129) applies to this taxon but for the differences noted. It does not necessarily mean that the two taxa are similar in appearance or that they are closely related. Additional descriptive information is sometimes also given, but in separate sentences.

Where dimensions are given, a measurement without qualification refers to length. Two measurements connected by  $\times$  indicate length followed by width. Further measurements in parentheses indicate exceptional cases outside the normal ranges.

The *diploid chromosome number* ( $2n =$  ) is given where it has been possible to verify that the count was made on material of known wild European origin. Details of those included in the first edition were provided by Moore, *Flora Europaea Check-list and Chromosome Index*, 1982, but subsequently published data have also been included in this revision.

*Ecological information* has been given very sparingly, and only where the ecological characteristics of a species are clearly and concisely definable for its total European range. There is an inevitable irregularity of treatment in this respect, but here, as with chromosome number, the Editorial Committee has thought it best to include only well-verified statements.

The description of each species is followed by an indication of its *distribution within Europe*. This falls into two parts: (1) a summary in a short phrase; (2) a list of abbreviations of 'territories' in which the species occurs. The summary phrase makes use of everyday geographical phrases and concepts such as 'W. Europe', 'the Mediterranean region', 'the Balkan peninsula', etc. Maps IV and V and the lists accompanying them indicate the interpretation which is to be put on these phrases. We would emphasize that they are to be interpreted in a simple geographical sense, and do not attempt in any way to divide Europe phytogeographically.

Species or subspecies believed to be endemic to Europe are distinguished by a symbol (●) before the summary of geographical distribution.

A more precise indication of distribution is given by the enumeration of the 'territories' (indicated by two-letter abbreviations from Latin) in which the plant is believed to occur. The limits of these territories follow, with very few exceptions, existing political boundaries. An alternative plan, which has been suggested by several colleagues, of dividing Europe into floristic regions and ignoring political boundaries would seem at first sight to have much to commend it. It is, however,

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impracticable for two reasons. First, although there is some agreement as to the broad primary units into which Europe might be divided floristically, there is no agreement on where exactly their boundaries are to be drawn, or on how they should be subdivided into smaller units of convenient size. Secondly, the information is more readily available in political than in phytogeographical terms. For rare or localized species it would have been possible to translate the information from one system to the other; but for wide-ranging species, which are described as occurring, for example, *dans une grande partie de la France mais très rare dans la région méditerranéenne*, the assignment to phytogeographical areas would have meant a search of local Floras and herbaria quite beyond the powers of authors or editors in the time available.

The political divisions have, therefore, been accepted. Each territory represents a sovereign State, with the following exceptions:

1. Certain islands or island-groups have, on account of their size, isolation, or floristic peculiarities, been treated as separate territories. These comprise Kriti, Corse, Sardegna, Sicilia, Islas Baleares, Færøer, Svalbard, Açores.
2. Malta is grouped with Sicilia, and the Channel Islands are grouped with France.
3. Ireland and Jugoslavia are each treated as a single territory.
4. The former U.S.S.R. has been subdivided, not according to its constituent republics (though these are often referred to by name in the geographical summary), but into six divisions formed by grouping together the floristic regions used in *Flora URSS*. A small adjustment has been made in the N. and E. Ukraine, so as to bring the boundaries as far as possible into line with those which delimit the regions used in *Flora RSS Ucr*.

The territories, of course, vary greatly in size, and Ga, Hs or Ju gives much less precise information than does Fa, Rs(K) or Tu. In all cases, however, the lists provide a statement as to which national Floras should be searched for further detailed information, whether on distribution or on taxonomy.

Occasionally the list of territories is followed by a brief indication, in parentheses, of extra-European distribution. We should, perhaps, explain why we have not done this for all species – a policy that was urged on us by many of our advisers. It is simply because we found that in far too many cases the information was not available. It is one thing to note that a plant has been recorded from China, from tropical Africa, or from North America under the same name as a European species; it is a very different matter to find out whether, in the opinion of a competent taxonomist, the two should really be judged as conspecific. We therefore thought it better to say nothing than to give further currency to data which have not been critically sifted and which contain many erroneous records. The only exceptions to this rule are for plants not native in Europe and for plants of which the European range is only a small fraction of their total area. If the only European record for a plant is from a limited area of S. Spain the reader may well wish to know whether it is strictly endemic there, or is found also across the straits in Morocco, or is a wide-ranging plant of North Africa that has established a small bridgehead in Europe. The three cases would be distinguished thus:

- *S. Spain*. Hs. indicates endemic to S. Spain,
- S. Spain*. Hs. indicates found also outside Europe,
- S. Spain*. Hs. (*N. Africa*.) indicates widespread also in North Africa; not primarily a European plant.

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### (f) *Infraspecific taxa*

In general the only infraspecific taxa described and keyed in the Flora are subspecies. Any formal treatment of variation below the level of subspecies would have been impossible in a Flora of this kind; most of the known variation of taxa is, however, covered in the descriptions. Taxa below the level of subspecies may be mentioned when, in the opinion of the author, they seem to have some claim to recognition at higher rank, but require further investigation. Conversely, many taxa published as species or subspecies, but whose claim to the rank seems doubtful, are described or briefly mentioned in supplementary notes under the species to which they seem most closely related.

No 'experimental' categories, such as ecotypes, are used in the Flora in a formal systematic sense, though they are sometimes mentioned in notes.

### (g) *Treatment of critical groups*

In certain cases where it is difficult to distinguish between a number of closely similar species, an *ad hoc* 'group' has been made, and these groups, not the individual species, are keyed out in the main species-key. They will serve for at least a partial identification. Following the description of a group in the text, a key to the component species is given, and they are then numbered and described so that a more detailed study, or the use of more adequate material, may enable the user to take the identification further. For example, in *Stellaria* there is the *S. media* group, which comprises the species *S. media* (L.) Vill., *S. neglecta* Weihe and *S. pallida* (Dumort.) Piré. Such groups have no taxonomic or nomenclatural status.

For the inbreeding and apomictic groups, other *ad hoc* treatments have been devised. The general approach to such groups is set out and discussed in detail in the Report of the first Flora Europaea Symposium in *Feddes Repert.* **63**: 107–228 (1961).

### (h) *Treatment of hybrids*

Only those few hybrids which reproduce vegetatively and are frequent over a reasonably large area (e.g. *Sagina* × *normaniana*) are described and keyed as for species. Other common hybrids may be mentioned individually in notes (e.g. *Silene dioica* × *latifolia*), or collectively for the whole genus (e.g. *Quercus*).

### (i) *Alien species*

The question of which alien species should be included is a difficult one for any Flora, and the difficulty is even greater on a continental scale. We have attempted to include the following categories:

- (i) Aliens which are effectively naturalized. These include garden plants which have escaped to situations not immediately adjacent to those in which they are cultivated, as well as weeds and other plants which have been accidentally introduced; provided, in both cases, that the plant has been established in at least one station for at least 25 years, or is reported as naturalized in a number of widely separated localities.
- (ii) Trees or crop-plants which are planted or cultivated in continuous stands on a fairly extensive scale.



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Casual aliens, i.e. those which do not persist without constant fresh introductions, are not included unless they have often been mistaken for a native or established species, or are for any other reason of special interest.

In assessing the status of a species in any part of Europe we have, however, been dependent almost entirely on the information contained in the national Floras, and it is clear that the criteria used by different authors vary widely. There are some genera, for example *Chenopodium*, in which every transitional state from a casual to a well-established weed can be observed. All data on native, established or casual status relating to weeds or other 'palaeosynanthropic' plants must, therefore, be regarded only as approximate.

### (j) *Publication of Novitates*

In the process of writing the accounts, new material requiring publication has naturally been brought together. For the publication of much of this material, the Committee made an arrangement with the Editorial Board of *Feddes Repertorium*, by which taxonomic and nomenclatural notes were published as part of a series entitled *Notulae Systematicae ad Floram Europaeam spectantes*. The first of these appeared in 1961. From 1971 such *Notulae* were published in the *Botanical Journal of the Linnean Society*. This continued until 1979, with the completion of the Flora in 1980. Beginning in 1987, a new series of *Notulae* relating to the revision of *Flora Europaea* vol. 1 has also been published in the *Botanical Journal of the Linnean Society*. By these arrangements, publication of new names or combinations in the Flora itself has been avoided.

## LIST OF STANDARD FLORAS

More detailed information on authorship and dates of publication as well as details of other floristic works can be found in Frodin, D. G., *Guide to standard floras of the world*, Cambridge, 1984.

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## SYNOPSIS OF FAMILIES IN VOLUME 1

### PTERIDOPHYTA

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|----|----------------------------------|----|----------------------------------|
|    | <b>PSILOTOPSIDA</b>              |    |                                  |
| 1  | Psilotaceae                      | 11 | Hymenophyllaceae                 |
|    | <b>LYCOPSIDA</b>                 | 12 | Polypodiaceae                    |
| 2  | Lycopodiaceae                    | 13 | Grammitidaceae                   |
| 3  | Selaginellaceae                  | 14 | Dicksoniaceae                    |
| 4  | Isoetaceae                       |    | (incl. <i>Cyatheaceae</i> )      |
|    | <b>SPHENOPSIDA</b>               | 15 | Hypolepidaceae                   |
| 5  | Equisetaceae                     |    | (incl. <i>Dennstaedtiaceae</i> ) |
|    | <b>FILICOPSIDA</b>               | 16 | Thelypteridaceae                 |
| 6  | Ophioglossaceae                  | 17 | Aspleniaceae                     |
| 7  | Osmundaceae                      | 18 | Woodsiaceae                      |
| 8  | Parkeriaceae                     |    | ( <i>Athyriaceae</i> )           |
| 9  | Adiantaceae                      | 19 | Dryopteridaceae                  |
|    | (incl. <i>Cryptogrammaceae</i> , |    | ( <i>Aspidiaceae</i> )           |
|    | <i>Gymnogrammaceae</i> ,         | 20 | Lomariopsidaceae                 |
|    | <i>Sinopteridaceae</i> )         |    | ( <i>Elaphoglossaceae</i> )      |
| 10 | Pteridaceae                      | 21 | Davalliaceae                     |
|    |                                  | 22 | Blechnaceae                      |
|    |                                  | 23 | Marsileaceae                     |
|    |                                  | 24 | Salviniaceae                     |
|    |                                  | 25 | Azollaceae                       |

### SPERMATOPHYTA

- |    |                      |    |                      |
|----|----------------------|----|----------------------|
|    | <b>GYMNOSPERMAE</b>  |    | <b>ANGIOSPERMAE</b>  |
|    | <b>CONIFEROPSIDA</b> |    | <b>DICOTYLEDONES</b> |
|    | <b>Coniferales</b>   |    | <b>Salicales</b>     |
| 26 | Pinaceae             | 31 | Salicaceae           |
| 27 | Taxodiaceae          |    | <b>Myricales</b>     |
| 28 | Cupressaceae         | 32 | Myricaceae           |
|    | <b>TAXOPSIDA</b>     |    | <b>Juglandales</b>   |
|    | <b>Taxales</b>       | 33 | Juglandaceae         |
| 29 | Taxaceae             |    | <b>Fagales</b>       |
|    | <b>GNETOPSIDA</b>    | 34 | Betulaceae           |
|    | <b>Gnetales</b>      | 35 | Corylaceae           |
| 30 | Ephedraceae          | 36 | Fagaceae             |
|    |                      |    | <b>Urticales</b>     |
|    |                      | 37 | Ulmaceae             |

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75	Hydrangeaceae		
76	Escalloniaceae		
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## KEYS TO MAJOR TAXA

- 1 Plant reproducing by spores; always herbaceous **Pteridophyta**  
 terminal on lateral stems; perianth absent; trees or shrubs **Gymnospermae**
- 1 Plant reproducing by seeds; often woody  
 2 Ovules not enclosed in an ovary, borne either on the upper surface of scales arranged in cones, or solitary and present; herbs, trees or shrubs **Angiospermae**

## KEY TO PTERIDOPHYTA

- 1 Plant without true roots or leaves **1. Psilotaceae**  
 1 Plant with roots and leaves  
 2 Stems jointed; leaves forming a sheath at the nodes **5. Equisetaceae**  
 2 Stems not jointed; leaves not fused into a sheath  
 3 Plants usually free-floating on water  
 4 Leaves 10–40 cm, 2- or 3-pinnatifid **8. Parkeriaceae**  
 4 Leaves less than 10 cm, not pinnatifid  
 5 Leaves in whorls of 3, two entire, floating, the third submerged and root-like **24. Salviniaceae**  
 5 Leaves small, 2-ranked, imbricate **25. Azollaceae**  
 3 Plant epiphytic or rooted to the ground, aquatic or terrestrial  
 6 Leaves not differentiated into lamina and petiole  
 7 Leaves forming a basal rosette **4. Isoetaceae**  
 7 Leaves not forming a basal rosette  
 8 Aquatic; leaves filiform **23. Marsileaceae**  
 8 Terrestrial; leaves not filiform  
 9 Plant homosporous; leaves without ligule **2. Lycopodiaceae**  
 9 Plant heterosporous; leaves with ligule **3. Selaginellaceae**  
 6 Leaves with distinct lamina and petiole  
 10 Leaves long-petiolate, with 4 leaflets **23. Marsileaceae**  
 10 Leaves not with 4 leaflets  
 11 Sporangia without an annulus  
 12 Plant 60–150 cm; vernation circinate **7. Osmundaceae**  
 12 Plant rarely more than 60 cm; vernation not circinate **6. Ophioglossaceae**  
 11 Sporangia with an annulus  
 13 Fertile and sterile leaves dissimilar  
 14 Leaves entire **20. Lomariopsidaceae**  
 14 Leaves not entire  
 15 Leaves 1-pinnate; pinnae entire **22. Blechnaceae**  
 15 Leaves 2- to 4-pinnate (or if 1-pinnate, pinnae pinnatifid)  
 16 Sori completely enclosed by thickened, inrolled margin of lamina **18. Woodsiaceae**  
 16 Sori exposed, or if enclosed then by herbaceous or membranous margin of lamina  
 17 Leaves often proliferous, the veins anastomosing; plants aquatic or in swamps **8. Parkeriaceae**  
 17 Leaves not proliferous, the veins free; plants terrestrial, in well-drained areas **9. Adiantaceae**
- 13 Fertile and sterile leaves similar (or differing only in size)  
 18 Leaves mostly not more than 1 cell thick **11. Hymenophyllaceae**  
 18 Leaves more than 1 cell thick  
 19 Leaves entire, or pinnatifid, or palmately lobed, or dichotomously forked 1–3 times  
 20 Leaves not pinnatifid  
 21 Sori orbicular, without indusia **13. Grammitidaceae**  
 21 Sori linear, with indusia **17. Aspleniaceae**  
 20 Leaves pinnatifid  
 22 Leaves not covered with scales **12. Polypodiaceae**  
 22 Leaves covered with scales on lower surface **17. Aspleniaceae**
- 19 Leaves pinnate  
 23 Sori covered by deflexed margin of leaf  
 24 Leaf-segments long, linear-lanceolate **10. Pteridaceae**  
 24 Leaf-segments not linear-lanceolate  
 25 Rhizome short, superficial **9. Adiantaceae**  
 25 Rhizome long, subterranean **15. Hypolepidaceae**
- 23 Sori not covered by deflexed margin of leaf  
 26 Indusium absent  
 27 Leaves not more than 8 cm **17. Aspleniaceae**  
 27 Leaves more than 8 cm  
 28 Pinnae entire **12. Polypodiaceae**  
 28 Pinnae divided  
 29 Leaves forming a crown **18. Woodsiaceae**  
 29 Leaves solitary  
 30 Groove of rhachis interrupted to admit grooves of costae; lamina tripartite **19. Dryopteridaceae**  
 30 Groove of rhachis not interrupted to admit grooves of costae; lamina not tripartite **16. Thelypteridaceae**
- 26 Indusium present  
 31 Leaves up to 250 cm, producing young plants vegetatively on the distal part **22. Blechnaceae**  
 31 Leaves not more than 200 cm, not producing plants vegetatively  
 32 Rhizome very hairy, without scales **14. Dicksoniaceae**  
 32 Rhizome not hairy, but with scales

## KEY TO PTERIDOPHYTA

- |  |                             |  |                            |
|--|-----------------------------|--|----------------------------|
| 33 Indusium cup-shaped                                 | <b>21. Davalliaceae</b>     | 38 Sori not marginal; indusium lying across vein           | <b>19. Dryopteridaceae</b> |
| 33 Indusium not cup-shaped                             |                             | 37 Sori ovate or linear                                    |                            |
| 34 Indusium a circumbasal ring of hairy scales         | <b>18. Woodsiaceae</b>      | 39 Leaves solitary on rhizome                              | <b>18. Woodsiaceae</b>     |
| 34 Indusium not a ring of scales                       |                             | 39 Leaves forming a crown or apical tuft on rhizome        |                            |
| 35 Indusium hood-like, attached at basic side of sorus | <b>18. Woodsiaceae</b>      | 40 Sori linear or ovate; lower margin of indusium straight | <b>17. Aspleniaceae</b>    |
| 35 Indusium not hood-like                              |                             | 40 Sori ovate; lower margin of indusium bent in the middle | <b>18. Woodsiaceae</b>     |
| 36 Indusium peltate                                    | <b>19. Dryopteridaceae</b>  |  |                            |
| 36 Indusium not peltate                                |                             |  |                            |
| 37 Sori orbicular                                      |                             |  |                            |
| 38 Sori marginal; indusium lying along vein            | <b>16. Thelypteridaceae</b> |  |                            |

## KEY TO GYMNOSPERMAE

- |   |                        |   |                         |
|---|------------------------|---|-------------------------|
| 1 Leaves all scale-like and usually brownish; internodes long | <b>30. Ephedraceae</b> | 3 Leaves opposite or whorled                        | <b>28. Cupressaceae</b> |
| 1 Most leaves green; internodes short                         |                        | 3 Leaves alternate or 2–5 on short shoots           |                         |
| 2 Female flowers solitary; seed surrounded by a fleshy aril   | <b>29. Taxaceae</b>    | 4 Bracts and cone-scales distinct from one another  | <b>26. Pinaceae</b>     |
| 2 Female flowers in cones; seeds without a fleshy aril        |                        | 4 Bracts and cone-scales wholly or partially united | <b>27. Taxodiaceae</b>  |

## KEY TO ANGIOSPERMAE

This key covers all the families of Angiospermae in vols. 1 (arabic numerals) and 2–5 (roman numerals).

- |  |                                 |   |                                |
|--|---------------------------------|---|--------------------------------|
| 1 Plant free-floating on or below the surface of the water, not rooted in mud  |                                 | 13 Flowers mostly unisexual; stamen 1   | <b>46. Balanophoraceae</b>     |
| 2 Plant without obvious differentiation into stems and leaves  | <b>CXCVI. Lemnaceae</b>         | 13 Flowers hermaphrodite; stamens 6–16  |                                |
| 2 Plant with obvious stems and leaves  |                                 | 14 Filaments free   | <b>CXXXI. Pyrolaceae</b>       |
| 3 Leaves divided into numerous filiform segments   |                                 | 14 Filaments connate into a column  | <b>45. Rafflesiaceae</b>       |
| 4 Plant with small bladders on leaves or on apparently leafless stems  | <b>CLXI. Lentibulariaceae</b>   | 12 Plant with chlorophyll   |                                |
| 4 Plant without small bladders   |                                 | 15 Perianth-segment 1, bract-like   | <b>CLXXIV. Aponogetonaceae</b> |
| 5 Leaves dichotomously divided, the segments often again divided   | <b>60. Ceratophyllaceae</b>     | 15 Perianth-segments more than 1, or perianth tubular                           |                                |
| 5 Leaves pinnately divided, the segments simple  | <b>CXXIV. Haloragaceae</b>      | 16 Stems succulent, leafless but with groups of spines                          | <b>CXVIII. Cactaceae</b>       |
| 3 Leaves not divided into numerous filiform segments   |                                 | 16 Not as above   |                                |
| 6 Leaves with a cuneate basal part, 4–6 lateral setaceous segments and a terminal orbicular lobe                     | <b>71. Droseraceae</b>          | 17 Stamens more than 12   |                                |
| 6 Leaves not as above  |                                 | 18 Leaves pinnate   | <b>61. Ranunculaceae</b>       |
| 7 Perianth entirely petaloid; basal part of petioles inflated  | <b>CLXXXVII. Pontederiaceae</b> | 18 Leaves not pinnate   | <b>61. Ranunculaceae</b>       |
| 7 Perianth with a distinct calyx and corolla; petioles not inflated  |                                 | 19 Herb   | <b>64. Magnoliaceae</b>        |
| 8 Sepals, petals and stamens 4   | <b>CXX. Trapaceae</b>           | 19 Tree   |                                |
| 8 Sepals and petals 3; stamens 9–12  | <b>CLXXII. Hydrocharitaceae</b> | 17 Stamens not more than 12   |                                |
| 1 Land plant or aquatic rooted in mud  |                                 | 20 Flowers in ovoid capitula; involucre absent                                  | <b>LXXX. Rosaceae</b>          |
| 9 Bifid to quadrid to coloured staminodes present; leaves often fasciculate  | <b>53. Molluginaceae</b>        | 20 Flowers not in capitula, or in capitula surrounded by an involucre of bracts |                                |
| 9 Not as above   |                                 | 21 Ovary superior   |                                |
| 10 Perianth absent, or of a single whorl or of 2 or more whorls all $\pm$ similar in shape, size, colour and texture |                                 | 22 Perianth-segments 4  | <b>41. Proteaceae</b>          |
| 11 Perianth petaloid   |                                 | 23 Flowers zygomorphic  |                                |
| 12 Plant without chlorophyll   |                                 | 23 Flowers actinomorphic  |                                |
|  |                                 | 24 Perianth with a long tube  | <b>CVII. Thymelaeaceae</b>     |
|  |                                 | 24 Perianth-segments free   |                                |
|  |                                 | 25 Herb   | <b>CLXXXIII. Liliaceae</b>     |
|  |                                 | 25 Shrub  | <b>47. Polygonaceae</b>        |
|  |                                 | 22 Perianth-segments more than 4  |                                |
|  |                                 | 26 Carpels more than 1, free or nearly so                                       |                                |

## KEY TO ANGIOSPERMAE

- 27 Leaves triquetrous, all basal  
**CLXXI. Butomaceae**
- 27 Leaves flat, cauline **51. Phytolaccaceae**
- 26 Carpel 1 or carpels obviously united
- 28 Perianth-segments 6
- 29 Stem stout, woody; leaves crowded, rigid, very fibrous  
**CLXXXIV. Agavaceae**
- 29 Not as above
- 30 Flowers actinomorphic  
**CLXXXIII. Liliaceae**
- 30 Flowers zygomorphic  
**CLXXXVII. Pontederiaceae**
- 28 Perianth-segments 5
- 31 Stigmas 2 or 3; stipules sheathing, scarious  
**47. Polygonaceae**
- 31 Stigma 1; stipules absent
- 32 Ovules numerous; perianth divided almost to base **CXXXV. Primulaceae**
- 32 Ovule 1; perianth with a long tube  
**50. Nyctaginaceae**
- 21 Ovary inferior, or flowers male
- 33 Leaves at least partly in whorls of 4 or more  
**CXLIV. Rubiaceae**
- 33 Leaves not in whorls of 4 or more
- 34 Flowers sessile in capitula surrounded by an involucre of bracts
- 35 Anthers cohering in a tube round the style, or flowers unisexual  
**CLXIX. Compositae**
- 35 Anthers free; flowers hermaphrodite  
**CLXVII. Dipsacaceae**
- 34 Flowers pedicellate, though pedicels sometimes short and flowers in compact umbels or cymes
- 36 Ovules 1 or 2
- 37 Leaves opposite **CLXVI. Valerianaceae**
- 37 Leaves alternate
- 38 Flowers in simple cymes or solitary  
**42. Santalaceae**
- 38 Flowers in umbels or superposed whorls  
**CXXXIX. Umbelliferae**
- 36 Ovules numerous
- 39 Perianth-segments 3 or perianth tubular with an entire, unilateral limb  
**44. Aristolochiaceae**
- 39 Perianth-segments 6 or 8
- 40 Perianth-segments in 2 whorls of 4  
**CXXXIII. Onagraceae**
- 40 Perianth-segments in 2 whorls of 3
- 41 Stamens 3 **CLXXXVIII. Iridaceae**
- 41 Stamens 6
- 42 Scapose plant with a bulb  
**CLXXXV. Amaryllidaceae**
- 42 Stem leafy; rhizomatous  
**CLXXXIV. Agavaceae**
- 11 Perianth dry and scarious (though sometimes brightly coloured) or sepaloïd or absent
- 43 Tree or shrub, sometimes small
- 44 Parasitic on branches of other trees or shrubs  
**43. Loranthaceae**
- 44 Not parasitic
- 45 Stems creeping or climbing with adventitious roots; evergreen **CXXVIII. Araliaceae**
- 45 Not as above
- 46 Most leaves opposite or subopposite
- 47 Young stems and leaves fleshy  
**48. Chenopodiaceae**
- 47 Neither stems nor leaves fleshy
- 48 Style 1
- 49 Leaves pinnate **CXXXIX. Oleaceae**
- 49 Leaves simple
- 50 Flowers in catkins **31. Salicaceae**
- 50 Flowers not in catkins **CIII. Rhamnaceae**
- 48 Styles 2 or more
- 51 Stamens 5; flowers hermaphrodite  
**CIII. Rhamnaceae**
- 51 Stamens 4 or 8; flowers often unisexual
- 52 Stamens 4; plant evergreen **CII. Buxaceae**
- 52 Stamens 8; plant usually deciduous  
**XCIV. Aceraceae**
- 46 Most leaves alternate
- 53 Leaves pinnate
- 54 Male flowers in catkins; styles 2; pith septate  
**33. Juglandaceae**
- 54 Flowers not in catkins; styles 3 or 1; pith not septate
- 55 Style 1; fruit a compressed legume with several seeds **LXXXI. Leguminosae**
- 55 Styles 3; fruit a dry, 1-seeded 'drupe'  
**XCIV. Anacardiaceae**
- 53 Leaves simple
- 56 Leaves not more than 2 mm wide, linear or oblong
- 57 Stigma 1 **CVII. Thymelaeaceae**
- 57 Stigmas 2-9
- 58 Stamens 3 **CXXXIII. Empetraceae**
- 58 Stamens 5 **48. Chenopodiaceae**
- 56 Leaves more than 2 mm wide
- 59 Petiole-base enclosing the bud **79. Platanaceae**
- 59 Petiole-base not enclosing the bud
- 60 Anthers opening by transverse valves  
**65. Lauraceae**
- 60 Anthers opening by longitudinal slits
- 61 Flowers not in catkins or dense heads
- 62 Inflorescence of several male flowers, each of 1 stamen, and a female flower, appearing as a stalked ovary, all surrounded by 4 or 5(-8) conspicuous glands; latex present  
**LXXXVII. Euphorbiaceae**
- 62 Inflorescence not as above; latex absent
- 63 Flowers unisexual
- 64 Peltate, scale-like silvery or ferruginous hairs present beneath the leaves and often elsewhere; ovary 1-locular; fruit fleshy  
**CVIII. Elaeagnaceae**
- 64 Peltate hairs absent; ovary 3-locular; fruit dry **LXXXVII. Euphorbiaceae**
- 63 Flowers hermaphrodite
- 65 Tree; perianth-tube short, with stamens inserted near its base  
**37. Ulmaceae**