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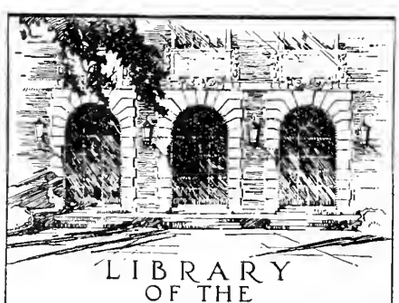

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THE

CAMBRIDGE BRITISH FLORA

VOLUME II TEXT

CAMBRIDGE UNIVERSITY PRESS
London: FETTER LANE, E.C.
C. F. CLAY, MANAGER

Edinburgh: 100, PRINCES STREET
London: WILLIAM WESLEY AND SON, 28, ESSEX STREET, STRAND
Berlin: A. ASHER AND CO.
Leipzig: F. A. BROCKHAUS
Bombay and Calcutta: MACMILLAN AND CO., LTD.
Toronto: J. M. DENT AND SONS, LTD.
Tokyo: THE MARUZEN-KABUSHIKI-KAISHA
New York: THE MACMILLAN COMPANY

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John Ray.

THE CAMBRIDGE BRITISH FLORA

BY

C. E. MOSS, D.Sc., F.L.S.

assisted by specialists in certain genera

ILLUSTRATED FROM DRAWINGS BY

E. W. HUNNYBUN

VOLUME II

SALICACEAE TO CHENOPODIACEAE

TEXT

Cambridge:
at the University Press
1914

Cambridge:
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SYNOPTICAL INDEX OF FAMILIES AND GENERA OF VOLUME II

LIST OF PLATES OF VOLUME II

ADDENDA ET CORRIGENDA

(VOLUME II)

Page 2, line 9. For "*Petaloïdae*" read "*Petaloïdeae.*"
Page 2, line 33. After "*Petaloïdeae*" insert "(p. 103)."
Page 2, line 41. After "*Centrospermae*" insert "(p. 150)."
Page 3, line 6 from bottom. After "*Urticales*" insert "(p. 88)."
Pages 5—16. After "*Cambr. Brit. Fl.* ii" delete "(1913)."
Page 9, line 20. For "Plates 9, 10" read "Plates 9; 10."
Page 18, line 32. For "Syme" read "White."
Page 77, line 9 from bottom. For "east" read "west."
Page 90. After line 23, insert "Arbor cum pulchrior tum procerior quam var. *sowerbyi*, ramis longioribus, infra horizontalibus, supra minus tortuosis. Foliorum laminas habet longiores, ad basin asymmetriam etiam majus exhibentes, valde acuminatas, fructum paulo majorem, procul dubio obovatam."
Page 100, line 26. For "var." read "subvar."
Page 102, line 20. For "*ramosa*" read "*genuina.*"
Page 108, line 27. For "*Petaloïdae*" read "*Petaloïdeae.*"
Page 118, line 6 from bottom. For "*R*" read "*P.*"
Page 121, line 10 from bottom. Before "*P. strictum*" insert "?".
Page 132, line 9. Delete "?".
Page 136, line 11 from bottom. For "*elongata*" read "*elongatus.*"
Page 151, line 21. For "*edule*" read "*flavum.*"
Page 156, line 5 from bottom. For "Cheshire" read "Anglesea."
Page 159, line 10 from bottom. Before "*C. serotinum*" insert "?".
Page 169, line 18 from bottom. For "*bracts*" read "*bracteoles.*"
Page 174, line 10. For "*lineare*" read "*linearis.*"
Page 178, line 16. For "*crassifolia*" read "*crassifoliae.*"
Page 179, line 5. For "*Scherocalyma*" read "*Sclerocalymma.*"
Page 181, line 11 from bottom. After "(β)" insert "var. **latifolia.**"

INTRODUCTION TO VOLUME II

ENGLISH BOTANY

A CENTURY has passed since Sir J. E. Smith completed the first edition of his *English Botany*[1], and half a century since the appearance of the first volume of the third edition of the *English Botany*[2] by J. T. I. [Boswell-]Syme[3]. Much has been added in the meantime to our knowledge of British plants; and it is felt that this increase is sufficient to justify at the present time the issue of a new, comprehensive, and authoritative British flora.

THE CAMBRIDGE BRITISH FLORA

It is a truism to state that knowledge has no finality; but there is need to emphasise the fact that the knowledge of even a limited flora like that of the British Islands is not only now in a state of flux, but always must be, so long as botanists continue to investigate it. Discoveries are frequently made of plants which, though known to the botanists of other countries, have not previously been distinguished in the British Islands; and occasionally plants are found in these islands which have previously escaped observation altogether. The knowledge of the distribution of the members of the British flora is being constantly augmented, whilst, at the same time, it is being rendered more precise. The knowledge too of the nomenclature of British plants is constantly being increased; and unfortunately this knowledge sometimes necessitates the adoption of an unfamiliar name. We hope that this increased nomenclatorial knowledge will eventually result in a greater degree of stabilisation; but we regret to record our belief that finality in the names of plants is no more possible than finality in any other branch of knowledge.

The work will be completed in about ten volumes of which the present (Volume II) is the first to appear. This will be followed by Volume III: the order of appearance of the remaining volumes will be announced in due course.

The objects of *The Cambridge British Flora* are three. First, an attempt is made to register the present state of knowledge with regard to British plants—their classification, their names, their characters, and their distribution. Secondly, an attempt is made to relate British plants to the allied forms of foreign countries. And thirdly, a hope is entertained that the work will result in stimulating further research concerning British plants, particularly with regard to the study of their variations and the distribution of the less well-known forms.

Contributors to THE CAMBRIDGE BRITISH FLORA

We have been fortunate in obtaining the assistance of many of the leading British field-botanists who have undertaken to contribute accounts of the genera of which they have made

[1] With illustrations by James Sowerby. Smith's name does not appear in the first three volumes of the work; but in the preface to the fourth volume Smith states that he has "to answer for every word in this publication, except the letter-press to plates 16, 17, and 18." The first edition of the *English Botany* is in the present work referred to as "Smith *Eng. Bot.*" or "*Eng. Bot.* ed. 1."

[2] With illustrations by J. Sowerby, J. de C. Sowerby, J. E. Sowerby, and J. W. Salter. The second edition of the *English Botany* was a reprint, with the text and plates rearranged in the Linnaean order, of the first. The *Supplement to the English Botany* was written by Sir W. J. Hooker and other eminent botanists during the years 1831 to 1863. Some parts, supplementary to the third edition, by N. E. Brown, were issued in 1891 and 1892. The three editions and the supplements are often referred to as "Sowerby's Botany"; but the botanical portion of the work is by Smith (editions 1 and 2), W. J. Hooker and others (suppl.), Syme (ed. 3), and N. E. Brown (suppl. to ed. 3). In the present work, the third edition of the *English Botany* is referred to as "Syme *Eng. Bot.*" or "*Eng. Bot.* ed. 3."

[3] *Né* Syme; later he adopted the name Boswell, and still later the name Boswell-Syme. In the present work, he is always referred to by his birth-name Syme.

a special study. An endeavour will be made to render these accounts as uniform as possible, in general treatment, with the rest of the work. In the present volume, the Rev. E. S. Marshall (*Betula*), Dr E. J. Salisbury (*Salicornia*), Mr C. E. Salmon (*Salsola*), and Mr A. J. Wilmott (*Atriplex*) have rendered assistance in this way. We have also to thank the Rev. E. F. Linton and Mr C. E. Salmon for kindly supplying us with notes on *Polygonum*, *Rumex*, and *Chenopodium*.

Specimens for drawing

We also wish to thank most heartily all who have sent specimens of plants to Mr Hunnybun for his drawings. When such specimens have been utilised, the initials of the sender and the county from which the specimen was sent are, wherever this is possible, stated in the text, after the explanation of the plates. The following are the names of botanists who have kindly sent specimens which have been utilised by Mr Hunnybun for reproduction in the present volume:— Mr R. S. Adamson, the late Mr W. H. Beeby, Mr S. H. Bickham, Mr F. H. Davey, Mr G. C. Druce, the late Mr A. Fryer, Mr J. Groves, Mr S. Guiton, Mr D. A. Haggart, Mr A. Hallard, Mr F. J. Hanbury, Professor A. Henry, the late Mr T. Hilton, Mr A. Holland, Mr E. M. Holmes, Miss Mildred Hunnybun, Miss C. E. Larter, the late Rev. A. Ley, the Rev. E. F. Linton, the Rev. E. S. Marshall, the late Mr J. Needham, Mr C. E. Salmon, Mr C. C. Vigurs, and Mr A. Wilson. Without the free and hearty co-operation of botanists in sending specimens to Mr Hunnybun, the production of the present work would be impossible.

In certain cases, Mr Hunnybun has had to rely for specimens on plants grown in botanical gardens; and the Director of the Royal Gardens at Kew (Sir David Prain), the Curator of the Royal Botanic Gardens at Edinburgh (Professor I. Bayley Balfour), the Curator of the Royal Botanic Garden at Dublin (Sir F. W. Moore), and the Curator of the University Botanic Gardens at Cambridge (Mr R. I. Lynch) are thanked for their kindness in forwarding specimens.

In a large number of cases, Mr Hunnybun has gathered the specimens himself; but, as this, as a rule, is no longer possible, we venture to hope that specimens will be supplied to him even more freely than before.

The Illustrations

All Mr Hunnybun's drawings are made from living plants. It is thus hoped that many errors will be eliminated. For example, we believe that some of the open flowers of published illustrations, particularly in such genera as *Cerastium*, *Sagina*, and *Arenaria*, never had an objective existence; but every open flower drawn by Mr Hunnybun is an image of an actual object. The main figure on each plate is drawn natural size; and when enlargements are figured, attention is drawn to the fact in the text. All the drawings are reproduced by photography.

Botanical terms

In another volume of the work, a glossary of terms will be provided. In the meantime, we can only refer readers to Willis's *Flowering Plants and Ferns* and Jackson's *Glossary of Botanic Terms*, where most of the technical terms used in the present work will be found to be explained. It is scarcely necessary to state that the glossaries in existing British floras are, from the standpoint of modern botany, unsatisfactory.

Systematic arrangement

The arrangement of the plant-groups in this work follows, in general, that of Engler and Prantl, the eminent German systematists, as seen in the volumes entitled *Die natürlichen Pflanzenfamilien* and as summarised in Engler's *Syllabus der Pflanzenfamilien* (editions 1—7; ed. 7, by Engler and Gilg). No British flora based on this arrangement has appeared before; and the only local flora in English which adopts Engler's plan is Lester-Garland's *A Flora of the Island of Jersey* (1903). We take the present opportunity therefore of stating that British botanists will find a synopsis of Engler's system, so far as genera and groups of higher than generic rank are concerned, in Carter's *Genera of British Plants*.

NOMENCLATURE

Principles, Rules, and Recommendations

In matters of nomenclature, the rules passed by the international congresses of botanists held at Vienna in 1905 and at Brussels in 1910 are, in general, adopted. It is necessary here to explain that the official report on nomenclature[1] is divided into general principles, rules, and recommendations. The general principles command universal assent, as the following extract will show: "Art. 3. The rules of nomenclature should neither be arbitrary nor imposed by authority. They must be simple, and founded on considerations clear and forcible enough for everyone to comprehend and be disposed to accept."

The rules are inevitably more controversial in character than the principles; but we have no hesitation in this work in following these rules in their more important aspects. The recommendations refer to less important matters; and, in a few cases, we deem it desirable to depart from them.

Names of the groups of plants

The following are the groups of plants, and the names of these groups, which we, following the international recommendations, adopt in this work:—class (e.g., *Pteridophyta*), division (e.g., *Dicotyledones*), order[2] (e.g., *Salicales*), family[2] (e.g., *Salicaceae*), tribe (e.g., *Atripliceae*), genus (e.g., *Atriplex*), section (e.g., *Lapathum*), series (e.g., *Tremulae*), species (e.g., *Populus tremula*), variety (e.g., *Populus nigra* var. *viridis*), and *forma* (e.g., *Polygonum amphibium* forma *terrestre*). Intermediate groups are interpolated, in accordance with the international recommendations, as occasion requires: thus, we recognise subclass (e.g., *Amentiflorae*), suborder (e.g., *Santalineae*), subfamily (e.g., *Chenopodioideae*), subtribe (e.g., *Loranthineae*), subgenus (e.g., *Obione*), subsection (e.g., *Robur*), series (e.g., *Albae*), and subvariety (e.g., *Salix cinerea* subvar. *aquatica*). We do not adopt the group "race" (a subdivision of a species), and only in special cases the group subspecies.

It would, in our judgment, be a very great advantage if each of these groups had some definite affix by which it could invariably be recognised. Such affixes are commonly given to some of the groups, namely, to the order (which commonly ends with the affix *-ales*), suborder (*-ineae*), family (*-aceae*), subfamily (*-ideae*), tribe (*-eae*), and subtribe (*-inae*). The suggestion was made long ago that these affixes should be universally used for the groups in question; and we think it is a pity that the suggestion has not been adopted by botanists. At present, there are so many exceptions to the above terminations that a beginner in botany is overwhelmed by them; and he may be pardoned for regarding the botanical names of the major groups as chaotic. For example, the usual affix denoting an order is *-ales*; but the following irregular names (among others) of orders are also recognised by many botanists:—*Myrtiflorae*, *Contortae*, *Helobiëae*, *Principes*, *Scitamineae*, and *Microspermae*. Again, the usual affix denoting a family is *-aceae*; but the following irregular names (among others) of families are also in common use:—*Leguminosae*, *Guttiferae*, and *Compositae*. In the present work, the affixes in question (namely, *-ales* for orders and *-aceae* for families) are regarded as absolute. The affix is always appended to the stem of the name of an existing genus; and thus such names as *Ranales*, *Rhoeadales*, *Pariëtales*, and *Caryophyllaceae* will disappear.

Starting-point of nomenclature

Botanical nomenclature, for the vascular plants, begins with the publication of the *Species Plantarum* (2 volumes) of Linnaeus, 1753. As the genera, however, in this work, are without

[1] *International Rules of Botanical Nomenclature* adopted by the international botanical congresses of Vienna 1905 and Brussels 1910 (in French, English, and German; Jena, 1912).

[2] In some British and American works, the term "cohort" is used instead of order, and the term "natural order" instead of family. The terms we use, order and family, are advised by the international recommendations; and we hope therefore that they will be adopted by all botanists in this country.

diagnoses, the generic names of the *Species Plantarum* are taken in conjunction with the corresponding generic descriptions of the *Genera Plantarum* (ed. 5) of Linnaeus, 1754: thus, it is really agreed to regard the date of publication of the latter work as identical with the date of publication of the former.

Nomina conservanda

However, to avoid disadvantageous changes in the nomenclature of genera by the strict application of the principle of priority in starting from the date of issue of the *Species Plantarum* (1753), certain generic names must be retained under all circumstances. The list of *nomina conservanda* appended to the *International Rules* includes the following British genera:—*Selaginella*, *Suaeda*, *Spergularia*, *Eranthis*, *Corydalis*, *Nasturtium*, *Capsella*, *Oxytropis*, *Villarsia*, *Calystegia*, *Mertensia*, *Wahlenbergia*, *Silybum*, *Taraxacum*, *Leersia*, *Hierochloë*, *Corynephorus*, *Cynodon*, *Glyceria*, *Luzula*, *Narthecium*, *Maianthemum*, *Romulea*, *Spiranthes*, *Listera*, *Neottia*, and *Liparis*.

Doubtful books

Although the fixing of a date as the starting-point of nomenclature might be thought to be a matter of very definite application, yet, on closer inspection, it is found that this is not the case.

It has been pointed out to us that Haller's *Enumeratio Plantarum Horti Regii et Agri Gottingensis*, having been published in 1753, the names in this work have to be taken into account in nomenclature. This, however, is not the case. It is not 1753 which is the starting-point, but the publication of the *Species Plantarum* (1753). Now, the latter work was published in two volumes; and we are informed that Haller's work, although published after the first volume of the *Species Plantarum*, was issued before the publication of the second volume of Linné's great work. Haller's book, therefore, is pre-Linnaean.

There are, however, some other works with regard to which it is not quite so easy to decide whether or not the names they contain must or must not be considered in nomenclature. We refer to certain works which, though published after the *Species Plantarum* (1753), yet belong to the pre-Linnaean era in the sense that they use Tournefortian genera and not Linnaean genera, and in the sense that they do not adopt the binominal method of naming species. Examples of such works are:—Miller's *Abridgment of the Gardener's Dictionary* ed. 4 (1754); Miller's *Gardener's Dictionary* ed. 7 (1759); Hill's *British Herbal* (1756); Hill's *Flora Britannica* (1760); and Haller's *Historium Stirpium Indigenarum Helvetiae Inchoata* (1768).

Different botanists take different views as to the standing of these books in nomenclature. First, some botanists maintain that all the names which do not actually contravene the rules, in these books should be adopted; and accordingly they cite from them certain generic names and also certain binominals, for it must be remembered that binominals existed to some extent before Linnaeus applied them universally. Secondly, some other botanists maintain that it is only the generic names in these books which need be taken into account in nomenclatorial matters, and that the binominals must be ignored. We ourselves take up a third position. We regard these books, for the reasons already given, as being pre-Linnaean in every respect except mere chronology, as being an overflow, as it were, from the pre-Linnaean era into the post-Linnaean era. Accordingly, we do not utilise any of the names in the books in question. We can appreciate the point of view of those botanists who use both the generic names and binominals in these books; but it appears to us to be illogical to choose to utilise the generic names and reject the binominals. As there is such a divergence of opinion in the matter, it seems to us imperative that, at the next international botanical congress of botanists, to be held in London in 1915, some definite ruling on the matter should be given. As we ourselves have to make a decision before the meeting of this congress, we unhesitatingly choose the third of the above plans—the rejection of all the names in the books in question. We choose this plan, first, because it results in conserving many names established in botanical literature, whilst the adoption of either of the other two plans would result in undesirable confusion; and secondly because the rejection of all the names of the books in question has been the practice of almost all responsible botanists during the whole of the nineteenth century, whilst very few (and these only quite recently) have adopted the names of the books to which we allude. It is, of course, because of this almost universal practice that the names in question have become established in botanical literature.

One other work calls for special consideration. This is Adanson's *Familles des Plantes* (1763). This also is a book which is wholly pre-Linnaean in character although not in chronology, as may be ascertained by reading the Introduction to the work. The book deals with genera almost entirely; but the genera adopted are Tournefortian ones and not Linnaean; and species, on the few occasions when they are alluded to, are given pre-Linnaean names and not binominals. The book therefore stands in the same category as those above cited of Miller, Hill, and Haller; and we accordingly reject the names in Adanson's book as well as those of the works cited of Miller, Hill, and Haller.

Of course, when these authors adopt binominals, they incorporate so much of the Linnaean outlook on botany that they must stand with other works of the post-Linnaean period; and consequently the generic names and the binominals in Miller's *Gardener's Dictionary* ed. 8 (1768), in Miller's *Abridgment of the Gardener's Dictionary*, ed. 6 (1771), and in Hill's *Vegetable System* (1759—1772) are quite valid.

Hence several familiar generic names will, in *The Cambridge British Flora*, displace several corresponding less familiar ones which at present appear in British lists of plants; and in some others a change of the authority will be necessitated.

Species subdivided by Linnaeus

We deviate slightly from the letter of the international rules in the cases of those few species of the first edition of the *Species Plantarum*, which Linnaeus himself subdivided into two or more species in the second edition (1762—1763). For these species, we take the second edition as the starting-point of nomenclature. Cf. *Beta maritima* and *Salicornia herbacea*, p. 168 and p. 191 respectively of the present volume.

General rule of nomenclature

Bearing in mind the points already laid down, the general rule of nomenclature may be stated as follows:—*The name first given to a group of plants is unalterable so long as the group retains the same rank.* An exception is made to this rule, where its adoption would lead to mere duplication. Thus, the name *Castanea castanea* for the Spanish chestnut is inadmissible; and the name *C. sativa* is adopted, although *castanea* (in *Fagus castanea* L.) is the earliest trivial name for the plant. Similarly (although the rules do not specifically mention this) the analogous duplication in names of lower than specific rank is not adopted in this work. For example, we should reject the names *Populus alba* subsp. *alba*, *Populus alba* var. *alba*, and all analogous names: we regard the rejection of these names as logically inevitable if such names as *Castanea castanea* are to be rejected, as the rules demand.

Groups named after a genus

Orders, suborders, families, subfamilies, tribes, and subtribes are given definite terminations which, in the present work, are regarded as absolute; and orders, and at least one suborder, one family, one subfamily, one tribe, and one subtribe should be named after the same genus that gives its name to the order when the group in question contains that genus.

The names of orders end with the affix *-ales*. The affix is placed after the stem of the genus (an existing one) which gives its name to the order.

Names of suborders end in *-ineae*. At least one suborder must be named after the genus which provides the name for the order.

Names of families end in *-aceae*. At least one family must be named after the genus which provides the name for the order.

Names of subfamilies end in *-ideae*. At least one of the subfamilies must be named after the genus which provides the name for the order.

Names of tribes end in *-eae*. At least one of the tribes must be named after the genus which provides the name for the order if this genus is contained in any of the tribes.

Names of subtribes end in *-inae*. At least one of the subtribes must be named after the genus which provides the name for the order if this genus is contained in any of the subtribes.

Genera, subgenera, sections, and subsections

The names of genera, subgenera, sections, and subsections are either substantives or are adjectives used as substantives. These names, and also all names of groups of lower rank except series and subseries, are used in the singular and may be of any gender, whilst the names of all groups of higher rank are in the plural and are feminine.

Series and subseries

The names of series and subseries are the names of a species in the particular series or subseries, the name of the species being put in the plural and its gender retained. The species chosen must be the species with the oldest trivial name, or one of the oldest when two or more are of the same age. The names of series and subseries differ from the names of higher groups, and resemble trivial and varietal names, in that they may be used repeatedly in different genera.

Species

The name of a species consists of a *generic name* (the name of the genus in which the species is placed) and a *trivial name.* The resulting binominal is the *specific name.*

The trivial name is usually an adjective agreeing in gender with the generic name. It may also be a substantive either in the genitive or used in apposition. Sometimes it is the name of a genus, old (pre-Linnaean) or new (post-Linnaean). When it commemorates some person or place or habitat, it may be a substantive used in the genitive or it may be adjectival in form.

A trivial name used *per se* is virtually meaningless, as it is indistinguishable from a name similarly used of a subspecies, race, variety, subvariety, or *forma.* Similarly, trinominals (e.g., *Salix cinerea aquatica*) are ambiguous, as it is not known whether the plants so designated are to be regarded as subspecies, races, varieties, subvarieties, or *formae.*

"The Kew rule"

The general rule of nomenclature previously laid down becomes very important when applied to the trivial names of species. Before the ruling of the Vienna congress in 1905, it was usual in the British empire and in France to adopt what is sometimes known as "the Kew rule." This rule states that the valid trivial name is the earliest one which a species had received when it was placed in its correct genus; and this rule was adopted by Dr B. Daydon Jackson in the *Index Kewensis.* Fortunately or unfortunately, "the Kew rule" is now obsolete.

"The Berlin rule"

A rule which, for the sake of brevity, may be referred to as "the Berlin rule" was, for a time at least, used by the Berlin school of systematists. The rule states that a trivial name which had been in general use for 50 years should be regarded as fixed, no matter whether or not an older trivial name existed. We confess to having a great deal of sympathy with this position, although there are objections to it. For example, it often happens that a certain name of a given species obtains in a certain coterie or school of botanists, whilst another name for the same species obtains in another coterie or school. Naturally, each coterie or school wishes to preserve the name with which it is most familiar.

"The Vienna rule"

To obviate this difficulty, the international congress of botanists held at Vienna in 1905 decided that the trivial to be adopted is the earliest one which the species had received. There are objections to this as to any other rule which might be framed bearing on the matter, not the least of which is the unfortunate necessity of occasionally having to discard a well-known trivial name for an obscure one; but the rule is now international and therefore more authoritative than any other.

Retention of Linnaean trivials

A very important nomenclatorial matter arises in cases where an aggregate species is subdivided into two or more species. Thus, when *Crataegus oxyacantha* is subdivided into two species, shall the old specific name be rejected altogether or retained for one of the smaller species? Here again the practice among botanists varies; and often the same botanist will sometimes adopt the one plan and sometimes the other. By Article 44 of the international rules, "a change of characters, or a revision which involves the exclusion of certain elements of a group or the addition of new elements, does not warrant a change in the name or names of a group," except in certain specified cases. These specified cases refer chiefly to names which are invalid on other grounds, and to the case when the group designated by the name in question "embraces elements altogether incoherent, or when it becomes a permanent source of confusion or error" (Art. 51, 5). Though there is here a certain amount of opportunity for differences of opinion, it is clear that the intention of the framers of the rule is that the older aggregate names should be retained wherever possible, and that the prerogative of rejecting the older aggregate names should be exercised on as few occasions as possible. We interpret the rule in question in this spirit, retaining the earliest trivial name whenever the plan seems desirable: there are occasions, however, when the retention of the earliest trivial name leads to so much confusion that it is better to reject it.

The use of capitals for trivial names

With regard to the use of small or capital letters for trivial names, there is no precise rule or custom among botanists. It is the practice of most botanists to begin some trivial names with small letters and others with capital letters; but here all appearance of agreement ends. Some botanists use capitals for trivial names when they commemorate a place or person or a pre-Linnaean genus. Others use capitals only for trivial names which commemorate places or persons. A recommendation by the international congress is that trivial names should begin with small letters except those which are taken from names of persons or from generic names. There are also other plans in actual use; but we know of no work in which any one plan is quite consistently followed. There are so many difficult cases that it is not surprising that even the most careful authors make many slips.

In our opinion, there are only two plans which can be said to be logical or which can be consistently applied. One is to spell all trivial names with initial capital letters, as was done by some of the older botanists, e.g., Miller. The second is to spell all trivial names with initial small letters; and this is the plan adopted in the present work. The adoption of this plan is no innovation, as it has long been in general use among zoologists; and it is also adopted by many geologists and by some botanists. It is obviously desirable that biologists should have a uniform plan; and the only hope of obtaining this seems to be in adopting the plan which has so long been used by zoologists.

Use of Linnaean symbols in trivial names

In the *Species Plantarum*, Linnaeus has sometimes added a symbol after a specific name. For example, Linnaeus writes "*Scandix pecten* ♀" and "*Veronica anagallis* ▽." According to the commentator of the international rules (Art. 26, annot.), these symbols must be transcribed; and the specific names in question then become *Scandix pecten-veneris* and *Veronica anagallis-aquatica*. We cannot see that this is demanded by Article 26 of the rules; and as the resulting trivial names are not only clumsy but sometimes misleading, we do not adopt them in the present work. We write merely *Scandix pecten* and *Veronica anagallis*.

Varietal names

The rule for the names of groups of plants of lower than specific rank in no way differs from the general rule already laid down (see p. xi). Hence, when a variety of a species has once been named, it is not possible to change its varietal name, so long as the plant retains varietal rank, even if the variety is afterwards referred to another species; and the same principle applies to subspecies, subvarieties, *formae*, and (if these be recognised) races. Much confusion has been caused through the non-observance of this rule, more particularly perhaps in this country. There has been a practice here (a practice, however, inconsistently followed), of retaining

the original trivial name when a species has been reduced to varietal rank, even when a varietal name was already in existence. This practice is condemned by the rules.

Names of hybrids

In the case of hybrids, the rule is that the hybrid in question shall be designated by the names of its parents (or putative parents), the latter names being placed in alphabetical order and connected by a cross. Thus, if it is known or believed that a given plant has been produced by the crossing of *Salix caprea* and *S. viminalis*, the hybrid is designated *S. caprea* × *viminalis*; and this rule holds no matter how many species are known or supposed to have taken part in the production of the hybrid. The connecting of the trivial names by a cross is rather a new plan. Formerly, a hyphen was often used instead; and at that time it was not the rule to place the trivial names in alphabetical order. Hence, we often see in the older books such names as *Salix caprea-viminalis* and *S. viminalis-caprea*. Sometimes, instead of a cross or a hyphen, a connecting letter was used, as in *Polygonum minori-persicaria*. We do not regard these conventional signs or connectives as of any importance; and accordingly, in the present work, we cite, as the first authority of a hybrid-plant, the first authority who so combined the correct trivial names as to show that he regarded the plant as being of hybrid origin; and we deliberately change his conventional sign when this is different from the one adopted nowadays.

By the rules of nomenclature, botanists are allowed, if they wish, to bestow upon a hybrid a *quasi*-binominal, i.e., a binominal with a cross placed in front of it. Thus, a hybrid has been recently named *Helianthemum chamaecistus* × *marifolium* (× *H. bickhami*). This means that the hybrid in question may be named either *H. chamaecistus* × *marifolium* or × *H. bickhami*, as is preferred. In the present work, the former of these two methods is employed; and *quasi*-binominals are reserved for subdivisions of hybrid plants. In general, we do not think it desirable to give *quasi*-binominals to hybrid-forms; but there are a few exceptional cases where the desirability exists. For example, it is desirable to give such names to putative hybrids when these have either a commercial or artistic value, as in the case of the Huntingdon elm (× *U. vegeta*). Again, when a hybrid-form has been produced artificially and when therefore its precise origin is known, it is sometimes well to describe it and to reserve a special name for it.

It is, however, inadmissible to cite as the author of a hybrid-form (or putative hybrid-form) the name of an author who described the same plant as a species or variety. To do so, in fact, would in many cases do the author in question grave wrong. For example, Sir J. E. Smith named as species a large number of willows which are now regarded as hybrids; but Smith combated, and combated most strongly with what were almost his dying words, the view that his species of *Salix* were largely hybrids. If therefore Smith's species in this genus are reduced to hybrids, some authority other than Smith must be found for the hybrids in question; and this authority is the botanist who first reduced the plant from specific rank to hybrid rank.

Latin diagnoses

Article 36 states that on and after January 1st, 1908, the publication of a new group of recent plants will be valid only when it is accompanied by a Latin diagnosis. Whilst generally adhering to this rule, we do not think it is necessary to insist on it in the cases of series, subseries, subvarieties, *formae*, and hybrids.

Size of species

It is necessary to make clear our position with regard to the size of the species adopted in the present work. In a general way, there are three possible plans from which an author of a flora must make his choice. It is almost needless to state here that each plan has its adherents and its advocates. First, there is the plan of using comprehensive species. This plan is usually chosen, and very naturally chosen, by botanists who attempt to write the flora of a large and a comparatively unknown country; and it is also the plan usually adopted by botanists who write monographs of the larger groups of plants. Secondly, there is the plan of using very small species. This plan has from time to time been adopted by botanists who intensively study the flora of a limited district or a small group of plants. The British botanist Bentham may be cited as a type of botanist who used very large species, and the French botanist Jordan as a type of one whose species were very small.

It is felt that, in the case of a well-worked area like the British Islands, some middle course is desirable; and accordingly the species in the present work are much wider than those of Jordan and considerably narrower than those of Bentham. We believe that the adoption of this middle course will commend itself to the great majority of botanists.

How species are subdivided into varieties

We also desire to make clear our position with regard to the subdivision of species into varieties. Here there are two plans each of which finds favour in certain circles. One is to regard a certain form of a species as typical of that species, and to regard any deviations from that type as varieties. The second plan is to subdivide the same species wholly into varieties, just as a genus is wholly subdivided into species. *Populus tremula* may be taken as an illustration. Two varieties of this are recognised as British. One is a form whose young leaves are silky, and the other a form whose leaves (excepting the leaves of the suckers) are always glabrous or almost glabrous. If the first of the above plans be adopted, it becomes necessary to decide which of the two varieties shall be regarded as the type. Supposing the silky variety be regarded as the type, the British forms would be written thus:—

Populus tremula
(*b*) var. glabra.

If the glabrous variety be regarded as the type, then the British forms would be written thus:—

Populus tremula
(*b*) var. sericea.

However we ourselves have decided not to adopt this first plan but the second; and accordingly we write the British forms thus:—

Populus tremula
(*a*) var. sericea
(*b*) var. glabra.

We have decided on this plan for two reasons. First, it is (so far as we are able to judge) quite arbitrary in many cases to decide which of the forms of a species is the type; and it is unusual to find agreement among botanists as to which form is to be regarded as the type and which the deviation from the type. We frequently find that the form which a botanist regards as the type is merely the form which he happens to have come to know first, or the form which is more abundant in the district which he usually investigates; and we find that this view of the type of the species sometimes prevents him from taking a broad view of the relationships of the different forms of the species. Secondly, it is impossible, if the first plan be chosen, for a botanist to record definitely the existence of a species in a given locality without committing himself to the recording of a particular form of that species, and of a form, it may be, of whose distinguishing characters he is wholly ignorant. By adopting the second plan, it is possible to record the existence of a species in a particular locality without being so committed; and, if it be desired to make the additional observation that the species exists in that locality in a particular form, it is only necessary to add the name of the particular variety, whichever it may happen to be, to that of the species.

Subvarieties and formae

Subvarieties and *formae* are prefixed by Greek letters, varieties by Roman letters. A subvariety is distinguished by a single character which is known or presumed to be constant, and is not related to habitat-conditions. A *forma* is known or presumed to be due to habitat-conditions, and reverts to the normal form of the variety or species when transplanted to the ordinary habitat of that variety or species.

Sign of certainty

A note of exclamation (!) after a synonym indicates that an authentic specimen has been seen, and that if more than one such specimen has been seen all the specimens are alike.

PLAN OF THE FLORA

Groups higher than species

Each group of plants of higher than specific rank is given a central heading in which the rank, number, and the name of the group are stated. This is followed by a paragraph of citations and synonyms beginning with the name of the group printed in thick type. The name of the group is followed by the authority and the place of publication in which the name first appeared, and by the names of some authorities (if any) who have used this name or a synonym of it, and the places of publication where these authorities used the names. Throughout the work the names of synonyms and the titles of publications are printed in italics. Dates of publications are given wherever possible. The date is placed in brackets, and the number before the brackets refers to the page of the publication on which the name appears, unless this number is preceded by a reference to a tablet or plate, when the page is given before the tablet-number. When a page-number is placed in brackets, the signification is that only an offprint, and not the original copy of the work, has been seen. Unfortunately offprints have often a different pagination from the original work.

The paragraph of synonymy is followed by a botanical description of the group, or by a reference to the page where the description occurs.

In the case of orders, families, and genera, the size and distribution of the group are briefly indicated.

Notes, in small type, are sometimes added in separate paragraphs following the description.

Pre-Linnaean names of genera and pre-Linnaean authorities of modern genera are placed between square brackets.

Species

In the case of species, the central heading consists of the number of the species in its genus, of the specific name, of the common name (if any), and of references to plates (if any) in the present work. The numbers of plates which refer to hybrids are placed after a semicolon.

Different kinds of headings are used for species. Some are included within square brackets: this means that the plants in question have very little, if any, claim to be regarded as British. Others are preceded by an asterisk: the plants so indicated are not indigenous but are more or less definitely naturalised. Still others are preceded by an obelisk: these are doubtfully indigenous. The rest of the species are, in our opinion, indigenous members of the British flora or so thoroughly established as weeds of cultivation that they are in practice indistinguishable from indigenous species.

After the heading, pre-Linnaean synonyms are sometimes added. These do not pretend to be in any way complete, nor is the first authority for the name necessarily given. The object of these names is, as a rule, merely to give an indication of the history of knowledge of the species in the British Islands.

Then follows a paragraph of synonymy on the lines outlined above.

A paragraph is then devoted to references to icones or illustrations (if any). Mr Hunnybun's plates illustrating the present work are then explained; and the county from which the specimen figured was obtained and the initials of the sender of the specimen are added wherever possible.

References to exsiccata or dried herbarium specimens follow in the next paragraph, a note sometimes being added relating to a critical specimen.

The description of the species follows; and the same kind of type is used for descriptions of all grades of plants throughout the work.

Varieties and formae, and distribution

The species may be subdivided into smaller groups: the latter are not given a central heading; but the name is printed in thick type, smaller however than the thick type used for the names of species and of the larger groups. The name is again followed by references to synonyms, icones, and exsiccata, by the description, and (where possible) by the distribution. The distribution of groups of lower than specific rank and of non-indigenous species is printed in smaller type than the distribution of the native species and of the higher groups.

After the description of the subspecific forms, the distribution (in the larger type) of the species as a whole completes the account of the species. Thus, each subspecific form is enclosed within the species of which it forms a part. The distribution is stated in two paragraphs, the first relating to the distribution of the plant within the British Isles, and the second to its distribution abroad.

Hybrids

Hybrids are not given a central heading; but the name of each hybrid is printed in thick special type; and the name is followed by synonymy, description, and distribution (this being again in the smaller type), in the manner of the other groups as above explained. Hybrid-forms are printed in smaller special type, and are preceded by a capital letter.

Common names of plants

The common names of plants are given in the central heading of the species, and on the plates; but it has not been thought worth while to insert "common" names for all species nor to use "common" names invented in recent years by other botanists. For example, we do not see that any useful purpose is served by naming *Scirpus pauciflorus* "the few-flowered spike-rush." The botanist who is interested in the study of this plant is content to name it *Scirpus pauciflorus*. Common names which are of local or limited use are not given. These vernacular names are, we need scarcely state, of very great interest; but they form a special study, and, on the whole, are out of place in a flora of a national character.

Maps showing distribution

In certain cases, maps are given showing the British distribution of species. It is, of course, unnecessary to furnish such maps of species which occur throughout the length and breadth of the British Islands, and of species whose occurrence is limited to a single county. In other cases, particularly in the cases of trees[1], the available records have not been found to be very useful in enabling us to decide the natural geographical limits of species; and maps therefore cannot be furnished of these species. Further, the published records of a considerable number of critical species are more or less unreliable; and in these cases it is unwise to furnish any map.

All the maps used in this work have the same scale. They are divided into counties by thin dotted lines, and into groups of counties by thicker dotted lines. In a few cases where the counties are unduly large and specially interesting from a phytogeographical point of view, subdivisions of the counties have been indicated; e.g., Yorkshire, Perthshire, Argyllshire, Inverness-shire, and co. Galway. Little or no attempt is made to indicate local distribution within the limits of the counties or the subcomital divisions.

Distribution

The following sources of information have been drawn upon in ascertaining the distribution of the species within the limits of the British Islands:—

Topographical Botany ed. 2 (1883), by H. C. Watson. In this work, county records are given of the plants of Great Britain.

Supplement to Topographical Botany ed. 2, by Arthur Bennett; in *The Journal of Botany* xliii (1905). This gives the additional records of the plants (except *Salix*) of Great Britain made up to 1903. For records later than this, we have often been indebted to Mr A. Bennett for supplying us with information.

Irish Topographical Botany, by R. Lloyd Praeger; in *Proc. Roy. Irish Acad.* ser. 3, vol. vii; and also Dublin (1901). Later Irish records by Mr Praeger are to be found in the *Proc. Roy. Irish Acad.* xxvi, B, 13—45 (1906), and in *The Irish Naturalist* xvii, 28—37 (1908) and xxii, 103—110 (1913).

Additions and Corrections to the Topographical Botany of Scotland, by Professor James W. H. Traill, in *Annals of Scottish Natural History* for 1905 and following years.

In addition, articles frequently appear in *The Journal of Botany* and elsewhere giving new particulars of local distribution; and these have been utilised to some extent. However, we have, for various reasons, not taken all these records at their face-value.

[1] The point of view which we adopt in relation to the indigenousness of trees has been stated in an article on "The Woodlands of England," by C. E. Moss, W. M. Rankin, and A. G. Tansley, in *The New Phytologist*, ix, pp. 113—149 (1910); also published separately by the British Ecological Society, London.

With regard to the distribution of plants in foreign countries we have relied largely on the following sources of information :—

Index Kewensis (1893—1895), by B. Daydon Jackson.
Supplements to *Index Kewensis,* by Durand and B. Daydon Jackson, Thistleton-Dyer, and Prain.
Genera Siphonogamarum (1900—1907), by de Dalla Torre and Harms.
Plantae Europaeae (1890—) i, ii (part), by Richter and Gürke.
Synopsis der Mitteleuropäischen Flora (1896—), i, ii, iii, iv (part), and vi, by Ascherson and Graebner.
The standard floras of various countries of Europe and of the U.S.A.

In the case of naturalised exotic species, we have consulted the floras of those countries in which these plants are indigenous, e.g., *Flora Capensis, Flora Australiensis,* and other works issued by the authorities at Kew.

Altitudes

The figures as to the altitudes reached by plants in the British Isles are largely obtained from various local floras and partly from a paper by Mr F. N. Williams on *The High Alpine Flora of Britain* (in *Ann. Scott. Nat. Hist.* (1908—1910)), whilst those relating to the altitudes reached on the mainland of Europe are largely obtained from *Die Farn- und Blütenpflanzen von Tirol, Vorarlberg, und Liechtenstein* (1902—) by v. Dalla Torre and v. Sarnthein, from Ascherson and Graebner's *Synopsis* (*op. cit.*), and from various monographs and papers by P. Jaccard, E. Rübel, H. S. Thompson, F. N. Williams, and others.

The Channel Isles

We include the Channel Isles within the limits of the British flora, though in no real geographical sense may this legitimately be done. Still, it has been usual to include the Channel Isles in British floras; and, on the whole, we think it desirable to continue to do so. There are only a few species which occur in the Channel Isles and not in the British Islands, scarcely more, e.g., than occur in Cornwall and the west of Ireland, whilst any Sarnican and non-British plant may at any time be discovered in the extreme south of Great Britain. The inclusion of such Sarnican species therefore in a British flora at least serves as a stimulus to British field-botanists, besides satisfying the natural desires of the English-speaking botanists of the Channel Isles themselves.

Citizenship of species

We have decided not to use the terms invented by H. C. Watson to denote the various grades of citizenship of British plants. The terms which Watson used are "native," "denizen," "colonist," "casual," and "alien." Of these, the term "denizen" has as often been used as synonymous with "alien" or at least "naturalised alien" as in the sense actually laid down by Watson; and it is, in our judgment, impossible in practice to differentiate between "colonists" and some "casuals," and between "casuals" and some "aliens." We have preferred to state the facts of distribution in simple language rather than to obscure the facts by the use of ambiguous terms.

The conspectus

We do not furnish any analytical or artificial keys to the groups of plants. These keys are scarcely ever satisfactory. We endeavour to assist the student in classifying his plants by setting forth, under each group, a conspectus of the more important characters of the groups of the next lower rank, and in giving (wherever the exigencies of book-production allow) a reference to the page where the lower group is considered: when no cross-reference to a page is found, it is necessary to consult the *Addenda* or the index. By following the groups and sub-groups in this way, it is hoped that the student will be able to identify the indigenous and established wild plants of the British Islands.

C. E. MOSS.

CAMBRIDGE.
December 24th, 1913.

SUBDIVISION I

DICOTYLEDONES (see Volume I)

Dicotyledones Jussieu *Gen. Pl.* lxxi et 70 (1789); Ascherson und Graebner *Syn.* iv, 1 (1908); *Dicotyledoneae* DC. *Syst.* i, 122 et 123 (1818); *Prodr.* i, 1 (1824); Engler *Syll.* 92 (1892) including *Chalazogamae* p. 64.

Cotyledons 2, rarely 1 or more than 2 (or apparently 1 or more than 2) or absent, lateral. *Primary root* usually persistent, except in geophilous forms. *Plumule* terminal. *Leaves* often consisting of stipules, petiole, and lamina, but many stages of reduction and many modifications occur; *basal sheath* usually absent and if present usually imperfect; *laminae* usually either pinnately veined or palmately veined, smaller veins reticulate; veins more or less obscured in succulent forms. *Perianth* monochlamydeous or dichlamydeous or rarely absent; *segments* usually cyclic (i.e., whorled), rarely spirally arranged; *sepals* usually 4 or 5, less commonly 3, rarely 1 or 2 or more than 5; *petals* usually as many as the sepals.

It is important to bear in mind that there is scarcely a single group of plants whose characters are constant. No matter which character or combination of characters be emphasised, plants can be found which refuse to accommodate themselves to the groups made by systematists. Consequently, be these groups constructed ever so well, the student soon perceives that there is no easy method of determining in which group a critical plant must be placed. This indeed is only what is to be expected if the doctrine of evolution is true. The only general rule which can be safely laid down is that the totality of the characters of a plant and not any single character or combination of characters must be taken into consideration in determining its systematic position.

Dicotyledons with more than 2 or apparently more than 2 cotyledons occur, e.g., in *Acer*. Dicotyledons which have or apparently have only 1 cotyledon occur, e.g., in *Carum*, *Chaerophyllum*, *Corydalis*, *Cyclamen*, *Eranthis*, *Ranunculus*. Dicotyledons which are destitute of cotyledons occur, e.g., in *Cuscuta*, *Orobanche*, *Viscum*.

Although the subdivision *Dicotyledones* as now understood dates from de Jussieu (*loc. cit.*), yet the name had been used previously by Ray (*Hist. Plant.* (1686—88)), Hallier (*Enum. Helv.* 33 et 321 (1742)), Linnaeus (*Phil. Bot.* 102 (1751)), and Gaertner (*Fruct.* i, clxxix (1788), ii, xliv (1789)); and the concept had been foreshadowed in 1570 by de L'Obel (*Stirp. Adv.*). It was Ray (*loc. cit.*) who first realised the importance of the characters of the cotyledons in classification, although the influence of the pre-Raian botanists who laid stress on mere plant-form in classification prevented a rigorous and logical application of his discovery.

In Engler's arrangement (*Syll.* editions 1—7), the *Monocotyledones* are placed before the *Dicotyledones*; but the general opinion among botanists at the present time is that although the latter have reached a higher state of development than the former, yet the former originally evolved from the latter; and in deference to the widespread nature and probable truth of this view, the *Dicotyledones* are in the present work taken before the *Monocotyledones*. In adopting this plan we are following Wettstein (*Handb. Syst. Bot.* ed. 2 (1911)) among modern systematists, and Bentham and Hooker (*Gen. Plant.* 1862—1883) and De Candolle (*op. cit.*) among botanists of an earlier date.

CLASSES OF *Dicotyledones*

Class 1. **Archichlamydeae** (p. 2). *Perianth* (1) monochlamydeous in the lower forms, (2) dichlamydeous in the higher forms, or monochlamydeous by reduction and then with allied forms dichlamydeous, (3) absent and then present in allied monochlamydeous or dichlamydeous forms. *Outer whorl of perianth* or *calyx* either polysepalous or gamosepalous. *Inner whorl of perianth* or corolla usually polypetalous, when gamopetalous, allied forms are polysepalous.

Gamopetalous forms occur, e.g., in *Cotyledon*. Cf. also *Portulacaceae*.

Class 2. **Metachlamydeae** or *Gamopetalae*. *Perianth* usually dichlamydeous, rarely monochlamydeous or apetalous, and then with dichlamydeous forms in allied genera; usually gamopetalous, rarely polypetalous and then with gamopetalous forms in allied genera or families.

Polypetalous forms occur, e.g., in *Pyrola*, *Monotropa*. Many genera, especially in *Ericaceae*, *Plumbaginaceae*, and *Primulaceae* are almost or even quite polypetalous. Monochlamydeous forms occur, e.g., in *Glaux*. Achlamydeous forms occur, e.g., in *Fraxinus*.

Class 1. *ARCHICHLAMYDEAE*

Archichlamydeae Engler *Syll.* 92 (1892) including *Chalazogamae* p. 64; in Engler und Prantl *Pflanzenfam. achtr.* 344 (1897); Ascherson und Graebner *Syn.* iv, 2 (1908).

The class *Archichlamydeae* includes the *Polypetalae* and the *Monochlamydeae* of De Candolle (*op. cit.*) and of Bentham and Hooker (*op. cit.*). The earlier orders of *Archichlamydeae* include those forms which we regard as primitively monochlamydeous, whilst those forms whose monochlamydeous perianth is thought to be due to suppression of a corolla are placed later on in the class near the dichlamydeous forms from which they are believed to have descended. As what we believe to be primitively monochlamydeous forms occur throughout the subclasses *Amentiflorae* and *Petaloïdae* and also in the lower families of the subclass *Centrospermae* and the lower genera of the subclass *Heterochlamydeae*, and as forms which are monochlamydeous by reduction are found scattered throughout the higher *Centrospermae* and *Heterochlamydeae* and even the *Metachlamydeae*, it is unwise to retain the group *Monochlamydeae*.

Engler still divides the *Archichlamydeae* into two main groups, the first of which contains only the non-British family *Casuarinaceae*. We do not adopt these two groups, as we believe that the *Casuarinaceae* are best left near the *Fagaceae* where Eichler (*Syll. der Vorlesungen* 20 (1876)) and formerly Engler himself (*Pflanzenfam.* iii, pt. i, 16 (1889)) placed them, as the peculiar characters on which the change was made have since been discovered in other genera of the *Fagales*. We have elsewhere (*New Phytol.* xi, 209 (1912)) stated our reasons more fully for differing with Engler on this matter.

We think it probable that the four sub-classes of the *Archichlamydeae* have descended from an unknown group of "primitive angiosperms," and have developed along diverging paths.

For characters, see page 1.

Subclasses of *Archichlamydeae*

Subclass 1. **Amentiflorae** (p. 3). Usually trees or shrubs, less often perennial or annual herbs. *Inflorescence* usually a simple or compound catkin, less often a compound cyme or raceme; ultimate branches of the compound inflorescences usually cymose. *Flowers* usually dioecious, or monoecious and diclinous, less often monoclinous. *Perianth* monochlamydeous, sepaloid, small or minute, rarely absent. *Pollination* usually anemophilous, rarely entomophilous. *Ovary* syncarpous. *Fertilisation* porogamous, mesogamous, or chalazogamous. *Integument of seed* double or single.

Non-catkinate inflorescences occur, chiefly in the order *Urticales*. Exceptionally, monoclinous flowers may occur in any of the genera of this subclass, e.g., *Populus*, *Salix*, *Castanea*. *Salix* and *Castanea* are entomophilous. Mesogamous fertilisation has been observed in *Ulmus*, and chalazogamous fertilisation in *Juglans*, in most of the genera of the order *Fagales*, and in *Ulmus*.

Subclass 2. **Petaloïdeae**. Trees, shrubs, or herbs. *Inflorescence* compound, usually cymose or cymose-spicate; ultimate branches usually cymose, rarely solitary. *Flowers* usually monoclinous, rarely diclinous, actinomorphic or zygomorphic. *Perianth* usually monochlamydeous and petaloid, rarely monochlamydeous and sepaloid, rarely dichlamydeous and sepaloid. *Pollination* anemophilous or entomophilous. *Ovary* syncarpous. *Fertilisation* porogamous. *Integument of seed* double or absent.

The suborder *Loranthineae*, including *Viscum*, has a sepaloid perianth. The perianth of *Rumex* and *Rheum* is dichlamydeous, and that of *Rumex* is also sepaloid.

Subclass 3. **Centrospermae**. *Inflorescence* compound, cymose, cymose-spicate, or racemose, rarely simple and spicate; ultimate branches of the compound inflorescences usually cymose, or very rarely reduced to a single flower. *Flowers* usually monoclinous, rarely diclinous. *Perianth* usually present, monochlamydeous in the earlier orders, usually dichlamydeous in the later ones; usually actinomorphic, very rarely zygomorphic. *Pollination* anemophilous in the earlier orders, usually entomophilous in the later ones, autophilous in the reduced achlamydeous forms. *Stamens* usually hypogynous, usually as many as the sepals and antisepalous in the earlier families, usually hypogynous and obdiplostemonous in the later ones, rarely perigynous, very rarely some petaloid. *Ovary* usually syncarpous, or with only 1 carpel, rarely apocarpous, usually superior, rarely subinferior. *Placentation* basal in the earlier orders, free-central in some of the later ones, rarely axile or parietal. *Fertilisation* porogamous. *Embryo* curved, very rarely straight. *Integument of seed* double.

In the forms with a simple and spicate inflorescence (e.g., *Salicornia disarticulata*), each of the ultimate branches of the inflorescence has lost all but the central flower. The pistillate flowers of most species of *Atriplex* are achlamydeous. Apetalous forms occur in the *Dianthaceae* (e.g., in some forms of *Cerastium* and *Stellaria*): it is clear that the apetaly is here due to reduction, as closely allied forms are dichlamydeous. The perianth of *Montia* is zygomorphic. In *Mesembryanthemum*, the outer stamens are petaloid; and the placentation at maturity is parietal. Hemi-epigynous flowers occur in *Beta*, *Mesembryanthemum*, and *Portulaca*. The embryo is straight in *Dianthus*.

Subclass 4. **Heterochlamydeae** (see Volume III). *Inflorescence* cymose or racemose, rarely solitary. *Flowers* usually monoclinous less often dioecious or diclinous, usually cyclic, sometimes spiral. *Perianth* usually dichlamydeous, rarely monochlamydeous and then either petaloid or sepaloid, rarely absent. *Pollination* usually entomophilous, less often anemophilous or autophilous. *Ovary* usually syncarpous, less often apocarpous or syncarpous only at the base. *Fertilisation* porogamous or very rarely mesogamous. *Integument of seed* double or single.

Monochlamydeous forms occur in several families, e.g., *Ranunculaceae*, *Rosaceae*, *Saxifragaceae*. Mesogamous fertilisation has been observed in *Alchemilla*. Apogamously produced seeds occur, e.g., in *Alchemilla*.

Subclass 1. *AMENTIFLORAE*

Amentiflorae nobis; *Dicotyledoneae A et B a* Engler *Syll.* ed. 2, 100 (1898).

The subclass *Amentiflorae* contains some of the most successful members of the class *Dicotyledones* if we judge from the standpoint of size, vegetative vigour, and longevity. It is an ancient group, being known in pre-Tertiary strata. However, they exhibit some signs of being a decadent race; and, having probably given rise to no higher forms, it is natural to take them before the remaining subclasses, although, in our opinion, the lower members of the latter are as primitive and of equal age. In the characters of the flower, the *Amentiflorae* show signs of reduction from the hypothetical group of "primitive angiosperms" which preceded them and which gave rise to numerous diverging groups. One of the most remarkable of the specialised characters of the *Amentiflorae* is the method of fertilisation which occurs in many of the forms with the most reduced flowers, the pollen-tube, in the plants in question, entering the ovule at the chalazal end instead of through the micropyle as is ordinarily the case both in the *Gymnospermae* and the *Angiospermae*, and as was in all probability the case in the "primitive angiosperms."

For characters, see page 2.

British orders of *Amentiflorae*

Order 1. **Salicales** (p. 4). *Leaves* simple, alternate, stipulate; *stipules* caducous or deciduous or persistent. *Catkins* simple. *Bracts* 1 to each flower. *Flowers* dioecious. *Perianth* either small and usually undivided or modified into 1—4, usually 1 or 2 nectaries. *Stamens* 2 to ∞. *Ovary* of 2 (sometimes apparently 3 or 4) carpels, unilocular; *placentation* parietal; *ovules* ∞ in each loculus, anatropous, with a tuft of long white hairs arising at the base; *fertilisation* porogamous. *Fruit* a loculicidal capsule, free from the bract. *Seeds* small, ∞; *hairs* persistent; *endosperm* absent; *integument* double.

Order 2. **Myricales** (p. 69). *Leaves* simple, alternate, stipulate or not; *stipules* caducous. *Catkins* simple. *Bracts* and bracteoles persistent, glandular. *Flowers* monoecious and diclinous, or dioecious. *Perianth* absent. *Stamens* 2 to 16. *Ovary* of 2 carpels, unilocular; *placentation* basal; *ovules* 1 to each ovary, orthotropous, glabrous; *fertilisation* porogamous. *Fruit* a nutlet (in the British species), adherent to the enlarged bract and bracteoles. *Seeds* 1 to each ovary, glabrous; *endosperm* absent; *integument* single.

Order 3. ***Juglandales** (p. 70). *Leaves* pinnate, alternate, exstipulate. *Catkins* simple. *Flowers* monoecious and diclinous. *Bracts* and 2 bracteoles persistent. *Perianth* small, with usually 4 (rarely fewer) segments. *Stamens* 3 to 40. *Ovary* of 2 carpels, unilocular; *placentation* basal; *ovules* 1 to each ovary, orthotropous, glabrous; *fertilisation* chalazogamous. *Fruit* a pseudocarpous "drupe" consisting of the ovary fused with the bracts and bracteoles. *Seeds* 1 to each ovary, glabrous; *endosperm* absent; *integument* single.

Order 4. **Fagales** (p. 71). *Leaves* simple, alternate, stipulate; *stipules* usually caducous. *Catkins* simple or compound. *Bracts* and bracteoles persistent. *Flowers* monoecious and diclinous. *Perianth* small and usually deeply divided, or absent. *Stamens* 2—∞. *Ovary* with 2 to about 9 carpels and as many loculi and stigmas; *placentation* axile or pendulous; *ovules* 1 or 2 to each loculus, but only 1 ripening, anatropous, glabrous; *fertilisation* porogamous or chalazogamous. *Fruit* a nut or small samara, often more or less enclosed by a "cupule" of persistent bracts and bracteoles. *Seeds* 1 to each ovary, glabrous; *endosperm* absent; *integument* double or single.

Order 5. **Urticales**. *Leaves* simple, alternate or opposite, stipulate; *stipules* persistent or not. *Inflorescence* catkinoid or cymose. *Flowers* dioecious, or monoecious and diclinous, or monoclinous. *Perianth* small, often campanulate. *Ovary* of 1 or 2 carpels, usually unilocular; *placentation* basal or pendulous; *ovules* 1 to each loculus, orthotropous, anatropous, or amphitropous, glabrous; *fertilisation* porogamous, mesogamous, or chalazogamous. *Fruit* (in the British species) a samara or achene. *Seeds* 1 to each loculus, usually with endosperm, glabrous; *integument* double.

Order 1. SALICALES

Salicales Lindley *Nat. Syst.* ed. 2, 186 (1836) partim; Engler *Führer Bot. Gart. Bresl.* 31 (1886); *Pflanzenfam. Nachtr.* 345 (1897).

For characters, see page 3. Only family:—*Salicaceae*.

Family 1. SALICACEAE

Salicaceae Lindley *Nat. Syst.* ed. 2, 186 (1836); Pax in Engler und Prantl *Pflanzenfam.* iii, pt. i, 29 (1894); Ascherson und Graebner *Syn.* iv, 13 (1908); *Salicineae* Mirbel *Elem.* ii, 905 (1815).

Trees, shrubs or undershrubs. *Leaves* deciduous. *Catkins* usually appearing before or at the same time as the leaves. *Flowers* wind-pollinated or insect-pollinated. *Filaments* usually free. *Anthers* basifixed, extrorse. *Ovary* subsessile or stalked. *Stigmas* 2, entire or bifid.

2 genera; about 200 species (but see *Populus*, below), chiefly in the north temperate zone, a few subtropical or tropical.

Genera of *Salicaceae*

Genus 1. **Populus** (see below). *Petioles* usually long. *Laminae* usually broad. *Staminate* catkins pendulous at maturity. *Stamens* more than 5. *Bracts* more or less laciniate. *Perianth* small, usually entire or subentire.

Genus 2. **Salix** (p. 13). *Petioles* usually short. *Laminae* usually narrow. *Staminate catkins* usually ascending. *Stamens* usually 2—5. *Bracts* entire. *Perianth* modified into 1 or 2, rarely more nectaries.

Genus 1. Populus

Populus [Tournefort *Inst.* 592, t. 365 (1719)] L. *Sp. Pl.* 1034 (1753) et *Gen. Pl.* ed. 5, 456 (1754); Pax in Engler und Prantl *Pflanzenfam.* iii, pt. i, 35 (1894); Ascherson und Graebner *Syn.* iv, 14 (1908).

Trees, usually with suckers. *Stipules* caducous. *Petioles* often laterally compressed, about as long as the laminae. *Laminae* usually broader than in *Salix*, lobed or toothed, the lower ones of each twig broader and larger than the upper ones. *Catkins* appearing before the leaves, cylindrical. *Staminate catkins* pendulous at maturity, fugaceous. *Pistillate catkins* pendulous, spreading, or ascending, shorter than the staminate ones, lengthening in fruit. *Bracts* irregularly crenate or laciniate, usually caducous especially on the staminate plants. *Flowers* dioecious (very rarely diclinous or monoclinous), wind-pollinated, protandrous. *Perianth* small, cup-shaped or saucer-shaped, very rarely lobed, usually crenulate or entire, often somewhat zygomorphic. *Stamens* about 8 to about 60. *Ovary* often more or less adherent to the perianth. *Stigmas* 2, each usually bifid. *Style* short. *Placentae* often large.

Probably *Populus* is a more primitive genus than *Salix*, as shown by the presence of a less specialised perianth, by the more numerous and less fixed number of the stamens, by the anemophilous habit which seems to be the primitive one in the *Amentiflorae*, and by the absence of a gynophore.

Sir J. E. Smith, *Eng. Fl.* iv, 245—6 (1828), recognised that our poplars merited more critical examination than had been accorded to them; but no British systematist seems ever to have devoted much attention to them. In the meantime, several forms have probably originated by hybridisation; and hybrid-forms and nurserymen's "sports" are being more and more abundantly planted in the country. Whilst little notice is here taken of forms which exist only in cultivation, an attempt is made to include those forms which, though planted, have become more or less established in natural or semi-natural situations. These forms are met with by botanists in their herborisations; and they must be understood if our indigenous plants are to be correctly distinguished.

The estimate of the number of species varies greatly. Engler gives 18, Dode about 100, Ascherson und Graebner 30. North temperate zone.

British sections of *Populus*

Section I. **Leuce** (p. 5). *Winter-buds* small, pubescent, or glabrous, not or scarcely viscous, not odorous when opening. *Petioles* more or less laterally compressed. *Laminae* hairy or glabrous below; of the sucker-leaves hairy below. *Bracts* irregularly crenate or laciniate, ciliate often with long silky hairs. *Perianth* obliquely truncate. *Stamens* (in the British species) about 8—12. *Pistillate catkins* rather dense, pendulous. *Stigmas* 2, greenish-yellow or purplish, more or less slender. *Capsules* more or less narrowly conical.

Section II. **Aigeiros** (p. 9). *Winter-buds* larger than in *Leuce*, glabrous, viscous but not markedly odorous when opening. *Petioles* markedly flattened laterally, rendering the laminae tremulous. *Laminae* glabrous or rather hairy when young, rarely ciliate, acute to acuminate, glandular-serrate. *Bracts* laciniate, glabrous. *Perianth* scarcely oblique, crenulate. *Stamens* about 8—60. *Stigmas* greenish-yellow, more or less dilated, stouter than in *Leuce*. *Capsules* stouter than in *Leuce*, ellipsoid or subglobular.

Section III. ***Tacamahacca** (p. 12). *Winter-buds* and young leaves resinous, especially when opening, as large as in *Aigeiros*. *Petioles* scarcely flattened laterally. *Laminae* of the young leaves hairy or glabrous below. *Bracts* laciniate, glabrous. *Perianth* rather oblique. *Stamens* about 20—30. *Capsules* with slender or stout pedicels.

Section I. *LEUCE*

Leuce Duby *Bot. Gall.* i, 427 (1828); Ascherson und Graebner *Syn.* iv, 15 et 16 (1908).

For characters, see page 4.

Series of *Leuce*

Series i. **Albae** (see below). *Winter-buds* often obtuse, hairy, not viscous. *Laminae* white or grey with hairs below at least when young; of the summer-leaves and sucker-leaves permanently white below, lobed or toothed. *Pedicel* hairy. *Stigmas* linear, greenish-yellow. (Hybrids may have pink or purplish stigmas.)

Series ii. **Tremulae** (p. 7). *Winter-buds* acute, glabrous, somewhat viscous but not odorous when opening. *Petioles* more compressed laterally than in *Albae*, and laminae very tremulous. *Laminae* glabrous or hairy when young, glabrous or almost so at maturity; of the sucker-leaves grey with hairs but not white. *Pedicel* glabrous. *Stigmas* purple, stouter than in *Albae*.

Series i. *ALBAE*

Albae nobis; *Albidae* Dode in *Mem. Soc. Hist. Nat. Autun* xviii, 18 (1905) as a section; Ascherson und Graebner *Syn.* iv, 16 (1908).

For characters, see above.

Species and hybrid of *Albae*

1. ***P. alba** (see below). *Winter-buds* densely pubescent. *Laminae* of the summer-leaves and sucker-leaves palmately lobed, snow-white below. *Catkins* shorter, appearing later. *Bracts* not or scarcely laciniate. *Stigmas* filiform.

2. **P. canescens** (p. 6). *Winter-buds* pubescent or subglabrous. *Laminae* of the summer-leaves and sucker-leaves broadly ovate, coarsely or evenly toothed, white below. *Catkins* longer and stouter, appearing earlier. *Bracts* laciniate. *Stigmas* narrowly oblong, stouter than in *P. alba*.

P. canescens* × *tremula (p. 7). *Laminae* suborbicular. *Stigmas* pink to purple.

1. *POPULUS ALBA. White Poplar. Plates 1, 2

Populus alba Gerard *Herb.* 1301 (1597); Ray *Syn.* ed. 3, 446 (1724).

Populus alba L. *Sp. Pl.* 1034 (1753)!; Smith *Fl. Brit.* 1079 (1804)!; Willdenow *Sp. Pl.* iv, 802 (1806); *Berl. Baumz.* ed. 2, 287 (1811); *P. major* Miller *Gard. Dict.* ed. 8, no. 4 (1768); *P. alba* var. *nivea* Aiton *Hort. Kew.* iii, 405 (1789); Wesmael in DC. *Prodr.* xvi, pt. ii, 324 (1868); *P. nivea* Willdenow *Berl. Baumz.* 227 (1796); Dode *op. cit.* 21 (1905); *P. alba* var. *β* Bieberstein *Fl. Taur.-Cauc.* ii, 421 (1808); *P. alba* subsp. *eu-alba* Syme *Eng. Bot.* viii, 192 (1868) excl. t. 1219; *P. alba* race *nivea* Ascherson und Graebner *Syn.* iv, 19 (1908); Rouy *Fl. France* xii, 249 (1910).

Icones:—Reichenbach *Icon.* t. 614, fig. 1270; Hartig *Forst. Culturpfl.* t. 32.

Camb. Brit. Fl. ii (1913). *Plate 1.* (*a*) Long shoot, in early summer. (*b*) Leaf of summer-shoot, under side. (*c*) The same, upper side. *Plate 2.* (*a*) Shoot with staminate catkins. (*b*) Staminate flowers (enlarged), one with bract. (*c*) Bracts (enlarged) of staminate flowers. (*d*) Pistillate catkins, early and late stages. (*e*) Pistillate flowers and bract (enlarged). (*f*) Ripening ovaries (enlarged). (*g*) Winter-bud (enlarged), from pistillate tree. Staminate catkins from planted tree in Jersey (S. G.). Other parts from planted pistillate tree in Cambridge (C. E. M.).

Exsiccata:—Billot, 3211, as *P. canescens*.

Tree, up to about 25 m. high in this country, suckering freely. *Bark* brownish-grey. *Branches* ascending at a rather wide angle. *Winter-twigs* more hairy, more slender, and less knotted than in *P. canescens*. *Winter-buds* hairy. *Summer-buds* and *summer-shoots* covered with snow-white hairs. *Petioles* shorter than the laminae. *Laminae* more or less suborbicular, sublobed, densely hairy below, somewhat glabrescent; of the terminal leaves of the summer shoots and of the suckers somewhat cordate, deeply and palmately lobed, lobes triangular, snow-white below, dark green above; of the lower leaves of the summer-shoots more or less suborbicular and sublobed. *Catkins* mid-March to late March. *Staminate catkins* rare (only seen from Jersey), shorter and more slender than in *P. canescens*. *Bracts* irregularly and rather acutely crenate. *Stamens* about 8. *Pistillate catkins* about 1·5 to 2·0 cm. long. *Bracts* not deeply divided. *Stigmas* greenish-yellow, linear, slender, spreading. *Capsule* about twice as long as broad.

Many of the records of "*P. alba*" in this country refer to *P. canescens*. The two species are, however, quite distinct, and easily recognisable in early spring by the shape of the bracts, and in summer by the shape of the laminae of the summer-shoots and of the suckers.

P. alba is always, we believe, a planted tree in this country and, indeed, in western Europe generally. Rouy (*loc. cit.*) questions its being indigenous in Corsica. The planted tree is almost invariably pistillate.

Suburban gardens, parks, plantations, and very rarely by stream-sides and in woods. Not uncommon in the Channel Isles, in the lowlands of southern England and Scotland, becoming rare westwards and northwards; planted at 300 m. in Derbyshire; Ireland.

Western Europe (not indigenous); central Europe (doubtfully indigenous); eastern and south-eastern Europe to Turkestan. An allied form or species occurs eastwards to central China.

2. POPULUS CANESCENS. Grey Poplar. Plates 3, 4; 5

P. alba foliis minoribus Johnson in Gerard *Herb.* ed. 2, 1487 (1636); *P. alba* "alia" Ray *Syn.* ed. 3, 446, no. 2 (1724).

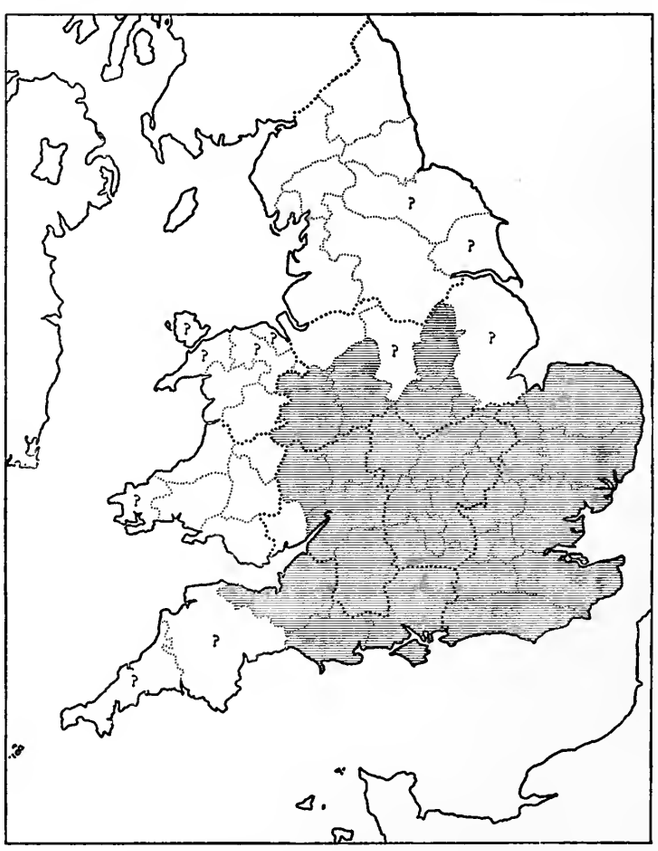
Populus canescens Smith *Fl. Brit.* 1080 (1804)!; Willdenow *Sp. Pl.* 802 (1806); *Berl. Baumz.* ed. 2, 287 (1811); *P. alba* Miller *Gard. Dict.* ed. 8, no. 1 (1768); Willdenow *Berl. Baumz.* 227 (1796); Bieberstein *Fl. Taur.-Cauc.* ii, 421 (1808) excluding var. *β*; Fries *Fl. Scan.* 147 (1835)!; non L.; *P. alba* var. *canescens* Aiton *Hort. Kew.* iii, 405 (1789); *P. alba* subsp. *canescens* Syme *Eng. Bot.* viii, 194 (1868); *P. alba* var. *genuina* Wesmael in DC. *Prodr.* xvi, pt. ii, 324 (1868); *P. alba* race *genuina* Ascherson und Graebner *Syn.* iv, 22 (1908).

Icones :—Smith *Eng. Bot.* t. 1618, as *P. alba*; t. 1619, excluding the stigmas which are abnormal; *Fl. Dan.* t. 2182, as *P. alba*; Hartig *Forst. Culturpfl.* t. 33.

Camb. Brit. Fl. ii (1913). *Plate 3.* (*a*) Long shoot, in early summer. (*b*) Long shoot, in summer, from a young tree. *Plate 4.* (*a*) Shoot with staminate catkins. (*b*) Staminate flowers, one with bract. (*c*) Staminate flower with bract (enlarged). (*d*) Pistillate catkins (early and later stages). (*e*) Pistillate flowers and bracts. (*f*) Ripening ovaries (enlarged). (*g*) Leaf-bud (enlarged), from staminate tree. (*h*) Leaf-bud (enlarged), from pistillate tree. (*i*) Long shoot in summer from a young tree. Huntingdonshire (E. W. H.).

Exsiccata :—Billot, 2534; Fries, xiii, 69, as *P. alba*.

Tree, growing to a height of 30 or 35 m., suckering freely. *Bark* brownish-grey. *Branches* wide-spreading; of old trees descending. *Twigs* thick and knotted. *Winter-buds* pubescent to glabrescent, obtuse. *Summer-buds* and *summer-shoots* hairy, often white with hairs. *Petioles* about as long as the laminae. *Laminae* broadly ovate-orbicular, truncate at the base, with a few large blunt teeth, obtuse, white to grey



Map 1. Distribution of *Populus canescens* in England and Wales

P. canescens is probably indigenous in the counties which are shaded, doubtfully indigenous in the counties which are marked with a "?", and not indigenous in the remaining counties.

below when young, more or less glabrescent; of the summer-leaves white or grey below, sublobed, often remaining small; of young trees and suckers cordate-ovate, irregularly and coarsely toothed or sublobed, with two red glands near the junction of the petiole, white or grey below. *Catkins* late February to mid-March. *Staminate catkins* opening earlier than the pistillate ones, about 5—10 cm. long. *Bracts* strongly laciniate, larger than in *P. alba* and with hairs relatively shorter. *Stamens* about 12. *Pistillate catkins* about 2·0—2·5 cm. long, darker in colour and thicker than in *P. alba*; in some years, they appear 3—4 weeks later than the staminate catkins. *Bracts* strongly laciniate. *Stigmas* yellowish, stouter than in *P. alba*. *Capsules* relatively shorter than in *P. alba*. *Seeds* with hairs shorter than in *P. alba*.

This species is often treated as a hybrid of *P. alba* and *P. tremula* owing, no doubt, to its having been confused with hybrids of *P. canescens* and *P. tremula*. We ourselves regard *P. canescens* as a species distinct from *P. alba* and having a very different distribution from either *P. alba* or *P. tremula*. *P. canescens* has greenish-yellow stigmas not very unlike those of *P. alba*, only rather stouter, not pink or purple ones like *P. canescens* × *tremula* (= *P. canescens* of many authorities, e.g., Dode and Rouy, but not of Smith).

Indigenous but thinly scattered on the damper and richer soils of southern and central England, and avoiding (as a native tree) the hills of the north and west. Quite rare and perhaps not indigenous in the extreme west and south-west of England. It prefers alluvial soils, chiefly by stream-sides; and, in such localities and on the upland edges of fens in eastern England, it is not uncommon. Also in ash-oak woods on marl, as in eastern Somerset, and in oak woods on clay, as in Kent. Perhaps indigenous in southern Ireland; probably not so in Wales, northern England, or Scotland. As a planted tree, it occurs as far north as Inverness.

Southern Sweden and Denmark (doubtfully indigenous), and western Europe generally; central Europe; southern Europe from Spain to the Balkan peninsula; Caucasus; Asia Minor.

P. canescens* × *tremula comb. nov.; *P. hybrida* Bieberstein *Fl. Taur. Cauc.* ii, 422 (1808); *P. alba* × *tremula* Neilreich in *d. Verhandl. Z.-B. Ver.* 120 (1851); *P. steiniana* Bornmüller in *Gartenfl.* xxxvii, 173, fig. 37 et 38 (1888); *P. canescens* Dode *op. cit.* 26 (1905); Rouy *Fl. France* xii, 249 (1910) partim; non Smith; *P. alba* × *tremula* forma *steiniana* Ascherson und Graebner *Syn.* iv, 30 (1908).

Icones:—*Fl. Dan.* t. 2183, as *P. canescens*.

Camb. Brit. Fl. ii (1913). *Plate 5.* (*a*) Long shoot, in early summer. (*b*) Leaf of sucker-shoot, under side. (*c*) Leaf of sucker-shoot, upper side. (*d*) Old pistillate catkin. (*e*) Pistillate flowers (enlarged). (*f*) Bracts (enlarged). Suffolk (C. E. M.).

Tree, freely suckering. *Bark* brownish or brownish-grey. *Branches* rather regular and ascending. *Twigs* smooth. *Buds* hairy, acute. *Petioles* nearly as long as the laminae. *Perianth* glabrous. *Laminae* suborbicular, irregularly toothed, eventually glabrous; of the sucker-shoots ovate, truncate to subcordate at the base, snowy white with hairs underneath. *Catkins* March and April. *Staminate catkins* about 5—6 cm. long. *Bracts* short, yellowish, rather pectinate, hairs shorter than the teeth. *Pistillate catkins* about 5—8 cm. long. *Bracts* deeply laciniate, often persistent, with a narrow dark-brown border, hairs longer than the teeth. *Pedicel* glabrous. *Stigmas* pink to purple. *Capsules* relatively shorter than in *P. alba*.

Very rare, or perhaps less rare than would appear to be the case owing to its having been confused with *P. canescens*.

Cambridgeshire, Suffolk, Dorset (planted), Hertfordshire.

Europe (excluding northern and Arctic); south-western Asia.

Series ii. *TREMULAE*

Tremulae nobis; *Trepidae* Dode *op. cit.* 19 (1905) as a section; Ascherson und Graebner *Syn.* iv, 24 (1908).

For characters, see page 5. Only British species:—*P. tremula*.

3. POPULUS TREMULA. Aspen. Plates 6, 7, 8; 5

Populus lybica Gerard *Herb.* 1302 (1597); Ray *Syn.* ed. 3, 446 (1724).

Populus tremula L. *Sp. Pl.* 1034 (1753); Syme *Eng. Bot.* viii, 196 (1868); Ascherson und Graebner *Syn.* iv, 24 (1908); Rouy *Fl. France* xii, 250 (1910).

Tree, growing to a height of about 20 m., suckering freely. *Bark* dark grey below, paler above. *Winter-buds* glabrous, acute. *Stipules* setaceous. *Petioles* usually longer than the laminae,

laterally compressed, and leaves therefore very tremulous. *Laminae* suborbicular or suborbicular-acute, coarsely toothed, glabrous at least at maturity, very tremulous; of the sucker-leaves with relatively shorter petioles, grey with hairs, cordate or ovate, more evenly serrate, teeth ending with a reddish gland, two reddish glands near the junction of the petiole. *Catkins* late February and early March. *Staminate catkins* about 5—8 cm. long. *Bracts* deeply laciniate. *Stamens* about 12. *Pistillate catkins* about 4—6 cm. long. *Bracts* deeply laciniate, hairs longer and more numerous than in *P. canescens*. *Stigmas* purple, suberect, broader than in *P. canescens*. *Pedicel* glabrous. *Capsule* narrowly elliptical, acute or subacute.

(a) **P. tremula** var. **sericea** [Lang ex] Döll *Rhein. Fl.* 259 (1843); *P. villosa* Lang in *Syll. Soc. Ratisb.* i, 185 (1824)!; *P. tremula* var. *villosa* Syme *Eng. Bot.* viii, 196 (1868); Rouy *Fl. France* xii, 250 (1910); *P. tremula* race *villosa* Ascherson und Graebner *Syn.* iv, 27 (1908).

Icones :—Reichenbach *Icon.* t. 617, fig. 1273, as *P. canescens*, excluding the stigmas which are copied from *Eng. Bot.* t. 1619.

Camb. Brit. Fl. ii (1913). *Plate 6.* (*a*) Normal shoot, with mature leaves. (*b*) The same, with very young leaves. (*c*) Sucker-shoots and leaves. (*d*) Shoots with pistillate catkins. (*e*) Shoot with staminate catkins. (*f*) Pistillate flowers, each with a bract (enlarged). (*g*) Staminate flower and bract (enlarged).

Exsiccata :—Reichenbach, 1633, as *P. villosa.*

Leaves when unfolding covered with long, silky, appressed hairs, becoming glabrous in summer and autumn. *Laminae* of the sucker-leaves and of the leaves of coppiced shoots up to twice as large as those of var. *glabra*, and cordate. *Bracts* rather larger and with rather longer hairs than var. *glabra*, and broader laciniations.

This variety is the commoner form in southern England where it is indigenous on stiff soils in ash woods, in ash-oak woods, and in oak woods. We have seen it growing in such habitats in Somerset, Cambridgeshire, and Huntingdonshire; and it has been reported to us from Hampshire, Surrey, and Kent. Not recorded for Wales, Ireland, or Scotland. Dode (*op. cit.* p. 30) and Rouy (*op. cit.* p. 251) agree in regarding it as commoner in France than var. *glabra.*

Western, central, and southern Europe.

(b) **P. tremula** var. **glabra** Syme *Eng. Bot.* viii, 196 (1868); *P. tremula* var. *genuina* Wesmael in DC. *Prodr.* xvi, pt. ii, 325 (1868); *P. tremula* Dode *op. cit.* 30 (1905); *P. tremula* race *typica* Ascherson und Graebner *Syn.* iv, 25 (1908); *P. tremula* var. *dodeana* Rouy *Fl. France* xii, 250 (1910).

Icones :—*Svensk Bot.* t. 103, as *P. tremula*; Smith *Eng. Bot.* t. 1909, excluding the bract which should be ciliate, as *P. tremula*; *Fl. Dan.* t. 2184, as *P. tremula*; Reichenbach *Icon.* t. 618, fig. 1274, as *P. tremula.*

Camb. Brit. Fl. ii (1913). *Plate 7.* (*a*) Winter-twig. (*b*) Shoot with staminate catkins. (*c*) Leaves. (*d*) Staminate flowers and bracts (six enlarged). *Plate 8.* (*a*) Shoot with mature leaves. (*b*) Sucker-shoot. (*c*) Portion of leaf (enlarged) of sucker-shoot. (*d*) Twigs with pistillate catkins. (*e*) Bract (enlarged). (*f*) Pistillate flowers and bracts (enlarged). (*g*) Hermaphrodite flower (enlarged). (*h*) Leaf-bud (enlarged). Cambridgeshire (R. H. A.) and Huntingdonshire (E. W. H.).

Exsiccata :—Billot, 2742, as *P. tremula*; Fellman, 221, as *P. tremula*; *Hb. Fl. Ingric.* vi, 576, as *P. tremula.*

In the Linnaean herbarium there are two sheets named *P. tremula*; one is this species, probably var. *glabra*; and the other is perhaps the American species *P. grandidentata.*

Laminae glabrous or sparsely hairy when very young; of the sucker-leaves small (about 3 to 6 cm. long), suborbicular-ovate, not cordate, hairy, regularly toothed.

In the hilly and rainy districts of western and northern Great Britain and of Ireland, var. *glabra* is the commoner if not indeed the only form of the species: in the south and east of England, this variety is rare; Cambridgeshire, Huntingdonshire, Derbyshire, Perthshire, Inverness-shire, Caithness-shire. Dr W. G. Smith states (*in litt.*) that *P. tremula* (probably var. *glabra*) is indigenous in Edinburghshire. Syme (*op. cit.* p. 196) reports it from Aberdeenshire. We have also seen specimens from the following counties; but it is impossible to state whether or not the specimens were gathered from indigenous or from planted trees :—Sussex, Suffolk, Shropshire, Denbighshire, Kircudbrightshire, Inverness-shire. Ascends to 480 m. on the Pennines.

It is said to have the same range abroad as the species (Ascherson und Graebner *op. cit.* p. 26). In the warmer districts, it occurs in the more mountainous and rainier parts.

Damp woods and scrub, streamsides and marshes, throughout the British Isles, but rather local. Europe, northern Africa, northern, western, and central Asia.

The British members of the section *Leuce* furnish an interesting sequence of forms as regards the hairyness of the winter-buds, twigs, and leaves. The degree of hairyness is correlated with the climate of the distributional area of the plants. *P. alba*, the most hairy, is indigenous in the driest and warmest region, *P. tremula* var. *glabra* in the wettest and coldest. *P. canescens* and *P. tremula* var. *sericea* are intermediate in both respects.

P. canescens × *tremula* (page 7).

Section II. *AIGEIROS*

Aigeiros Duby *Bot. Gall.* 427 (1828); Ascherson und Graebner *Syn.* iv, 15 et 31 (1908); *Aegiri* Dode *op. cit.* p. 34.

For characters, see page 5.

Series of *Aigeiros.*

Series iii. **Nigrae** (see below). *Laminae* acute to acuminate, usually with no glands at the junction of the petiole, margin not ciliate. *Catkins* shorter and rather more slender than in *Deltoïdeae.* *Stamens* about 12—20. *Capsules* more elongated.

Series iv. **Deltoïdeae** (p. 11). *Laminae* acute, some or all on each twig with 1—2 greenish glands at or near the junction of the petiole. *Catkins* longer and stouter than in *Nigrae.* *Stamens* about 30—60. *Capsule* subspherical.

Series iii. *NIGRAE*

Nigrae nobis; *Nigra* Dode *op. cit.* p. 37.

For characters, see above.

British species of *NIGRAE*

4. ***P. italica** (see below). *Branches* strongly fastigiate. *Young twigs* and *petioles* glabrous. *Laminae* smaller than in *P. nigra,* abruptly acuminate. *Stamens* about 20.

5. **P. nigra** (p. 10). *Lower branches* spreading or arched. *Young twigs* and *petioles* glabrous or hairy. *Laminae* acuminate. *Stamens* about 8—16.

4. *POPULUS ITALICA. Lombardy Poplar. Plates 9, 10

Populus italica Moench *Baüme Weissenst.* 79 (1785); *P. nigra* var. *italica* Duroi *Harbk. Baumz.* ii, 141 (1772); *P. pyramidalis* [Rozier *Cours d'Agric.* (1786) ex] Dode *op. cit.* 50 (1905); *P. fastigiata* Fougeroux in *Mém. Agric.* (*Soc. Roy. Paris*) for 1786, pt. i, 82 (1787); *P. dilatata* Aiton *Hort. Kew.* iii, 406 (1789); *P. pyramidata* Moench *Meth. Pl.* 339 (1794); *P. nigra* var. *pyramidalis* Spach in *Ann. Sci. Nat.* sér. 2, 31 (1841); Wesmael in DC. *Prodr.* xvi, pt. ii, 328 (1868); *P. nigra* race *italica* Ascherson und Graebner *Syn.* iv, 41 (1908).

Icones:—*Camb. Brit. Fl.* ii (1913). *Plate 9.* Long shoot. *Plate 10.* (*a*) Twig with staminate catkins. (*b*) Bracts (enlarged). (*c*) Staminate flower (enlarged). (*d*) Leaf-bud (enlarged). Huntingdonshire (E. W. H.). (*e—h*) See **P. italica* × *nigra* var. *genuina* (below).

Tree strongly fastigiate, attaining a height of about 30 or 35 m., rarely with suckers. *Bark* less black than in *P. nigra,* often brownish or greyish in the upper part of the tree, smooth. *Winter-buds* very acute. *Branches* strongly fastigiate, short, slender; young ones glabrous. *Leaves* unfolding in late March or early April, about two weeks earlier than in *P. nigra.* *Stipules* as in *P. nigra.* *Petioles* glabrous, shorter than the laminae. *Laminae* smaller than in *P. nigra,* subdeltoid to subrhomboidal, crenations bigger and more irregular than in *P. nigra,* apex abruptly acuminate. *Staminate catkins* 3 or 4 cm. long; mid-March, about 2—4 weeks earlier than *P. nigra.* *Bracts* more irregularly laciniate than in *P. nigra.* *Stamens* about 20. Pistillate plants not known.

The statement is commonly made that the Lombardy poplar differs from the black poplar only in habit; but we find the differences of the two plants to be indefinite in number. These differences apply to the habit, to the shape of the buds and leaves, to the time of unfolding of the leaves and of the catkins, to the time of leaf-fall, to the time of flowering, and to the structure of the different parts of the flower. We have no hesitation therefore in regarding *P. italica* and *P. nigra* as distinct species. If *P. italica* is merely a fastigiate form of *P. nigra,* we can only say that it is a fastigiate form of some variety of *P. nigra* which we have never seen. Dode (*op. cit.* 50) distinguishes the following "species" of fastigiate poplars in the series *Nigrae*:—*P. pyramidalis, P. bethmontiana, P. thevistina,* and *P. thracia* (= *P. pannonica* Reichenbach *Icon.* t. 619, fig. 1276). The species (*P. italica*) is thus very variable; but outside Botanic Gardens we have only seen the first of these forms in this country.

Commonly planted in the lowlands of the British Isles, but, like all our poplars, thriving best in damp soils.

It is difficult to state where this tree is indigenous: it is certainly not so in the Plain of Lombardy. Ascherson und Graebner (*op. cit.* p. 43) regard its home as in "eastern Europe; Orient, eastwards to Turkistan; north-western Asia; northern Africa."

****P. italica* × *nigra* var. *genuina*** comb. nov.; *P. pyramidalis* × *nigra* Figert in *Deutsche Bot. Monat.* v, 109 (1887); *P. nigra* var. *typica* × var. *italica* C. K. Schneider *Handb. Laubh.* i, 6 (1906); *P. nigra* race *typica* × race *italica* Ascherson und Graebner *Syn.* iv, 43 (1908).

Icones :—*Camb. Brit. Fl.* ii (1913). *Plate 10.* (*e*) Twig with pistillate catkins. (*f*) Pistillate flowers (enlarged). (*g*) Bracts of pistillate flowers (enlarged). (*h*) Leaf-bud (enlarged). Royal Gardens, Kew.

Tree. *Branches* fastigiate, but less so than in *P. italica*. *Laminae* as in *P. nigra*. *Pistillate catkins* more drooping than in *P. nigra*, about 3—5 cm. long; late March. *Bracts* laciniate, rather larger than in *P. italica*. Staminate trees not known.

Planted, near Cambridge, and doubtless elsewhere; but rare.

Germany (planted). Perhaps of garden origin.

5. POPULUS NIGRA. Black Poplar. Plates 11, 12, 13; 10, 15, 16

Populus nigra Gerard *Herb.* 1301 (1597); Ray *Syn.* ed. 3, 446 (1724).

Populus nigra L. *Sp. Pl.* 1034 (1753); Syme *Eng. Bot.* viii, 198 (1868); Ascherson und Graebner *Syn.* iv, 36 (1908); Rouy *Fl. France* xii, 251 (1910).

Tree, attaining a height of about 30 or 35 m., rarely with suckers. *Root* deep. *Old bark* black, thick, often with large corky excrescences. *Twigs* with brownish-yellow bark, terete or subterete. *Winter-buds* glabrous, shorter than in *P. deltoïdea*. *Laminae* attenuate or truncate at the base, the lower ones of each twig acute to subacuminate, the upper ones narrower, smaller, and more acuminate. *Catkins* opening in April. *Staminate catkins* about 3 to 6 cm. long, drooping at maturity. *Stamens* about 8 to 16. *Pistillate catkins* peduncled, ascending or spreading, about 6 or 7 cm. long. *Bracts* laciniate. *Stigmas* yellowish. *Capsules* ovate, ripening in May.

(*a*) **P. nigra** var. **genuina** Wesmael in DC. *Prodr.* xvi, pt. ii, 328 (1868); *P. nigra* race *typica* Ascherson und Graebner *Syn.* iv, 39 (1908); *P. nigra* Rouy *Fl. France* xii, 251 (1910) in sensu stricto.

Dode *op. cit.* pp. 50—53 (1905) has a number of "species" which conform to this var. *genuina* and which perhaps represent small varieties not distinguished in this country; e.g., *P. bisattenuata* ("espèce douteuse"), *P. scythica*, *P. gallica*, *P. vistulensis*, *P. europaea*, *P. viadri*, *P. hypomelaena*.

Icones :—Smith *Eng. Bot.* t. 1910, excluding the bracts of the enlarged flower, which should be glabrous.

Exsiccata :—Fries, xii, 64, as *P. nigra*; Schlaginweit, 370, as *P. nigra*.

Young branches glabrous. *Stipules* narrowly triangular. *Petioles* glabrous, about as long as or shorter than the laminae. *Laminae* subdeltoid or subrhomboidal. *Stamens* about 8 to 12.

This variety appears to be very rare in England. We have only seen it in Cambridgeshire, where the tree occurs rarely on the banks of streams. Whence the specimen was obtained from which the figure in *Eng. Bot.* was drawn, we have not been able to ascertain. The variety is cultivated in the University Botanical Garden at Cambridge. It is said to have the same distribution as the species.

(*b*) **P. nigra** var. **betulifolia** Torrey *Fl. New York* ii, 216 (1843); *P. hudsonica* Michaux fil. *Hist. For.* iii, 293, t. 10, 1 (1813); *P. betulifolia* Pursh *Fl. Amer.* 619 (1814); Dode *op. cit.* 48 (1905); *P. nigra* race *hudsonica* Ascherson und Graebner *Syn.* iv, 39 (1908).

Icones :—The figure in *Bot. Mag.* t. 8298, purporting to be this variety is, at least so far as it was drawn from specimens from the pistillate tree at Turnham Green, *P. deltoïdea* × *nigra* var. *betulifolia* (see p. 11).

Camb. Brit. Fl. ii (1913). *Plate 11.* (*a*) Shoot in summer. (*b*) Base of young leaf (upper side). (*c*) The same (under side). *Plate 12.* (*a*) Winter-twig. (*b*) Twigs with staminate catkins. (*c*) Twigs with pistillate catkins. (*d*) Staminate flower and bracts (enlarged). (*e*) Pistillate flowers and bract (enlarged). (*f*) Leaf-bud (enlarged). Huntingdonshire (E. W. H.).

[Exsiccata :—Todaro (*Fl. Sic. Ex.*) 1370, as *P. nigra*. This is an allied variety, *P. nigra* var. *pubescens* Parlatore *Fl. Ital.* iv, 289 (1867) differing from var. *betulifolia* in having the laminae pubescent on both sides.]

Young twigs hairy, at least when young. *Stipules* oblong. *Petioles* hairy when young, sometimes as long as or even longer than the lamina. *Laminae* usually rhomboidal, sometimes rather narrowly so, very acuminate. *Stamens* about 12.

Essex, Suffolk, Cambridgeshire, Huntingdonshire, Bedfordshire, Gloucestershire, Herefordshire, Hertfordshire. Some of the trees in western Suffolk are very large and very old.

Probably has nearly the same range as the species, though we have seen no foreign specimens; North America (not indigenous).

(*c*) **P. nigra** var. **viridis** Lindley *Syn.* 238 (1829)!; *P. nigra* Dode *op. cit.* 48 (1905) in sensu stricto; *P. nigra* race *dodeana* Ascherson und Graebner *Syn.* iv, 38 (1908).

Icones :—*Camb. Brit. Fl.* ii (1913). *Plate 13.* (*a*) Long shoot. (*b*) Branch with short shoots. (*c*) Base of leaf (enlarged), upper side. (*d*) Portion of leaf (enlarged). (*e*) Portion of young twig (enlarged). Cambridgeshire (C. E. M.).

Young twigs hairy, more or less glabrescent. *Stipules* shorter than in var. *genuina* and in var. *betulifolia*. *Petioles* hairy when young, longer than the laminae. *Laminae* triangular rather than rhomboidal in outline, truncate or even subcordate at the base, broader at the base than in the other varieties, less markedly acuminate, of a darker green as a rule than in the other varieties. *Stamens* about 12 to 16.

Jersey (E. W. H.), Suffolk, Norfolk (Lindley, *loc. cit.*), Cambridgeshire.

P. nigra is indigenous in England on rich alluvial soils where the water is not stagnant, by stream-sides, and near the upland margins of fens, chiefly in the lowlands of eastern England. It is impossible to state its precise range, owing partly to its having been confused with the black Italian poplar (p. 12), partly to the fact that British botanists when recording trees have rarely distinguished between indigenous and non-indigenous plants. Lines connecting Chelmsford, Gloucester, Shrewsbury, and Lincoln would probably include the great bulk of the area in which *P. nigra* is indigenous in England. Perhaps indigenous in southern Ireland. Not indigenous, and rare even as a planted tree, in Wales, northern England, and northern Ireland. Not reported from Scotland.

Mid-western, central, and southern Europe; northern Africa, Caucasus; the Orient, central Asia to the Himalaya mountains; North America (not indigenous).

P. deltoïdea* × ***nigra* var. ***betulifolia*** comb. nov.; *P. lloydii* Henry in *Trees of Great Britain and Ireland* vii, 1830 (1913).

Icones:—Skan in *Bot. Mag.* t. 8298—the parts from a pistillate tree—as *P. nigra* var. *betulifolia*.

Differs from *P. deltoïdea* in its young twigs and petioles being hairy, in its spring-leaves not being cordate or subcordate at the base, not or scarcely ciliate at the margin, and more acuminate at the apex. Differs from *P. nigra* var. *betulifolia* in many of its laminae being glandular at the junction of the petiole, in its summer-leaves being less acuminate, in its more numerous stamens, and in its pistillate catkins being rather more pendulous. Fruits not seen.

Planted at Turnham Green, near London, in hedgerows in Hertfordshire, and doubtless elsewhere. The Turnham Green plant was shown to us by Mr A. B. Jackson, who supplied specimens from it for the pistillate parts of the illustration in *Bot. Mag., loc. cit.*

**P. deltoïdea* × *nigra* var. *genuina* (see page 12); **P. italica* × *nigra* var. *genuina* (see page 9).

Series iv. **DELTOÏDEAE*

***Deltoïdeae** nobis; *Virginiana* Dode *op. cit.* 36 et 41 (1905).

For characters, see page 9.

[***P. deltoïdea** (see below). *Laminae* subcordate, slightly ciliate, suddenly acute. *Stamens* about 60.]

× ****P. serotina*** (p. 12). *Laminae* acute. *Stamens* about 20—30. Always staminate.

× ****P. canadensis*** (p. 12). *Laminae* acuminate. *Capsules* subspherical. Always pistillate.

[*POPULUS DELTOÏDEA. Cotton-wood or Necklace Poplar. **Plates 14; 15, 16**]

Populus deltoïdea Marshall *Arbust. Amer.* 106 (1785); Sargent *Silva N. Amer.* ix, 179, 1896; *P. virginiana* Fougeroux in *Mém. Agric.* (*Soc. Roy. Paris*) for 1786, pt. i, 87 (1787); Ascherson und Graebner *Syn.* iv, 35 (1908); *P. monilifera* Aiton *Hort. Kew.* iii, 406 (1789); Spach in *Ann. Sci. Nat.* ser. 2, xv, 32 (1841); Dode *op. cit.* 42 (1905).

Icones:—Watson *Dendrol. Brit.* ii, t. 5, as *P. monilifera*; Sargent *op. cit.* t. 494.

Camb. Brit. Fl. ii (1913). *Plate 14.* (*a*) Long shoot. (*b*) Base of leaf (enlarged), upper side. (*c*) Margin of leaf (enlarged). Cambridge Botanic Garden (R. I. L.)

Tree, attaining a height of about 30—35 m., sometimes with suckers. *Bark* smooth, greyish. *Branches* regular, curved, ascending. *Winter-twigs* subterete, glabrous. *Winter-buds* long and pointed, much longer than in *P. nigra*. *Stipules* larger than in *P. nigra*, about 8 mm. long, and 3—4 broad. *Petioles* about as long as the laminae, glabrous. *Laminae* tremulous, broadly ovate, more or less subcordate at the base; margin subcartilaginous, ciliate especially when young, serrate with large hooked teeth; apex suddenly acute. *Catkins* larger than in *P. nigra*;

April. *Staminate catkins* about 7 or 8 cm. long. *Bracts* much bigger than in *P. nigra*. *Stamens* much more numerous (about 60) than in *P. nigra*. *Pistillate catkins* pendulous, much longer than in *P. nigra*. *Capsules* larger than in *P. nigra*, more loosely arranged, on slender pedicels about 6—10 mm. long.

According to Loudon (*Arboret. Brit.* iii, 1656 (1838)), this "used to be very commonly propagated in nurseries and extensively introduced into plantations; but, within the last thirty years, the black Italian poplar [see below] has been substituted for it." It is now either very rare, even in cultivation, in this country, or overlooked.

Europe (not indigenous); North America, from Florida and western Quebec westwards to the Rocky Mountains.

P. deltoïdea** × ***nigra var. ***genuina*** comb. nov.; *P. monilifera* × *nigra* Figert in *Deutsche Bot. Monatschr.* v, 110 (1887); in *Allg. Bot. Zeitschr.* i, 159 (1895).

It would appear that the American species *P. deltoïdea*, soon after its introduction into Europe, hybridised with the European *P. nigra*. Several hybrid-forms, the results of the crossing of the two species, are now in cultivation in the country; and, of these, the two following appear to be sufficiently at home in wild-looking localities to deserve a place in the present work.

(A) ×**P. serotina* comb. nov.; *P. monilifera* Michaux fil. *Hist. Arb. Forest.* iii, 295 (1813) non Aiton; *P. serotina* Hartig *V. Naturg. Forstl. Culturpfl.* 437 (1851); Dode *op. cit.* 44 (1905); *P. canadensis* Ascherson und Graebner *Syn.* iv, 33 (1908) excl. syn. Marshall non Moench.

P. nigra foliis acuminatis ad marginem undulatis Duhamel *Traité Arbres* ii, 178, t. 39, fig. 5 (1755).

Icones:—*Camb. Brit. Fl.* ii (1913). *Plate 15.* (*a*) Twig with staminate catkins. (*b*) Staminate flower (enlarged). (*c*) Bracts (enlarged). (*d*) Shoot in summer. (*e*) Bases of leaves (enlarged). Huntingdon (E. W. H.).

Tree, closely resembling *P. deltoïdea* in habit, differing from it in the following characters:—*Laminae* less cordate at the base; margin glabrous, less cartilaginous, less coarsely hooked, apex less abruptly acute. *Stamens* about 20—30. From *P. nigra*, it differs in the following characters:—*Branches* curved-ascending, regular, as in *P. deltoïdea*. *Winter-buds* much longer. *Laminae* of some of the leaves of every twig with 1—2 glands at or near the junction of the petiole, margin more coarsely hooked, less acuminate; bronze-coloured when unfolding, dark green later; the last poplar to unfold its leaves. *Staminate catkins* longer and stouter. *Stamens* more numerous. Pistillate plants are unknown.

Although not indigenous, this is by far the commonest poplar in the British Isles. It is planted in almost every conceivable kind of situation, including hedgerows, plantations, and the borders of woods, northwards to Caithness-shire. Being always a staminate tree, it is reproduced by cuttings. There are, however, in the nurseries, some closely allied forms which are pistillate: these occur rarely in cultivation, and will no doubt become commoner as time goes on: they have mostly been supplied with binominals by Dode (*op. cit.*), and reduced to races or varieties or subvarieties or forms by Ascherson und Graebner (*op. cit.*). The tree is probably a product of the nurseries, where it is known as the black Italian poplar, or in France and Belgium *le peuplier Suisse*.

Europe; North America.

(B) ×***P. canadensis** comb. nov.; *P. canadensis* Moench *Bäume Weissenst.* 81 (1785); Hartig *V. Naturg. Forstl. Culturpfl.* 436 (1851); *P. euxylon* Dode *op. cit.* p. 41 (1905); *P. canadensis* var. *euxylon* Ascherson und Graebner *Syn.* iv, 34 (1908).

Icones:—*Camb. Brit. Fl.* ii (1913). *Plate 16.* (*a*) Twig with pistillate catkins. (*b*) Pistillate flowers (enlarged). (*c*) Shoots in early summer. (*d*) Base of leaf (enlarged). Planted tree, Cambridge (C. E. M.).

Tree, nearly as tall as *P. deltoïdea* and ×*P. serotina*. *Branches* more spreading. *Young twigs* glabrous. *Winter-buds* long and pointed. *Petioles* glabrous, shorter than the laminae. *Laminae* ovate-acuminate, cuneate at the base, crenate, glabrous. *Pistillate catkins* pendulous, very lax, 10 to 12 cm. long, April. *Stigmas* yellowish-green. *Capsules* subspherical. *Pedicels* 2—3 mm. long. Staminate trees are unknown.

Naturalised in fenny places, by streams and rivers, where it is sometimes associated with ×*P. serotina* and *P. nigra*, as in Suffolk. Also planted in gardens and avenues. Probably of garden origin, like ×*P. serotina*.

Europe.

P. deltoïdea × *nigra* var. *betulifolia* (see page 11).

Section III. **TACAMAHACCA*.

***Tacamahacca** Spach in *Ann. Sci. Nat.* xv, 32 (1841); Ascherson und Graebner *Syn.* iv, 15 et 46 (1908).

For characters, see page 5. Only British species:—**P. tacamahacca*.

6. *POPULUS TACAMAHACCA. Ontario Poplar. **Plate 17**

P. foliis subcordis inferne incanis superne atroviridis Miller *Gard. Dict.* ed. 7, no. 7 (1759).

Populus tacamahacca Miller *Gard. Dict.* ed. 8, no. 6 (1768); Fougeroux in *Mém. Agric.* (*Soc. Roy. Paris*) for 1786, pt. i, 91 (1787) excl. syn. Catesby et syn. Duhamel; *P. candicans* Aiton *Hort. Kew.* iii, 406 (1789); Dode *op. cit.* 65 (1905); Ascherson und Graebner *Syn.* iv, 51 (1908); *P. balsamifera* var. *candicans* Gray *Man.* ed. 2, 419 (1856).

Icones:—Sargent *Sylv. N. Amer.* ix, t. 491, as *P. balsamifera* var. *candicans.*

Camb. Brit. Fl. ii (1913). *Plate 17.* (*a*) Twig with pistillate catkins. (*b*) Pistillate flowers and bracts. (*c*) Pistillate flower and bract (enlarged). (*d*) Shoot in summer. (*e*) Base of leaf (enlarged). Planted tree, near Huntingdon (E. W. H.).

Small tree, attaining a height of about 15—20 m., sometimes with suckers. *Winter-buds* narrow and pointed, resinous and odorous when opening. *Laminae* of the lower leaves broadly subcordate, hairy at least below when young; of the upper leaves more acuminate; the earliest poplar in this country to unfold its leaves. *Pistillate catkins* drooping, up to about 15 or 16 cm. long; late February or March. *Stigmas* yellowish at first, then pink. *Capsules* with stout pedicels, April. Staminate plants not seen.

Often mistaken for the balsam poplar (*P. balsamifera* L. *Sp. Pl.* 1034 (1753)), to which it is closely allied, but which has much narrower and non-cordate laminae, and which is very rare in this country even in cultivation.

There is some confusion in the American floras as to the distribution of this species. Britton and Brown (*Ill. Fl.* i. p. 491, 1896) state that it occurs from "New Brunswick to New Jersey, west to Minnesota, mostly escaped from cultivation, apparently indigenous northwards"; but in Gray's *New Manual* (p. 329 (1908)) we read that it is "perhaps of Asiatic origin." Gates, in a recent paper dealing with the vegetation of Illinois and south-eastern Wisconsin (*Bull. Illinois Lab.* ix. p. 287 (1912)), states that sand dunes in the district he describes are sometimes "surmounted by narrow groves of balm of Gilead (*Populus candicans*)."

Frequently planted, especially in suburban gardens; more rarely along the borders of woods, as in the West Riding of Yorkshire. It seems to flourish best on siliceous soils. Very common around London, in the north of England, and in the south of Scotland.

Genus 2. **Salix**

Salix [Tournefort *Inst.* 590, t. 364 (1719)]; L. *Sp. Pl.* 1015 (1753) et *Gen. Pl.* ed. 5, 447 (1754); Pax in Engler und Prantl *Pflanzenfam.* iii, pt. i, 36 (1894); A. et G. Camus *Classif. Saul.* 9 (1904) et ii, 9 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 54 (1908).

Trees, shrubs, or undershrubs, rarely with suckers. *Buds* with only 2 scales which are concrescent. *Stipules* caducous or more or less persistent. *Petioles* usually much shorter than in *Populus*, not laterally compressed. *Laminae* usually narrower than in *Populus*, entire or more or less serrate, not lobed. *Catkins* appearing before the leaves or at the same time, or a little later, sometimes with a second crop in the summer or autumn, usually suberect or spreading, ovoid or cylindrical; pistillate ones lengthening in fruit. *Bracts* entire, usually ciliate or hairy. *Flowers* dioecious (rarely monoclinous or monoecious), insect-pollinated. *Perianth* modified into 1 or 2, rarely more nectaries; *nectaries* median; when 2 or more, more or less coherent at the base or free; when 2, 1 anterior (i.e., between the flower and the bract), and 1 posterior (i.e., between the flower and the axis), the anterior one smaller than the posterior one and the posterior one not infrequently lobed; when 1, posterior. *Stamens* 2—12, rarely more, with filaments free or more or less coherent. *Ovary* stalked (i.e., with a gynophore) or sessile. *Stigmas* 2, entire or bifid.

About 160 species, many of which hybridise; chiefly in the Arctic and north temperate zones.

Sections of *Salix*

Section I. **Amerina** (p. 14). Trees or large shrubs. *Laminae* lanceolate, serrate, acute to acuminate. *Catkins* lateral (i.e., from lateral buds formed the preceding year), cylindrical, the pistillate ones on leafy peduncles, appearing with the leaves or a little later. *Bracts* yellowish, not darker towards the tip. *Nectaries* 2 to each staminate flower, 1—2 to each pistillate flower; when 2, free or coherent a little at the base. *Stamens* 2—12, rarely more, with filaments and anthers free. *Style* short. *Stigmas* bifid or emarginate. *Capsules* glabrous.

Section II. **Chamaetia** (p. 25). Dwarf undershrubs, with rhizomes. *Petioles* about as long as the laminae. *Laminae* broadly elliptical or suborbicular. *Stem* prostrate. *Catkins* terminal (i.e., from terminal buds formed the preceding year), on leafless peduncles. *Bracts* concolorous or rather

darker towards the tip. *Nectaries* at least 2 to each flower, either free or slightly united at the base and more or less surrounding the base of the stamens or ovary. *Stamens* 2, with filaments and anthers free. *Style* short. *Stigmas* bifid. *Capsules* hairy or glabrous.

Section III. **Vetrix** (p. 28). Small trees, shrubs, or undershrubs. *Laminae* ovate to elliptical-acute. *Catkins* usually lateral, ovate or ovate-cylindrical, usually appearing before the leaves, sessile or shortly peduncled. *Bracts* usually discolorous. *Nectaries* 1 to each flower. *Stamens* 2; filaments free or united a little at the base; anthers free. *Style* long or short. *Stigmas* entire to bifid. *Capsules* hairy or glabrous.

Section IV. **Vimen** (p. 58). Small trees or shrubs, usually osiers and of lowland distribution. *Laminae* linear to broadly lanceolate or narrowly elliptical, very much longer than broad. *Catkins* lateral, usually much longer than broad, cylindrical, sessile or subsessile, appearing before or with the leaves. *Bracts* discolorous. *Nectaries* 1 to each flower. *Stamens* 2. *Filaments* free, or partially or wholly coherent. *Anthers* free or coherent. *Style* long. *Capsules* glabrous or pubescent.

Section I. *AMERINA*

Amerina Du Mortier in *Bijdr. Natuurk. Wetensch.* (15) (1825); in *Bull. Bot. Soc. Belg.* i, 145 (1862); Fries *Fl. Suec. Mant.* i, 41 (1832); Babington in *Journ. Bot.* i, 170 (1863); *Albella* [Seringe *Sal. Rev.* ined., ex] Duby *Bot. Gall.* i, 425 (1828) including *S. pentandra* p. 427.

For characters, see page 13.

Series of *Amerina*

Series i. **Pentandrae** (see below). Small trees and shrubs. *Branches* spreading. *Petioles* at maturity strongly glandular near the junction of the laminae. *Laminae* glandular-serrate, glabrous, shining above, more or less fragrant and viscid when young, asymmetrical. *Catkins* suberect or pendulous. *Bracts* brownish-yellow, falling off before the fruit is mature. *Nectaries* 2 (rarely 3 or 4) to each flower, sometimes more or less united at the base. *Stamens* 4—12, rarely more, usually 5, not infrequently 4—6. *Style* short or absent. *Stigmas* bifid, short. *Capsules* subsessile or stalked.

Series ii. **Fragiles** (p. 17). Trees, often tall trees, or large shrubs. *Young branches* slender, ascending. *Laminae* lanceolate, either glabrous or silvery with hairs on the upper surface. *Catkins* often curved. *Bracts* yellowish, falling off before the fruit is mature. *Nectaries* 2 to each staminate flower, 1—2 (usually 1) to each pistillate flower; when 2, either surrounding the base of the stamens or pedicel, or free at the base with the anterior one smaller and arising at a higher level than the posterior one, anterior one sometimes more or less crenate at the top. *Stamens* 2—6, usually 2, not very rarely 2—3 (especially in *S. fragilis* var. *latifolia* and var. *decipiens*). *Style* very short or distinct. *Stigmas* bifid. *Capsules* sessile, subsessile, or stalked.

Series iii. **Triandrae** (p. 22). Shrubs or small trees. *Laminae* lanceolate to narrowly ovate, glabrous. *Catkins* ascending or spreading, on short peduncles. *Bracts* with yellow veins, persisting as long as the capsules. *Nectaries* 2 to each staminate flower, free at the base, 1 to each pistillate flower. *Stamens* 2—5, usually 3. *Style* very short. *Capsules* on rather long stalks.

Series i. *PENTANDRAE*

Pentandrae Borrer in Hooker *Brit. Fl.* 416 (1830); A. et G. Camus *Classif. Saul.* 84 (1904) as a subsection; *Lucidae* v. *pentandrae* Andersson *Monogr. Sal.* 30 (1867); *Lucidae* v. Seemen in Ascherson und Graebner *Syn.* iv, 56 et 61 (1908).

For characters, see above.

Species and hybrids of *Pentandrae*

1. **S. pentandra** (see below). *Laminae* acute to acuminate, very odorous when young. *Catkins* late May and June. *Stamens* usually 5.

S. alba* × *pentandra (p. 16). *Laminae* like those of *S. alba* in shape, but lacking at maturity the silvery hairs of this species, and sometimes much larger. *Catkins* appearing in May. *Stamens* usually 6.

S. fragilis* × *pentandra (p. 16). *Laminae* more acuminate than in *S. pentandra*. *Catkins* appearing in May. *Stamens* usually 4.

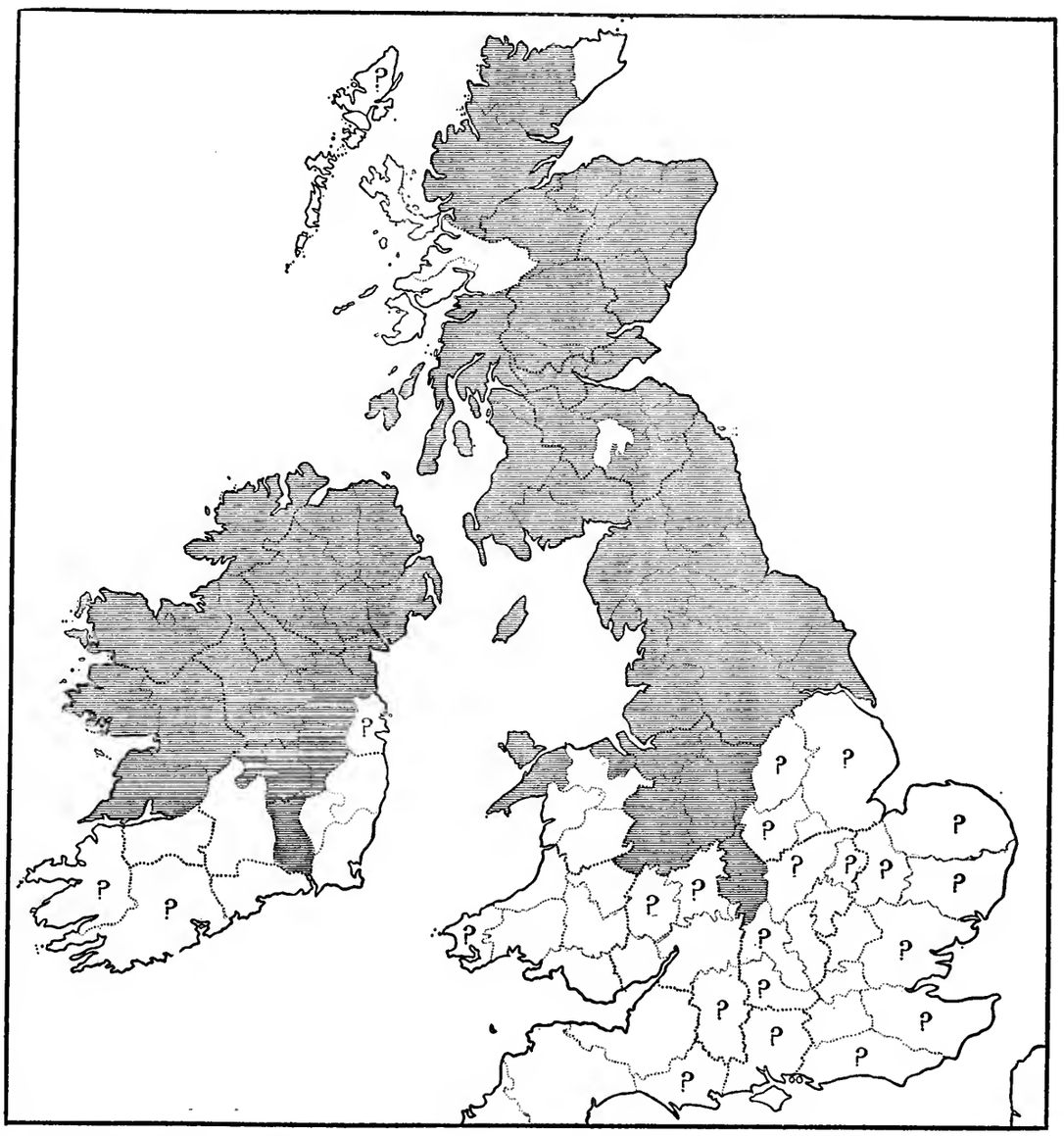
1. SALIX PENTANDRA. Bay-leaved Willow. Plates 18; 19

Salix folio laureo sive lato glabro odorato folio nondum descripta Johnson *Merc. Bot.* ii, 32 (1641); Ray *Syn.* ed. 3, 449 (1724).

Salix pentandra L. *Sp. Pl.* 1016 (1753)!; Syme *Eng. Bot.* viii, 202 (1868); A. et G. Camus *Classif. Saul.* 84 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 61 (1908); Rouy *Fl. France* xii, 192 (1910); *S. meyeriana* Hooker *Brit. Fl.* 417 (1830) non Willdenow.

Icones:—Smith *Eng. Bot.* t. 1805; Forbes *Sal. Woburn.* t. 34; *Fl. Dan.* t. 943; Reichenbach *Icon.* t. 612, fig. 1268; Hartig *Forst. Culturpfl.* t. 36; A. et G. Camus *op. cit., Atlas* t. 4.

Camb. Brit. Fl. ii (1913). *Plate 18.* (*a*) Shoot with staminate catkins. (*b*) Staminate flowers. (*c*) Staminate flower (enlarged). West Riding of Yorkshire (A. W.). (*d*) Shoot with pistillate catkins. (*e*) Barren shoot.



Map 2. Distribution of *Salix pentandra* in the British Isles. *S. pentandra* is indigenous in the counties which are shaded, but more or less doubtfully so in those which are marked "?"

(*f*) Pistillate flowers. (*g*) Pistillate flowers (enlarged). (Hort. Rev. E. F. Linton.) (*h*) Autumnal leaf. Forfarshire (C. E. M.).

Exsiccata:—Billot, 1065; Fries, ix, 60; A. et J. Kerner, 9, 19; 47, 98; Leefe, 1, 2; E. F. et W. R. Linton, 1; Reichenbach, 1423; *Hb. Fl. Ingric.*, iv, 553.

Small tree or large shrub, attaining a height of about 6 or 7 m., fragrant, glabrous. *Young branches* smooth, often shining as if varnished. *Winter-buds* blackish, narrowly ovate, shining. *Stipules* usually caducous. *Petioles* about 1 cm. long. *Laminae* broadly lanceolate to oblong-ovate, usually broadest a little above the middle, rounded at the base, acute to acuminate, about 5—10 cm.

long and 1·3—3·0 broad, more or less subglaucous underneath, subcoriaceous at maturity. *Catkins* appearing later than the leaves; late May and early June, the last British willow to come into flower. *Bracts* more or less oblong, hairy only at the base on the inner surface and about half-way up on the outer surface, greenish-yellow at the apex. *Staminate catkins* large and showy, about 2—6 cm. long and 1·0 to 1·5 broad. *Stamens* usually 5. *Filaments* hairy towards the base. *Anthers* pale orange-yellow before dehiscence. *Pistillate catkins* up to about 5 cm. long and 1 broad at maturity. *Capsules* ovate, about 5 or 6 mm. long; late June or early July.

"This species is much sought after by the Irish harvest-men who call it the black willow, and cut it for their *shillelahs*" (Leighton, *Fl. Shropsh.*, 485 (1851)).

Local; by stream-sides, in fens, marshes and wet woods, chiefly in northern and submontane localities. Indigenous from Warwickshire, Carnarvonshire and Lincolnshire to Sutherlandshire; rare in northern Scotland and in the southern Midland and southern counties of England, where it is usually regarded as not indigenous; frequent in the north of Ireland, thinning out southwards. Ascending to nearly 400 m. in Northumberland.

Scandinavia (to 72° N.), Denmark, Germany, France, central Europe (to 2100 m.), Russia, Spain (southwards to 42° N.), the Balkans; the Caucasus and western Asia to Manchuria.

S. alba* × *pentandra Ritschl *Fl. Posen* 291 (1850); Wimmer *Sal. Eur.* 138 (1866); A. et G. Camus *Classif. Saul.* ii, 97 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 208 (1909); *S. hexandra* Ehrhart *Beitr.* vii, 138 (1792); *S. ehrhartiana* Smith in Rees' *Cyclop.* xxxi, no. 10 (1815)[1]!; × *S. hexandra* Andersson in DC. *Prodr.* xvi, pt. ii, 208 (1868); White in *Journ. Linn. Soc.* xxvii, 361 (1890).

Icones:—Andersson *Monogr. Sal.* t. 3, fig. 27, as *S. hexandra*; A. et G. Camus *op. cit.*, *Atlas* ii, t. 6 (39), fig. A—E, as × *S. hexandra.*

Exsiccata:—Huter, 1440, as *S. hexandra*; A. et J. Kerner (*H. S. A.*) 27, as *S. ehrhartiana*; Toeppfer, 51.

Low tree. *Branches* and *buds* glabrous at maturity. *Stipules* caducous or small. *Petioles* slightly glandular when young. *Laminae* about the same shape as those of *S. alba* but sometimes much larger (up to about 12—13 cm. long and 3·5 broad) and lacking at maturity the silvery hairs of this species and only slightly hairy when young. *Catkins* like those of *S. alba*; May. *Stamens* 4—6, usually 6, pilose towards the base. *Bracts* yellow, thinly covered with white hairs, especially towards the base, caducous. *Ovaries* subsessile or shortly stalked. *Style* short or almost absent.

Rare or overlooked. Cambridgeshire (not indigenous), Westmorland, Cumberland, Edinburghshire, and Forfarshire; sometimes planted.

Southern Scandinavia, Germany, France, central Europe, Russia.

S. fragilis* × *pentandra Wimmer *Fl. Schles. Nachtr.* 476 (1845); in *Flora* xxxi, 308 (1848); A. et G. Camus *Classif. Saul.* 246 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 202 (1909); Rouy *Fl. France* xii, 220 (1910); *S. meyeriana* Willdenow *Berl. Baumz.* ed. 2, 427 (1811) non Forbes *Sal. Woburn.* t. 33 (1829) nec Hooker *Brit. Fl.* 417 (1830); *S. tinctoria* Smith in Rees' *Cyclop.* xxxi, no. 13 (1815)!; *S. cuspidata* Schultz *Prodr. Fl. Starg. Suppl.* 47 (1819); Woods *Tour. Fl.* 334 (1850); Syme *Eng. Bot.* viii, 204 (1868); × *S. cuspidata* Kerner in *Verhandl. Z.-B. Gesellsch. Wien* 181 (1860); White in *Journ. Linn. Soc.* xxvii, 360 (1890).

Icones:—Forbes *Sal. Woburn.* t. 32, as *S. lucida*; Borrer in *Eng. Bot. Suppl.* t. 2961, t. 2962, as *S. cuspidata*; Reichenbach *Icon.* t. 611, fig. 1266, as *S. meyeriana*; Hartig *Forst. Culturpfl.* t. 37, as *S. meyeriana*; A. et G. Camus *op. cit.*, *Atlas* t. 23, fig. D—I, as × *S. cuspidata.*

Camb. Brit. Fl. ii (1913). *Plate 19.* (*a*) Shoot with staminate catkins. (*b*) Barren shoot. (*c*) Staminate flowers. Cambridge Botanic Garden (R. I. L.).

Exsiccata:—Fries, xv, 61, as *S. cuspidata*; A. et J. Kerner, 26, as *S. cuspidata*; E. F. et W. R. Linton, 51, as *S. cuspidata*; Reichenbach, 1144, as *S. meyeriana.*

There is a specimen of this in the Linn. herb. It is unnamed by Linnaeus, but named "*pentandra*" by Linn. fil. Smith has added on the sheet "*species nova, tinctoria*"; and Professor Mertens has written "*S. meyeriana* Willdw."

Small tree or shrub of rapid growth, attaining a height of 8 or even 12 m., in habit intermediate between *S. fragilis* and *S. pentandra* but usually more like the former. *Young branches* not nearly so brittle as in *S. fragilis.* *Stipules* more often persistent than in *S. pentandra.* *Petioles* glandular near the junction of the lamina. *Laminae* more acuminate, thinner, and less

[1] The date on the title-page of this work is 1819; but see "The Dates of Rees's *Cyclopaedia*" by Dr B. Daydon Jackson (in *Journ. Bot.* xxxiv, 307 (1896)).

odorous than in *S. pentandra*. *Catkins* appearing with the leaves, a little earlier than in *S. pentandra*; mid-May and late May. *Stamens* usually 3—5, often 4. *Bracts* thinly hairy to the summit, as a rule. *Capsules* more slender than in *S. pentandra*; early and mid-June.

This willow is interesting as being the last of the numerous "species" described by Smith and Borrer, the first being *S. repens* (*Eng. Bot.* no. 183 (1794)). After all the 70 years spent by these eminent and extremely careful systematists in elucidating this difficult genus, Borrer pathetically remarks:—"We learn that Wimmer...gives our plant as a hybrid of *S. pentandra* and *S. fragilis*. We cannot disprove this opinion; but if hybrid willows are so easily produced, so often fertile, and so capable of perpetuating their own forms[1]...the 'gift of scientific divination'...is indeed needful for determining the species and their products" (*Eng. Bot. Suppl.* no. 2961 et no. 2962 (1863)). In these words, the opponents of the hybrid-theory of the origin of many willows, and indeed of many other plants, acknowledged their defeat. Whatever faults may be laid to the Salician work of Smith and Borrer, it was always thorough and exact. In these respects, we regret to say, their worthy example has not always been followed by their successors.

Rare, osier-beds and hedgerows; Cambridgeshire (not indigenous), Suffolk (not indigenous), Herefordshire, Shropshire, Westmorland; Ireland—co. Kildare, co. Mayo; sometimes planted.

Sweden, Denmark, Germany, France, Austria, Russia.

Series ii. *FRAGILES*

Fragiles Koch *Sal. Comment.* 13 (1828) excluding *S. pentandra* and × *S. cuspidata*; Borrer in Hooker *Brit. Fl.* 417 (1830); v. Seemen in Ascherson und Graebner *Syn.* iv, 57 et 70 (1908) including *Albae* pp. 57 et 78; *Eu-Fragiles* A. et G. Camus *Classif. Saul.* 76 (1904) including *Albae* p. 69, as a subsection.

It is usual in systematic works to separate *S. alba* from the series *Fragiles* on the ground that the nectary of the pistillate flowers of *S. alba* is single; but we do not find it possible to retain a series *Albae*, as the character in question is rather unstable, and cannot be regarded as outweighing the many common characters of *S. alba* and *S. fragilis*.

For characters, see page 14.

Species and hybrids of *Fragiles*

2. **S. fragilis** (see below). *Laminae* glabrous or nearly so at maturity, long. *Nectaries* of the staminate flowers broader than in *S. alba*. *Capsules* tapering, stalked.

3. **S. alba** (p. 19). *Laminae* more or less silvery-white with hairs, short. *Nectaries* of the staminate flowers narrower than in *S. fragilis*. *Capsules* obtuse, sessile or subsessile.

S. alba* × *fragilis (p. 21). *Laminae* intermediate in size and hairyness between *S. alba* and *S. fragilis*, silvery-white with hairs when young. *Capsules* more or less stalked.

4. ***S. babylonica** (p. 22). *Young branches* weeping. *Laminae* glabrous or almost so at maturity. *Style* longer than in the other British members of this series. *Capsules* sessile.

2. SALIX FRAGILIS. Crack Willow. Plates 20, 21; 19, 22, 24

Salix folio longo latoque splendente fragilis Ray *Cat. Cantab.* 143 (1660); *Syn.* ed. 3, 448 (1724).

Salix fragilis L. *Sp. Pl.* 1017 (1753); Smith *Fl. Brit.* 1051 (1804); Syme *Eng. Bot.* viii, 205 (1868); A. et G. Camus *Classif. Saul.* 76 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 70 (1908); Rouy *Fl. France* xii, 193 (1910).

Tree, attaining a height of about 25—30 m. *Bark* of old trees rugged. *Branches* more widespreading than in *S. alba*; young ones glabrescent, shining, easily breaking at the base. *Winter-buds* glabrous, more or less viscous. *Stipules* caducous or persistent, variable in shape, larger than in *S. alba*, outer margin more or less toothed. *Petioles* about 1·0—1·5 cm. long, glabrous or glabrescent, more or less glandular towards the summit at least when young. *Laminae* lanceolate, broadest towards the base, up to about 13 cm. long and 2—4 broad, glabrescent, often subglaucous underneath, longer and usually broader than in *S. alba*, width very variable. *Catkins* often more or less pendulous at maturity, appearing with the leaves; April, a little earlier than *S. alba*. *Nectaries* broad, sometimes lobed, usually 2 to each flower. *Bracts* oblong or elliptical, variable in size, obtuse or truncate at the summit, ciliate with long straight hairs. *Staminate catkins* up to about 6 cm. long and nearly 1 broad. *Stamens* arising from the base of the larger outer nectary. *Filaments* hairy at the base. *Anthers* yellow or orange-yellow. *Pistillate catkins* up to about 7 cm. long and 0·5 broad. *Ovaries* subsessile or shortly stalked. *Style* short. *Stigmas* bifid. *Capsules* more or less elongate and attenuate, on stalks twice or thrice as long as the nectaries.

[1] Doubtless this is a reference to Max Wichura's experiment on × *S. ambigua* (see page 57).

(*a*) **S. fragilis** var. **vulgaris** Koch *Syn.* 643 (1837); *S. fragilis* var. *genuina* Syme *Eng. Bot.* viii, 206 (1868); *S. fragilis* var. *angustifolia* Andersson in DC. *Prodr.* xvi, p. ii, 209 (1868).

Icones :—*Svensk Bot.* t. 373, as *S. fragilis*; *Fl. Dan.* t. 2484, as *S. fragilis*; Reichenbach *Icon.* t. 609, fig. 1264, as *S. fragilis*; Hartig *Forst. Culturpfl.* t. 42, as *S. fragilis*; A. et G. Camus *op. cit.*, *Atlas* t. 3, as *S. fragilis*.

Camb. Brit. Fl. ii. *Plate 20.* (*a*) Shoot with staminate catkins. (*b*) Shoot with pistillate catkins. (*c*) Barren shoot. (*d*) Staminate flowers (one enlarged). (*e*) Pistillate flowers (three enlarged). Staminate plant from the Cambridge Botanic Garden (R. I. L.). Pistillate plant from Huntingdonshire (E. W. H.).

Exsiccata :—Billot, 1955, as *S. fragilis*; Fries, i, 60, as *S. fragilis*; van Heurck, iii, 142, as *S. fragilis*; Leefe, 51, 52, 53, as *S. fragilis*; E. F. et W. R. Linton, 2, 76, as *S. fragilis*; 31, 77, as *S. fragilis* var. *britannica*; Reichenbach, 1143, as *S. fragilis* var. *androgyna*; *Herb. Fl. Ingric.* ix, 555, as *S. fragilis*; herb. White, 86, 166, 280, 389, as *S. fragilis* var. *britannica*.

Tall tree. *Bark* of second year's branches angular at the point of insertion, less highly polished than in var. *decipiens*. *Winter-buds* brown. *Laminae* longer than in var. *decipiens*, less deeply and coarsely toothed than in var. *latifolia*, less glaucous underneath than in var. *decipiens*, up to about 2 cm. broad. *Bracts* nearly as long as the stamens or ovaries as a rule. *Stamens* 2. *Capsules* with longer pedicels than in var. *decipiens*.

This variety is the common form of the species: it occurs from the Channel Islands, Cornwall, and Kent northwards to Forfarshire.

(*b*) **S. fragilis** var. **latifolia** Andersson in DC. *Prodr.* xvi, pt. ii, 209 (1868).

Icones :—Smith *Eng. Bot.* t. 1807, as *S. fragilis*; Forbes *Sal. Woburn.* t. 27, as *S. fragilis*.

Camb. Brit. Fl. ii. *Plate 21.* (*a*) Shoot with staminate catkins. (*b*) Leaves. (*c*) Staminate flowers (enlarged). Huntingdonshire (E. W. H.).

Exsiccata :—Leefe, 54, 55, as *S. russelliana*.

Laminae subcuspidate, from about 2·5—3·0 cm. wide. *Stamens* usually 2, sometimes 3.

There is a broad-leaved form of *S. fragilis* growing at Kew which may belong to this variety. It has been named *S. fragilis* × *triandra*, doubtless because its flowers have sometimes three stamens. The figure by Forbes cited above (t. 27) has two enlarged flowers, one with two and the other with three stamens. This broad-leaved plant has little or no resemblance to Tausch's specimens of *S. alopecuroides* which is usually referred to the hybrid in question. On the other hand, it is not at all unlike Host's figure (*Hist. Sal.* t. 17) of his *S. speciosa*, and the figure by MM. Camus (*Atlas* t. 23) of their × *S. speciosa*.

White (*op. cit.* p. 368) subdivided *S. fragilis* by the relative length of the bract and flower. When the bract is almost as long as the flower, the plant is var. *genuina* White (*loc. cit.*) non Syme; when the bract is only about half as long as the flower, the plant is var. *britannica* Syme. However, these characters can only be judged during a few weeks in the year; and they vary to some extent with the age of the individual flower (cf. *S. alba*, Plate 23, fig. *e*).

Von Seemen (*op. cit.* p. 213) refers White's var. *britannica* to *S. alba* × *fragilis*; but we do not know on what grounds, and fear it was so placed owing to some misapprehension.

(*c*) **S. fragilis** var. **decipiens** Koch *Syn.* 643 (1837); Syme *Eng. Bot.* viii, 206 (1868); *S. decipiens* Hoffman *Hist. Sal.* ii, i, 9 (1791); Smith *Eng. Bot.* no. 1937 (1808)!; *Eng. Fl.* iv, 183 (1828).

Icones :—Hoffman *op. cit.* t. 31, as *S. decipiens*; Smith *Eng. Bot.* t. 1937, as *S. decipiens*; Forbes *Sal. Woburn.* t. 29, as *S. decipiens*.

Exsiccata :—Fries, ix, 61, as *S. fragilis* var. *decipiens*; Leefe, 50, as *S. decipiens*; E. F. et W. R. Linton, 30, as *S. decipiens*.

A smaller tree than var. *vulgaris*, frequently only a large shrub. *Bark* of second year's branches more polished, looking as if varnished, clay-coloured. *Branches* ascending at an acuter angle than those of var. *vulgaris*; young ones often of a crimson colour on the exposed side. *Buds* with the outer scales becoming blackish in winter, as in *S. pentandra*. *Laminae* smaller, subglaucous underneath, white with hairs when young, glabrous at maturity. *Catkins* dense. *Nectaries* more variable than in the other varieties. *Stamens* usually 2, occasionally 3. *Capsules* with shorter stalks than in var. *vulgaris*. Pistillate plants are rare.

White (*op. cit.* p. 350) urges the view that var. *decipiens* is a hybrid of *S. fragilis* and *S. triandra*, whilst the Rev. E. F. Linton (in *Journ. Bot.* xxxiv, p. 464 (1896)), on the whole, opposes this hypothesis. We are inclined to think that the plant is a hybrid, with *S. fragilis* as one parent; but it is impossible to decide the other parent with certainty on mere morphological grounds.

Smith (*Eng. Fl.* iv, p. 184) regarded it as "truly wild in several parts of England," and White (*loc. cit.*) concurs. It is planted as an osier, though Smith maintained that its commercial value disappeared after a few years' cultivation. At the present time, the plant may be purchased as *S. cardinalis*; and among the dealers the name "decipiens" appears to be lost.

Local; Cornwall and Kent to Perthshire, usually avoiding the hills; Argyllshire, "apparently not planted" (*Journ. Bot.* xlix, 195 (1911)). Ireland (doubtfully indigenous).

S. fragilis occurs in damp soils, by stream-sides, and in alluvial meadows, marshes, and fens, on both siliceous and calcareous soils. As an indigenous tree, it is, in Great Britain, commoner and more widespread than *S. alba*; and it ascends to higher elevations, e.g., up to about 200 m. in Derbyshire; from the Channel Isles, Cornwall, and Kent northwards to Perthshire. Frequently planted, as far north as Caithness-shire, and up to about 300 m. in Derbyshire. According to Mr R. Ll. Praeger (*Irish Top. Bot.* p. 283), it is doubtfully indigenous in Ireland.

Southern Scandinavia and Denmark (doubtfully indigenous), Germany, France, central Europe (ascending to 1150 m. in the Tyrol), Russia, southern Europe, northern Africa (not indigenous); Asia Minor to central Asia; North America (not indigenous).

S. alba × *fragilis* (p. 21); *S. fragilis* × *pentandra* (p. 16).

S. fragilis* × *triandra Wimmer in *Denkschr. Schles. Gesellsch.* 156 (1853); A. et G. Camus *Classif. Saul.* 243 (1904); *S. amygdalina* × *fragilis* Wimmer in *Flora* xxxi, 333 (1848) nomen; v. Seemen in Ascherson und Graebner *Syn.* iv, 211 (1909); Rouy *Fl. France* xii, 222 (1910); non White; × *S. alopecuroïdes* A. Kerner in *Verhandl. Z.-B. Gesellsch. Wien* (69) (1860).

Icones:—*Camb. Brit. Fl.* ii. *Plate 22.* (*a*) Shoot with staminate catkins. (*b*) Leaves. (*c*) Staminate flowers (two enlarged). (*d*) Staminate flowers (two enlarged). (*e*) Shoot with pistillate catkins. (*f*) Leaves of the pistillate plant. (*g*) Pistillate flowers (enlarged). (*h*) Pistillate flowers with very large nectaries, although from the same plant. Cambridge Botanic Garden (R. I. L.).

Exsiccata:—E. F. et W. R. Linton, 78, as *S. fragilis* × *triandra*?; Tausch, as *S. alopecuroïdes.*

Small tree or large shrub. *Young branches* glabrous, shining. *Buds* glabrous. *Stipules* caducous or small on the spring shoots, larger on the coppiced and summer shoots. *Petioles* 1·0—1·5 cm. long, often glandular near the junction of the lamina. *Laminae* lanceolate or narrowly oblong-elliptical, margin serrate-undulate, apex acute to obliquely acuminate. *Catkins* on leafy peduncles, cylindrical, 3—6 cm. long and about 5—7 mm. broad, appearing a little earlier than in *S. fragilis*; April. *Bracts* oblong to oboval, obtuse or truncate at the summit, caducous, ciliate towards and at the summit. *Stamens* 2—3. *Styles* variable in length. *Stigmas* small. *Capsules* long and narrow, on long stalks; late May and June.

The specimens by the Messrs Linton (no. 78) are not far removed from *S. fragilis*: that by Tausch is much nearer *S. triandra*: those in the Botanic Garden at Cambridge and figured in this work (Plate 22) are more intermediate. *S. fragilis* var. *decipiens* and forms of *S. fragilis* var. *latifolia* have also been referred to *S. fragilis* × *triandra*; and, from some points of view, the suggestions are not unreasonable. The latter forms are not unlike the figure of *S. speciosa* by Host (*Hist. Sal.* t. 17).

Rare and critical. Dorset (E. F. et W. R. Linton, no. 78).

Southern Sweden, Germany, France, Austria-Hungary.

3. SALIX ALBA. White Willow. Plates 23; 24

Salix Gerard *Herb.* 1203 (1597); Ray *Syn.* ed. 3, 447 (1724) [= var. *genuina*]; *S. folio utrinque glauco viminibus rubris* Ray *Cat. Cantab.* 142 (1660) [= var. *vitellina*]; *S. folio longo subluteo non auriculato viminibus luteis eademque viminibus rubris* Ray *Syn.* ed. 2, 293 (1696); ed. 3, 450 (1724) [= var. *vitellina*].

Salix alba L. *Sp. Pl.* 1021 (1753), including *S. vitellina*; Syme *Eng. Bot.* viii, 210 (1868); A. et G. Camus *Classif. Saul.* 69 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 78 (1908); Rouy *Fl. France* xii, 194 (1910).

Tree, attaining a height of about 25—30 m. *Bark* thick and rugged. *Branches* sharply ascending at least in young trees; young ones more or less silky with hairs when young, flexible at the base. *Stipules* usually caducous, small and subulate when persistent. *Petioles* short (about 5 mm.), not glandular at maturity. *Laminae* lanceolate, usually broadest a little above the middle, margin with small acute and regular serrations which are glandular at least when young, acute to acuminate, about 6—8 cm. long and 1·5—2·0 broad, shorter than in *S. fragilis*, covered with white silky hairs. *Catkins* on rather short peduncles, appearing with the leaves; late April and May, later than *S. fragilis*. *Bracts* narrowly ovate. *Staminate catkins* about 4·5—5·0 cm. long and 6 mm. broad. *Posterior nectary* entire or 2—3 lobed. *Filaments* hairy in the lower half. *Pistillate catkins* a little shorter and narrower. *Ovaries* sessile or subsessile. *Style* short but distinct. *Stigmas* rather thick, bifid or emarginate. *Capsules* obtuse, glabrous, sessile or shortly stalked; June.

(*a*) **S. alba** var. **genuina** Godron *Fl. Lorraine* ii, 289 (1843); Syme *Eng. Bot.* viii, 211 (1868); *S. alba* forma *argentea* Wimmer *Sal. Eur.* 17 (1866); *S. alba* var. *argentea* A. et G. Camus *Classif. Saul.* 74 (1904); Rouy *Fl. France* xii, 194 (1910); *S. alba* L. *loc. cit.*, sensu stricto; Smith *Fl. Brit.* 1071 (1804)!.

Icones :—Hoffman *Hist. Sal.* t. 7, t. 8, et t. 24, fig. 3, as *S. alba*; Smith *Eng. Bot.* t. 2430, as *S. alba*; Forbes *Sal. Woburn.* t. 136, as *S. alba*; *Fl. Dan.* t. 2552, as *S. alba*; Reichenbach *Icon.* t. 608, fig. 1263, as *S. alba*; Hartig *Forst. Culturpfl.* t. 40, as *S. alba*; A. et G. Camus *op. cit.*, *Atlas* t. 2, as *S. alba.*

Camb. Brit. Fl. ii. *Plate 23.* (*a*) Barren shoot. (*b*) Shoot with staminate catkins. (*c*) Shoot with pistillate catkins. (*d*) Leaf (lower surface). (*e*) Staminate flowers (enlarged). (*f*) Capsules (one enlarged). Huntingdonshire (E. W. H.).

Exsiccata :—Billot, 847, as *S. alba*; Fries, i, 62, as *S. alba*; A. et J. Kerner, 18, as *S. alba*; Leefe, 56, 57, 58, 59, as *S. alba*; E. F. et W. R. Linton, 3, 79?, as *S. alba*; Todaro, 483, as *S. alba.*

In the herbarium of Linnaeus one sheet of *S. alba* is correctly named, whilst another sheet, doubtless due to a momentary aberration, is named *S. fragilis.*

Laminae of the spring-leaves with long silvery hairs on both surfaces when young, more or less glabrescent; of the summer-leaves with more or less persistent silvery hairs. *Capsules* sessile or very shortly stalked.

(*b*) **S. alba** var. **caerulea** Smith, *Eng. Fl.* iv, 231 (1828)!; Syme, *Eng. Bot.* viii, 211 (1868); A. et G. Camus *Classif. Saul.* 75 (1904); *S. caerulea* Smith *Eng. Bot.* no. 2431 (1812)!.

Icones :—Smith *Eng. Bot.* t. 2431, as *S. caerulea.*

Tree subpyramidal in habit, and of extremely rapid growth. *Branches* ascending at a narrower angle than even in var. *genuina.* *Laminae* usually rather larger than in var. *genuina*, with silky white hairs when young, but at maturity less hairy than in var. *genuina*, more bluish-green above, and more subglaucous below. *Capsules* shortly stalked.

This variety yields the most valuable timber for cricket-bats of any willow, though other members of the series *Fragiles*, chiefly *S. alba* and *S. alba* × *fragilis* are sometimes used for the same purpose. See E. R. Pratt in *Journ. Roy. Agric. Soc.* lxvi, 19—34 (1905), and W. J. Bean in *Kew Bull.* 311 (1907). The staminate tree does not appear to be cultivated for the best cricket-bat timber.

Suffolk, Cambridgeshire, Hertfordshire, Shropshire. Many of the British records of *S. alba* var. *caerulea* may be referred to forms of *S. alba* × *fragilis.*

It is recorded for several countries on the mainland of Europe; but we doubt if the majority of these records really refer to Smith's plant.

(*c*) †**S. alba** var. **vitellina** Stokes *Bot. Mat. Med.* iv, 506 (1812); Syme *Eng. Bot.* viii, 211 (1868); A. et G. Camus *Classif. Saul.* 75 (1904); *S. vitellina* L. *Sp. Pl.* 1016 (1753)!; Smith *Fl. Brit.* 1050 (1804)!.

Icones :—Hoffman *Hist. Sal.* t. 11; t. 12; t. 24, fig. 1; as *S. vitellina*; Smith *Eng. Bot.* t. 1389, as *S. vitellina*; Forbes *Sal. Woburn.* t. 20, as *S. vitellina*; *Fl. Dan.* t. 2854, as *S. vitellina*; Hartig *Forst. Culturpfl.* t. 41, as *S. vitellina.*

Exsiccata :—E. F. et W. R. Linton, 32; Toeppfer, 103, as *S. alba* var. *vitellina* f. *vestita.*

A smaller tree than var. *genuina.* *Bark* of the young branches bright orange or red in colour, very noticeable in winter and spring. *Laminae* losing most of their silky hairs as they mature. *Bracts* longer, narrower, more acute. *Capsules* shortly stalked.

We have only seen this variety where planted as an osier; but Smith (*Eng. Bot.*) states that "Mr Crowe observed it in rough low pastures at Ovington, Norfolk, unquestionably wild." Southern England and northwards to Forfarshire, avoiding the hills.

S. alba, *S. fragilis*, and their varieties and hybrids are the common "pollard willows" of southern England.

S. alba occurs in lowland localities, by stream-sides, in wet alluvial meadows and woods, in marshes and fens, demanding a soil richer in mineral content than *S. fragilis.* So frequently planted, from the Channel Isles to Caithness, that it is difficult to state its natural limits; but we believe it to be indigenous in eastern England, as, for example, in the fens of Norfolk, and we think it is probably so throughout the richer alluvial soils of southern and eastern England and even eastern Scotland (northwards to south-eastern Perthshire) and southern Ireland. Planted up to nearly 300 m. in Derbyshire.

Scandinavia (planted northwards to 63° 52′) and Denmark (doubtfully indigenous), Germany, France, central Europe, Russia, southern Europe (ascending to 1624 m. in Spain); northern Africa; Asia Minor to Siberia and the Himalaya mountains and Tibet; North America (not indigenous).

S. alba* × *fragilis Wimmer in *Denkschr. Schles. Gesellsch.* 156 (1853); A. et G. Camus *Classif. Saul.* 238 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 212 (1909) excl. syn. White; *S. russelliana*[1] Smith *Fl. Brit.* 1045 (1804)!; *S. viridis* Fries *Fl. Suec.* ed. 2, 283 (1828)!; Syme *Eng. Bot.* viii, 207 (1868); × *S. viridis* Wimmer *Sal. Eur.* 133 (1866); White in *Journ. Linn. Soc.* xxvii, 371 (1890)!

Icones :—Smith *Eng. Bot.* t. 1808, as *S. russelliana* (repeated in Syme *Eng. Bot.* viii, t. 1308, as *S. viridis*); Forbes *Sal. Woburn.* t. 28, as *S. russelliana*; t. 127, as *S. caerulea*; Host *Hist. Sal.* t. 24, t. 25, as *S. palustris*; t. 28, t. 29, as *S. excelsior*; *Fl. Dan.* t. 2486, as *S. viridis*; Reichenbach *Icon.* t. 610, fig. 1265, as *S. russelliana*; A. et G. Camus *op. cit., Atlas* t. 22, fig. A—D, as × *S. viridis.*

Camb. Brit. Fl. ii. *Plate 24.* (*a*) Shoot with pistillate catkins. (*b*) Barren shoot. (*c*) Ripening capsules (enlarged). (*d*) Bract (enlarged). Huntingdonshire (E. W. H.).

Exsiccata :—Fries, i, 61, as *S. viridis*; Leefe, 55, as *S. russelliana*; E. F. et W. R. Linton, 33.

Trees, intermediate between *S. alba* and *S. fragilis.* *Young branches* less fragile at the base than *S. fragilis.* *Leaves* more or less covered with silky hairs when young, glabrous or glabrescent at maturity; intermediate in size between *S. alba* and *S. fragilis.* *Nectaries* very variable. *Capsules* with a longer stalk than in *S. alba.*

S. russelliana Smith is a particular form or segregate of this hybrid, as his specimen conclusively shows. According to the account given by Smith (vide *Eng. Fl.* iv, 186 (1828)) and by the Duke of Bedford (see the Introduction to Forbes *Sal. Woburn.* (1829)), this form was very valuable economically; and it would therefore be desirable to retain a form of the hybrid, under the name × *Salix russelliana*, if we could be certain of the precise form which constituted this, the Bedford or Leicestershire willow.

There has, however, been much confusion among botanists with regard to the plant. In herbaria, we find willows named "*S. russelliana*," many of which are simply forms of *S. fragilis*, whilst others are forms of *S. alba* × *fragilis.* Of course, a few of the latter may really be Smith's plant; but until the confusion has been cleared up, it is impossible to decide which of these are × *S. russelliana* and which are not.

White (*op. cit.*) adopted a remarkable attitude with regard to *S. fragilis.* He maintained that *S. fragilis* Smith was *S. alba* × *fragilis*, and that *S. russelliana* Smith was *S. fragilis* Linn. We are unable to endorse this view. Not only is it inconceivable that Sir J. E. Smith, the greatest and most careful of Salicologists as well as one of the greatest of systematic botanists, did not know such a common species as *S. fragilis*, but his descriptions, figure, and specimen prove White's view to be incorrect. Smith himself (*Eng. Fl.* iv, 187 (1828)) definitely rejected the view that his *S. russelliana* was "only the crack willow." Smith's specimen of his *S. russelliana* is, in our judgment, unmistakably a form of *S. alba* × *fragilis.* Syme (*op. cit.*) adopted this view in placing *S. russelliana* Smith as a synonym of the later name *S. viridis* Fries. The leaves of Smith's figure of *S. russelliana* (*Eng. Bot.* t. 1808) are evidently from a coppiced shoot, and are older, larger, and less silvery than those of Smith's specimen which is taken from a normal shoot.

We conclude that the particular segregate or mutant × *S. russelliana* has been lost sight of; but its alleged economic importance makes its rediscovery desirable.

According to Smith (*loc. cit.*), it is a tree of quicker growth than *S. fragilis.* The *bark* is said to contain an exceptionally large quantity of tannin. *Young branches* not angular at the point of insertion (Smith). *Petioles* with glands more often modified into leaflets than in *S. fragilis.* *Laminae* rather smaller, often more deeply serrated, more gradually acuminate, and more silky with hairs when young than in *S. fragilis.* *Catkins* lax-flowered, stalked. Staminate plants were not known to Smith.

Some continental works (e.g., Camus, *op. cit.*, p. 239) describe a form × *S. russelliana*; but, as this is described as having glabrous leaves, it differs from Smith's type-specimen.

The putative hybrids of *S. alba* and *S. fragilis* grow in similar situations as the supposed parents: they are fairly widespread and not uncommon in this country, being recorded from Somerset and Kent to Perthshire; but they are less abundant and more local than the supposed parents. North of Ireland (Syme, *op. cit.*), but perhaps not indigenous there.

Norway, Sweden, Denmark, Germany, Holland, Belgium, France, central Europe, Russia, the Balkan peninsula; the Caucasus.

S. alba × *pentandra* (p. 16).

[***S. alba* × *triandra*** Gürke *Plant. Europ.* ii, 5 (1897)?; A. et G. Camus *Classif. Saul.* ii, 99 (1905)?; excluding syn. White; non Wimmer.

Icones :—A. et G. Camus *op. cit., Atlas* ii, t. 6 (39) fig. K (a leaf only), as × *S. erythroclados*, ?

S. undulata Ehrhart is sometimes referred to *S. alba* × *triandra.* Wimmer (*Sal. Eur.* p. 144) adopted this view, after having previously held (*Denkschr.* p. 157 (1853)) that *S. undulata* Ehrhart should be referred to *S. triandra* × *viminalis.* MM. Camus (*op. cit.*, i, 251) adopt Wimmer's earlier view; but they also (*op. cit.*, ii, 99) refer *S. undulata* Ehrhart herb. to *S. alba* × *triandra.* The specimen of *S. undulata* Ehrhart which we have seen in herb. Smith does not, however, agree with the description of *S. alba* × *triandra* given by MM. Camus.

For remarks on *S. lanceolata* Smith, see page 24.

[1] After Francis Russell (1765—1802), fifth Duke of Bedford, who first brought this willow into notice (cf. Smith *Eng. Fl.* iv, 186 (1828)).

To the same hybrid (*S. alba* × *triandra*), White (*op. cit.*, p. 355) refers a Perthshire plant which he names × *S. subdola*. Of this, he gives a very unconvincing account. He states that "whilst the dwarf stature and general facies of the bushes incline me still to think that *S. triandra* and *S. alba* have both something to do with the parentage of this plant, more recently obtained leaves (from young shoots) strongly recall *S. fragilis*. It may be, therefore, possibly a form of [×] *S. viridis* [= *S. alba* × *fragilis*], though that seems to me improbable; or, perhaps, *S. decipiens* × *S. alba* (i.e., *S. fragilis* × *S. triandra* × *S. alba*)." The Rev. E. F. Linton regards × *S. subdola* White as a form of *S. alba* × *fragilis*. We have seen White's specimen; and it does not agree with the figure, cited above, of MM. Camus.]

4. *SALIX BABYLONICA. Weeping Willow

Salix babylonica L. *Sp. Pl.* 1017 (1753)!; Smith in Rees' *Cycl.* xxxi, no. 42 (1815)!; A. et G. Camus *Classif. Saul.* 65 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 82 (1909).

Icones:—Forbes *Sal. Woburn.* t. 22; A. et G. Camus *op. cit., Atlas* t. 1.

Exsiccata:—Billot, 3209; Schultz, ii, 1.

Tree, attaining a height of about 20 m. *Young branches* long, weeping. *Leaves* remaining on the tree much longer than in any other of our deciduous trees, and indicating that the tree is from a region with a very different climate from our own (cf. *Populus italica*, page 9). *Pistillate catkins* on peduncles at least half as long as the catkins themselves, about 3 cm. long and 4 mm. broad, appearing with the leaves; late March and April. *Nectaries* one to each pistillate flower. *Style* rather long. *Stigmas* more or less divided or emarginate. *Ovaries* subsessile, shortly stalked; May.

Planted, by the sides of rivers and ponds chiefly, in the lowlands of southern, eastern, and central England. Staminate plants are apparently unknown, but androgynous ones are said to occur. The hybrids *S. alba* × *babylonica* and *S. babylonica* × *fragilis* also occur as planted trees.

Variously stated to be indigenous from the Caucasus to northern Persia, and in China.

Series iii. *TRIANDRAE*

Triandrae Borrer in Hooker *Brit. Fl.* 415 (1830); Du Mortier in *Bijdr. Natuurk. Wetensch.* (17) (1825) nomen; in *Bull. Bot. Soc. Belg.* i, 146 (1862); Babington in *Journ. Bot.* i, 170 (1863); v. Seemen in Ascherson und Graebner *Syn.* iv, 74 (1908); *Amygdalinae* Koch *Sal. Comment.* 17 (1828); A. et G. Camus *Classif. Saul.* 90 (1904) as a section.

For characters, see page 14.

British species and hybrid of *Triandrae*

5. **S. triandra** (see below). *Laminae* broadly lanceolate or narrowly ovate. *Style* short or absent. *Capsule* on more or less short stalks.

S. triandra* × *viminalis (p. 24). *Laminae* lanceolate, often more or less undulate at the margin, more gradually acute or acuminate. *Style* rather long. *Capsule* on longer stalks.

5. SALIX TRIANDRA. Almond-leaved Willow. Plates 25, 26; 22, 27, 28

S. folio auriculato splendente flexilis Ray *Cat. Cantab.* 144 (1670); *Syn.* ed. 3, 448 (1724); *S. folio amygdalino utrinque aurito corticem abjiciens* Ray *Syn.* ed. 3, 448 (1724).

Salix triandra L. *Sp. Pl.* 1016 (1753) including *S. amygdalina*; Syme *Eng. Bot.* viii, 215 (1868); A. et G. Camus *Classif. Saul.* 90 (1904); *S. amygdalina* L. *loc. cit.*; v. Seemen in Ascherson und Graebner *Syn.* iv, 74 (1909); Rouy *Fl. France* xii, 195 (1910).

Icones:—Curtis *Fl. Lond.* i, 199; *Fl. Dan.* t. 2558, as *S. amygdalina*; Hartig *Forst. Culturpfl.* t. 39; Reichenbach *Icon.* t. 614, fig. 1256, as *S. amygdalina*; A. et G. Camus *op. cit., Atlas* t. 5, t. 6.

Exsiccata:—Billot, 2363, 2363 bis, 2363 ter, as *S. triandra*; Fries, iii, 51, as *S. amygdalina*; A. et J. Kerner, 84, 85, as *S. amygdalina*; 86, 87, as *S. triandra*; *Herb. Fl. Ingric.* x, 537, as *S. amygdalina.*

Shrub about 4 or 5 m. high, or rarely a small tree about 8 or 9 m. high. *Bark* flaking off in autumn like that of the plane-tree (*Platanus*). *Young branches* glabrous. *Stipules* usually persistent, large especially on the coppiced shoots. *Petioles* about 1—2 cm. long, glabrous, minutely glandular at the top at least when young. *Laminae* variable, usually narrowly oblong-elliptical,

glandular-serrate, up to about 8 or 9 cm. long and about 2 broad but rather smaller as a rule, dark green and shining above, glabrous. *Catkins* on short peduncles more or less leafy especially towards the base, variable in size and shape especially in continental examples, usually more or less divaricate at maturity, appearing with the leaves; late March to early May, often a second crop of catkins in July and August. *Bracts* pale greenish yellow, rather hairy at least towards the base. *Staminate catkins* much longer than broad, cylindrical. *Bracts* obovate. *Stamens* 3—4, usually 3. *Filaments* hairy at the base. *Anthers* pale yellow. *Pistillate catkins* shorter, denser, and more elliptical. *Bracts* persistent, more or less elliptical or oblong-elliptical. *Ovaries* obtuse, pedicelled. *Style* short or absent. *Stigmas* divaricate, often emarginate at the apex. *Capsules* broad, glabrous, on more or less short stalks; June.

(*a*) **S. triandra** var. **genuina** Syme *Eng. Bot.* viii, 215 (1868); *S. triandra* L. *Sp. Pl.* 1016 (1753); Smith *Eng. Bot.* no. 1435 (1805)!.

Icones:—Smith *Eng. Bot.* t. 1435, as *S. triandra*; Forbes *Sal. Woburn.* t. 15, as *S. triandra.*

Camb. Brit. Fl. ii. *Plate 25.* (*a*) Shoot with staminate catkins. (*b*) Barren shoot. (*c*) Staminate flowers (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Leefe, 6, 7, 8, as *S. triandra.*

Young branches terete. *Stipules* narrower than in the other varieties, acute. *Laminae* rather cuneate at the base, acute, pale green underneath or rather glaucous when young. Smith (*Eng. Fl.* iv, p. 167) states that the seeds have "a long dense snow-white woolly crown."

The commonest British form, occurring as far north as Ross-shire, but perhaps not indigenous north of Perthshire; Ireland, co. Cork.

(*b*) **S. triandra** var. **amygdalina** Babington *Manual* 272 (1843); Syme *Eng. Bot.* viii, 216 (1868); *S. amygdalina* L. *Sp. Pl.* 1016 (1753); Smith *Fl. Brit.* 1045 (1804)!; *Eng. Fl.* iv, 169 (1828).

Icones:—Smith *Eng. Bot.* t. 1936, as *S. amygdalina*; Forbes *Sal. Woburn.* t. 18, as *S. amygdalina.*

Camb. Brit. Fl. ii. *Plate 26.* (*a*) Shoot with pistillate catkins. (*b*) Barren shoot. (*c*) Pistillate flowers (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Leefe, 3, 4, as *S. amygdalina*; E. F. et W. R. Linton, 26, as *S. triandra.*

Young branches furrowed. *Stipules* broad. *Laminae* narrowly ovate, broad and rounded at the base, acute to acuminate, more or less glaucous underneath. Smith (*Eng. Fl., loc. cit.*) states that its *seeds* have shorter and less abundant hairs than in var. *genuina.*

Smith (*loc. cit.*) remarks that as an osier this is inferior to *S. triandra.* See also Smith (*loc. cit.*) for some careful remarks on the synonymy of *S. amygdalina* L.

Rather rare; we have seen specimens from Dorset, Essex, Suffolk, Huntingdonshire, and Warwickshire.

(*c*) **S. triandra** var. **hoffmanniana** Babington *Man.* 272 (1843); Syme *Eng. Bot.* viii, 215 (1868); *S. triandra* Hoffman *Hist. Sal.* i, 45 (1785) fide Smith *loc. cit.*; *S. hoffmanniana* Smith *Eng. Fl.* iv, 168 (1828)!, non Bluff et Fingerhuth.

Icones:—Hoffman *Hist. Sal.* t. 9, t. 10, t. 23, fig. 2, as *S. triandra*, fide Smith *loc. cit.*; Forbes *Sal. Woburn.* t. 16, as *S. hoffmanniana*; Borrer in *Eng. Bot. Suppl.* t. 2620, as *S. hoffmanniana.*

Exsiccata:—Leefe, 5, as *S. hoffmanniana*; E. F. et W. R. Linton, 27, as *S. triandra* var. *hoffmanniana.*

Shrub or small tree, up to about 3—4 m. high. *Bark* deciduous. *Young branches* terete. *Stipules* larger and more rounded. *Laminae* narrowly ovate, rounded at the base, more acuminate, pale or even subglaucous underneath, more yellow-green, thinner, shorter (about 3·7 to 5·0 cm. long).

Smith (*loc. cit.*) and Borrer (*loc. cit.*) agree that there is no remarkable difference in the staminate catkins; and pistillate plants have not been identified with certainty.

Local, by stream-sides and in osier-beds, chiefly in southern, eastern, and central England, from Dorset, Glamorganshire, and Kent northwards to Shropshire and Derbyshire.

S. triandra is locally abundant by stream-sides, in marshes and wet woods, in lowland localities; from Cornwall and Kent northwards to the Border; southern and eastern Scotland, northwards to Perthshire and Ross-shire (? indigenous); southern and south-eastern Ireland. Often planted, as it is a valuable osier: many cultivated "varieties" are known to osier-growers.

Europe, to 66° N. in Scandinavia and 67° N. in Russia, ascending to 1527 m. in the southern Alps; Asia Minor and the Caucasus to northern Persia (3000 m.), and from the Ural mountains to Japan.

[*S. alba* × *triandra* (p. 21)] *S. fragilis* × *triandra* (p. 19); *S. purpurea* × *triandra* (p. 68).

S. triandra* × *viminalis Wimmer in *Flora* xxxii, 39 (1849); *Sal. Eur.* 140 (1866); A. et G. Camus *Classif. Saul.* 251 (1904); *S. amygdalina* × *viminalis* Wimmer in *Flora* xxxi, 309 (1848) excluding f. *hippophaëfolia*; v. Seemen in Ascherson und Graebner *Syn.* iv, 332 (1909), including *S. alba* × *amygdalina* p. 206 partim; Rouy *Fl. France* xii, 223 (1910); *S. alba* × *triandra* Wimmer *Sal. Eur.* 144 (1866); × *S. undulata* White in *Journ. Linn. Soc.* xxvii, 355 (1890).

(A) × ***S. hippophaëfolia*** Döll *Fl. Baden.* ii, 506 (1859) non Wimmer in *Flora* xxxi, 309 (1848); Wimmer *Sal. Eur.* 142 (1866) including × *S. trevirani* p. 141; A. et G. Camus *Classif. Saul.* 257 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 333 (1909); Rouy *Fl. France* xii, 223 (1910); *S. hippophaëfolia* Thuiller *Fl. Env. Paris* éd. 2, 514 (1799); *S. triandra* × *viminalis* f. *polyphylla* Wimmer in *Denkschr. Schles. Gesellsch.* 157 (1853); × *S. undulata* f. *hippophaëfolia* White in *Journ. Linn. Soc.* xxvii, 358 (1890).

Icones :—Forbes *Sal. Woburn.* t. 13, as *S. undulata*; Hartig *Forst. Culturpfl.* t. 38, as *S. undulata*; A. et G. Camus *op. cit., Atlas* t. 24, fig. C—H, as × *S. hippophaëfolia.*

Camb. Brit. Fl. ii. *Plate 27.* (*a*) Shoot with staminate catkins. (*b*) Leaves. (*c*) Staminate flowers. (*d*) Staminate flowers (enlarged). Cambridge Botanic Garden (R. I. L.). (*e*) Shoot with pistillate catkins. (*f*) Pistillate flowers (enlarged). Herefordshire (Rev. A. Ley).

Exsiccata :—Billot, 3898, 3898 bis, as *S. undulata*; 2138, 2138 bis, as *S. hippophaëfolia*; Fries, iii, 55, as *S. undulata*; x, 59, as *S. hippophaëfolia*; Reichenbach, 959, as *S. hippophaëfolia*; 960, as *S. undulata*; E. F. et W. R. Linton, 28, as *S. triandra* × *viminalis*; 29, as *S. undulata.* Wirtgen, ix, 524, as *S. hippophaëfolia*; vi, 247, as *S. undulata*; Tausch, as *S. undulata.*

Tausch's specimen is the only one of the above on which we have noticed hairy ovaries.

Shrubs, growing to a height of about 3—5 m., smaller than × *S. lanceolata.* *Young branches* and *buds* glabrous at maturity. *Petioles* up to 1 cm. long. *Laminae* lanceolate to linear-lanceolate, margin more or less undulate, denticulate, acute to acuminate, about 7·5 to 10·0 cm. long and up to 1·5 cm. broad, glabrous at maturity, smaller and less gradually tapering than × *S. lanceolata.* *Catkins* subsessile or shortly peduncled, dense-flowered, much shorter than in × *S. lanceolata,* about 2·5 cm. long, not infrequently monoecious, appearing with or a little later than the leaves; April and early May. *Bracts* ciliate or hairy. *Stamens* 2, sometimes 3. *Ovaries* usually hairy or glabrescent. *Styles* rather long. *Stigmas* more or less bifid. *Capsules* hairy or glabrous, stalked.

The Rev. E. F. Linton (in *Journ. Bot.* xxxiv, 464, 1896) states that he has "succeeded in crossing *S. triandra* and *S. viminalis,* and...*S. hippophaëfolia* Thuiller...is the product."

The dense-flowered catkins and the long style of this hybrid suggest those characters as seen in *S. viminalis,* whilst the leaves when full grown are intermediate in size and shape between *S. fragilis* and *S. viminalis.* The laminae vary a great deal with regard to the degree of glaucousness on the lower surface.

Stream-sides and osier-beds, recorded chiefly from the eastern and midland counties, from Glamorganshire to Nottinghamshire.

Scandinavia, Denmark, Germany, France, central Europe.

(B) × ***S. lanceolata*** nobis; *S. lanceolata* Smith *Eng. Bot.* no. 1436 (1805)!; *Eng. Fl.* iv, 168 (1828); *S. undulata* Syme *Eng. Bot.* viii, 213 (1868) non Ehrhart.

Icones :—Smith *Eng. Bot.* t. 1436, as *S. lanceolata* (repeated in Syme *Eng. Bot.* viii, t. 1312, as *S. undulata*): the leaves of Smith's figure are those of coppiced or summer-shoots. Forbes *Sal. Woburn.* t. 14, as *S. lanceolata*; Reichenbach *Icon.* t. 516, fig. 1261, as *S. undulata.*

Camb. Brit. Fl. ii. *Plate 28.* (*a*) Shoot with pistillate catkins. (*b*) Barren shoot. (*c*) Pistillate flowers (enlarged). Huntingdonshire (E. W. H.).

Shrub. *Bark* flaking off in autumn as in *S. triandra.* *Stipules* usually persistent, acute to acuminate; of the leaves of coppiced and summer-shoots large, acuminate. *Petioles* about 1 cm. long, decurrent at the base, glandular at the junction of the lamina. *Laminae* lanceolate, gradually narrowing to the apex, serrate, longer and narrower than in *S. triandra* or × *S. undulata.* *Catkins* on short leafy peduncles, appearing with the leaves; mid-April to early May. *Pistillate catkins* long (up to 7—8 cm.), dense-flowered. *Bracts* covered with shaggy hairs, as long as the ovaries, variable in width. *Ovaries* rather broader than in *S. triandra,* stalked, glabrous, often abruptly constricted above the middle. *Style* rather long. *Stigmas* rather long and stout, more or less divided. *Capsules* usually glabrous, stalked; late May and June.

This plant is referred by some authorities to *S. alba* × *triandra.*

Smith (*Eng. Fl.* iv, 169) insisted, and we think rightly insisted, that his *S. lanceolata* was a different plant from Ehrhart's *S. undulata* (Ehrhart *Beitr.* vi, 101 (1791); *Arb.* 108!). Comparing the specimens of Smith and Ehrhart, we find that the laminae of Smith's plant are, as in the illustration of the present work (plate 28), about 11 cm. long, whereas those of Ehrhart's plant are only about two-thirds as long as this. Moreover, the laminae of Smith's plant taper more gradually to the apex than those of Ehrhart's. The petioles of Ehrhart's plant are not glandular, thus differing from those of

Smith's. Ehrhart describes the ovaries of his *S. undulata* as hairy; but those of his own specimen are glabrous. Further, the description of *S. alba* × *triandra* by Wimmer (*loc. cit.*) also disagrees with Smith's plant which cannot be said to have lax catkins and oblong-lanceolate laminae; and the leaf-measurements given by Wimmer are also inconsistent with the view that he was describing Smith's plant. There is no evidence to show that Wimmer ever saw an authentic specimen of *S. lanceolata* Smith; and it is clear that he never saw Smith's figure, for this is cited as "ex Hooker *Fl. Scot.*" For all these reasons, we cannot accept the prevailing view that *S. undulata* Ehrhart and *S. lanceolata* are identical, apart from the matter of the pubescence or glabrousness of the capsules.

Some modern authorities (e.g., v. Seemen in Ascherson und Graebner *op. cit.*) follow Wimmer in his treatment of *S. lanceolata* Smith; but we think we have made it quite clear that, regarding this particular willow, Wimmer was not in possession of first-hand knowledge.

Owing to the confusion which prevails, some doubt attaches to many records of × *S. lanceolata*.

Stream-sides, alluvial meadows and woods, and osier-beds, chiefly in the eastern and midland counties, from Surrey and Essex to Shropshire and the North Riding of Yorkshire; Perthshire (planted).

Western and central Europe and Russia.

× *S. mollissima* (= *S. mollissima* Ehrhart *Beitr.* vi, 101 (1791)) is another form of *S. triandra* × *viminalis*, nearer to *S. viminalis*, with rather larger leaves more hairy underneath, which does not appear to have been definitely recorded for this country: it possibly occurs here, however. × *S. trevirani*, which is sometimes separated as a special hybrid-form we include within the limits of × *S. hippophaëfolia*, as well as some plants named × *S. undulata* Ehrhart.

S. triandra × *viminalis* is recorded for southern Scandinavia and Denmark (doubtfully indigenous), Holland, Belgium, Germany, France, central Europe, western and central Russia.

Section II. *CHAMAETIA*

Chamaetia Du Mortier in *Bijdr. Natuurk. Wetensch.* (15) (1825); *Chamelyx* Fries *Fl. Suec. Mant.* i, 72 (1832); Babington in *Journ. Bot.* i, 172 (1863) excluding *Myrsinites*; *Glaciales* Koch *Sal. Comment.* 61 (1828).

For characters, see page 13.

British series of *Chamaetia*

Series iv. **Reticulatae** (see below). Dwarf undershrubs of Arctic-Alpine distribution. *Aërial branches* prostrate to suberect. *Laminae* suborbicular, entire or subentire, strongly reticulated underneath, silky with hairs when young, usually glabrous and subglaucous when mature. *Catkins* on long leafless peduncles, narrow, cylindrical. *Bracts* greenish towards the base, reddish at the margin or towards the summit. *Nectaries* 2—4, free or united at the base and surrounding the base of the stamens or gynophore, with several (often 4) narrow erect dark green segments. *Style* short. *Stigmas* short, stout, reddish. *Capsules* sessile, broadly oval, covered with white hairs.

Series v. **Herbaceae** (p. 27). Dwarf undershrubs of Arctic-Alpine distribution. *Aërial branches* short, a little ascending. *Laminae* broadly elliptical to suborbicular, smooth, thin, crenate, glabrous, flexible, markedly reticulate. *Catkins* on short leafless peduncles with 1—2 leaves at the base. *Bracts* concolorous, yellowish, rounded at the apex. *Nectaries* usually 2, sometimes more or less united at the base and surrounding the base of the stamens or gynophore, with two broad or narrow lobes. *Style* short. *Stigmas* divided. *Capsules* shortly stalked, narrowly conical, glabrous, often reddish.

Series iv. *RETICULATAE*

Reticulatae [Borrer in Hooker *Brit. Fl.* 422 (1830) nomen] v. Seemen in Ascherson und Graebner *Syn.* iv, 67 (1908); *Chamitea* A. Kerner in *Verhandl. Z.-B. Gesellsch. Wien* 275 (1860) as a genus; *Chamiteae* A. et G. Camus *Classif. Saul.* 129 (1904) as a section.

For characters, see above.

S. reticulata possesses so many remarkable characters, showing it to be, in spite of the great difference in habit, intermediate in several respects between *Populus* and species of *Salix* in general, that there is little wonder that Kerner (*loc. cit.*) suggested it should be placed in a new genus. However, the remarkable characters possessed by *S. reticulata* are so distributed among the other more primitive species of *Salix* that its generic separation from them cannot be maintained; and indeed Kerner himself at a later date accepted this view. The characters by which *S. reticulata* recalls *Populus* are the suckering habit, the long petioles, the broad laminae, and the perianthoid nature of the nectary. In its androecium, however, it has become a thorough *Salix*, more so even than *S. pentandra*, which has rather broad laminae, a double nectary, and, as a rule, 5 stamens at least. It seems to us that *S. pentandra* and *S. reticulata* diverged long ago from a primitive Salicalian stock, that each has retained a few of the *Populus*-like characters which this ancestral hypothetical group possessed, and that each of these species or their ancient allies have given rise to the other species of *Salix*, some of which (e.g., *S. lanata* and *S. daphnoïdes*, and *S. lapponum* and *S. viminalis* respectively) exhibit interesting features of convergent development.

Sir J. E. Smith (*Eng. Fl.* iv, p. 201) shrewdly remarked, so long ago as 1828, that "the spreading woody roots [of *S. reticulata*], dwarf stems, round veiny leaves, and terminal and long-stalked catkins, coming after the foliage, from the same bud and unattended by floral leaves, accord singularly with *S. herbacea*, to which the plant before us, however widely and essentially distinct as a species, is evidently akin." On these grounds, we regard it as thoroughly justifiable to place the two series *Reticulatae* and *Herbaceae* in the same section.

MM. Camus (*op. cit.*) base their subgeneric divisions of *Salix* largely on anatomical characters. These authors first divide *Salix* into two main groups. The first of these is characterized by the presence of stomata on the upper surface of the lamina, the second by the absence of such stomata. *S. herbacea* is placed in the first of these groups, and *S. reticulata* in the second. In our judgment, such a classification, though very interesting, is both unnatural and impracticable. MM. Camus claim (*op. cit.* p. 13) that the classification they have adopted is based on the sum of the morphological and anatomical characters of the genus; but it may be doubted if they have correctly assessed the relative values of these characters.

Only British species:—*S. reticulata.*

6. SALIX RETICULATA. Plate 29

Salix pumila folio rotundo Ray *Syn.* ed. 3, 449 (1728) part.

Salix reticulata L. *Sp. Pl.* 1018 (1753)!; Lightfoot *Fl. Scot.* 601 (1777); Smith *Fl. Brit.* 1057 (1804)!; Syme *Eng. Bot.* viii, 260 (1868); A. et G. Camus *Classif. Saul.* 129 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 67 (1908); Rouy *Fl. France* xii, 217 (1910); *Chamitea reticulata* A. Kerner in *Verhandl. Z.-B. Gesellsch. Wien* 277 (1860).

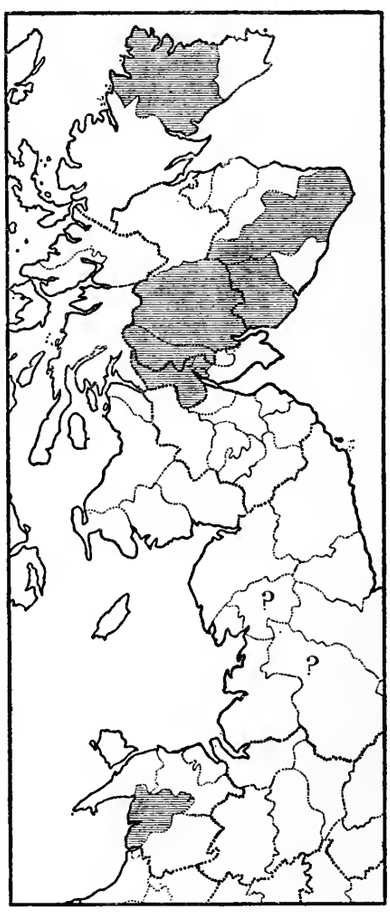
Icones:—Smith *Eng. Bot.* t. 1908; Forbes *Sal. Woburn.* t. 67; Hartig *Forst. Culturpfl.* t. 107 (35 d); Reichenbach *Icon.* xi, t. 557, fig. 1184; A. et G. Camus *op. cit., Atlas* t. 9, fig. J—L (? M).

Camb. Brit. Fl. ii. *Plate 29.* (*a*) Shoot with staminate catkin. (*b*) Shoot with pistillate catkins. (*c*) Barren shoot. (*d*) Staminate flower. (*e*) Staminate flowers (enlarged). (*f*) Ovaries. (*g*) Pistillate flowers (enlarged). From a Swiss specimen (E. W. H.).

Exsiccata:—Billot, 1963; Fellman, 218; Fries, ix, 62; A. et J. Kerner, (*H. S. A.*) 35, 36; Leefe, 48, 49; E. F. et W. R. Linton, 50; Reichenbach, 1421.

Dwarf undershrub. *Rhizome* branched, short. *Aërial stem* procumbent or a little ascending, much branched. *Buds* oval. *Stipules* caducous, glandular. *Petioles* long, usually reddish in colour. *Laminae* suborbicular to broadly oval or oboval, up to about 3·0 cm. long, and 2·5 cm. broad, entire or finely glandular serrate, thick, upper surface rugose and dark green, lower surface subglaucous or greyish and reticulated with prominent veins, sometimes more or less silky when young. *Catkins* narrowly cylindrical, about 1·5—3·0 cm. long and 3·0 mm. broad, on leafless peduncles of about the same length, appearing with the leaves; June. *Bracts* ovate or obovate, hairy. *Anthers* red. *Filaments* whitish, hairy towards the base. *Ovaries* broad, sessile, pubescent. *Style* short. *Stigmas* rather large. *Capsules* broadly oval or ovate, more or less hairy, about 3—4 mm. long.

Calcareous rocks on mountains, locally abundant. Merionethshire (see *Journ. Bot.* l, 174 (1912)); Stirlingshire, Perthshire, Forfarshire, Aberdeenshire, and Sutherlandshire; from about 600 to over 1000 m.



Map 3. *Salix reticulata* occurs in the counties which are shaded, and has been recorded for those marked "?"

We have seen the Merionethshire specimen above alluded to. It is in herb. Holmesdale, in the Natural History Club, Reigate, Surrey. The plant was gathered on Cader Idris at an altitude of about 890 m.

The pre-Linnaean name for *S. reticulata* was *S. pumila folio rotundo*; but Ray (*Syn.* ed. 3, 449) included in this name *S. herbacea.* Thus several of the early British post-Linnaean records of *S. reticulata* are clerical errors for *S. herbacea.* The author (probably James Bolton) of a list of plants in Watson's *History of Halifax* (1775) carried this error a step further by recording *S. reticulata* for localities in the West Riding of Yorkshire where neither *S. reticulata* nor *S. herbacea* is known to grow.

Northern and Arctic Europe (to 66° N.), Asia (to 70° 10′ N.), and America; mountains of Central Europe (ascending to 2800 m. in the Tyrol), southwards to the Pyrenees, the Alps and the Carpathians; mountains of Central Asia; Labrador.

S. arbuscula × *reticulata* (p. 40); *S. herbacea* × *reticulata* (p. 28); *S. lanata* × *reticulata* (p. 31); *S. lapponum* × *reticulata* (cf. p. 38); *S. myrsinites* × *reticulata* (cf. × *S. eugenes* p. 36); *S. nigricans* × *reticulata* (p. 44).

Series v. *HERBACEAE*

Herbaceae Borrer in Hooker *Brit. Fl.* 432 (1830); A. et G. Camus *Classif. Saul.* 106 (1904) as a section; von Seemen in Ascherson und Graebner *Syn.* iv, 64 (1908).

For characters, see page 25.

SPECIES AND HYBRID OF *Herbaceae*

7. **S. herbacea** (see below). Very small undershrub, subherbaceous. *Catkins* terminal, very small. *Bracts* subconcolorous, ciliate.

S. herbacea* × *reticulata (p. 28). *Petioles* half to a third as long as the laminae. *Laminae* suborbicular.

7. SALIX HERBACEA. Dwarf Willow. Plates 30; 37, 38, 39

Salix pumila folio rotundo Ray *Cat. Angl.* 273 (1670) part.; *Syn.* ed. 3, 449 (1724) part.; *S. alpina alni rotundo folio repens* Dillenius in Ray *Syn.* ed. 3, 448 (1724).

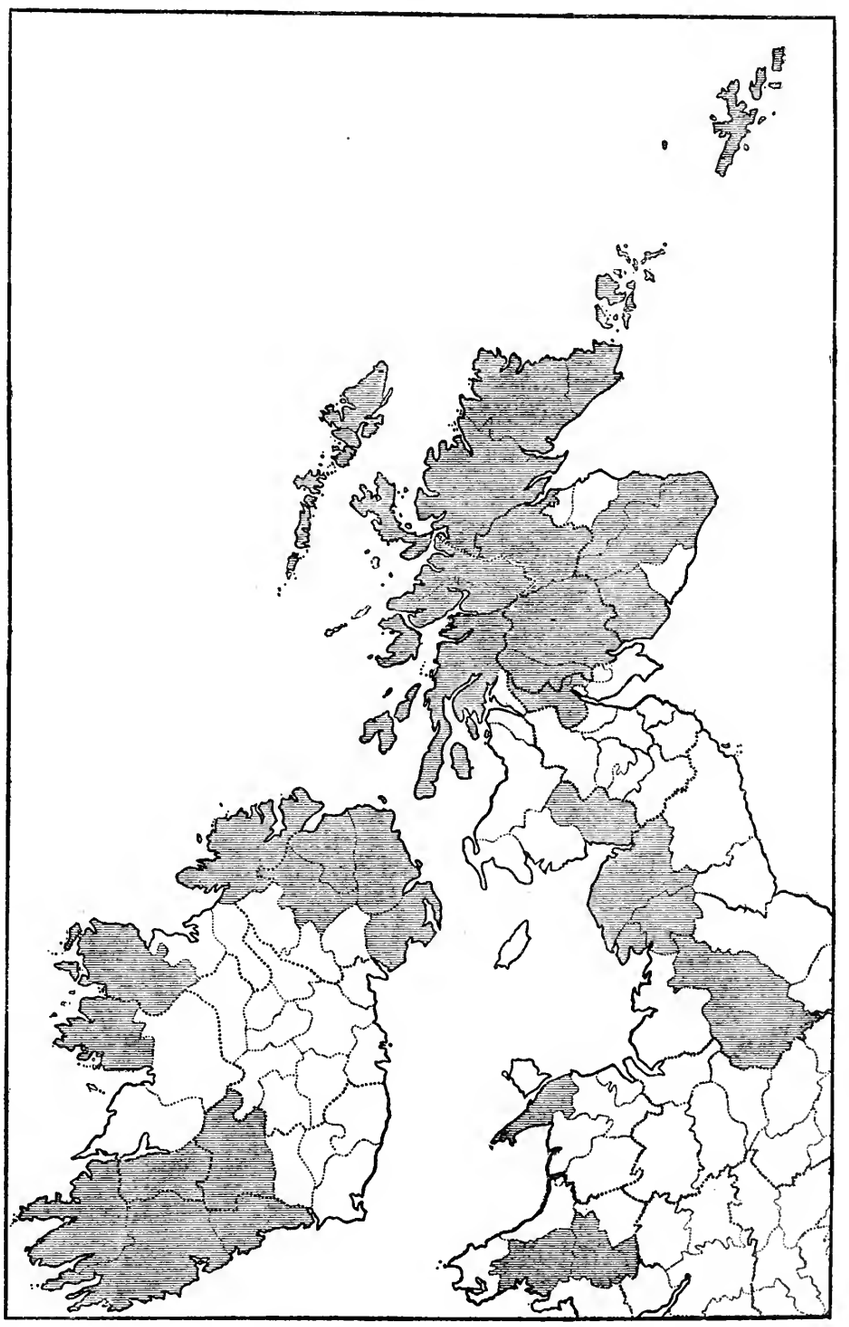
Salix herbacea L. *Sp. Pl.* 1018 (1753)!; Smith *Fl. Brit.* 1056 (1804)!; Syme *Eng. Bot.* viii, 259 (1868); A. et G. Camus *Classif. Saul.* 106 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 64 (1908); Rouy *Fl. France* xii, 218 (1910).

Icones:—Smith *Eng. Bot.* t. 1907; Reichenbach *Icon.* t. 557, fig. 1182; *Fl. Dan.* t. 117; Hartig *Forst. Culturpfl.* t. 105 (35 b); A. et G. Camus *op. cit.*, *Atlas* t. 8, fig. A.

Camb. Brit. Fl. ii. *Plate 30.* (*a*) Shoot with staminate catkins. (*b*) Group of staminate flowers. (*c*) Staminate flowers (enlarged). (*d*) Shoot with pistillate catkins. (*e*) Group of pistillate flowers. (*f*) Pistillate flowers (enlarged). From a Swiss specimen (E. W. H.). (*g*) Shoot with fruiting catkins. (*h*) A large leaf. (*i*) Capsules (enlarged). Forfarshire (E. S. M.).

Exsiccata:—Billot, 1964; Bourgeau, 668; Fellman, 219; Fries, v, 67; A. et J. Kerner (*H. S. A.*) 37; Leefe, 49; E. F. et W. R. Linton, 48; Reichenbach, 953.

Dwarf undershrub; the smallest British willow. *Rhizomes* up to half a metre or rather more in length, much branched. *Aërial branches* subherbaceous, short, procumbent or a little ascending at the tips, with only a few leaves on each, usually not rising more than 2—3 cm. above the ground. *Stipules* usually caducous. *Petioles* very short, rarely more than 5 mm. long. *Laminae* suborbicular to broadly oval or oboval, finely serrate, glabrous, smooth, thin, shiny, prominently reticulated on both sides, up to about 2 cm. long and broad. *Catkins* very small,



Map 4. Distribution of *Salix herbacea* in the British Isles

few-flowered, about 5—10 mm. long, on peduncles rather shorter, subcontemporaneous, June. *Bracts* broadly oval or oboval, ciliate or glabrous, yellowish-green, margin often darker. *Nectaries* yellow. *Style* short, distinct. *Stigmas* large, yellowish or tinged with purple. *Capsules* usually more or less pedicelled, narrowly ovate or oblong; July.

The figure in *Sal. Woburn.* t. 62, purporting to be of this species, is perhaps a hybrid.

The unusually low altitudes to which this and some other Arctic-Alpine willows descend in the British Isles sometimes cause a strange juxtaposition of species. It is doubtless due to this fact that there are in this country a number of endemic natural hybrids of the species of this genus.

Among humus on mountains, on siliceous soils; Brecknockshire, Carmarthenshire, and Carnarvonshire; central and northern Pennines, and northwards locally to Zetland; south-western, western, and northern Ireland; ascending to about 1300 m. on Ben Nevis, and descending to about 260 m. in co. Donegal and 90 m. in Sutherlandshire.

Northern and Arctic Europe (including the Faeröes and Iceland), Asia, and America; mountains of western, central, and southern Europe; Greenland, Labrador and U.S.A., southwards to Mt. Katahdin, Me., and Mt. Washington, N. H.

S. arbuscula × *herbacea* (p. 40); *S. aurita* × *herbacea* (p. 57); *S. herbacea* × *lanata* (p. 30); *S. herbacea* × *lapponum* (p. 35); *S. herbacea* × *lapponum* × *myrsinites* (cf. × *S. eugenes* p. 36); *S. herbacea* × *myrsinites* (cf. p. 32); *S. herbacea* × *nigricans* (cf. p. 37); *S. herbacea* × *phylicifolia* (cf. pp. 36, 37, and 47); *S. herbacea* × *repens* (cf. p. 35).

S. herbacea* × *reticulata Floderus *Bih. Sv. Vet. Akad.* xvii, iii, i, 52 (1891); E. F. et W. R. Linton in *Journ. Bot.* xxx, 365 (1892); A. et G. Camus *Classif. Saul.* ii, 255 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 202 (1905); *S. onychiophylla* Andersson in *Bot. Notiser* 119 (1867).

Exsiccata:—E. F. et W. R. Linton, 112, as *S. herbacea* × *reticulata*?; Toepffer, 129.

Dwarf undershrub. *Branches* prostrate, glabrous at maturity. *Buds* large, scales subpersistent as in *S. reticulata*. *Petiole* about one-third to one-half as long as the lamina. *Laminae* suborbicular, crenulate, prominently reticulated on both surfaces, subglaucous underneath. *Catkins* resembling those of *S. herbacea*, but larger (about 0·8 cm. long), peduncled.

Enander (*Sched. Sal. Scand.* i, 2 (1911)) takes a different view of the hybrids of *S. herbacea* and *S. reticulata* from other authorities. His opinions are supported by excellent specimens which may be consulted in Herb. Kew.

Perthshire, Forfarshire.

Also recorded for northern Scandinavia.

Section III. *VETRIX*

Vetrix Du Mortier in *Bijdr. Natuurk. Wetensch.* (14) (1825); in *Bull. Bot. Soc. Belg.* i, 140 et 141 (1862); Fries *Fl. Suec. Mant.* i, 48 (1832) excluding *Viminales* p. 60; Babington in *Journ. Bot.* i, 168 et 171 (1863); *Cinerella* [Seringe *Sal. Rev.*, ined., ex] Duby *Bot. Gall.* i, 423 (1828) including *Arbuscella* p. 426.

For characters, see page 14.

Series of *Vetrix*

Series vi. **Lanatae** (p. 29). Undershrubs of Arctic distribution. *Young branches* thick, hairy. *Laminae* broadly elliptical to suborbicular, very hairy with long and more or less silky hairs at least when young. *Catkins* terminal or lateral, large, stout, sessile to shortly peduncled, peduncles not leafy. *Bracts* discolorous with long hairs. *Anthers* golden yellow. *Style* long, slender. *Stigmas* short, rather stout, more or less bifid or entire. *Capsules* shortly stalked, rather narrow, glabrous.

Series vii. **Myrsinites** (p. 31). Undershrubs of Arctic-Alpine distribution. *Laminae* ovate or lanceolate-ovate, glabrous and shining at maturity, strongly reticulated on both sides, turning blackish on drying. *Catkins* lateral, on short peduncles leafy or leafy at the base, appearing with the leaves. *Bracts* discolorous, with long hairs. *Nectaries* 1, oblong-linear, purplish. *Anthers* reddish before dehiscence. *Styles* usually rather long and slender, purplish. *Stigmas* purplish, shorter than the style, more or less bifid. *Catkins* usually slightly hairy, shortly stalked. *Capsules* shortly stalked.

Series viii. **Glaucae** (p. 33). Undershrubs of Arctic-Alpine distribution. *Laminae* elliptical or oblong-elliptical, entire. *Catkins* lateral, on short peduncles, broadly elliptical or cylindrical. *Style* long at maturity. *Stigmas* rather long, often more or less bifid. *Capsules* subsessile or shortly stalked, hairy.

Series ix. **Arbusculae** (p. 39). Undershrubs of Arctic-Alpine distribution. *Branches* numerous, short, erect or decumbent. *Laminae* lanceolate or oblong-elliptical, acute, margin not recurved, shining above, subglaucous below, glabrous or puberulent at maturity. *Catkins* lateral, peduncled or sessile, appearing with the leaves. *Bracts* discolorous. *Nectaries* oblong, yellowish. *Anthers* reddish-yellow before dehiscence. *Style* long, slender. *Stigmas* divided, filiform, yellowish. *Capsules* pubescent, shortly stalked.

Series x. **Phylicifoliae** (p. 41). Shrubs or small trees of northern or sub-Alpine distribution. *Laminae* broadly obovate to oval-lanceolate, margin serrate, glabrous or hairy, often turning more or less blackish on drying. *Catkins* oval or oval-cylindrical, subsessile or on short leafy peduncles. *Filaments* free. *Anthers* yellow. *Styles* rather long, longer than the stigmas, not more than half as long as the capsules. *Capsules* stalked, glabrous or pubescent.

Series xi. **Rosmarinifoliae** (p. 48). Undershrubs with creeping rhizomes. *Young branches* thin, somewhat viscous when young. *Stipules* narrow when persistent. *Laminae* lanceolate to oblong-elliptical, margin more or less recurved, often with silky hairs especially when young and on the under surface, becoming strongly reticulated, turning blackish on drying. *Catkins* appearing a little before the leaves, sessile or on short peduncles, subrotund to shortly elliptical. *Anthers* yellow. *Styles* rather short. *Stigmas* short. *Capsules* usually with short stalks, conical, usually pubescent.

Series xii. **Capreae** (p. 51). Shrubs or small trees. *Stem* aërial. *Young branches* rather thick. *Stipules* broad. *Laminae* broadly lanceolate, obovate, or broadly oblong-elliptical. *Catkins* appearing before the leaves, sessile or shortly peduncled. *Style* short. *Capsules* with long stalks, usually pubescent.

Series vi. *LANATAE*

Lanatae Koehne *Deutsche Dendrol.* 87 (1893); *Chrysantheae* Koch *Sal. Comment.* 52 (1828); *Hastatae* Borrer in Hooker *Brit. Fl.* 433 (1830) excluding *S. hastata.*

For characters, see page 28.

SPECIES AND CHIEF HYBRIDS OF *Lanatae*

8. **S. lanata** (see below). *Laminae* large, covered with long soft woolly hairs especially on the upper surface when young. *Bracts* discolorous. *Catkins* golden yellow, large.

S. herbacea* × *lanata (p. 30).

(A) × ***S. sadleri*** (p. 30). Less hairy than *S. lanata.* *Bracts* subconcolorous, greenish.

(B) × ***S. stephánia*** (p. 30). Smaller than *S. lanata.* *Bracts* subconcolorous, brownish.

S. lanata* × *lapponum (p. 30). *Young branches* and *buds* with long caducous hairs. *Bracts* discolorous.

8. SALIX LANATA. Plates 31, 32; 51

Salix lanata L. *Sp. Pl.* 1019 (1753)!; Wahlenberg *Fl. Lapp.* 259 (1812); Smith in Rees' *Cyclop.* xxxi no. 88 (1815)!; *Eng. Fl.* iv, 205 (1828); Syme *Eng. Bot.* viii, 251 (1868); A. et G. Camus *Classif. Saul.* ii, 66 (1905).

Icones :—*Fl. Dan.* t. 1057, as *S. chrysanthos* (repeated in Forbes *Sal. Woburn.* t. 71, with a leaf of the Scottish plant); Hooker in *Eng. Bot. Suppl.* t. 2624; A. et G. Camus *op. cit., Atlas* ii, t. 3 (36) fig. A—E.

Cambr. Brit. Fl. ii. *Plate 31.* (*a*) Shoots with pistillate catkins. (*b*) Barren shoot. (*c*) Pistillate flowers. (*d*) Pistillate flowers (enlarged). (*e*) Ripening capsules (enlarged). Edinburgh Botanic Garden (I. B. B.). *Plate 32.* (*a*) Shoots with staminate catkins. (*b*) Shoot with pistillate catkins. (*c*) Staminate flower. (*d*) Staminate flowers (enlarged). (*e*) Pistillate flowers. (*f*) Pistillate flowers (enlarged). Staminate plant from Perthshire (D. A. H.). Pistillate plant from the Edinburgh Botanic Garden (I. B. B.).

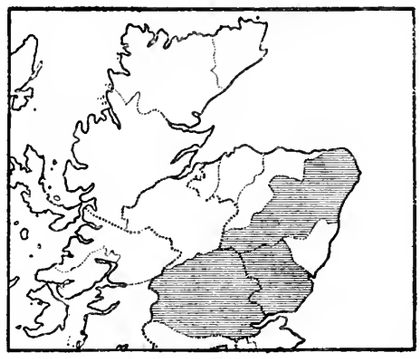
Exsiccata :—Fries, viii, 59; E. F. et W. R. Linton, 44.

Undershrub, from half a metre to a metre high. *Branches* thick, somewhat shining; young branches hairy. *Stipules* hairy, ovate, large (4—12 mm.), glandular especially when young. *Petioles* hairy, stout, up to about 1 cm. long. *Laminae* suborbicular to broadly ovate-elliptical, sometimes more or less cordate at the base, margin entire, apex rounded to acute, often with a short and more or less oblique acumination, covered with long soft woolly hairs especially on the upper surface when young, hairs more or less deciduous, subglaucous and markedly reticulate below at maturity. *Catkins* the most beautiful in the genus, usually erect or suberect, appearing before the leaves; May. *Bracts* whitish towards the base, blackish towards the summit, ovate or obovate,

very hairy, hairs golden yellow soon fading to pale grey. *Staminate catkins* sessile or subsessile, broadly cylindrical, large, stout, up to about 3·5 cm. long, brilliant golden yellow. *Filaments* yellow. *Anthers* orange-yellow before dehiscence. *Pistillate catkins* brilliant yellow, subsessile or on short peduncles with or without leaves. *Ovary* subsessile, elongate, about 1 cm. long and only about 2 mm. broad, tapering above, glabrous. *Style* long and slender. *Stigmas* rather short, linear, entire or bifid. *Capsules* shortly stalked, rather narrowly ovate-acuminate, pale green or yellowish, glabrous; early July.

Rare; wet rocks and banks of streams in sub-Alpine localities, from about 600 to 900 m.; Perthshire, Forfarshire, Aberdeenshire.

Iceland, northern Scandinavia (ascending to 1300 m.), Lapland, Nova Zembla, Arctic and northern Asia, northern North America, Greenland.



Map 5. Distribution of *Salix lanata* in Scotland

S. caprea × *lanata* (cf. p. 54).

S. herbacea* × *lanata E. S. Marshall in *Journ. Bot.* xxxii, 212 (1894); Gürke *Plant. Eur.* ii, 37 (1897) including *S. lanata* var. *sadleri* p. 28; A. et G. Camus *Classif. Saul.* ii, 258 (1905); Enander *Sched. Scand.* i, 27—34 (1911).

Among the putative hybrids of *S. herbacea* and *S. lanata*, Enander (*op. cit.* p. 27) includes × *S. sommerfeldti* Andersson, a plant which has usually been referred to *S. herbacea* × *myrsinites* (cf. p. 32).

To the same parentage (*S. herbacea* × *lanata*) Enander (*op. cit.* p. 28) also refers "*S. grahami* Borrer *ex parte*." We believe, from the evidence of a note by Enander on a sheet in Herb. Kew. labelled *S. grahami*, that this opinion refers only to the specimen in question, and not really to × *S. grahami* at all. The practice of adding "*ex parte*" or "*partim*" after the name of a plant when the part excluded was not meant to be included by the original author is to be condemned: yet it is not infrequently done, and confusion is thereby caused.

(A) × ***S. sadleri*** A. et G. Camus *Classif. Saul.* ii, 259 (1905); *S. sadleri*[1] Syme in *Trans. Bot. Soc. Edinb.* xii, 208 (1874); in *Journ. Bot.* xiii, 33 (1875); *S. lanata* var. *sadleri* White in *Journ. Linn. Soc.* xxvii, 422 (1890).

Icones:—Syme in *Journ. Bot., loc. cit.*, t. 158, as *S. sadleri.*

Habit approaching that of *S. lanata.* *Young branches* rather stout. *Stipules* caducous or large, ovate and finely glandular-denticulate. *Laminae* ovate to elliptical-ovate, large, up to about 4·5 cm. long, entire or finely glandular-denticulate especially towards the base. *Catkins* on leafy peduncles. *Bracts* greenish, concolorous or darker towards the summit, covered with long white hairs. *Ovary* stalked. *Style* long, greenish-yellow. *Stigmas* yellow, bifid, about half as long as the style.

Regarded by White (*loc. cit.*) as a remarkable form of *S. lanata.* It has also been regarded (cf. White, *loc. cit.*) as a hybrid of *S. lanata* and *S. reticulata*; whilst the Rev. E. S. Marshall (*Journ. Bot.* xxxii, 212 (1894)) looks upon it as a form of *S. herbacea* × *lanata* nearer to *S. herbacea* than to *S. lanata.*

Discovered by Sadler on rocky ledges in Aberdeenshire at an altitude of about 750 m. It has been cultivated since in various gardens. Not known elsewhere.

(B) × ***S. stephánia*** White in *Journ. Linn. Soc.* xxvii, 424 (1890)!; A. et G. Camus *Classif. Saul.* ii, 258 (1905) part.

Exsiccata:—E. F. et W. R. Linton, 105, as *S. herbacea* × *lanata.*

Undershrub or dwarf undershrub, with rhizomes. *Young aërial branches* softly hairy, soon becoming glabrous or subglabrous. *Stipules* caducous or small and ovate. *Laminae* suborbicular, subcordate or rounded at the base, more or less crenate-serrate, up to about 3·7 cm. long. *Catkins* lateral and terminal, on leafy peduncles, up to about 2·5 cm. long, lax-flowered. *Bracts* brownish, usually darker towards the summit, covered with long white hairs. *Ovary* narrow, glabrous, stalked. *Style* long and slender. *Stigmas* long, bifid.

White (*loc. cit.*) regarded his × *S. stephánia* as a hybrid of *S. herbacea* and *S. lanata.*

Perthshire (D. A. Haggart and F. B. White), Forfarshire.

Norway (Blytt *Norg. Fl.* 264 (1906)).

S. lanata* × *lapponum Floderus in *Bihang Kongl. Sv. Vet.-Akad. Handligar* xvii, iii, i, 30 (1891); Linton in *Journ. Bot.* xxix, 215 (1891); A. et G. Camus *Classif. Saul.* ii, 251 (1905).

Young branches and *buds* with long caducous hairs. *Stipules* usually caducous. *Petiole* long. *Laminae* large oblong-ovate, margin undulate, rather twisted at the apex, upper surface with persistent or subpersistent hairs, lower surface whitish with woolly hairs. *Catkins* not seen.

[1] After John Sadler (1837—1882).

Plants purporting to have this parentage are recorded for Aberdeenshire.
Also recorded for northern Sweden.

[***S. lanata*** × ***repens*** Linton in *Journ. Bot.* xxxvi, 124 (1898); A. et G. Camus *Classif. Saul.* ii 205 (1905).

Exsiccata :—E. F. et W. R. Linton, 99, 100.

An artificially produced hybrid, not known to occur in nature.]

[***S. lanata*** × ***reticulata*** Gürke *Plant. Eur.* ii, 38 (1897); A. et G. Camus *Classif. Saul.* ii, 261 (1905); × *S. superata* White in *Journ. Linn. Soc.* xxvii, 423 (1890)!.

Exsiccata :—E. F. et W. R. Linton, 101.

"A willow which grows in company with *S. lanata* and other mountain-species on the rocks at the head of Allt Innis Choarach, Glen Lochay, Perthshire, has required," according to White (*loc. cit.*), "a considerable amount of study to decipher." Eventually, White regarded it as having the above parentage.

On one of White's sheets (no. 469), E. J. Enander has written :—"*S. herbacea* L. × *lanata* L. forma *sublanata* mihi."

Perthshire, Forfarshire.

Also recorded for Sweden.]

Series vii. *MYRSINITES*

Myrsinites Borrer in Hooker *Brit. Fl.* 431 (1830); Babington in *Journ. Bot.* i, 172 (1863); *Myrtosalix* A. Kerner in *Verhandl. Z.-B. Gesellsch. Wien* x, (47) et (81) (1860); A. et G. Camus *Classif. Saul.* 111 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 161 (1909).

For characters, see page 28.

Species and chief hybrids of *Myrsinites*

9. **S. myrsinites** (see below). *Laminae* elliptical, about 2 cm. long and 1·3 broad, glabrous at maturity, subentire or serrate. *Catkins* on leafy peduncles.

S. myrsinites × ***nigricans*** (p. 33). *Laminae* oblong-elliptical, acute, much larger (up to 7 cm. long and 3 broad) than in *S. myrsinites*. *Catkins* on short leafy peduncles.

9. SALIX MYRSINITES. Plates 33; 34

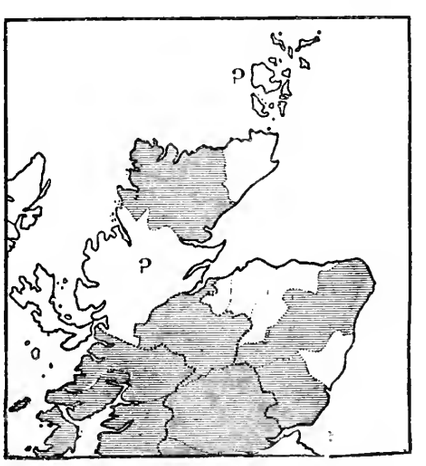
Salix myrsinites L. *Sp. Pl.* 1018 (1753)!; Lightfoot *Fl. Scot.* 599 (1777); Smith *Fl. Brit.* 1054 (1804)!; *Eng. Fl.* iv, 195 (1828); Syme *Eng. Bot.* viii, 256 (1868) including var. *arbutifolia*; A. et G. Camus *Classif. Saul.* 111 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 162 (1909); Rouy *Fl. France* xii, 214 (1910); *S. retusa* Dickson *Trans. Linn. Soc.* ii, 288 (1794) non L.; *S. laevis* Hooker *Brit. Fl.* 432 (1830).

Icones :—Smith *Eng. Bot.* t. 1360; Forbes *Sal. Woburn.* t. 60, t. 61, as *S. procumbens*; Borrer in *Eng. Bot. Suppl.* t. 2753, as *S. procumbens*; Reichenbach *Icon.* t. 559, fig. 1188, as *S. myrsinites* var. *genuina*; fig. 1189, as var. *leiocarpa*; fig. 1190, as var. *pilosa*; *Fl. Dan.* t. 1054; A. et G. Camus *op. cit.*, *Atlas* t. 9, fig. A—D.

Camb. Brit. Fl. ii. *Plate 33.* (*a*) Shoot with pistillate catkins. (*b*) Barren shoot. (*c*) Ovaries (enlarged). Hort. (Rev. E. F. Linton).

Exsiccata :—Fellman, 217; Fries, v, 66; A. et J. Kerner, 14, 15; E. F. et W. R. Linton, 23 ("the broad-leaved form which has been known as var. *procumbens*"); 47; Reichenbach, 1422.

Dwarf shrub, up to about half a metre high, erect or decumbent. *Young branches* glabrous in summer, shining. *Stipules* often caducous, ovate or narrowly ovate. *Petioles* about a sixth or a fifth as long as the laminae, more or less glandular at least when young. *Laminae* elliptical, variable in width, more or less rounded at the base, usually more or less glandular-serrate, usually obtuse at the apex, about 2 cm. long and 1·3 broad, glabrous and shining in summer, veins usually prominent especially in dried specimens, turning blackish on drying. *Catkins* rather lax, appearing with the leaves or a little later; May. *Bracts* oblong, obtuse, hairy, small, purplish towards the apex. *Nectary* small, purplish. *Staminate catkins* about 1·5—2·5 cm. long, on short peduncles, leafy at the base. *Anthers* purplish before dehiscence. *Pistillate catkins* about 2·0—2·5 cm. long, lengthening in fruit, on more or less leafy peduncles. *Ovaries* rather elongate, subsessile or on short stalks. *Style* rather slender, variable in length, usually about a fifth or fourth as long as the ovary. *Stigmas* usually shorter than the style, purplish, more or less bifid. *Capsules* purplish, shortly stalked, slightly hairy as a rule; June or July.



Map 6. Distribution of *Salix myrsinites* in Scotland

The British plants belong to var. *genuina* Reichenbach *Icon.* xi, 16 (1849); Neilreich *Fl. Wien* 121 (1851); = var. *serrata* Neilreich *Fl. N.-Oest.* 266 (1846): the var. *jacquiniana* Koch *Syn.* ed. 2, 758 (1844) (= *S. alpina* Scopoli *Fl. Carn.* ed. 2, ii, 255 t. 61, no. 1208 (1772)) is a form of central Europe and Asia, and is not known as a British plant.

Sub-Alpine rocks and stream-sides in Scotland, from about 300 to 800 metres; Argyllshire, Perthshire, Forfarshire, and northwards to Sutherlandshire and Orkney; preferring limestone.

Northern and Arctic Scandinavia (to 71° N.) and Russia, mountains of central Europe (to 2650 m.) and southwards to the Pyrenees, the Apennines and the Carpathians; northern and Arctic Asia, eastwards to Kamtchatka; North America—Labrador and Greenland.

S. arbuscula × *myrsinites* (see page 40).

S. aurita* × *myrsinites E. F. et W. R. Linton in *Journ. Bot.* xxx, 361 (1892); A. et G. Camus *Classif. Saul.* ii, 151 (1905); × *S. saxetana* White in *Journ. Linn. Soc.* xxvii, 434 (1890)!.

Icones :—*Camb. Brit. Fl.* ii. *Plate 34, a.* (*a*) Shoot with pistillate catkins. (*b*) Leaves. (*c*) Pistillate flowers (enlarged). Hort. (Rev. E. F. Linton).

Exsiccata :—E. F. et W. R. Linton, 18; herb. Marshall, 66.

Undershrub. *Young branches* glabrous at maturity. *Stipules* small. *Petioles* about 1 cm. long. *Laminae* broadly elliptical to slightly obovate or oblong-elliptical, margin undulate, coarsely serrate, with a short apical acumination, a little rugose, glabrous at maturity, grey and reticulate underneath. *Catkins* on leafy peduncles variable in length; late May. *Bracts* acute, hairy. *Nectary* small, much shorter than the bract or gynophore. *Style* rather long. *Stigmas* bifid. *Capsules* covered with short dense hairs, stalked.

Rare and critical; Perthshire, Forfarshire. Not recorded for any other country.

S. aurita* × *myrsinites* × *nigricans E. F. et W. R. Linton in *Journ. Bot.* xxx, 360 (1892); A. et G. Camus *Classif. Saul.* ii, 272 (1905).

Exsiccata :—E. F. et W. R. Linton, 57, as *S. aurita* × *myrsinites* × *nigricans*?.

Messrs Linton (*loc. cit.*) confidently ascribe the above parentage ("which," they add, "will seem incredible") to a willow from Forfarshire. On the label of their no. 57, the Rev. E. F. Linton states that "the '?' is added to indicate the want of absolute certainty which must attend such a solution, rather than any doubt in my mind." Not known elsewhere.

S. caprea* × *myrsinites Linton in *Journ. Bot.* xxxii, 201 (1894); A. et G. Camus[1] *Classif. Saul.* ii, 214 (1905).

Exsiccata :—E. F. et W. R. Linton, 46; 115 (artificial hybrid).

Undershrub, up to 1 m. high when cultivated. *Laminae* obovate-elliptical, crenulate, mucronate, softly pubescent on both sides especially when young. *Catkins* up to 5 cm. long, on short leafy peduncles. *Bracts* obtuse at the summit, discolorous. *Nectary* short, yellowish. *Ovaries* pubescent stalked. *Style* rather short. *Stigmas* large, more or less bifid.

Glen Fiagh, Clova, Forfarshire. Not recorded for any other country.

[***S. cinerea* × *myrsinites*** Linton in *Journ. Bot.* xxxvi, 124 (1898); A. et G. Camus *Classif. Saul.* ii, 1139 (905); v. Seemen in Ascherson und Graebner *Syn.* iv, 254 (1909).

Exsiccata :—E. F. et W. R. Linton, 92, as *S. cinerea* × *myrsinites*.

This hybrid was made artificially by Messrs Linton. It has since been recorded for the Tyrol, at 1600 m. (vide v. Seemen, *op. cit.*, p. 255).]

[***S. herbacea* × *myrsinites*** E. F. et W. R. Linton in *Journ. Bot.* xxx, 365 (1892)?; A. et G. Camus, *Classif. Saul.* ii, 256 (1905)?; v. Seemen in Ascherson und Graebner *Syn.* iv, 325 (1909)?; × *S. sommerfelti* Andersson in DC. *Prodr.* xvi, pt. ii, 291 (1868)?.

Icones :—A. et G. Camus *op. cit.*, *Atlas* ii, t. 15 (48) fig. AB—AC, as × *S. sommerfelti*?.

Exsiccata :—Herb. Marshall, 694?.

Enander (*Sched.* i, 16 (1911)) refers × *S. sommerfelti* to *S. herbacea* × *lapponum* and (p. 27) to *S. herbacea* × *lanata*.

Aberdeenshire?.

Northern Scandinavia, the Tyrol.]

S. lapponum × *myrsinites* (see page 37).

[1] MM. Camus also give an alternative name, × *S. lintoni*, named after the Rev. E. F. Linton.

S. myrsinites* × *nigricans Wimmer *Sal. Eur.* 227 (1866); A. et G. Camus *Classif. Saul.* ii, 191 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 239 (1909); *S. punctata* Wahlenberg *Fl. Lapp.* 269 (1812); *S. macnabiana*[1] Macgillivray *Edinb. New Phil. Journ.* ix, 335 (1830); × *S. wahlenbergi* Andersson in *Bot. Notiser* 115 (1867); White in *Journ. Linn. Soc.* xxvii, 433 (1890).

Icones :—A. et G. Camus *op. cit.*, *Atlas* ii, t. 9 (42) fig. R—T, t. 12 (45) fig. A—D, as × *S. myrsinitoïdes*. *Camb. Brit. Fl.* ii. *Plate 34, b.* (*a*) Shoot with staminate catkins. (*b*) Leaves. (*c*) Staminate flower. (*d*) Staminate flower (enlarged). Hort. (Rev. E. F. Linton).

Exsiccata :—E. F. et W. R. Linton, 24 (hort.), 74, 102; Schultz, 2489.

Shrub or dwarf shrub, a great number of forms occurring, some of which have been named by continental botanists. "In its best form," says White (*loc. cit.*), it "combines the characteristics of its parents, deriving from *myrsinites* the rigidity, glossiness, and in part the venation of the leaves, the often erect leafy-peduncled catkins, and the structure and colour of the style and stigmas, from *nigricans* the somewhat tomentose twigs and leaves, the greater thinness of the latter, and their greater tendency to become black in drying, the often longer petioles, and the often longer pedicels of the catkins." Other forms pass imperceptibly into *S. myrsinites*, and still others into *S. nigricans*.

Grows with the putative parents, among which it is not rare. Recorded for Perthshire, Forfarshire, and Aberdeenshire.

Norway, Sweden, northern Russia, Switzerland.

[***S. myrsinites* × *phylicifolia*** A. et G. Camus *Classif. Saul.* ii, 177 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 240 (1909); *S. notha* Andersson in *Bot. Not.* 114 (1867); × *S. normanni* Andersson in DC. *Prodr.* xvi, pt. ii, 288 (1868).

Icones :—A. et G. Camus *op. cit.*, *Atlas* t. 11 (44) fig. K, as × *S. notha*.

Exsiccata :—E. F. et W. R. Linton, 103 (accidental garden hybrid), 104, as *S. myrsinites* × *phylicifolia*?; herb. Marshall, 1173, as *S. myrsinites* × *phylicifolia*?.

Perthshire, Aberdeenshire.

Recorded for northern Scandinavia.]

S. myrsinites × *reticulata* (cf. p. 36).

Series viii. *GLAUCAE*

Glaucae Borrer in Hooker *Brit. Fl.* 422 (1830); *Frigidae* Koch *Sal. Comment.* 53 (1828) part.; A. et G. Camus *Classif. Saul.* 135 (1904).

Wimmer (*Sal. Eur.* 35 (1866)) suggests that *S. lapponum* is closely allied to *S. viminalis*; but we think it more reasonable to suppose that the resemblances of the two species are due to convergent development. The late Dr von Seemen (*op. cit.*) placed *S. lapponum* in the series *Viminales* and *S. glauca* in a far-removed series *Sericeae*; but it appears to us that both species are better placed among the other Arctic-Alpine undershrubs than with lowland osiers. *S. glauca* has not been discovered in the British Isles (cf. page 38).

For characters, see page 28.

Species and chief hybrid of *Glaucae*

10. **S. lapponum** (p. 34). *Laminae* elliptical or oblong-elliptical, about 2·5—3·5 cm. long and 1·0—1·5 broad, more or less covered with long hairs, especially underneath. *Catkins* stout, dense-flowered. *Capsules* very hairy.

S. herbacea* × *lapponum (p. 35). *Laminae* broadly oval to ovate, up to about 3 cm. long and 1·5 broad, with silky hairs when young. *Catkins* usually much more slender and more lax than in *S. lapponum*.

[**S. helvetica** (p. 38). *Laminae* dark green above, snowy white below. *Capsules* with snowy white and dense hairs.]

[**S. hastata** (p. 38). *Stipules* often very large, giving the leaves a hastate appearance. *Laminae* ovate or elliptical, glabrous. *Catkins* on leafy peduncles. *Capsules* glabrous.]

[1] After William Macnab (1780—1848), Superintendent of the Edinburgh Botanic Garden.

10. SALIX LAPPONUM. Lapland Willow. Plates 35; 36, 37, 38, 39, 40

Salix lapponum L. *Sp. Pl.* 1019 (1753) including *S. arenaria*; Lightfoot *Fl. Scot.* ii, 604 (1777); Syme *Eng. Bot.* viii, 252 (1868); *S. lanosa* Wahlenberg *Fl. Lapp.* 265 (1812); A. et G. Camus *Classif. Saul.* 147 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 182 (1909); Rouy *Fl. France* xii, 200 (1910).

Icones:—Smith *Eng. Bot.* t. 1809, as *S. arenaria*!; t. 1810, as *S. glauca*!; t. 2586, as *S. stuartiana*[1]!; Forbes *Sal. Woburn.* t. 70, as *S. arenaria*; t. 68?, as *S. glauca*; t. 72, as *S. stuartiana*; t. 73; Reichenbach, *Icon.* t. 572, fig. 2016 [1216]; Hartig *Forst. Culturpfl.* t. 108 (35 e) as *S. lapponum* var. *arenaria*; *Fl. Dan.* t. 1058; A. et G. Camus *op. cit.*, *Atlas* t. 12, fig. A—E.

Camb. Brit. Fl. ii. *Plate 35.* (*a*) Shoot with staminate catkins. (*b*) Shoot with pistillate catkins. (*c*) Barren shoot. (*d*) Staminate flower (enlarged). (*e*) Pistillate flowers (enlarged). (*f*) Bract (enlarged). Hort.; from a plant raised by Mr Hunnybun from cuttings sent by the Rev. E. F. Linton.

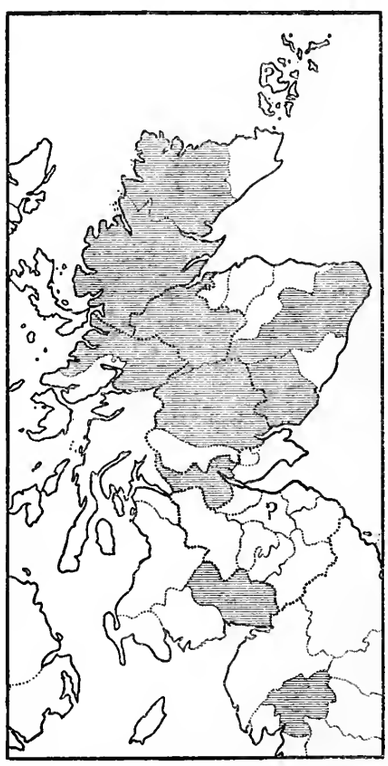
Exsiccata:—Fries, vii, 58; Leefe, 90, as *S. arenaria*; E. F. et W. R. Linton, 45; *Herb. Fl. Ingric.* iv, 573.

Undershrub, up to about a metre or a metre and a half in height. *Branches* numerous, short, straight, pubescent when young, glabrous or nearly so when mature. *Stipules* usually caducous. *Petioles* distinct, often about a sixth as long as the laminae, more or less hairy when young. *Laminae* elliptical or oblong-elliptical, rounded or subcuneate at the base, margins usually entire, sometimes wavy, acute to subacute, about 2·5 to 3·5 cm. long and 1·0 to 1·4 broad, upper surface often with silky hairs especially when young, lower surface grey with silky hairs. *Catkins* subsessile or on short peduncles, not leafy at the base, broadly elliptical, about 2·5 to 3·0 cm. long, dense-flowered, odorous, appearing a little before the leaves; late May and June; July and August. *Bracts* oblong, oval or ovate, with numerous long white hairs, whitish towards the base, dark brown at least towards the summit. *Nectary* long, linear, yellow. *Filaments* glabrous, tending to be connate at the base. *Anthers* dull yellow. *Style* usually long. *Stigmas* rather long, entire or more or less bifid, yellowish. *Capsules* subsessile or shortly pedicelled, very hairy; July—August.

Wet rocks and rocky banks of streams in Alpine and sub-Alpine localities; from Westmorland and southern Scotland northwards to Sutherlandshire; ascending to about 915 m. and descending to about 213 m. in Perthshire.

Northern and Arctic Europe (northwards to about 71° N.), mountains of central Europe (ascending to about 1050 m.), central Russia; Asia to the Altai Mountains.

S. arbuscula × *lapponum* (see page 40).



Map 7. Distribution of *Salix lapponum* in Great Britain

S. aurita* × *lapponum Wimmer in *Denkschr. Schles. Gesellsch.* 166 (1853)!; White in *Journ. Linn. Soc.* xxvii, 429 (1890); A. et G. Camus *Classif. Saul.* ii, 147 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 276 (1909); *S. obtusifolia* Willdenow *Sp. Pl.* iv, 705 (1805); *S. laestadiana* var. *opaca* f. *subaurita* Andersson in DC. *Prodr.* xvi, pt. ii, 278 (1868).

Icones:—*Camb. Brit. Fl.* ii. *Plate 36.* (*a*) Shoot with staminate catkins. (*b*) Leaves. (*c*) Staminate flowers. (*d*) Staminate flowers (enlarged). Hort. (Rev. E. F. Linton). The leaves are larger than in the wild plants.

Exsiccata:—E. F. et W. R. Linton, 37; herb. Marshall, 703, 705, 707, 2956; Schultz, xxv, 2484.

Dwarf shrub. *Young branches* and *buds* pubescent at least when young. *Stipules* caducous or not, dentate. *Petioles* about 1 cm. long or rather more. *Laminae* broadly elliptical, acute to ovate, margin subentire, apex acute, more or less pubescent especially underneath. *Staminate catkins* broadly elliptical, about 2 cm. long, appearing a little before the leaves, on short peduncles rather leafy at the base. *Bracts* hairy. *Filaments* rather long. *Pistillate*

[1] After the Rev. Dr John Stuart (1777—1805) who "first gave us a specimen of it, in August, 1782, from his garden at Luss [Dumbartonshire], as the male plant of Lightfoot's *S. lapponum*" (Smith, *Eng. Bot.* no. 2586).

catkins rather longer than the staminate ones, subsessile. *Bracts* hairy. *Ovaries* rather elongate. *Style* rather long. *Stigmas* short. *Capsules* hairy, pedicelled.

Edinburghshire, Perthshire, Forfarshire, Inverness-shire.

Scandinavia, central Europe, northern Russia.

S. caprea* × *lapponum Wimmer *Sal. Europ.* 192 (1866); A. et G. Camus *Classif. Saul.* ii, 210 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 271 (1909); *S. laestadiana* var. *canescens* Andersson in DC. *Prodr.* xvi, pt. ii, 278 (1868).

Icones :—A. et G. Camus *op. cit.*, *Atlas* ii, t. 13 (46) fig. G—J, as × *S. canescens.*

Exsiccata :—E. F. et W. R. Linton, 39; herb. Marshall, 706, 2772, 2961.

Very rare; Perthshire, Forfarshire, Aberdeenshire.

Recorded also for northern Scandinavia, northern Russia, and central Europe.

S. cinerea* × *lapponum Wimmer *Sal. Eur.* 193 (1866); A. et G. Camus *Classif. Saul.* ii, 138 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 267 (1909); *S. laestadiana* var. *opaca* f. *subcinerea* Andersson in DC. *Prodr.* xvi, pt. ii, 278 (1868); *S. cinerea-limosa* [Laestadius[1] ex] White in *Journ. Linn. Soc.* xxvii, 430 (1890).

Icones :—A. et G. Camus *op. cit.*, *Atlas* ii, t. 5 (38) fig. M—P, as × *S. laestadiana.*

Exsiccata :—Fries, v, 64, as *S. canescens.*

Only known, as a British plant, from "a specimen, in Edinburgh University Herbarium, labelled '*Salix cinerea*, Carlowrie, 1838,' by, I think, J. H. Balfour" (White *loc. cit.*). Carlowrie is near Edinburgh, near which city *S. lapponum* formerly occurred as an introduced plant.

Northern Sweden, Germany, and northern Russia.

S. herbacea* × *lapponum Floderus in *Bih. Sv. Akad. Handl.* xvii, iii, i, 41 (1891); A. et G. Camus *Classif. Saul.* ii, 249 (1905) including *S. herbacea* × *phylicifolia* p. 179 et p. 181, et *S. herbacea* × *nigricans* p. 194, et *S. herbacea* × *repens* p. 206, et *S. myrsinites* × *reticulata* p. 262; Enander *Sched. Sal. Scand.* 15—27 (1911).

In the treatment of this hybrid, we follow Enander, the eminent Swedish Salicologist. Numerous forms of the putative hybrid in question are described by Enander (*loc. cit.*); and he has also issued a very beautiful and convincing set of specimens which illustrate his position. These specimens may be seen in the herbarium at Kew. However, as Enander's views differ considerably from those usually expressed by British authorities, we retain, as hybrid-forms, a number of plants which Enander refers to *S. herbacea* × *lapponum*, but which have been otherwise described by British botanists. There should therefore be little difficulty in relating the commonly accepted British opinions with those here put forward.

Almost every possible intermediate appears to occur between the alleged parents; and it seems therefore more useful to describe separately the named British forms than to give a generalised and vague description of the whole series of putative hybrids.

(A) × ***S. cernua*** Linton in *Journ. Bot.* xxxii, 202 (1894)!; *S. herbacea* × *repens* A. et G. Camus *Classif. Saul.* ii, 206 (1905).

Icones :—*Camb. Brit. Fl.* ii. *Plate 37.* (*a*) Shoots with staminate catkins. (*b*) Barren shoot. (*c*) Staminate flowers (enlarged). (*d*) Bract (enlarged). (*e*) Shoot with pistillate catkins. (*f*) Barren shoot. (*g*) Pistillate flowers (enlarged). Hort., origin Glen Shee (E. S. M.).

Exsiccata :—E. F. et W. R. Linton, 110, 111 (Enander suggests that this is *S. herbacea* × *lapponum*), as *S. cernua*; herb. Marshall, 2965, 2966, 2967.

Dwarf undershrub. *Branches* slender, prostrate, creeping. *Stipules* caducous. *Petioles* very short. *Laminae* ovate or obovate to elliptical, serratulate, more or less pubescent on both sides, up to about 1·8 cm. long and nearly 1·0 broad, subglaucous underneath. *Catkins* mostly lateral, on short leafy peduncles, up to about 1·2 cm. long at maturity. *Bracts* oblong to oboval, ciliate at least towards the summit. *Ovaries* stalked, somewhat pubescent. *Style* variable in length. *Stigmas* rather stout, more or less bifid. *Capsules* on long stalks, reddish in colour.

Perthshire (not uncommon in Glen Shee, between 360 and 460 m.; Rev. E. S. Marshall, *Journ. Bot.* xlv, 295 (1907)); Aberdeenshire; eastern and western Sutherlandshire. Not known outside Scotland.

(B) × ***S. sobrina*** White in *Journ. Linn. Soc.* xxvii, 440 (1890)!.

Icones :—A. et G. Camus *op. cit.*, *Atlas* ii, t. 15 (48) fig. P—T, as × *S. sobrina.*

Camb. Brit. Fl. ii. *Plate 38, a.* (*a*) Shoots with staminate catkins. (*b*) Barren shoot. (*c*) Staminate flowers (enlarged). Forfarshire (E. S. M.).

[1] The name "*S. cinereo-limosa* Laestadius" appears in Andersson *Sal. Lapp.* 29 (1845) where it is cited in synonymy under *S. canescens* (2) *oblongo-obovata.*

Exsiccata:—E. F. et W. R. Linton, 49, 75; 107 (*fide* Enander) as *S. herbacea* × *nigricans*; 109 (*fide* Enander) as *S. herbacea* × *phylicifolia*; 112 (*fide* Enander) as *S. herbacea* × *reticulata*?; herb. Marshall, 2782, 2785, 2788, 2790, 2791, 2792.

Dwarf undershrubs or undershrubs, up to nearly 1 m. high, or prostrate. *Young branches* often rather stout at maturity, and often hairy. *Stipules* usually caducous, at least on the normal leaves, often hairy at least when young. *Petioles* up to about 4 mm. long. *Laminae* elliptical to oval or ovate, margin more or less minutely denticulate or crenulate, often glandularly so at least when young, up to about 2 cm. long and 1·5 broad, more or less hairy when young, ultimately subglabrous or even glabrous at least on the upper surface, often rather strongly reticulated. *Catkins* usually lateral, short (*ca.* 1·5 cm.), on short leafy peduncles; May. *Bracts* subdiscolorous, often brownish towards the summit, often with white hairs. *Nectaries* usually rather long, sometimes double. *Style* rather long. *Stigmas* rather thick, entire or bifid. *Capsules* subsessile or stalked, glabrous or pubescent often with white hairs; June.

The stamens of the plant figured (plate 38 (*a*)) may be, as is not infrequently the case in hybrid plants, monstrous; but Mr Marshall, who sent the plant to be drawn, wrote that the drawing was correct.

On a note attached to a specimen of this in herb. Rev. E. F. Linton (no. 155), it is said that the Rev. W. R. Linton suggested the specimen might be a hybrid of *S. spuria* and *S. herbacea*.

Rare; Perthshire, Forfarshire, Aberdeenshire.

Northern Scandinavia.

(C) × ***S. eugenes*** Linton in *Journ. Bot.* xxx, 364 (1892); *S. myrsinites* × *reticulata* E. F. et W. R. Linton in *Journ. Bot., loc. cit.*; *S. herbacea* × *lapponum* × *myrsinites*? Linton in *Lond. Cat. Brit. Plants* ed. 9, 48 (1895) nomen [cf. *S. herbacea* × *lapponum* × *myrsinites* Floderus in *Bih. Sv. Vet. Akad. Handl.* xvii, iii, i, 44 (1891)].

Exsiccata:—E. F. et W. R. Linton, 106, as *S. eugenes* (Enander suggests that this is *S. herbacea* × *lapponum*); herb. Marshall, 2793.

Stem prostrate. *Young branches* usually ascending, pubescent at first. *Laminae* ovate, sometimes cordate at the base, more or less serrate or crenate-serrate, ultimately glabrous above with veins deeply impressed, with long silk-like hairs underneath when young, markedly reticulate underneath, later ones subglaucous. *Catkins* about 1·2 cm. long on pubescent peduncles about the same length. *Nectaries* double. *Bracts* very large, lower ones pale brown and concolorous, upper ones darker brown above. *Ovaries* subsessile to sessile. *Styles* very long, red. *Stigmas* large, bifid.

Messrs Linton (*loc. cit.*) at first believed "from the creeping habit" of their plant "that *S. herbacea* was present" in its composition: "the fruit characters, however, in due time quite upset this view, not to mention the divergence.....in the leaf."

Glen Fiagh, Forfarshire. Not recorded elsewhere.

(D) × ***S. grahami*** White in *Journ. Linn. Soc.* xxvii, 437 (1890)!; *S. grahami*[1] [Borrer *ined.*] Baker in *Journ. Bot.* v, 157 (1867)!; *S. herbacea* × *phylicifolia* [A] × *S. grahami* A. et G. Camus *Classif. Saul.* ii, 179 (1905).

Icones:—Baker in *Journ. Bot.* v, t. 66 (1867) as *S. grahami*; Syme *Eng. Bot.* viii, t. 1377 (1868) as *S. grahami*!

Camb. Brit. Fl. ii. *Plate 38, b.* (*a*) Shoots with pistillate catkins. (*b*) Barren shoot. (*c*) Pistillate flower. (*d*) Pistillate flowers (enlarged). (*e*) Leaf, upper surface. (*f*) Leaf, lower surface. Cambridge Botanic Garden (R. I. L.).

Exsiccata:—Leefe, iii, 54, as *S. grahami*; E. F. et W. R. Linton, 25 (hort.), as *S. grahami.*

Undershrub. *Aërial branches* trailing, young ones covered with appressed grey silky hairs. *Stipules* caducous. *Petioles* short, covered with silky hairs at least when young. *Laminae* broadly elliptical or oblong-elliptical, about 1·8 cm. long and 1·0 broad when in flower; of the mature summer-shoots larger, rounded at the base and at the apex, often with a short oblique mucronation at the apex, glabrous and shining above, thinly covered with appressed silky hairs underneath, veins prominent underneath. *Catkins* from lateral buds, on leafy peduncles about as long as or a little longer than the catkins, about 1·5 cm. long at maturity; May. *Bracts* ciliate and somewhat hairy at the back. *Ovaries* glabrous, stalked. *Style* long. *Stigmas* bifid, large; June. Staminate plants unknown.

[1] After Dr Robert Graham (1786–1845), Professor of Botany at the Universities of Glasgow (1813) and of Edinburgh (1818).

Regarded by Borrer and Baker (*op. cit.*) as connecting *S. herbacea* and *S. polaris*; but the catkins, formed from lateral buds and borne on leafy peduncles, do not support this suggestion. The same objection applies to Nyman's view (*Consp.* 671 (1881)), followed in the *Index Kewensis*, that the plant should be placed under *S. retusa*. Sir J. D. Hooker (*Student's Flora* ed. 3, 376 (1884)) said it appeared to him to be a form of *S. myrsinites*, with smaller catkins, paler bracts, a glabrous capsule, and a long silky gynophore. Syme (*op. cit.*) thought it might be a hybrid of *S. herbacea* with either *S. nigricans* or *S. phylicifolia*. White (*op. cit.*) referred it doubtfully to *S. herbacea* × *phylicifolia*. Linton (*Ann. Scott. Nat. Hist.* 239 (1894)) argued strongly that it should be referred to *S. herbacea* × *myrsinites*. Enander[1], perhaps unaware that all the specimens are alleged to have come originally from the same pistillate plant, has referred some examples to *S. herbacea* × *lapponum*, others to *S. herbacea* × *lapponum* (× *lanata*?), and still others to *S. herbacea* × *lanata*.

That the plant does not conform to any known species is clear, and that it is a hybrid is a very reasonable suggestion; but the various hypotheses regarding its supposititious origin, offered by leading Salicologists, afford conclusive proof that the task of determining the putative parents of doubtful hybrids by morphological evidence alone is, at least in certain cases, an impossible one. Until careful and critical experiments in hybridisation have been performed, no certainty can prevail.

Said to have been collected by Professor Graham in Sutherlandshire, and to have been brought by him to the Royal Botanic Garden, Edinburgh (Baker, *loc. cit.*).

(E) × ***S. moorii***[2] White in *Journ. Linn. Soc.* xxvii, 438 (1890)!; *S. grahami* var. *moorii* Watson in *Lond. Cat. Brit. Plants* ed. 7, 21 (1874) nomen; *S. herbacea* × *phylicifolia*? [B] × *S. moorii* A. et G. Camus *Classif. Saul.* ii, 180 (1905).

Icones:—*Camb. Brit. Fl.* ii. *Plate 39.* (*a*) Shoot with pistillate catkins. (*b*) Barren shoot. (*c*) Pistillate flowers (enlarged). Hort. (Rev. E. F. Linton).

Exsiccata:—E. F. et W. R. Linton, 109 (hort.; origin, co. Donegal), as *S. herbacea* × *phylicifolia.*

Very similar to × *S. grahami.* *Laminae* of young leaves duller and rather more hairy, rather less rounded at the two ends, rather narrower in proportion to the length. *Bracts* obovate, much shorter, ciliate towards the summit. *Ovary* slightly pubescent towards the apex, stalked, stalk glabrous. *Capsules* on a long stalk.

The first mention of this appears to be by D. Moore in *Journ. Bot.* viii, 209 (1870), where the plant was referred to a form of *S. arbuscula.* The plant is there said to have been first collected, on the top of Muckish Mountain, co. Donegal, in September, 1866. Authentic examples by Dr Moore are in Herb. Kew. See also *Journ. Bot.* ix, p. 300.

White suggests that × *S. moorii* is a form of *S. herbacea* × *nigricans*, Linton (*Journ. Bot.* xxxiv, 438 (1896)) that it is a form of *S. herbacea* × *phylicifolia*, and Enander (in Herb. Kew.) that it is *S. herbacea* × *lapponum.* *S. lapponum* is not usually regarded as an Irish plant; but there is a doubtful record of it in Watson's *Cybele Brit.* iv, 212 (1859); and it has to be admitted that Irish willows have never been thoroughly investigated.

Known only from co. Donegal, Ireland, and cultivated in botanical gardens.

S. lanata × *lapponum* (see page 30).

[***Salix lapponum* × *myrsinites*** E. F. et W. R. Linton in *Journ. Bot.* xxx, 363 (1892)?; A. et G. Camus *Classif. Saul.* ii, 252 (1905)?; *S. phaeophylla* Andersson in *Bot. Notiser* 116 (1867)?.

Andersson first described the plant (*S. phaeophylla*) which later authorities have held to have this parentage; but Enander states (*Sched.* i, 16 (1911)) that all the original specimens are *S. herbacea* × *lapponum* (see page 35).

Very critical; recorded for Forfarshire.

Northern Scandinavia.]

S. lapponum* × *nigricans Rouy in *Rev. Bot. Syst. et Geogr.* ii, 181 (1904); A. et G. Camus *Classif. Saul.* ii, 186 (1905); × *S. dalecarlica* Rouy *loc. cit.*

Icones:—A. et G. Camus *op. cit.*, *Atlas* ii, t. 16 (49) fig. U—Y, as × *S. dalecarlica.*

Exsiccata:—Herb. Marshall, 681.

A plant, said to have this parentage, was recorded by the Rev. E. S. Marshall (*Journ. Bot.* xxxi, 228 (1893)) from Forfarshire. This appears to be the first record of the hybrid; but no description was then published.

Also recorded for Sweden.

S. lapponum × *phylicifolia* (see page 47).

S. lapponum* × *repens Wimmer *Sal. Europ.* 241 (1866); A. et G. Camus *Classif. Saul.* ii, 203 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 279 (1909); *S. limosa* var. *subversifolia* [Laestadius ms. ex] Wimmer *loc. cit.*

Icones:—A. et G. Camus *op. cit.*, *Atlas* ii, t. 12 (45) fig. X—Y″ (1905) as × *S. subversifolia.*

[1] The Rev. E. J. Enander, the eminent Swedish Salicologist, has written his suggestions on herbarium sheets in Herb. Mus. Brit., in Herb. Kew., and in herb. White. Most of Enander's suggestions are adopted in this work.

[2] After Dr David Moore (1807—1879), director of the Royal Botanic Garden, Glasnevin, Dublin (1838).

Cambr. Brit. Fl. ii. *Plate 40.* (*a*) Shoot with staminate catkins. (*b*) Shoot with pistillate catkins. (*c*) Barren shoot. (*d*) Staminate flowers (enlarged). (*e*) Pistillate flowers (enlarged). Drawn from specimens sent by the Rev. E. F. Linton, and produced by him by crossing *S. lapponum* and *S. repens.*

Undershrub. *Young branches* pubescent, ultimately glabrous. *Laminae* elliptical, entire, subrevolute, acute, pubescent to hairy. *Catkins* dense-flowered. *Bracts* broadly ovate, hairy. *Styles* rather long. *Capsules* sessile, hairy.

Exsiccata:—E. F. et W. R. Linton, 87 (artificial hybrid); herb. Marshall, 709, 2963B.

Perthshire.

Sweden, Germany, Austria, and Russia.

S. lapponum* × *reticulata Gürke *Plant. Europ.* ii, 38 (1897); A. et G. Camus *Classif. Saul.* ii, 252 (1905); × *S. sibyllina* White in *Journ. Linn. Soc.* xxvii, 446 (1890).

Some leaf-specimens in Herb. Univ. Edinb. are regarded by White as having the above parentage. The specimens were gathered by Greville, Forfarshire, in 1824. Not recorded for any other country.

[†SALIX HELVETICA]

†Salix helvetica Villars *Hist. Pl. Dauph.* iii, 783 (1789); A. et G. Camus *Classif. Saul.* 151 (1904); *S. lapponum* var. *helvetica* Andersson in DC. *Prodr.* xvi, pt. ii, 277 (1868); *S. lapponum* subsp. *helvetica* v. Seemen in Ascherson und Graebner *Syn.* iv, 186 (1909) excl. syn. Reichenbach; Rouy *Fl. France* xii, 201 (1910); excluding syn. *S. arenaria* Smith and *S. glauca* Smith and their equivalents, and excluding references to Reichenbach Exsicc. 1628 et 2520.

Exsiccata:—A. et J. Kerner 5, 89; herb. Smith, as *S. glauca.*

Differs from *S. lapponum* in the following characters:—*Laminae* darker green and glabrous above, snowy white below. *Catkins* on longer peduncles which are leafy towards the base, and more slender. *Ovaries* snowy white with very dense hairs, almost as in *S. glauca* L.[1]

White (*op. cit.* p. 428) points out that a specimen in Herb. Univ. Edinb. labelled by Winch "*Salix glauca* Ben Lawers," Perthshire, is *S. helvetica* Villars; and the Rev. E. F. Linton, as is seen by a note on the same sheet, subscribes to this determination. The specimen undoubtedly agrees with the original description of *S. helvetica.* Winch's specimen also agrees with specimens in Smith's herbarium named by Smith *S. glauca.* There is an identical plant in herb. Forster (in Herb. Mus. Brit.) by Winch "from Scotland," and another from Borrer in Herb. Univ. Cantab. labelled by Babington "*S. glauca* Smith! (Borrer); Mr Borrer's garden, 1844."

However, these plants—*S. glauca* Smith herb.—are not, in our opinion, *S. glauca* Smith *Eng. Bot.* t. 1810, which we regard as the same as *S. arenaria* Smith *Eng. Bot.* t. 1809, both of which, along with *S. stuartiana* Smith *Eng. Bot.* t. 2586, we place under *S. lapponum.*

We believe that the description of *S. glauca* Smith *Eng. Fl.* iv, 201 (1828) refers to *S. helvetica*; but the initial diagnosis is simply repeated from *S. glauca* of his *English Botany.*

With regard to Winch's record of *S. helvetica* (sub nom. *S. glauca*) from Ben Lawers, White remarks that "it is desirable that it should be rediscovered." Perhaps White suspected that there had been some mixing or planting of specimens, a view we are inclined to adopt. Cf. *S. hastata* (see below) and *S. rosmarinifolia* (page 48).

In the Alps of France, Switzerland (ascending to about 2600 m.), Austria, and Italy. Recorded also for Scandinavia, but we have seen no specimens.

[*SALIX HASTATA]

S. hastata L. *Sp. Pl.* 1017 (1753); A. et G. Camus *Classif. Saul.* 155 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 152 (1909); Rouy *Fl. France* xii, 212 (1910); *S. malifolia* Smith *Fl. Brit.* 1053 (1804)!; *Eng. Fl.* iv, 180 (1828).

Icones:—*Svensk Bot.* t. 719; Smith *Eng. Bot.* t. 1617, as *S. malifolia*; Forbes *Sal. Woburn.* t. 35, t. 36, as *S. malifolia*; *Fl. Dan.* t. 1238; Reichenbach *Icon.* t. 570, fig. 2013 [1213]; Hartig *Forst. Culturpfl.* t. 111 (35*h*); A. et G. Camus *op. cit., Atlas* t. 13.

Exsiccata:—Billot, 3899, as *S. jayetiana*; Fries, iii, 53; A. et J. Kerner, 41, 42; Reichenbach, 956; Leefe, ii, 36, as *S. hastata* var. *malifolia.*

Undershrub, 1—2 m. high. *Stipules* often very large (up to 2·5 cm.) giving the leaves a hastate appearance. *Petioles* short, stout. *Laminae* ovate or elliptical, acute, glabrous on both surfaces, about 4—6 cm. long and 2·5 broad. *Catkins* on leafy peduncles, appearing with the leaves; May and June. *Styles* rather long. *Stigmas* about as long as the style. *Capsule* stalked, glabrous; June and early July.

[1] *S. glauca* L. *Sp. Pl.* 1019 (1753) is not known to be a British plant. Cf. Billot, 1961; Fellman, 216; Fries, iii, 52; A. et J. Kerner, 77, 78; Reichenbach, 1628, 2520. Has *leaves* as in *S. lapponum*, stout *catkins*, and *capsules* white with very dense hairs. It should be searched for in Scotland. *S. glauca* × *lapponum* occurs in Scandinavia, and *S. glauca* × *helvetica* in Switzerland.

The British plants are referable to *S. hastata* var. *vegeta* Andersson *Monogr. Sal.* 172 (1867) (= var. *malifolia* Gürke *Plant. Eur.* ii, 22 (1897)).

Like *S. rosmarinifolia*, this species was figured in *Eng. Bot.* (as *S. malifolia*); but the evidence that it was British was then slight (see Smith *Eng. Fl.* loc. cit.). Later, it was recorded from the Sands of Barrie, Forfarshire, by Drummond (see Hooker, *Brit. Fl.* 433 (1830)); and there is a specimen by him from this locality in Herb. Mus. Brit. The plant has also been recorded from Middlesex (Woods, *Bot. Guide*, 413 (1805)). However, there is no evidence to show that *S. hastata* has ever occurred in this country as an indigenous plant.

Scandinavia, Denmark, Germany, France, Central Europe, Spain (3000 m.); Central Asia to the Himalayas (5000 m.) and Tibet.

Series ix. *ARBUSCULAE*

Arbusculae A. Kerner in *Verhandl. Z.-B. Gesellsch. Wien* x, 48 et 205 (1860); A. et G. Camus *Classif. Saul.* 123 (1904); *Vacciniifoliae* Borrer in Hooker *Brit. Fl.* 431 (1830).

For characters, see page 29.

Species and chief hybrid of *Arbusculae*

11. **S. arbuscula** (see below). *Laminae* oblong-elliptical to ovate, margin glandular-denticulate to subentire, somewhat shining above, subglaucous underneath. *Catkins* small, slender, cylindrical, subsessile or on leafy peduncles. *Style* distinct. *Capsules* subsessile.

S. arbuscula* × *lapponum (p. 40). A series of intermediates connecting the putative parents.

11. SALIX ARBUSCULA. Plate 41

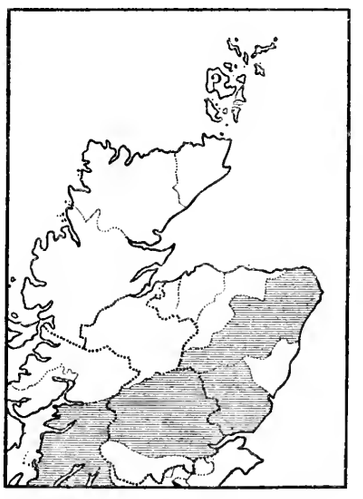
Salix arbuscula L. *Sp. Pl.* 1018 (1753); Syme *Eng. Bot.* viii, 254 (1868); A. et G. Camus *Classif. Saul.* 123 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 146 (1909); Rouy *Fl. France* xii, 213 (1910); *S. myrsinites* Lightfoot *Fl. Scot.* 599 (1777) non L.; *S. prunifolia* Smith *Fl. Brit.* 1054 (1804) incl. *S. venulosa* p. 1055 et *S. carinata* p. 1055; *S. prunifolia* Smith *Eng. Fl.* iv, 193 (1828)! incl. *S. vacciniifolia*!, p. 194, et *S. venulosa*!, p. 195, et *S. carinata* p. 197, et *S. livida*, p. 199.

Icones:—Smith *Eng. Bot.* t. 1361, as *S. prunifolia*!; t. 1362, as *S. venulosa*!; t. 1363, as *S. carinata*!; t. 2341, as *S. vacciniifolia*!; Forbes *Sal. Woburn.* t. 56, as *S. prunifolia*; t. 58, as *S. venulosa*; t. 59, as *S. carinata*; t. 138, fig. 138 as *S. vacciniifolia*; *Fl. Dan.* t. 1055.

Cambr. Brit. Fl. ii. *Plate 41.* (*a*) Shoot with staminate catkins. (*b*) Shoot with pistillate catkins. (*c*) Barren shoot. (*d*) Pistillate flowers. (*e*) Pistillate flowers (enlarged).

Exsiccata:—Billot, 1962; Fries, vi, 61; A. et J. Kerner (*H.S.A.*), 33; Leefe ii, 47; E. F. et W. R. Linton, 22.

Dwarf shrub, up to about 1 m. high. *Branches* erect, or ascending, or procumbent, or prostrate, short, sometimes rooting; young ones glabrous in summer, smooth, somewhat shining. *Stipules* usually caducous, or small. *Petioles* short (2—4 mm.). *Laminae* broadly or narrowly oblong-elliptical to ovate, cuneate to broad at the base, margin glandular-denticulate to subentire, acute, with numerous white dots, somewhat shiny above, subglaucous underneath, turning blackish on drying. *Catkins* small, rarely more than about 2 cm. long, cylindrical, appearing with the leaves; May. *Bracts* hairy, reddish-brown towards the summit, often not longer than half the ovary. *Nectary* comparatively large, yellowish. *Staminate catkins* subsessile, leafy at the base, rarely more than 1·5 cm. long and often shorter. *Filaments* glabrous. *Anthers* reddish-yellow before dehiscence. *Pistillate catkins* on leafy peduncles which are sometimes as long as the catkins, longer than the staminate ones, elongating up to about 3 cm. in fruit. *Ovaries* pubescent. *Style* distinct, rather slender, usually comparatively long at maturity. *Stigmas* more or less bifid, yellowish or more or less tinged with pink. *Capsules* subsessile or on stalks shorter than the nectaries, more or less hairy; June.



Map 8. Distribution of *Salix arbuscula* in Scotland

The British forms are referable to var. *foetida* Koch *Syn.* 658 (1837) (= *S. vacciniifolia* Smith *loc. cit.*) and to var. *prunifolia* Koch *loc. cit.* (= *S. prunifolia* Smith *loc. cit.* and *S. venulosa* Smith *loc. cit.* and *S. carinata* Smith *loc. cit.*): the var. *waldsteiniana* Koch *loc. cit.* (= *S. waldsteiniana* Willdenow *Sp. Pl.* iv, 679 (1805)) does not appear to be represented among the known British forms.

Rare; wet rocks in the sub-Alpine and Alpine regions of central Scotland; Argyllshire, Perthshire, Forfarshire; also reported for Dumfriesshire, Aberdeenshire, and Orkney; from about 120 to 800 metres.

Northern Europe (to 68° N.); mountains of western and central Europe (2500 m. in the Alps), Pyrenees, Balkans; Caucasus (3330 m.) to China, North America, Greenland.

S. arbuscula* × *herbacea Floderus in *Sv. Vet. Akad. Handl.* xvii, iii, i, 48 (1891); A. et G. Camus *Classif. Saul.* ii, 241 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 324 (1909); × *S. simulatrix* White in *Journ. Linn. Soc.* xxvii, 439 (1890)!.

Exsiccata:—E. F. et W. R. Linton, 67, 96; herb. Marshall, 48, 69, 3468.

White referred specimens collected in Perthshire to *S. arbuscula* × *herbacea*. On one of White's sheets (no. 496), Enander has written "*S. herbacea* × *lanata* forma *subherbacea* mihi." Of Mr Marshall's plants named × *S. simulatrix* by White, one is herb. Marshall, 48: this is named by Mr Marshall "*S. arbuscula* L. forma (or possibly *S. arbuscula* × *herbacea*)"; another is herb. Marshall, 69: this is barren, and named by Mr Marshall "*S. herbacea* × *myrsinites*?".

Rare and critical. Perthshire and Argyllshire.

S. arbuscula × *herbacea* is also recorded for Sweden and Switzerland.

S. arbuscula* × *lapponum Wimmer in *Denkschr. Schles. Gesellsch.* 167 (1853); Floderus in *Sv. Vet. Akad. Handl.* xvii, iii, i, 39 (1891); A. et G. Camus *Classif. Saul.* ii, 239 (1905); × *S. spuria* Andersson in DC. *Prodr.* xvi, pt. ii, 279 (1868); White in *Journ. Linn. Soc.* xxvii, 430 (1890).

Icones:—A. et G. Camus *Classif. Saul.* ii, *Atlas* t. 15 (48), fig. E—G, as × *S. whitiana*[1].

Exsiccata:—E. F. et W. R. Linton, 46.

Judging from the remarks of White, there seems to be a series of intermediates or hybrids of *S. arbuscula* and *S. lapponum*, some examples showing "more affinity with one parent than the other," and others being "tolerably intermediate in character."

From *S. arbuscula* such plants "may be distinguished generally by the duller colour of the *leaves* which are more or less...pubescent..., by the finer and more scanty serration of the leaf-margins, by the longer shape of the *catkins*, longer *styles*, and usually narrower *scales* [= *bracts*] darker at their tips; and from *S. lapponum* by the firmer and more shiny *leaves* which are more nearly glabrous and have more or less serrate margins, by the smaller *catkins* with short leafy peduncles, and by the short *stigmas*" (White *loc. cit.*).

Some of such plants are with difficulty distinguished from certain forms of *S. arbuscula* × *phylicifolia*; and in the *ensemble* it is not unlikely that forms occur which correspond to *S. arbuscula* × *lapponum* × *phylicifolia* (Floderus in *Bih. Sv. Vet. Akad. Handl.* xvii, iii, i, 41 (1891)).

Perthshire, between 610 and 730 m.

Recorded also for Sweden.

S. arbuscula* × *myrsinites Floderus in *Bih. Sv. Vet. Akad. Handl.* xvii, iii, i, 47 (1891); A. et G. Camus *Classif. Saul.* ii, 243 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 240 (1909); × *S. serta* White in *Journ. Linn. Soc.* xxvii, 436 (1890).

White (*loc. cit.*) described his × *S. serta* from a specimen in Syme's herbarium (in the possession of Mr F. J. Hanbury) labelled "*Salix arbuscula*, Breadalbane mts. [Perthshire], Lyon," and also from "a scrap in the same herbarium labelled "*Salix prunifolia*, Breadalbane mts. [Perthshire], J. D. Hooker."

Also recorded for Sweden and Switzerland.

S. arbuscula × *nigricans* (cf. page 48, footnote); *S. arbuscula* × *phylicifolia* (page 45).

S. arbuscula* × *reticulata A. et G. Camus *Classif. Saul.* ii, 239 (1905).

Icones:—A. et G. Camus *op. cit.*, *Atlas* ii, t. 14 (47), fig. Z et Z—B.

A specimen in Herb. Mus. Brit., by R. Brown, 1793, from Ben Lawers, Perthshire, is referred by Enander to *S. arbuscula*? × *reticulata*.

Also recorded from Sweden, Switzerland, and the Tyrol.

[1] × *S. whitiana* A. et G. Camus *op. cit.* p. 239 = *S. arbuscula* × *lapponum* A. et G. Camus *loc. cit.* After F. B. White (1842—1894), the leading Scottish Salicologist. However, the name × *S. whitiana* was published later than the synonym × *S. pseudospuria* Rouy *Rev. Bot. Syst.* 181 (1904).

Series x. *PHYLICIFOLIAE*

Phylicifoliae Fries *Fl. Suec. Mant.* i, 48 (1832) excluding *S. arbuscula* and *S. silesiaca*; Du Mortier *Prodr.* 12 (1827) nomen; in *Bull. Bot. Soc. Belg.* 142 (1862); v. Seemen in Ascherson und Graebner *Syn.* iv, 59 (1908) et 130 (1909) excluding *S. arbuscula*; Rouy *Fl. France* xii, 209 (1910) excluding *S. hastata*; *Nigricantes* Borrer in Hooker *Brit. Fl.* 426 (1830) including *Bicolores* p. 428.

For characters, see page 29.

BRITISH SPECIES AND CHIEF HYBRIDS OF *Phylicifoliae*

12. **S. nigricans** (see below). *Young branches* dull, usually more or less pubescent. *Laminae* dull, more or less softly hairy especially when young, with a greater tendency to turn black in drying than *S. phylicifolia*. *Nectary* usually about one-third or one-fourth as long as the gynophore.

S. aurita* × *nigricans (p. 43). Differs from *S. cinerea* × *nigricans* by the more rugose *laminae* and smaller *catkins* and *capsules*.

S. cinerea* × *nigricans (p. 43). *Laminae* up to about 6 cm. long and 2·5 broad, pubescent. *Catkins* peduncled.

13. **S. phylicifolia** (p. 44). *Young branches* smooth, more or less shining, glabrous at maturity. *Laminae* smooth, usually glabrous, rather shining above, usually subglaucous underneath, usually not blackening very much on drying. *Catkins* usually rather smaller than in *S. nigricans*. *Nectary* about one-half or one-third as long as the gynophore.

S. aurita* × *phylicifolia (p. 46). *Laminae* elliptical to obovate, more or less rugose. *Catkins* rather small, on leafy peduncles.

S. caprea* × *phylicifolia (p. 46). *Laminae* large, up to about 5·0—7·5 cm. long and about 2·5 broad. *Catkins* shortly peduncled.

S. cinerea* × *phylicifolia (p. 46). Differs from *S. caprea* × *phylicifolia* in the duller and more persistently hairy branches, buds, and leaves. *Laminae* smaller.

S. nigricans* × *phylicifolia (p. 47). Plants intermediate between the putative parents.

12. SALIX NIGRICANS. Plates 42, 43; 34, 44, 46

Salix nigricans Smith *Trans. Linn. Soc.* vi, 120 (1802)!; Fries *Fl. Suec. Mant.* i, 52 (1832); Syme *Eng. Bot.* viii, 241 (1868); A. et G. Camus *Classif. Saul.* 194 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 131 (1909); Rouy *Fl. France* xii, 210 (1910); *S. phylicifolia* var. β L. *Sp. Pl.* 1016 (1753).

Icones:—Smith *Eng. Bot.* t. 1213; t. 1403, as *S. cotinifolia*!; t. 1404, as *S. hirta*!; t. 2342, as *S. rupestris*!; t. 2343, as *S. andersoniana*[1]!; t. 2344, as *S. forsteriana*[2]!; Borrer in *Eng. Bot. Suppl.* t. 2709, as *S. damascena*!; t. 2725, as *S. petraea*!; Forbes *Sal. Woburn.* (1829) t. 37; t. 114, as *S. cotinifolia*; t. 113, as *S. hirta*; t. 111, as *S. rupestris*; t. 109, as *S. andersoniana*; t. 110, as *S. forsteriana*; t. 97, as *S. petraea*; *Fl. Dan.* t. 1053, as *S. phylicifolia* var.; t. 2553; Reichenbach *Icon.* t. 573, fig. 2017 [1217]; fig. 2018 [1218] as *S. nigricans* var. *eriocarpa*; Hartig. *Forst. Culturpfl.* t. 115 (41 *c*), as *S. nigricans* var. *amaniana*; Camus *op. cit.*, *Atlas* t. 18.

Camb. Brit. Fl. ii. *Plate 42.* (*a*) Shoot with staminate catkins. (*b*) Barren shoot. (*c*) Staminate flowers. (*d*) Staminate flower (enlarged). Cambridge Botanic Garden, as *S. nigricans* var. *hirta* (R. I. L.). *Plate 43.* (*a*) Shoot with pistillate catkins. (*b*) Barren shoot. (*c*) Pistillate flowers. (*d*) Pistillate flowers (enlarged). From cutting sent by the Rev. E. F. Linton.

Exsiccata:—Billot, 1960; Fellman, 210, 211, as *S. nigricans* var. *borealis*; Fries, v, 62, as *S. nigricans* var. *leiocarpa*; vii, 63, as *S. nigricans* var. *borealis*; viii, 62, as *S. nigricans* var. *eriocarpa*; xi, 62, as *S. nigricans* var. *angustifolia*; A. et J. Kerner, 11, 12, 13, 34, 64, 65; Leefe, i, 16, et i, 17, et i, 19, et i, 20, as *S. nigricans*; 67, i, 4, ii, 43, iii, 69, iii, 71, iii, 74 as *S. hirta*; 68, 69, as *S. rupestris*; 70, 71, iv, 91, as *S. rupestris*?; 75, as

[1] After George Anderson (d. 1817) who "discovered" the plant "in the Highlands" (Smith, *Eng. Fl* iv, 222 (1828)).

[2] After Edward Forster (1765—1849). "Two names more dear than these [Anderson and Forster], to the memory of their friends or to botany, can scarcely be recorded in the history of science" (Smith, *Eng. Fl.* iv, 224 (1828)).

S. propinqua; i, 9, i, 13, as *S. andersoniana*; i, 14, as *S. damascena*; ii, 35, as *S. petraea*; iii, 73, as *S. forsteriana*; i, 9, i, 16, i, 17, i, 20, ii, 43; E. F. et W. R. Linton, 20, 64; 65, as *S. nigricans* forma; Reichenbach, 568; Wirtgen, xv, 850, as *S. nigricans* var. *nuda*; xv, 851, as *S. nigricans* var. *eriocarpa*; *Herb. Fl. Ingric.* viii, 565; viii, 565 b, as *S. nigricans* var. *eriocarpa*; x, 565 c, as *S. nigricans* var. *platyphylla*.

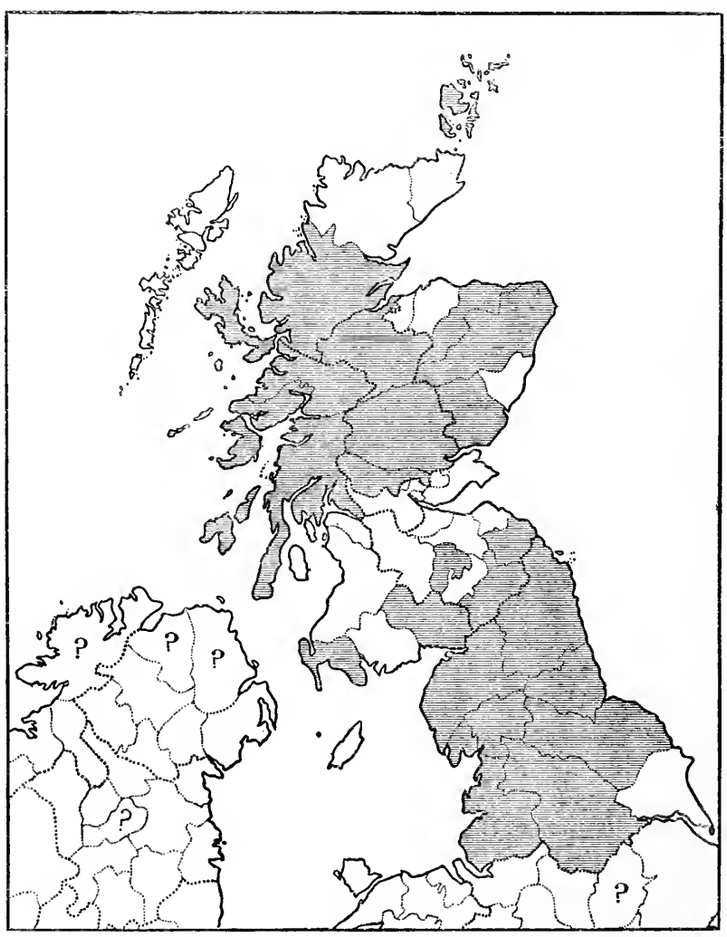
Shrub, up to about 4 m. high, or trailing undershrub. *Branches* spreading or suberect or elongated and arched, often divaricate, blackish or brownish or olive-green, more or less hairy or glabrescent. *Buds* oval, pubescent at least when young. *Stipules* often rather large, subcordate, dentate, acute. *Petioles* up to about 1 cm. in length, more or less hairy. *Laminae* very variable in shape, elliptical or oblong-elliptical or broadly lanceolate or rather obovate or almost suborbicular, more or less rounded at the base, more or less serrate or crenate-serrate to subentire, often acute to subacuminate, upper surface glabrescent or glabrous, lower surface greyish and more or less pubescent especially on the midrib, thinner and duller than in *S. phylicifolia*, often turning blackish when dried. *Catkins* shortly peduncled, appearing a little before or along with the leaves; late April and May. *Staminate catkins* subsessile, bracteate at the base, oval or oblong-oval, about 1·5 to 2·0 cm. long as a rule. *Bracts* oval or oblong-oval or oboval, brown towards the apex, hairy. *Filaments* often rather hairy towards the base. *Pistillate catkins* with short sub-leafy peduncles, cylindrical, up to about 3 cm. long, lengthening in fruit to about twice the length. *Bracts* more or less oval and hairy. *Ovary* stalked, elongate, hairy or glabrous. *Styles* long and rather slender. *Stigmas* large, usually bifid, yellowish-green. *Capsules* pubescent or (usually) glabrous; May and June.

Some Swedish authorities, e.g., Enander (*Sal. Scand.* iii (1910)), maintain that the ovaries and capsules of *S. nigricans* are invariably glabrous, and that all plants which appear to be *S. nigricans* having pubescent ovaries and capsules are *S. nigricans* × *phylicifolia*. Smith, however, who is the author of the species, described its ovaries as being pubescent, and maintained this to the end (vide *Eng. Fl.* iv, 172, 1828). The great majority of botanists now recognise that this, like other species of this section of the genus, may have either glabrous or pubescent ovaries. Enander (*op. cit.* p. ix) writes the name thus:—"*S. nigricans* [♂ Sm. atque ♀ (Fr. ex p.)]," a cumbersome and non-permissible method of citation: not only so, but it obscures the fact that Fries himself issued specimens of *S. nigricans*, some of which have glabrous ovaries and others of which have pubescent ovaries.

White (in *Trans. and Proc. Perthshire Soc. Nat. Sc.* i, pt. iv, 179 (1890)) states that as represented by the specimens in his herbarium, "which have not been selected with any special purpose in this respect, glabrous capsules occur in 34 bushes of *S. nigricans* and in 4 of *S. phylicifolia*, and more or less pubescent capsules in 27 bushes of *S. nigricans* and 14 bushes of *S. phylicifolia*. It would seem from this that pubescent capsules are comparatively commoner in *S. phylicifolia*—the more glabrous plant in other respects—than in *S. nigricans*."

(*α*) subvar. **leiocarpa** nobis; *S. nigricans* var. *leiocarpa* Godet *Fl. Jura* 647 (1853); A. et G. Camus *Classif. Saul.* 199 (1904). *Capsules* glabrous.

(*β*) subvar. **eriocarpa** nobis; *S. nigricans* var. *eriocarpa* Koch *Syn.* 651 (1837); *S. nigricans* var. *hebecarpa* A. et G. Camus *Classif. Saul.* 200 (1904). *Capsules* pubescent.



Map 9. Distribution of *Salix nigricans* in the British Isles

Stream-sides in northern and hilly districts; indigenous from Lancashire and Yorkshire to Ross-shire and Orkney; perhaps always planted in England south of Lancashire and Yorkshire, e.g., in Warwickshire, Norfolk, Herefordshire, Oxfordshire, and Surrey; there are rather old records of it for the north of Ireland, but Praeger (*Irish Top. Bot.* p. 284) says "its rediscovery is desirable"; planted in co. Westmeath; ascending to about 610 m. in the Highlands.

Scandinavia (northwards to 71° N., ascending to 1330 m.), Denmark, Germany, France, central Europe, Spain, Corsica, Italy (ascending to 2000 m.), Balkan peninsula; Syria and the Urals eastwards to Kamtchatka.

S. arbuscula × *nigricans* (cf. page 48, footnote).

S. aurita* × *nigricans Gürke *Plant. Eur.* ii, 20 (1897); A. et G. Camus *Classif. Saul.* ii, 143 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 247 (1909); *S. coriacea* [Schleicher *Cat. Sal.* (1809) ex] Seringe *Essai* 68 (1815) nomen; Forbes *Sal. Woburn.* 223 (1829); × *S. coriacea* White in *Journ. Linn. Soc.* xxvii, 409 (1890).

Icones:—Forbes *Sal. Woburn.* t. 112, as *S. coriacea*; t. 119, as *S. grisophylla*; A. et G. Camus *op. cit.*, *Atlas* ii, t. 8 (41) fig. F—G, K—L; et t. 16 (49) fig. Q—T, as × *S. coriacea.*

Camb. Brit. Fl. ii. *Plate 44.* (*a*) Shoot with staminate catkins. (*b*) Barren shoot. (*c*) Staminate flowers (enlarged). Perthshire (E. S. M.).

Exsiccata:—Heidenreich; E. F. et W. R. Linton, 56 [Enander suggests that this is *S. nigricans*]; herb. Marshall, 680, 2771, 2964, 2995.

Small shrub. Very similar to *S. cinerea* × *nigricans*, but distinguishable by the smaller and more rugose *laminae* which are less persistently pubescent, by the smaller and narrower *catkins* on short peduncles, and by the smaller *capsules* which are stalked and more or less pubescent.

Not often recorded, and local if not really rare; from the North Riding of Yorkshire to Perthshire and Forfarshire; Ireland—co. Westmeath.

Scandinavia, Germany, Switzerland.

S. caprea* × *nigricans Wimmer *Sal. Eur.* 226 (1866)!; A. et G. Camus *Classif. Saul.* ii, 181 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 243 (1909); *S. latifolia* Forbes *Sal. Woburn.* 235 (1829); × *S. badensis* Döll *Fl. Baden* 519 (1859); × *S. latifolia* Andersson in DC. *Prodr.* xvi, pt. ii, 249 (1868); White in *Journ. Linn. Soc.* xxvii, 406 (1890).

Icones:—Forbes *Sal. Woburn.* (1829) t. 118, as *S. latifolia*; A. et G. Camus *op. cit.*, *Atlas* t. 11 (44) fig. L—O, as × *S. latifolia.*

Exsiccata:—Leefe, ii, 52 et ii, 53, as *S. latifolia*; E. F. et W. R. Linton, 38.

Very rare; Dumfriesshire, Perthshire, and Forfarshire.

Also recorded for northern Scandinavia, Finland, Germany, and central Europe.

S. cinerea* × *nigricans Wimmer in *Denkschr. Schles. Gesellsch.* 169 (1853)!; *Sal. Eur.* 224 (1866); A. et G. Camus *Classif. Saul.* 329 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 241 (1909); Rouy *Fl. France* xii, 240 (1910); × *S. puberula* Döll *Fl. Baden* 518 (1859); × *S. strepida* White in *Journ. Linn. Soc.* xxvii, 408 (1890).

Icones:—Forbes *Sal. Woburn.* t. 100 (1829) as *S. strepida*; t. 106, as *S. firma*; t. 107, as *S. ansoniana*[1]; t. 117, as *S. vaudensis*; A. et G. Camus *op. cit.*, *Atlas* t. 30, fig. A—F, as × *S. puberula.*

Exsiccata:—E. F. et W. R. Linton, 93 (ex hort. Kew.); Heidenreich; Schultz, x, 922; Wimmer (*Sal. Wimmeri Rel.*).

Shrubs, intermediate between *S. cinerea* and *S. nigricans*, and bridging the gap between them. *Young branches* pubescent. *Laminae* obovate-elliptical, up to about 6 cm. long and 2·5 broad, more or less pubescent especially underneath, larger and more persistently hairy than in *S. cinerea* × *phylicifolia.* *Catkins* peduncled, appearing a little before the leaves; April. *Style* rather long. *Stigmas* usually bifid. *Capsules* usually elongate, pubescent, stalked; May.

Not often recorded (especially staminate plants), but perhaps not really rare; from the North Riding of Yorkshire to Forfarshire.

Sweden, Finland, Germany, France, central Europe, Russia.

S. lapponum × *nigricans* (see page 37); *S. myrsinites* × *nigricans* (see page 33); *S. nigricans* × *phylicifolia* (see page 47); *S. nigricans* × *purpurea* (see page 67).

S. nigricans* × *repens [Heidenreich *in litt.*] Wimmer *Sal. Eur.* 239 (1866); White in *Journ. Linn. Soc.* xxvii, 394 (1890); A. et G. Camus *Classif. Saul.* ii, 183 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 256 (1909).

[1] After Thomas, first Viscount Anson (1767—1843).

Icones :—A. et G. Camus *op. cit.*, *Atlas* ii, t. 11 (44) fig. P—R (1905) as × *S. felina.*

Exsiccata :—Kihlman (*Pl. Finl. Exs.*), 176; herb. Marshall, 700.

The Rev. E. F. Linton states (*Journ. Bot.* xxxiv, 468 (1896)) that he failed to produce this hybrid artificially.

Rare and critical; recorded for Perthshire.

Also recorded for Sweden, Germany, and central Europe.

S. nigricans* × *reticulata Gürke *Plant. Eur.* ii, 38 (1897); A. et G. Camus *Classif. Saul.* ii, 195 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 327 (1910); × *S. semireticulata* White in *Journ. Linn. Soc.* xxvii, 444 (1890)!.

Exsiccata :—Herb. White[1], 403.

Young branches long, slender, trailing. *Stipules* usually caducous. *Petioles* about a quarter as long as the laminae. *Laminae* broadly elliptical, truncate or subcordate at the base, serrate-crenate or entire, more or less hairy above when young, at maturity dark green above, shining, rugose, about 1·3—2·5 cm. long and 1·3—2·0 broad. *Catkins* lateral, on leafless peduncles about as long as the catkins, ovate, small, dense-flowered. *Nectaries* much longer than the gynophore. *Style* short. *Stigmas* as long as the style, stout, bifid. *Capsules* shortly stalked, almost or quite glabrous at maturity.

White has two sheets of type-specimens (no. 402). With regard to them the Rev. E. F. Linton suggests that the plant is *S. herbacea* × *nigricans.*

Found by Mr James Brebner, of Dundee, in Perthshire, at an altitude of about 950 m.; a critical plant.

Also recorded for the Tyrol by Gürke (*loc. cit.*).

13. SALIX PHYLICIFOLIA. Tea-leaved Willow. Plates 45; 46, 68

Salix phylicifolia L. *Sp. Pl.* 1016 (1753) excluding var. *β*; Smith in *Trans. Linn. Soc.* vi, 123 (1802); Syme *Eng. Bot.* viii, 237 (1868); A. et G. Camus *Classif. Saul.* 189 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 140 (1909); *S. bicolor* Ehrhart *Beitr.* v, 162 (1790), nomen, non Smith; *S. tenuifolia* Smith *Fl. Brit.* 1052 (1804) including *S. radicans*, p. 1053; *S. weigeliana* Willdenow *Spec. Pl.* iv, 678 (1806); Wimmer *Sal. Eur.* 76 (1866); *S. arbuscula* var. *weigeliana* A. Kerner in *Verhandl. Wien* x, 208 (1860).

Icones :—Smith *Eng. Bot.* t. 1146, as *S. crowiana*[2]!; t. 1958, as *S. phylicifolia*!; t. 2186, as *S. tenuifolia*!; Borrer in *Eng. Bot. Suppl.* t. 2650, as *S. tenuior*!; t. 2656, as *S. weigeliana*!; t. 2701, as *S. davalliana*[3]!; Forbes *Sal. Woburn.* t. 52, as *S. crowiana*; t. 46, as *S. phylicifolia*; t. 54, as *S. floribunda*; t. 48, as *S. wulfeniana*; t. 47, as *S. davalliana*; t. 50, as *S. tenuifolia*; *Fl. Dan.* t. 2856; Reichenbach *Icon.* t. 563, fig. 2001 [1201], as *S. maialis*; fig. 2002 [1202], as *S. weigeliana*; Hartig *Forst. Culturpfl.* t. 110 (35 g); A. et G. Camus *op. cit.*, *Atlas* t. 19.

Camb. Brit. Fl. ii. *Plate 45.* (*a*) Shoot with staminate catkins. (*b*) Shoot with pistillate catkins. (*c*) Barren shoot. (*d*) Pistillate flower. (*e*) Pistillate flowers (enlarged).

Exsiccata :—Fellman, 212, 213; Fries, iii, 54; viii, 61, as *S. phylicifolia* var. *tenuifolia*; A. et J. Kerner (*H. S. A.*), 16, 32, as *S. bicolor*; Leefe, 72, as *S. tenuior*; 76, 77, 78 (with coherent stamens), 79, as *S. weigeliana*; 80, 81, 83 ("the same plant as Smith's"), as *S. crowiana*; i, 25, ii, 44, iv, 83, as *S. bicolor*; ii, 42, as *S. davalliana*; iii, 60, iii, 62, iv, 88, iv, 100; E. F. et W. R. Linton, 40; 41, as *S. phylicifolia* var. *weigeliana*; 66, as *S. phylicifolia* forma *leiocarpa*; Reichenbach, 1629, 1630, as *S. bicolor*; Tausch, as *S. weigeliana*; as *S. bicolor* var. *androgyna*; Wirtgen, xv, 847; *Herb. Fl. Ingric.*, iv, 570.

Shrub. *Branches* glabrous at least at maturity, polished. *Buds* narrow, acute, glabrous, yellow. *Stipules* caducous or minute. *Petioles* usually short. *Laminae* elliptical or oblong-elliptical, rounded at the base, subentire to minutely crenate-serrate, subacute, upper surface yellowish-green, smooth and shining, subglaucous underneath, glabrous at least at maturity, not turning black when dried. *Catkins* shortly peduncled with 2—4 basal leaves, peduncles often more or less pubescent, appearing a little before or along with the leaves; late April and May. *Bracts* usually narrow, obtuse. *Staminate catkins* ovoid-elliptical, about 2·5 cm. long or rather less. *Pistillate catkins* oblong-elliptical, about 3 cm. long, lengthening considerably in fruit. *Ovaries* pubescent or less frequently glabrous, stalked. *Styles* rather long. *Stigmas* rather large and stout, bifid, yellowish-green.

[1] White's plants are preserved in the Perthshire Natural History Museum, Perth.

[2] After James Crowe (d. 1807).

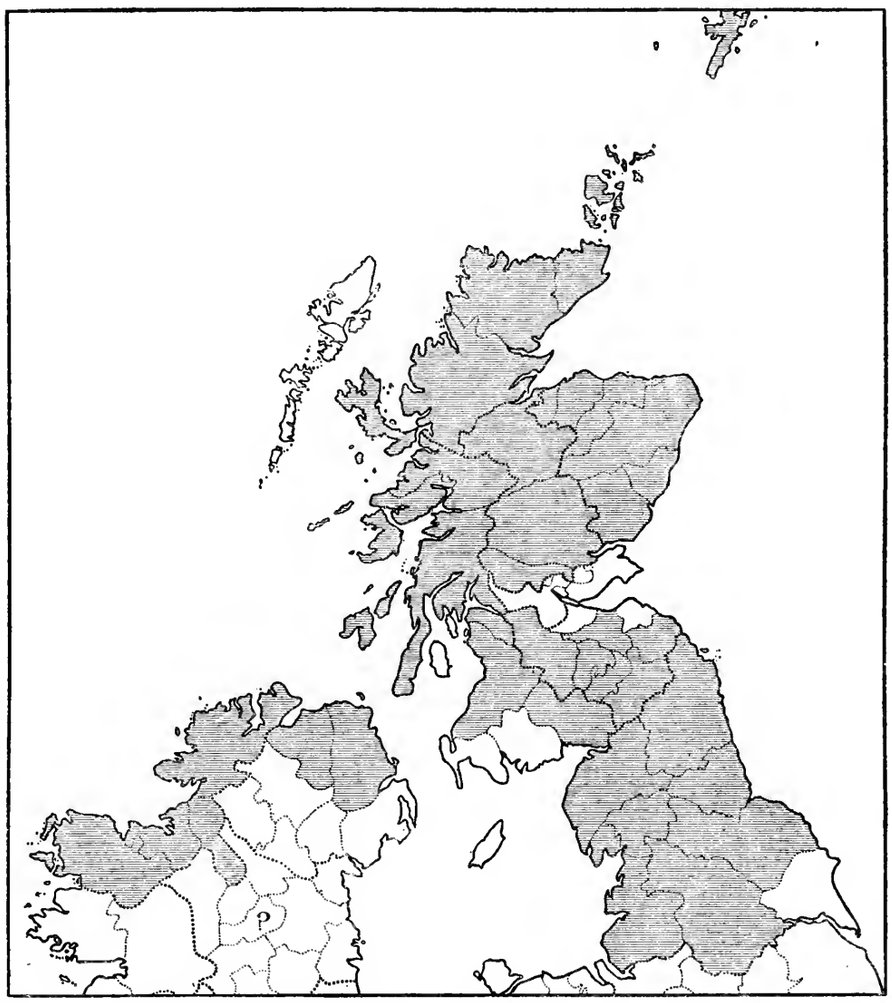
[3] After "my late friend Mr [Edmund] Davall" (1763—1798) (Smith *Eng. Fl.* iv, 176 (1828))

Smith and Borrer described a large number of "species" belonging to the series *Phylicifoliae*; and some continental authorities have several varieties of both *S. phylicifolia* and *S. nigricans*. Of these forms, Arnott (in Hooker and Arnott *Brit. Fl.* ed. 6, 395 (1850)) writes:—"We can find no good characters to distinguish the...supposed species; and notwithstanding we have been supplied with cultivated specimens by Mr Borrer..., we cannot refer our wild ones (and those we have ourselves obtained from gardens) with certainty to any of them, so variable is the foliage...."

We retain *S. phylicifolia* and *S. nigricans* as species, though we confess that many plants of the series *Phylicifoliae* conform neither to one nor to the other; but still less do they conform to any other species. We believe the two species hybridise freely, and that many of Smith's and Borrer's plants (most of which are cited by us among the synonymy of the species in question and their hybrids) are more or less complicated hybrids of the two species. We also believe that the matter is even more complicated by many of the doubtful plants having been crossed with other allied species, and that it is not possible to name, with any approach to accuracy, a large number of forms which occur both in the wild state and in cultivation.

Stream-sides and woods from Lancashire and the West Riding of Yorkshire northwards to Zetland, ascending to about 610 m. in Perthshire. In Ireland, apparently very rare; co. Mayo, co. Sligo, co. Leitrim, co. Donegal, co. Antrim, and co. Londonderry; planted in co. Westmeath (Praeger *Irish Top. Bot.* p. 284).

Faeröes, Iceland, Norway (ascending to 1300 m.), Sweden (northwards to 71° N.), Denmark, Germany, France, central Europe (to 1900 m. in the Tyrol), Russia, Pyrenees; Asia—from Siberia to northern China.



Map 10. Distribution of *Salix phylicifolia* in the British Isles

S. arbuscula* × *phylicifolia Wimmer in *Denkschr. Schles. Gesellsch.* 169 (1853); Floderus in *Bih. Sv. Vet.-Akad. Handl.* xvii, iii, i, 47 (1891); A. et G. Camus *Classif. Saul.* ii, 176 (1905); *S. myrtilloïdes* Smith *Fl. Brit.* 1056 (1804) non L.; *S. dicksoniana*[1] Smith *Eng. Bot.* no. 1390 (1805); *S. phylicifolia* var. *dicksoniana* Syme *Eng. Bot.* viii 238 (1868); × *S. dicksoniana* White in *Journ. Linn. Soc.* xxvii, 412 (1890).

Icones:—Smith *Eng. Bot.* t. 1390, as *S. dicksoniana*; A. et G. Camus *op. cit.*, *Atlas* ii, t. 15 (48) fig. Z, as × *S. dicksoniana*.

Exsiccata:—Leefe, i, 11, et i, 12 ("received from Mr Borrer as the plant of Smith"), as *S. dicksoniana*; herb. Marshall, 68, 2117 (but Enander suggests that these are *S. nigricans* × *phylicifolia*), 2118 (but Enander suggests that this is *S. nigricans*).

Dwarf undershrub, about a third of a metre high, glabrous. *Laminae* elliptical, serrate, subacute, about 3—5 cm. long. *Catkins* sessile or subsessile, appearing before the leaves; April. *Bracts* hairy. *Style* short. *Stigmas* large, stout, yellow, undivided at least when young. *Capsules* hairy, stalked. Staminate plants unknown.

White thought that *S. dicksoniana* Smith might perhaps be a hybrid of *S. arbuscula* and *S. phylicifolia*.

Very rare and critical. Sent to Sir J. E. Smith by Dickson from "the Highlands of Scotland," and by Winch "from Scotland." White puts it that Winch's plant came from the Breadalbane mountains of Perthshire; but it has never been rediscovered.

S. arbuscula × *phylicifolia* has been recorded for northern Scandinavia.

[1] "Its name commemorates that great British botanist [James Dickson (1738—1822)] who discovered it among his own native hills, and who has gathered and discriminated more species perhaps of this genus than any other person" (Smith *Eng. Fl.* iv, 196 (1828)).

S. aurita* × *phylicifolia Schmalhausen in *Bot. Zeit.* xxxiii, 571 (1875); E. F. et W. R. Linton *Journ. Bot.* xxx, 360 (1892); A. et G. Camus *Classif. Saul.* ii, 142 (1905); × *S. ludificans* White in *Journ. Linn. Soc.* xxvii, 405 (1890)!.

Exsiccata:—E. F. et W. R. Linton, 58; Kihlman (in herb. White), as *S. aurita* × *phylicifolia* (June, 1885); herb. Marshall, 684, 2890, 2954, 3158.

Shrub. *Young branches* somewhat polished, glabrous at maturity. *Stipules* usually persistent. *Petioles* about 1 cm. long or rather more. *Laminae* elliptical to slightly obovate or narrowly ovate, margin crenulate, more or less rugose, glabrous at maturity, subglaucous underneath. *Catkins* rather small, on more or less leafy peduncles, cylindrical; late April. *Bracts* hairy. *Stigmas* very variable in size. *Capsules* stalked, pubescent; early June.

The Rev. E. F. Linton (*Journ. Bot.* xxxiv, 466) does not think that the plants on which White founded his × *S. ludificans* are hybrids of *S. aurita* and *S. phylicifolia*, but believes that no. 59 of his own published set is of this parentage. To our eyes, White's plants and Linton's no. 58 seem to be correctly named; but we doubt the name which Linton applies to his no. 59. MM. Camus (*loc. cit.*) also cite Linton's no. 59 with doubt; and Enander suggests it is *S. nigricans* × *phylicifolia*, and this view we accept. Our plate 46 is of the same form as Linton's no. 59.

Rare; Dumfriesshire, Ayrshire, Perthshire, Banffshire, Caithness-shire.

Northern Scandinavia, Finland, Russia.

S. aurita × *phylicifolia* × *purpurea*? (see page 57).

S. caprea* × *phylicifolia Wimmer in *Denkschr. Schles. Gesellsch.* 167 (1853); A. et G. Camus *Classif. Saul.* ii, 167 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 244 (1909); *S. laurina* Smith in *Trans. Linn. Soc.* vi, 122 (1802)!; Syme *Eng. Bot.* viii, 235 (1868); *S. bicolor* Smith *Fl. Brit.* 1048 (1804)! nec Ehrhart; *S. phylicifolia* var. *laurina* Koch *Syn.* ed. 2, 751 (1844); *S. caprea* × *weigeliana* Wimmer *Sal. Eur.* 215 (1866)!; × *S. laurina* Andersson in DC. *Prodr.* xvi, pt. ii, 250 (1868); White in *Journ. Linn. Soc.* xxvii, 402 (1890)!.

Icones:—Smith *Eng. Bot.* t. 1806, as *S. bicolor*; Forbes *Sal. Woburn.* t. 38, as *S. bicolor*; *Fl. Dan.* t. 2855, as *S. laurina*; Reichenbach *Icon.* t. 564, fig. 2004 [1204], as *S. laurina*; A. et G. Camus *op. cit.*, *Atlas* ii, t. 10 (43) fig. O—Q′, as × *S. laurina*.

Exsiccata:—Leefe, 73; i, 3; ii, 38; as *S. laurina*; herb. Marshall, 39, 712, 2892; Reichenbach, 2417, as *S. laurina*; Wimmer (*H. S.*) 68, as *S. laurina*; Wirtgen, vi, 260, as *S. laurina*; *Herb. Fl. Ingric.*, as *S. laurina*.

Shrub or small tree. *Young branches* suberect, long, brown, brittle, pubescent when young, glabrous at maturity. *Stipules* subcordate, serrate, acute. *Petioles* pubescent on the upper side, broad at the base, variable in length even on the same tree. *Laminae* large, up to about 5·0—7·5 cm. long and about 2·5 broad, somewhat rounded at the base, margin often faintly and remotely toothed, sometimes slightly revolute, apex terminating in a short broadish point, upper surface shining and dark green, lower surface subglaucous, pubescent when young, smooth, not blackening much on drying. *Catkins* appearing before the leaves; April and May, later than *S. caprea*; shortly peduncled, peduncles with a few silky leaves at the base. *Bracts* oblong to obovate, brown towards the apex, with long hairs. *Ovaries* ovate-lanceolate, on long stalks, densely pubescent with snow-white hairs. *Style* distinct, rather shorter than the stigmas. *Stigmas* rather thick, usually not bifid.

The Rev. E. F. Linton regards *S. laurina* Smith as *S. cinerea* × *phylicifolia*.

Rather rare and critical; not indigenous south of the mid-Pennines; Norfolk (Smith *Eng. Fl.* iv, p. 178), Warwickshire, Staffordshire, North Riding of Yorkshire, Dumbartonshire, Linlithgowshire, Perthshire, Banffshire, western Inverness-shire, Isle of Skye; Ireland (doubtfully indigenous)—co. Derry and co. Antrim (Syme, *op. cit.*). Other records, of a more or less doubtful nature, are given by Watson (*Top. Bot.* ed. 2, 376 (1883)).

Recorded also for Scandinavia, Denmark, Germany, and Russia.

[***Salix caprea* × *cinerea* × *phylicifolia*** A. et G. Camus *Classif. Saul.* ii, 275 (1905); v. Seemen in Ascherson und Graebner *Syn.* 243 (1909); *S. caprea* × *cinerea* × *weigeliana* Wichura *Bastardbefr. im Pflanzeur.* 61 (1865); × *S. tephrocarpa* Wimmer *Sal. Eur.* 205 (1866); White in *Journ. Linn. Soc.* xxvii, 406 (1890)!.

White states that a plant found by Mr C. M'Intosh in Perthshire "agrees pretty well with the description of *S. tephrocarpa*." On one of White's sheets, the Rev. E. F. Linton has written:—"Probably *S. caprea* × *cinerea* × *phylicifolia*: good evidence of all three." To us, some of White's specimens appear to resemble very closely plants named *S. aurita* × *phylicifolia*. The complicated hybrid is also recorded for Germany and "*S. tephrocarpa*" is known in botanical gardens.]

S. cinerea* × *phylicifolia Hjelt in *Med. Soc. Faun. et Fl. Fenn.* xi, 170 (1885); E. F. et W. R. Linton in *Journ. Bot.* xxx, 359 (1892); A. et G. Camus *Classif. Saul.* 337 (1904); × *S. wardiana*[1] White in *Journ. Linn. Soc.* xxvii, 403 (1890)!.

[1] After James Ward (d. 1873), "a diligent and sagacious student of British willows" (White, *op. cit.*).

Icones :—A. et G. Camus *op. cit.*, *Atlas* t. 31, fig. S—U (1904) as × *S. wardiana.*

Exsiccata :—Leefe, 43 ("I should refer it to *aquatica*, Borrer": "mihi *S. laurinae* forma," Andersson); iii, 60 (the same plant as the foregoing), as *S. phylicifolia* ("*S. laurinae* Sm., proxima," Leefe); i, 3, as *S. laurina*; iii, 62, as *S. phylicifolia* ("*S. laurinae* Sm., proxima," Leefe); E. F. et W. R. Linton, 14; herb. Marshall, 49.

Shrubs, intermediate between the putative parents, and completing the transition. *Young branches* less hairy than in *S. cinerea.* *Laminae* ovate-lanceolate, smaller than in *S. caprea* × *phylicifolia*, less hairy at maturity than in *S. cinerea* or *S. cinerea* × *nigricans.* *Catkins* smaller than in *S. cinerea* and *S. caprea* × *phylicifolia*; May. *Style* longer than in *S. cinerea.* *Stigmas* often bifid, yellowish or reddish. *Capsules* subglabrous or pubescent, stalked; June.

The putative hybrids *S. caprea* × *phylicifolia* and *S. cinerea* × *phylicifolia* are with difficulty distinguished from each other; and, until the hybrids have been artificially produced, the difficulties cannot be overcome.

Perthshire, Forfarshire, and doubtless elsewhere.

Also recorded for Scandinavia and France.

[*S. herbacea* × *phylicifolia*

Exsiccata :—E. F. et W. R. Linton, 108 ("arte facta ex *S. herbacea* ♀ × *S. phylicifolia* ♂": Enander suggests that this is "*S. phylicifolia* var."; but perhaps he failed to notice that the specimen was produced by artificial crossing).

Laminae ovate to obovate, rather smaller than in *S. phylicifolia*, rather dull above, subglaucous underneath. *Catkins* up to about 2·5 cm., on short peduncles, with a few leaves at the base, ? lateral; April. *Bracts* narrow. *Ovaries* shortly stalked, about 3—4 mm. long, pubescent. *Styles* rather long. *Capsules* stalked, thinly pubescent.

As in this work we follow Enander in regarding × *S. grahami* and × *S. moorii* as forms of *S. herbacea* × *lapponum*, there is no record left of a natural British hybrid of *S. herbacea* × *phylicifolia.* Floderus (in *Bih. Sv. Vet. Akad. Handl.* xvii, iii, i, 50 (1891)) has a record for Sweden.]

S. lapponum* × *phylicifolia Wimmer in *Denkschr. Schles. Gesellsch.* 168 (1853); Kihlman in *Med. Soc. Faun. et Fl. Fenn.* xiii, 248 (1886); *Floderus* in *Bihang Kongl. Sv. Vet.-Akad. Handl.* xvii, iii, i, 40 (1891); E. F. et W. R. Linton in *Journ. Bot.* xxx, 362 (1892); A. et G. Camus *Classif. Saul.* ii, 173 (1905); × *S. gilloti* A. et G. Camus *Classif. Saul.* 365 (1904).

Icones :—A. et G. Camus, *op. cit.*, *Atlas* t. 33, fig. B—C, ? D, as × *S. gilloti.*

Exsiccata :—E. F. et W. R. Linton, 53, as *S. lapponum* forma; 85, 86 (but Enander suggests that these are *S. nigricans* × *phylicifolia* ?).

Undershrub. *Young branches* shining. *Stipules* caducous or small. *Petioles* about 2 mm. long. *Laminae* oblong-lanceolate, rounded at the base, margin entire or subentire, acuminate, about 7 cm. long and 3 broad. *Catkins* peduncled, leafy at the base, dense-flowered. *Bracts* discolorous, hairy. *Capsules* rather stout, hairy, shortly stalked.

Recorded for Perthshire and Forfarshire.

Sweden, France, and Russia.

S. myrsinites × *phylicifolia* (see page 33).

S. nigricans* × *phylicifolia Wimmer in *Denkschr. Schles. Gesellsch.* 168 (1853); White in *Journ. Linn. Soc.* xxvii, 400 (1890); A. et G. Camus *Classif. Saul.* ii, 169 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 234 (1909); *S. tetrapla* [Walker *Essays* 408 (1812) nomen] Smith *Eng. Fl.* iv, 177 (1828); *S. nigricans* × *weigeliana* Wimmer *Sal. Eur.* 217 (1866)!.

Icones :—Borrer in *Eng. Bot. Suppl.* t. 2619 (1830), as *S. borreriana*[1]!; t. 2655 (1830), as *S. nitens*; t. 2660 (1830), as *S. phillyreïfolia*; t. 2702 (1831), as *S. tetrapla*; t. 2729 (1832), as *S. propinqua*; t. 2749 (1832), as *S. laxiflora*; t. 2795 (1835), as *S. tenuifolia*; A. et G. Camus *op. cit.*, *Atlas* ii, t. 10 (43), fig. R—T′ Forbes *Sal. Woburn.* (1905), as × *S. tetrapla.*

Camb. Brit. Fl. ii. *Plate 46.* (*a*) Shoot with staminate catkins. (*b*) Shoot with pistillate catkins. (*c*) Barren shoots. (*d*) Staminate flowers. (*e*) Staminate flowers (enlarged). (*f*) Pistillate flowers (enlarged).

Exsiccata :—Leefe, 75, as *S. propinqua*; 82, as *S. nitens*; 84, 85, et i, 5, et i, 8, as *S. tetrapla*; i, 7, as *S. phillyreïfolia*; ii, 26, as *S. borreriana*[1]; iii, 68, as *S. tenuifolia*; E. F. et W. R. Linton, 21, 42, 43; 59, as *S.*

[1] *S. borreriana* Smith *Eng. Fl.* iv, 174 (1828)!; after William Borrer (1781—1862).

aurita × *phylicifolia*; 97 [*fide* Enander], as *S. arbuscula* × *nigricans*[1]; 103; 104, as *S. nigricans* × *phylicifolia*?; herb. Marshall, as *S.*? *myrsinites* × *phylicifolia*; 704, as *S. phylicifolia* × *repens*; 1169, as *S. arbuscula* × *nigricans.*

In the field, many plants occur which cannot be referred positively either to *S. phylicifolia* or to *S. nigricans*, but which are obviously more or less intermediate between them. The intermediates fill the rather narrow gap between the two species; and it seems hopeless therefore to frame a description which will include all the intermediates and exclude the two supposed parents and their varieties. As there is no experimental knowledge to draw upon, the only available method of determining the supposed hybrids is to become acquainted with the characters of the two species, and to regard as possible hybrids those examples which then appear to be intermediate, and which only occur in localities where both species are found. It is found that such intermediates frequently possess the duller and more pubescent twigs and leaves of *S. nigricans* and perhaps its larger stipules combined in varying degrees with the more shining and glabrous twigs and leaves and the smaller stipules of *S. phylicifolia.* It is obvious, however, that little agreement can be expected at present either in the determinations of these supposed hybrids or their putative parents.

With the parents; Ireland—planted in co. Westmeath.

Hybrids of *S. nigricans* and *S. phylicifolia* have also been recorded for Scandinavia, Germany, northern Russia, and central Europe; but most of the records for central Europe refer to cultivated plants. Doubtless, however, the hybrids in question are as widespread as the putative parents.

S. phylicifolia × *purpurea* (see page 67).

S. phylicifolia* × *repens Andersson *Monogr. Sal.* 156 (1867); A. et G. Camus *Classif. Saul.* ii, 170 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 257 (1909); *S. schraderiana* Willdenow *Sp. Pl.* iv, 695 (1806); × *S. schraderiana* Andersson in DC. *Prodr.* xvi, pt. ii, 251 (1868).

Icones:—Reichenbach *Icon.* t. 564, fig. 2003 [1203], as *S. phylicifolia, fide* Andersson, *loc. cit.*; A. et G. Camus *op. cit., Atlas* ii, t. 10 (43) fig. U—Z′, as × *S. schraderiana.*

Exsiccata:—E. F. et W. R. Linton, 95; herb. Marshall, 704, 711; Wimmer (*Sal. Wimmeri Rel.*), as *S. schraderiana.*

Rare and critical. White (*op. cit.*, p. 395) thought this might be a British plant. Since then, it has been recorded for Perthshire and Aberdeenshire.

Recorded also for Sweden, Germany, and central Europe. Known best as a plant of Botanic Gardens, often under the name of *S. bicolor.*

Series xi. *ROSMARINIFOLIAE*

Rosmarinifoliae Borrer in Hooker *Brit. Fl.* 419 (1830) including *Fuscae* p. 420; *Argenteae* Koch *Sal. Comment.* 46 (1828); v. Seemen in Ascherson und Graebner *Syn.* iv, 123 (1909); *Repentes* A. et G. Camus *Classif. Saul.* 45 (1904); v. Seemen *op. cit.* p. 58.

For characters, see page 29.

Species and hybrid of *Rosmarinifoliae*

[**S. rosmarinifolia** (see below). *Laminae* longer and narrower than in *S. repens*, about 6 or more times as long as broad, about 7—12 nerved. *Catkins* ovoid or subglobose, sessile or subsessile.]

14. **S. repens** (p. 49). *Laminae* not more than about 3 times longer than broad and often much broader, about 5—7 nerved. *Catkins* usually more elliptical. *Pistillate catkins* often distinctly peduncled.

S. repens* × *viminalis (p. 51). *Young branches, buds, leaves* and *catkins* stouter than in *S. rosmarinifolia* to which it has a superficial resemblance.

[†SALIX ROSMARINIFOLIA]

Salix pumila rhamni secundi clusii folio Dillenius in Ray *Syn.* ed. 3, 447 (1724).

Salix rosmarinifolia L. *Sp. Pl.* 1020 (1753); Smith *Fl. Brit.* 1062 (1804)!, including *S. arbuscula* p. 1050!; Syme *Eng. Bot.* viii, 248 (1868); *S. repens* subsp. *rosmarinifolia* A. et G. Camus *Classif. Saul.* ii, 78 (1905); *S. repens* race *rosmarinifolia* v. Seemen in Ascherson und Graebner *Syn.* iv, 127 (1909); Rouy *Fl. France* xii, 208 (1910).

Icones:—Smith *Eng. Bot.* t. 1365; t. 1366, as *S. arbuscula*; Forbes *Sal. Woburn.* t. 87; t. 86, as *S. arbuscula*; *Fl. Dan.* t. 2556; Reichenbach *Icon.* t. 588, fig. 2038 [1238], as *S. angustifolia*; t. 591, fig. 1242; Hartig *Forst. Culturpfl.* t. 50.

[1] *S. arbuscula* × *nigricans* Brügger in *Jahres. Naturf. Gesellsch. Graub.* xxiii et xxiv, 117 (1880) nomen; × *S. kraettliana* Brügger *op. cit.*, xxv, 105 (1882). Judging by Enander's identifications of British plants referred to *S. arbuscula* × *nigricans*, this putative hybrid can scarcely at present be admitted as British.

Exsiccata:—Fries, vi, 56; A. et J. Kerner, 79, 80, as *S. angustifolia*; Leefe, i, 19 ("received from Mr Borrer many years ago as the plant of Smith, but not as a British species"); i, 24 ("received originally from the Cambridge Botanic Garden as *S. arbuscula*); E. F. et W. R. Linton, 72, as *S. repens* var. *rosmarinifolia* (ex hort. Kew.); *Herb. Fl. Ingric.* v, 74.

Undershrub or dwarf undershrub, with creeping rhizomes. *Young branches* slender, often more or less tomentose, often ultimately glabrous. *Stipules* often caducous, small, lanceolate. *Petioles* usually very short. *Laminae* linear or linear-lanceolate, about 6 or more times as long as broad, with about 8—12 pairs of lateral veins, often with white silky silvery hairs underneath. *Catkins* small, oval or subglobose, sessile or subsessile; April. *Bracts* oboval, hairy. *Stamens* with very long filaments. *Style* rather short or almost absent. *Stigmas* reddish. *Capsules* usually hairy, stalked; May.

There are two or three old unlocalised records of this species (see Smith *Eng. Bot.* iv, 214 (1828)), and a definite one by Winch (*Fl. Northumb. and Durham* 63 (1831); cf. also Winch *Bot. Guide* i, 70 (1805)) from the "banks of the Derwent, Friar Side, near Ebchester," Durham. This last record is supported by a specimen in herb. Forster (in Herb. Mus. Brit.), from the "banks of Derwent, Durham," and is by Winch. There is also a specimen in Herb. Univ. Cantab. sent by Winch, from Scotland.

There is a remarkable similarity about the British history of *S. rosmarinifolia* and *S. helvetica* (see page 38). There is the same early confusion of names, then later the same correct but garden specimens finding their way into herbaria, then the same correct specimens "from Scotland," then the same localised record by Winch, and finally the same unanimity among mid-nineteenth century systematists in ignoring Winch's localised records. We can scarcely assume that these botanists were unfamiliar with Winch's records: perhaps they thought he mixed his specimens or planted specimens (as not a few botanists have done, thinking it no wrong) in order to "enrich" our flora. In any case, confirmation of these records is desirable.

Southern Scandinavia, eastern Denmark, Germany, France(?)[1], central Europe, Russia, Italy; Asia, eastwards to the Amur region.

14. SALIX REPENS. Creeping Willow. Plates 47, 48; 40, 54, 68

Salix humilis Gerard *Herb.* 1205 (1597); *S. pumila angustifolia inferne lanuginosa* Ray *Syn.* ed. 3, 447 (1724); *S. pumila angustifolia prona parte cinerea* Ray *loc. cit.*; *S. alpina pumila rotundifolia repens inferne subcinerea* Dillenius in Ray *op. cit.*, p. 448; *S. pumila foliis utrinque candicantibus et lanuginosis* [= var. *argentea*] Dillenius in Ray *Syn.* ed. 3, 447 (1724).

Salix repens L. *Sp. Pl.* 1020 (1753) including *S. incubacea* et *S. fusca* et *S. arenaria* part.; Syme *Eng. Bot.* viii, 246 (1868); A. et G. Camus *Classif. Saul.* 161 (1904) excluding subsp. *rosmarinifolia* ii, p. 78; v. Seemen in Ascherson und Graebner *Syn.* iv, 123 (1909) excluding race *rosmarinifolia* p. 127; Rouy *Fl. France* xii, 207 (1909) excluding race *rosmarinifolia* p. 208.

Icones:—*Fl. Dan.* t. 2489; Hartig *Forst. Culturpfl.* t. 51; Host *Sal.* t. 51, as *S. pratensis*; t. 53.

Exsiccata:—Billot, 1959, as *S. repens* var. *argentea*; Fries, vi, 55; A. et J. Kerner, 58, 59; Leefe, i, 2, as *S. incubacea*; E. F. et W. R. Linton, 68, 69, 70, 71; Schultz, ii, 56; Wirtgen, xv, 856, as *S. repens* var. *vulgaris*; xv, 857, as *S. repens* var. *fusca*; xv, 858, as *S. repens* var. *argentea.*

Undershrub, attaining, in some of its forms, a height of a metre and a half. *Rhizomes* creeping. *Branches* numerous, more or less pubescent when young. *Stipules* variable. *Petioles* short. *Laminae* very variable, oval or elliptical or elliptical lanceolate or lanceolate, rounded or attenuate at the base, margin entire or somewhat revolute or glandular-denticular, apex obtuse or acute and asymmetrical, usually more or less hairy at least underneath. *Catkins* subsessile or on short leafy peduncles, appearing before the leaves; April; often a second crop in summer and autumn. *Bracts* elliptical to obovate, hairy. *Nectary* greenish. *Staminate catkins* oval or elliptical. *Anthers* bright yellow. *Filaments* tending to be coherent at the base. *Pistillate catkins* subglobular to elliptical, up to about 2·5 cm. long at maturity or rather longer. *Ovaries* stalked, elongate, usually hairy. *Style* distinct. *Stigmas* entire or bifid. *Capsules* stalked, usually hairy; June.

(*a*) **S. repens** var. **ericetorum** Wimmer et Grabowski *Fl. Siles.* iii, 380 (1829) including var. *repens*; *S. repens* Smith *Fl. Brit.* 1061 (1804)!; including *S. prostrata*!; *S. repens* var. *vulgaris* Koch *Syn.* 656 (1837); A. et G. Camus *Classif. Saul.* 167 (1904); Rouy *Fl. France* xii, 208 (1910); *S. repens* var. *genuina* Syme *Eng. Bot.* viii, 246 (1868) including var. *prostrata* p. 247, et var. *ascendens* p. 247, et var. *parvifolia* p. 247.

Icones:—Smith *Eng. Bot.* t. 183, as *S. repens*!; t. 1959, as *S. prostrata*!; t. 1961, as *S. parvifolia*!; t. 1962, as *S. adscendens*!; Forbes *Sal. Woburn.* t. 84, as *S. repens*; t. 81, as *S. parvifolia*; t. 80, as *S. adscendens*; Reichenbach *Icon.* t. 589, fig. 2039 [1239]; A. et G. Camus *op. cit.*, *Atlas* t. 14, fig. A—D, G—H.

[1] Given for France by Rouy, but not by MM. Camus.

Exsiccata:—Leefe, i, 11, as *S. fusca* var. *parvifolia*; 86, as *S. fusca* var. *repens*; 87, as *S. fusca* var. *prostrata*; 88, as *S. fusca* var. *adscendens*.

Rhizomes long, creeping, sending out rather short and numerous prostrate or ascending branches. *Laminae* very variable in size and shape, narrowly or broadly elliptical, often more or less hairy especially when young and especially on the lower surface. *Pistillate catkins* usually sessile or subsessile even at maturity. *Capsules* subglabrous or pubescent

Very variable, and perhaps closer study would result in the rehabilitation of some of Smith's forms. There is a curious tendency among present-day British workers on willows to ignore varieties and to increase the number of putative hybrids.

Locally common on heaths on a sandy or gravelly soil containing acidic humus, rare on peat moors.

(*b*) **S. repens** var. **fusca** Wimmer et Grabowski *Fl. Siles.* iii, 381 (1829); Koch *Syn.* 656 (1837); Syme *Eng. Bot.* viii, 246 (1868) including var. *incubacea* p. 247; A. et G. Camus *Classif. Saul.* 167 (1904) including var. *lanata*; *S. fusca* L. *Sp. Pl.* 1020 (1753) including *S. incubacea*; Smith *Fl. Brit.* 1060 (1804) including *S. incubacea* Smith *Eng. Fl.* iv, 212 (1828) excl. syn. Wulfen.

Icones:—Smith *Eng. Bot.* t. 1960, as *S. fusca* ("a wrong fertile plant, sent for *S. fusca*, gave rise to an erroneous description in *Fl. Brit.*, corrected in" this figure (Smith *Eng. Fl.* iv, 210 (1810)); Forbes *Sal. Woburn.* t. 83, as *S. fusca*; Borrer in *Eng. Bot. Suppl.* t. 2600, as *S. incubacea*; Reichenbach *Icon.* t. 590, fig. 2040; A. et G. Camus *Atlas* t. 14, fig. E.

Camb. Brit. Fl. ii. *Plate 47.* (*a*) Shoot with staminate catkins. (*b*) Shoot with pistillate catkins. (*c*) Barren shoot. (*d*) Staminate flowers (enlarged). (*e*) Pistillate flowers (enlarged). Huntingdonshire (E. W. H.).

Rhizomes short. *Stem* erect, up to about 1·5 m. or rather more in height, often free from branches near the ground. *Branches* slender, often ascending or suberect. *Laminae* narrowly or broadly oblong-elliptical or elliptical-lanceolate, usually with an abundance of silky hairs underneath and sometimes on both surfaces. *Pistillate catkins* with longer and more leafy peduncles than in var. *ericetorum*.

Common on the fens of East Anglia, where it usually grows to the exclusion of the other varieties of *S. repens*, as on Wicken Fen, Cambridgeshire, and doubtless elsewhere. We are unable to state positively whether or not the variety grows on acidic peat, though it occurs on transitional moors.

The form of var. *fusca* with numerous silky hairs on both surfaces has often been mistaken for var. *argentea*; and indeed it may be regarded as forming the passage to this variety. Perhaps the following names refer to this form:—*S. lanata* Roth *Fl. Germ.* i, 418 (1788); Thuiller *Fl. Enr. Paris* ed. 2, 516 (1799); non L.; *S. repens* var. *argentea* Duby *Bot. Gall.* i, 424 (1828); Wimmer et Krause *Fl. Siles.* ii, 380 (1829); Gaudin *Fl. Helv.* vi, 234 (1830); Koch *Syn.* 656 (1837); Rouy *Fl. France* xii, 208 (1910); non *S. argentea* Smith *loc. cit.*; *S. repens* var. *lanata* A. et G. Camus *Classif. Saul.* 168 (1904). It is to be distinguished from var. *argentea* chiefly in its less social habit.

(*c*) **S. repens** var. **argentea** Syme *Eng. Bot.* viii, 248 (1868); *S. arenaria* L. *Sp. Pl.* 1019 (1753) pro minima parte (hoc est, syn. Raii); Hudson *Fl. Angl.* 364 (1762) part.; *S. argentea* Smith *Fl. Brit.* 1059 (1804)!; *S. repens* subsp. *argentea* A. et G. Camus *Classif. Saul.* 168 (1904); *S. repens* race *eu-repens* var. *arenaria* v. Seemen in Ascherson und Graebner *Syn.* iv, 126 (1909); *S. repens* subsp. *dunensis* Rouy *Fl. France* xii, 209 (1910).

Icones:—Smith *Eng. Bot.* t. 1364, as *S. argentea*; *Fl. Dan.* t. 2605, as *S. repens* var. *argentea*; Hartig *Forst. Culturpfl.* t. 118, fig. a—c, as *S. argentea*; Reichenbach *Icon.* t. 591, fig. 1243, as *S. argentea*; A. et G. Camus, *op. cit., Atlas*, t. 15, *as S. argentea.*

Camb. Brit. Fl. ii. *Plate 48.* (*a*) Shoot with staminate catkins. (*b*) Shoot with pistillate catkins. (*c*) Young barren shoot. (*d*) Staminate flowers. (*e*) Staminate flowers (enlarged). (*f*) Pistillate flowers. (*g*) Pistillate flowers (enlarged). Jersey (E. W. H.).

Rhizome very extensively creeping. *Branches* usually ascending, and attaining a height of from 1·0 to 1·5 m., often longer and less branched than in the other varieties. *Laminae* larger and broader as a rule than in the other varieties, up to about 2·5 to 4·5 cm. long and about two-thirds as broad, usually oval to elliptical, margin usually entire, with an abundance of shining silvery hairs underneath and often on both surfaces. *Catkins* at maturity with rather long peduncles which are more or less leafy at least at the base, usually larger than in the other varieties.

When founding his *S. argentea* (*Fl. Brit.* p. 1059), Smith states as its habitat "in arenosis maritimis," and terms it in the vernacular the "silky sand willow," and records it from "the sea-shores of Scotland" and "the sand burrows at Laugharn." When figuring it (*Eng. Bot.* t. 1364), he repeats that it is "a native of loose blowing sandy ground on the sea-shore." When towards the close of his life he reviews all his willows, he reiterates that it is a plant of "the sea-shore, among loose blowing sand-banks." What excuse is there, therefore, for the suggestion by A. et G. Camus (*op. cit.* p. 168) or for the definite statement by Rouy (*op. cit.* pp. 208, 209) that Smith confused his *S. argentea* with inland, allied forms?

Sand-dunes, especially in damp hollows; a social plant, sending up shoots through recently blown sand which it fixes; very abundant, for example, on the dunes between Liverpool and Southport. Many records are doubtful through confusion with the silvery-leaved form of var. *fusca*.

Of the three varieties of *S. repens* recognised here, var. *ericetorum* is by far the most variable in leaf-characters, and yet it remains distinct from the other two varieties. On the other hand, var. *fusca* and var. *argentea* are closely allied, and are connected by the silvery-leaved forms of var. *fusca*. Until the forms of *S. repens* as a whole have been subjected to rigorous cultural experiments, we believe that the subdivisions of the species here adopted are sufficient. The three varieties represent three interesting edaphic forms, the first one (var. *ericetorum*) typical of siliceous hill-slopes, heaths, and moors, the second (var. *fusca*) of fens, the third (var. *argentea*) of sand-dunes.

In herb. Marshall (no. 3241 et no. 3242), specimens from Sutherlandshire are named *S. myrsinites* × *repens*; but the Rev. E. F. Linton suggests that they are only *S. repens*. The hybrid in question does not appear to have ever been described.

S. repens is locally abundant on sandy, gravelly, and the lighter siliceous soils, when acidic humus is more or less abundant; rather rare on moors; abundant on fens; abundant and often social on sand-dunes; very rare or absent on clay and on strongly acidic peat; ascending to about 860 m. in Perthshire. Throughout Great Britain, from the Channel Islands, Cornwall, and Kent to Zetland; rare or local in the Midland counties of England; local but widespread in Ireland.

Europe (northwards to 63° 28′ N. in Norway, and ascending to 1700 m. in the Tyrol); Asia Minor to central Asia.

S. aurita × *repens* (see page 57); *S. caprea* × *repens* (see page 54); *S. cinerea* × *repens* (see page 55); *S. herbacea* × *repens* (cf. × *S. cernua*, p. 35); *S. lanata* × *repens* (cf. page 31)] *S. lapponum* × *repens* (see page 37); *S. nigricans* × *repens* (see page 43); *S. phylicifolia* × *repens* (see page 48); *S. purpurea* × *repens* (see page 67).

S. repens* × *viminalis Wimmer in *Denkschr. Schles. Gesellsch.* 162 (1853); A. et G. Camus *Classif. Saul.* ii. 128 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 279 (1909); *S. angustifolia* Fries *Fl. Suec.* ed. 3, 285 (1828) non Willdenow; *S. friesiana* Andersson *Monogr. Sal.* 121 (1867).

Icones:—Reichenbach *Icon.* t. 2038 [= 1238], as *S. angustifolia*; A. et G. Camus *op. cit.*, *Atlas* ii, t. 7 (40) fig. AB—AF′ as × *S. friesiana*.

Exsiccata:—Fries, ii, 60, as *S. angustifolia*; v, 65, as *S. angustifolia* var. *elatior*; A. et J. Kerner (*Fl. Austr.-Hung.*) 1470; E. F. et W. R. Linton, 98 (artificial hybrid); Heidenreich (*Fl. Bor. Or.*); herb. Marshall, 1928.

Shrub or undershrub, from about 0·5 to 1—2 m. high. *Young branches* stouter than in *S. rosmarinifolia*. *Buds* obtuse, hairy. *Stipules* usually caducous. *Petioles* short. *Laminae* lanceolate, margin a little reflexed, entire or subentire, larger than in *S. rosmarinifolia*, up to about 8 cm. long and 1·2 broad, lower surface usually silvery with hairs. *Catkins* appearing a little before the leaves; April. *Pistillate catkins* cylindrical, dense-flowered, much larger than in *S. rosmarinifolia*, up to about 1·5 long or a little more and about a third as broad, on short leafy peduncles. *Bracts* prominent in the catkin, ovate or obovate, hairy. *Ovaries* usually pubescent, shortly stalked. *Style* long or rather long. *Stigmas* filiform, reddish. *Capsules* usually pubescent, stalked; May.

Very rare; Sutherlandshire (*Journ. Bot.* xxxvi, 175 (1898)).

Sweden and Denmark (doubtfully indigenous), Germany, Austria-Hungary, Russia.

Series xii. *CAPREAE*

Capreae Koch *Sal. Comment.* 31 (1828) emend.; v. Seemen in Ascherson und Graebner *Syn.* iv, 93 (1909); *Cinereae* Borrer in Hooker *Brit. Fl.* 424 (1830); *Rugosae* A. Kerner *op. cit.* p. (120); *Cinerascentes* vel *Capreae* Andersson in DC. *Prodr.* xvi, pt. ii, 215 (1868).

For characters, see page 29.

British species and chief hybrids of *Capreae*

15. **S. caprea** (p. 52). *Young branches* reddish, glabrous or only slightly hairy at maturity. *Laminae* about half to three-quarters as broad as long, usually apiculate. *Catkins* broadly oval-elliptical. The earliest of the series to come into flower.

S. caprea* × *cinerea (p. 53). Intermediates between *S. caprea* and *S. cinerea*.

16. **S. cinerea** (p. 54). *Young branches* blackish, very hairy, hairs persisting for more than a year. *Laminae* about a third to half as broad as long. *Catkins* narrowly oval-elliptical.

S. cinerea* × *repens (p. 55). Less creeping, taller, and more erect than *S. repens*. *Laminae* and *catkins* intermediate between the putative parents.

17. **S. aurita** (p. 55). *Young branches* like *S. caprea* as regards hairiness, but more slender than in either *S. caprea* or *S. cinerea*. *Laminae* more rugose and smaller than in *S. caprea* or *S. cinerea*. *Catkins* shorter and slenderer than in *S. caprea* or *S. cinerea*. The last of the series to come into flower.

S. aurita* × *cinerea (p. 56). Intermediate between the putative parents.

S. aurita* × *repens (p. 57). *Young branches* as in *S. aurita*. *Laminae* elliptical-lanceolate to oboval-oblong, more or less rugose. *Catkins* subsessile, rather dense.

[A plant collected in Linlithgowshire, in 1831, by H. C. Watson, was said by Andersson (see *Bot. Gaz.* iii, 62 (1851)) to have leaves very similar to those of *S. grandifolia* Seringe *Essai* 20 (1815). This is a central European species scarcely likely to occur as an indigenous plant in the British Isles. It belongs to the series *Capreae*.]

15. SALIX CAPREA. Palm or Goat Sallow. Plate 49; 50, 51, 63, 64

Salix caprea rotundifolia Gerard *Herb.* 1203 (1597) including *S. caprea latifolia*; *S. latifolia rotunda* Ray *Syn.* ed. 3, 449 (1724).

Salix caprea L. *Sp. Pl.* 1020 (1753)!; Syme *Eng. Bot.* viii, 233 (1868); A. et G. Camus *Classif. Saul.* 202 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 98 (1909); Rouy *Fl. France* xii, 204 (1910).

Small tree or large shrub. *Young branches* terete, glabrous or only slightly hairy by autumn. *Buds* eventually glabrous. *Stipules* often persistent, especially on the leaves of the summer-shoots and then rather large and dentate. *Petioles* about one-sixth as long as the laminae. *Laminae* broader than in *S. cinerea*, broadly ovate or oblong-ovate or elliptical, broadest near the middle, subcordate or rounded or attenuate at the base, margin serrate or entire, apex subobtuse to subacute often with a short oblique acumination, up to about 6 cm. long and 3—4 broad, softly hairy when young, with a tendency to become glabrous on the upper surface, persistently grey with soft hairs underneath. *Catkins* sessile or subsessile, with a few rudimentary leaves at the base, appearing before the leaves; March and early April, the earliest member of the *Capreae* to come into flower. *Bracts* obovate to elliptical, with long silky hairs. *Nectary* yellowish-green. *Staminate catkins* up to about 2·5—3·5 cm. long and 1·5—2·0 broad, dense-flowered. *Anthers* yellow. *Filaments* more or less pilose in the lower half. *Pistillate catkins* rather longer and narrower, less dense-flowered. *Ovaries* pubescent, large, up to about 6—7 mm. long and 3 broad at the base, on stalks often as long as or nearly as long as the ovaries. *Style* short but usually distinct at maturity, rarely conspicuous. *Stigmas* usually rather stout, yellowish, often bifid, erect or suberect at maturity. *Capsules* tomentose, on long stalks; May.

Several leaf-forms are described by Andersson (*Monogr. Sal.* i, 76 (1867)).

(*a*) **S. caprea** var. **genuina** Syme *Eng. Bot.* viii, 234 (1868); *S. caprea* Smith *Fl. Brit.* 1067 (1804)!.

Icones:—Smith *Eng. Bot.* t. 1488, as *S. caprea*; Forbes *Sal. Woburn.* t. 122, as *S. caprea*; *Fl. Dan.* t. 2603, as *S. caprea*; Reichenbach *Icon.* t. 2024 [1214], as *S. caprea*; Hartig *Forst. Culturpfl.* t. 48, as *S. caprea*; A. et G. Camus *op. cit.*, *Atlas*, t. 17, fig. A—G, as *S. caprea*.

Camb. Brit. Fl. ii. *Plate 49.* (*a*) Shoot with staminate catkins. (*b*) Shoot with pistillate catkins. (*c*) Barren shoot. (*d*) Pistillate flower. (*e*) Pistillate flowers (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 462, as *S. caprea*; A. et J. Kerner (*H. S. A.*), 48, 70, as *S. caprea*; Leefe, 60, 61, 64, as *S. caprea*; 62, 65, 66, as *S. caprea* var.; Linton, 19, as *S. caprea*; 54 (a form with a conspicuous style), as *S. caprea* forma; *Herb. Fl. Ingric.* viii, 566, as *S. caprea*.

A much larger plant than var. *sphacelata*, not infrequently a small tree or large shrub. *Laminae* larger and broader, usually subcordate or rounded at the base, serrate, and usually with a characteristic acumination at the apex. *Catkins* larger and broader. *Bracts* usually shorter.

Both this and *S. cinerea* are gathered as "palm" on Palm Sunday.

This variety is the common lowland plant of woods and hedgerows.

(*b*) **S. caprea** var. **sphacelata** Wahlenberg *Fl. Carpat.* 319 (1814); Syme *Eng. Bot.* viii, 234 (1868); *S. lanata* Lightfoot *Fl. Scot.* 602 (1777) non L.; *S. sphacelata* Smith *Fl. Brit.* 1066 (1804); *S. caprea* var. *alpina* Gaudin *Fl. Helv.* vi, 240 (1830); A. et G. Camus *Classif. Saul.* 207 (1904); Rouy *Fl. France* xii, 205 (1910).

Icones :—Smith *Eng. Bot.* t. 2333, as *S. sphacelata*; Forbes *Sal. Woburn.* t. 121, as *S. sphacelata*; Reichenbach *Icon.* t. 579, fig. 2027, as *S. caprea* var. *parvifolia.*

Exsiccata :—Leefe, 66, as *S. caprea* var. *sphacelata*; herb. Lightfoot, as *S. lanata* (*fide* Smith *Fl. Br.*, *loc. cit.*).

Small shrub, up to about 2 m. high. *Young branches* softly pubescent. *Stipules* when persistent smaller than in var. *genuina.* *Petioles* shorter, pubescent. *Laminae* softly pubescent when unfolding, oval-acute to obovate, rather cuneate at the base, entire or slightly serrate, upper surface pale green and glabrous at maturity, lower surface pubescent, tip often withering early. *Catkins* smaller. *Bracts* darker. *Style* usually very short. *Stigmas* entire or notched. *Capsules* somewhat silky.

Several of the records of this plant appear to refer to hybrids of *S. aurita* and *S. cinerea.*

A montane or sub-Alpine form. "In valleys, among the Highlands of Scotland" (Lightfoot, *op. cit.*). "At Fionlarig [Perthshire], near the head of Loch Tay" (Smith, *op. cit.*); North Riding of Yorkshire (Leefe, *op. cit.*).

S. caprea is common in woods and hedgerows, preferring drier localities than *S. cinerea*, throughout the British Isles except in northern Scotland; ascending to about 610 m. in Perthshire. The Rev. E. F. Linton (*Journ. Bot.* xxxii, 202 (1894)) gives an unlocalised record of *S. caprea* at 760 m. In the fens of eastern England, *S. caprea* is almost absent, whilst *S. cinerea* is abundant; and also in the damp woods of the chalky boulder clay of eastern England, *S. caprea* is rare, whilst *S. cinerea* is common.

Europe (to 70° N. in Scandinavia, and ascending to 2000 m. in the Alps; Asia Minor and the Urals to Japan.

S. aurita × *caprea* (see page 56); *S. caprea* × *caprea* × *viminalis* (see page 63).

S. caprea × **cinerea** Wimmer in *Denkschr. Schles. Gesellsch.* 162 (1853)!; A. et G. Camus *Classif. Saul.* 326 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 214 (1909); Rouy *Fl. France* xii, 239 (1910); *S. polymorpha* Host *Hist. Sal.* 21 (1828) part.; × *S. reichardti* A. Kerner in *Verh. Z.-B. Gesellsch. Wien* 249 (1860)!; White in *Journ. Linn. Soc.* xxvii, 386 (1890); excluding syn. *S. aquatica* Smith.

Icones :—Host *Hist. Sal.* t. 69, as *S. polymorpha*; A. et G. Camus *op. cit.*, *Atlas* t. 30, fig. K—R, as × *S. reichardti.*

Camb. Brit. Fl. ii. *Plate 50.* (*a*) Shoot with androgynous catkins. (*b*) Barren shoot. (*c*) Stamens and staminodes (enlarged). (*d*) Ovaries (enlarged). (*e*) Androgynous flower (enlarged). Huntingdonshire (E. W. H.).

Exsiccata :—Leefe, 63, as *S. caprea* var. *androgyna*; E. F. et W. R. Linton, 55; herb. Marshall, 3386.

Habit usually of *S. caprea.* *Young branches* and *buds* more or less persistently pubescent. *Laminae* usually intermediate in width between *S. caprea* and *S. cinerea*, more or less persistently pubescent above as well as underneath. *Catkins* intermediate in size; April and early May.

Both White (*op. cit.*) and Linton (*Journ. Bot.* xxxiv, p. 466) regard *S. caprea* × *cinerea* as rather rare. Still, White has 24 sheets of Perthshire specimens in his herbarium. According to our own experience, wherever the putative parents grow together, individuals occur which are with difficulty referred to either the one species or the other. As we find no such difficulty where only one of the species occurs, it is reasonable to suppose that the doubtful plants are of hybrid origin. These hybrids are very variable; but, on the whole, they approach *S. caprea* more closely than *S. cinerea*, and are often recognisable only with difficulty in dried specimens.

Androgynous flowers (cf. plate 50) are not infrequent among hybrid willows in which also it is not uncommon to find so-called "monstrous" characters of the nectary. It would appear that the hybridising of plants frequently induces "germinal instability," as Dr R. R. Gates suggests with regard to hybrids in *Oenothera* (1913).

It appears probable that *Salix* has descended from ancestors with monoclinous flowers; and hence the phenomenon of "androgynous" flowers in hybrid willows may be due to a kind of reversion, as mentioned by Bateson as occurring in hybrids (*Mendel's Principles of Heredity* (1909) passim).

Northwards as far as Ross-shire.

Recorded for Scandinavia, Germany, France, central Europe, Russia, and doubtless as widespread as the putative parents.

S. caprea × *cinerea* × *phylicifolia* (see page 46).

[***S. caprea* × *lanata*** Floderus in *Bih. Sv. Vet. Akad. Handl.* xvii, iii, i, 27 (1891); Linton in *Journ. Bot.* xxxvi, 123 (1898); A. et G. Camus *Classif. Saul.* ii, 209 (1905); × *S. lanatella* Rouy in *Rev. Bot. Syst.* 173 (1904).

Icones :—*Camb. Brit. Fl.* ii. *Plate 51.* (*a*) Shoot with staminate catkins. (*b*) Barren shoot. (*c*) Staminate flowers (enlarged). (*d*) Bract (enlarged). Hort. (Rev. E. F. Linton).

Exsiccata :—E. F. et W. R. Linton, 88 (artificial hybrid).

This hybrid, artificially raised by the Rev. E. F. Linton, is not definitely known to occur wild in the British Isles. It has been recorded for northern Scandinavia.]

S. caprea × *lapponum* (see page 35); *S. caprea* × *myrsinites* (see page 32); *S. caprea* × *nigricans* (see page 43); *S. caprea* × *phylicifolia* (see page 46); *S. caprea* × *cinerea* × *phylicifolia* (see page 46).

S. caprea* × *repens [Lasch *in litt.*] Wimmer in *Denkschr. Schles. Gesellsch.* 170 (1853)!; White in *Journ. Linn. Soc.* xxvii, 394 (1890); A. et G. Camus *Classif. Saul.* ii, 198 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 228 (1909); *S. laschiana* Reisland und Brand in Koch *Syn.* ed. 3, 234 (1907).

Icones :—A. et G. Camus *op. cit.*, *Atlas* ii, t. 12 (45) fig. P—R″, as × *S. laschiana.*

Exsiccata :—Herb. Marshall, 2959; Heidenreich.

White (*loc. cit.*) believed that two plants collected by Messrs Linton, on cliffs at Armadale, Sutherlandshire, should be referred to this hybrid; but the Rev. E. F. Linton (*Journ. Bot.* xxxiv, p. 466) thinks the plants in question are *S. cinerea* × *repens.* Mr Marshall's no. 2959 is a dwarf shrub, erect (up to about 1·3 m. high) or procumbent; *laminae* pubescent, serrate; *catkins* not seen.

Apparently very rare; Perthshire, Aberdeenshire.

Also recorded for Sweden, Finland, and central Europe.

S. caprea × *viminalis* (see page 62).

16. SALIX CINEREA. Common Sallow. Plates 52, 53; 50, 54, 56, 57, 67

Salix folio ex rotundidate acuminato Ray *Syn.* ed. 3, 449 (1724) [= subvar. *aquatica*].

Salix cinerea L. *Sp. Pl.* 1021 (1753); Syme *Eng. Bot.* viii, 230 (1868); A. et G. Camus *Classif. Saul.* 181 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 93 (1909); Rouy *Fl. France* xii, 203 (1910); *S. acuminata* Miller *Gard. Dict.* ed. 8, no. 14 (1768); Hoffmann *Hist. Sal.* ii, 35 (1785); non Smith; *S. hoffmanniana* Bluff et Fingerhuth *Consp. Fl. Germ.* ii, 568 (1825) non Smith.

Icones :—Hoffmann *Hist. Sal.* t. 6, et t. 22, fig. 2, as *S. acuminata*; *Fl. Dan.* t. 2601; A. et G. Camus *op. cit.*, *Atlas* t. 16, fig. A—G.

Exsiccata :—Billot, 2364; Fries, vii, 59; A. et J. Kerner (*H. S. A.*) 29, 66; Leefe, 39 as *S. cinerea*?; 40, as *S. cinerea* var. *β*; 44, as *S. oleïfolia*?; ii, 46, as *S. oleïfolia*; E. F. et W. R. Linton, 36, 61 ("a form with a long style"), 62; Reichenbach, 1140, 2033; Wirtgen, xv, 845, as *S. cinerea* var. *angustifolia*; *Herb. Fl. Ingric.* viii, 564.

Small tree or large shrub, attaining a height of about 6—9 m. *Young branches* usually blackish, rather stout, pubescent. *Young wood*, when the bark is stripped, is stated (MM. Camus *op. cit.*, *passim*) to be striate. *Stipules* often persistent, variable in size and shape, often rather dentate. *Petioles* rather short, distinct. *Laminae* obovate to elliptical, attenuate to rounded at the base, somewhat undulate or subdentate or irregularly serrate, rounded or acute to subacuminate at the apex, often from about 4·0—6·5 cm. long, variable in breadth, often from about 1·5—2·5 cm. broad, narrower than in *S. caprea*, pubescent on both surfaces. *Catkins* sessile or subsessile, dense-flowered, more slender than those of *S. caprea*, appearing before the leaves; late March and April, later than *S. caprea*. *Bracts* hairy. *Nectary* small, greenish. *Staminate catkins* ovoid, about 2—3 cm. long and 1·0—1·5 broad, upper flowers opening before the lower ones. *Filaments* free, pilose at the base. *Anthers* reddish-yellow when very young to orange-yellow just before dehiscence. *Pistillate catkins* longer and narrower than in *S. caprea*. *Style* short or almost absent, rarely rather long. *Stigmas* bifid, stout. *Capsules* on long pedicels, pubescent; May and early June.

(α) subvar. oleïfolia nobis; *S. oleïfolia* Smith *Fl. Brit.* 1065 (1804)! including *S. cinerea* p. 1063!; *S. cinerea* var. *oleïfolia* Reichenbach *Fl. Germ. Exscurs.* 169 (1830); Syme *Eng. Bot.* viii, 231 (1868) including var. *genuina*; *S. cinerea* var. *angustifolia* Döll *Fl. Baden.* 496 (1859).

Icones :—Smith *Eng. Bot.* t. 1402, as *S. oleïfolia*; t. 1897, as *S. cinerea*; Forbes *Sal. Woburn.* t. 126, as *S. oleïfolia*; t. 125, as *S. cinerea*; Reichenbach *Icon.* t. 576, fig. 2022 [1222], as *S. cinerea.*

Camb. Brit. Fl. ii. *Plate 52.* (*a*) Shoot with young pistillate catkins. (*b*) Shoot with older pistillate catkins. (*c*) Barren shoot. (*d*) Pistillate flowers (enlarged). Huntingdonshire (E. W. H.).

Laminae narrower than in subvar. *aquatica*, elliptical or more or less oboval, up to about 6 cm. long and 2 broad.

(*β*) subvar. **aquatica** nobis; *S. aquatica* Smith *Fl. Brit.* 1065 (1804)!; *S. cinerea* var. *aquatica* Reichenbach *Fl. Germ. Excurs.* 169 (1830); Syme *Eng. Bot.* viii, 231 (1868); *S. cinerea* var. *obovatis* Koch *Syn.* 650 (1837); *S. cinerea* var. *rotundifolia* Döll *Fl. Baden.* 496 (1859).

Icones :—Hoffmann *Hist. Sal.* t. 5, fig. 3, as *S. aurita*; Smith *Eng. Bot.* t. 1437, as *S. aquatica*; Forbes *Sal. Woburn.* t. 127, as *S. aquatica.*

Camb. Brit. Fl. ii. *Plate 53.* (*a*) Shoot with staminate catkins. (*b*) Barren shoot. (*c*) Staminate flowers. (*d*) Staminate flowers (enlarged). Huntingdonshire. (E. W. H.).

Laminae about as long as in subvar. *oleïfolia*, but broader (ca. 2·5—3·0 cm.).

Forms of *S. aurita* × *cinerea* and of *S. caprea* × *cinerea* are frequently mistaken for this subvariety.

Damp woods and hedgerows, stream-banks, marshes, and fens; throughout the British Isles, where it is the commonest and most widely distributed species of *Salix*; northwards to Zetland; ascending to 610 m. in Perthshire.

Europe (except Arctic, ascending to 2100 m. in the Alps), northern Africa, Caucasus and western Asia to Kamtchatka (to 67° 40′ N.).

S. aurita × *cinerea* (see page 56); *S. caprea* × *cinerea* (see page 53); *S. cinerea* × *lapponum* (see page 35); *S. cinerea* × *myrsinites* (see page 32); *S. cinerea* × *nigricans* (see page 43); *S. cinerea* × *phylicifolia* (see page 46); *S. cinerea* × *purpurea* (see page 67).

S. cinerea* × *repens Wimmer in *Flora* xxxi, 329 (1848)!; White in *Journ. Linn. Soc.* xxvii, 393 (1890)!; A. et G. Camus *Classif. Saul.* 332 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 226 (1909); Rouy *Fl. France* xii, 239 (1910); × *S. subsericea* Döll *Fl. Baden* 517 (1859).

Icones :—A. et G. Camus *op. cit., Atlas* t. 30, fig. AB, AC, AD, AE, as × *S. subsericea.*

Camb. Brit. Fl. ii. *Plate 54.* (*a*) Shoot with pistillate catkins. (*b*) Leaves. (*c*) Pistillate flower. (*d*) Pistillate flowers (enlarged). From plant raised from a cutting sent by the Rev. E. F. Linton. Leaves larger than in the wild form.

Exsiccata :—E. F. et W. R. Linton, 63, 94; herb. Marshall, 2451; Wimmer (*H. S.*) 1; Wirtgen, xvii, 984.

Small shrub or dwarf shrub, prostrate, ascending, or erect, less creeping than *S. repens*. *Young branches* more or less pubescent. *Stipules* often persistent. *Petioles* distinct. *Laminae* variable in size and shape, oval-elliptical to obcuneate, entire or subentire, glabrous or glabrescent above, often more or less hairy underneath. *Catkins* appearing before the leaves; late March and April; subsessile or on short peduncles, more or less leafy at the base, up to about 3 cm. long and 1 broad. *Bracts* oboval, hairy. *Capsules* elongate, more or less pubescent.

Not often recorded, but we believe that it is not uncommon in many places where the two putative parents occur together; e.g., both staminate and pistillate plants of it are rather abundant on Woodwalton Fen, Huntingdonshire, and on Wicken Fen, Cambridgeshire. The allied hybrid, *S. aurita* × *cinerea* × *repens* Gürke *Plant. Europ.* ii, 16 (1897) is recorded for Sweden and Germany, and probably occurs in this country also. Another allied and still more complicated hybrid, *S. aurita* × *caprea* × *cinerea* × *repens* Gürke *loc. cit.* is recorded for Germany.

Local; Cambridgeshire, Huntingdonshire, Derbyshire, Forfarshire, and Sutherlandshire, and doubtless elsewhere.

Scandinavia, Germany, France, central Europe (ascending to 1800 m.).

S. cinerea × *viminalis* (see page 64).

17. SALIX AURITA. Plates 55; 34, 36, 44, 56, 57, 62

Salix folio rotundo minore Dillenius in Ray *Syn.* ed. 3, 450 (1724); *S. caprea pumila folio subrotundo subtus incano* Dillenius in Ray *Syn.* ed. 3, 450 (1724).

Salix aurita L. *Sp. Pl.* 1019 (1753); Syme *Eng. Bot.* viii, 232 (1868); A. et G. Camus *Classif. Saul.* 171 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 111 (1909); Rouy *Fl. France* xii, 205 (1910).

Icones :—Hoffman *Hist. Sal.* t. 4, t. 5, fig. 3; t. 22, fig. 1 a—d; Smith *Eng. Bot.* t. 1487; Forbes *Sal. Woburn.* t. 124; *Fl. Dan.* t. 2600; A. et G. Camus *op. cit., Atlas* t. 16, fig. H—M.

Camb. Brit. Fl. ii. *Plate 55.* (*a*) Shoot with staminate catkins. (*b*) Shoot with pistillate catkins. (*c*) Barren shoot. (*d*) Staminate flowers and bract (enlarged). (*e*) Pistillate flowers (enlarged). Dorset (Rev. E. F. Linton).

Exsiccata :—Billot, 848, 848 bis; Fries, vii, 60; Kerner (*H. S.*) 166—171; Leefe, 45, as *S. aurita* var.; 46, as *S. aurita* var. *uliginosa*; 47 as *S. aurita* forma *humilior*; E. F. et W. R. Linton, 15; Wirtgen, xv, 846, as var. *uliginosa*; Herb. *Fl. Ingric.* iv, 568.

Shrub or low shrub, usually 1—2 m. rarely 3 m. high. *Branches* wide-spreading, usually angular, usually glabrous at maturity. *Stipules* persistent, subcordate to rounded at the base, often subreniform, irregularly dentate. *Petioles* short, more or less hidden by the stipules, pubescent. *Laminae* obovate to elliptical-obtuse, usually more or less rounded at the base, margin undulate and irregularly dentate to subentire, apex obtuse or with a short oblique acumination, about 3—4 cm. long and 2 to 2·5 broad, very rugose and wrinkled with veins sunken above and prominent underneath, pubescent above, grey and pubescent underneath. *Catkins* smaller than in *S. caprea* or *S. cinerea*, subsessile or on short peduncles; appearing a little before the leaves; April. *Bracts* obovate, with rather long hairs. *Staminate catkins* broadly elliptical, often about 1—2 cm. long. *Filaments* long, hairy at the base. *Pistillate catkins* narrower, cylindrical. *Ovaries* on pubescent stalks, hairy. *Style* very short or absent. *Stigmas* short, thick, emarginate or bifid. *Capsules* pubescent; May and early June.

Borrer (in Hooker *Brit. Fl.* ed. 4, 365) truly remarks that *S. aurita* is "one of the least equivocal species"; yet it is very variable, and, when growing with *S. cinerea*, forms may easily be found which connect the two species.

Continental botanists distinguish several varieties; and it is certain that some of these occur in the British Isles. However, British botanists have not studied the species very closely; and until that has been done, we deem it best not to attempt any subdivision of the British forms. Syme (*op. cit.*) distinguishes (*a*) var. *genuina* which is perhaps var. *uliginosa* Gaudin *Fl. Helv.* vi, 246, and (*b*) var. *minor* which is perhaps var. *microphylla* Gaudin *loc. cit.*; and we should expect var. *nemorosa* Andersson (= *S. nemorosa* Fries in *Bot. Notiser* 187 (1840) also to be British: Syme, however, gives no localities of his two varieties; but var. *minor* has since been recorded for Ben More (see *Journ. Bot.* xxvii, 234—235 (1889)).

Marshes, stream-sides, and damp woods on siliceous soils, and on acidic or transitional peat-moors; throughout the British Isles, but local or rare in those counties, like Cambridgeshire, where calcareous or clayey soils predominate; ascending to about 790 m. in Perthshire.

Northern, western, and central Europe, ascending to 1700 m. in the Tyrol; local in southern Europe; Caucasus and Trans-Caucasia (2160 m.) to the Altai mountains.

S. aurita* × *caprea Wimmer in *Denkschr. Schles. Gesellschaft.* 163 (1853)!; A. et G. Camus *Classif. Saul.* 346 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 219 (1909); Rouy *Fl. France* xii, 243 (1910); *S. capreola* [J. Kerner *in litt.*, ex] Andersson *Monogr. Sal.* 79 (1867); × *S. capreola* White in *Journ. Linn. Soc.* xxvii, 387 (1890).

Icones :—A. et G. Camus *op. cit.* t. 31, fig. H et J', as × *S. capreola.*

Exsiccata :—A. et J. Kerner (*H. S.*), 161, 162, as *S. capreola*; E. F. et W. R. Linton, 90 (accidental garden hybrid).

Shrub or small tree. *Branches* spreading. *Buds* smaller than in *S. caprea*. *Stipules* broad. *Laminae* lanceolate or elliptical to oval, attenuate below, rather rugose above, pubescent underneath, subcrenate-serrate. *Catkins* appearing before the leaves, a little larger than in *S. aurita*. *Bracts* acute. *Style* short or absent. *Stigmas* slender, yellowish. *Capsules* a little larger than in *S. aurita*, acute, tomentose, stalked.

Not often recorded, and doubtless rather local, as *S. aurita* and *S. caprea* do not very often grow together. From Somerset and Kent to Perthshire. Ireland—co. Westmeath.

Scandinavia, Germany, Belgium, France, central Europe.

S. aurita* × *cinerea Wimmer in *Flora* xxxi, 330 (1848); A. et G. Camus *Classif. Saul.* 324 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 216 (1909); Rouy *Fl. France* xii, 239 (1910); × *S. multinervis* Döll *Fl. Baden* 516 (1859); × *S. lutescens* A. Kerner in *Verhandl. Z.-B. Gesellsch. Wien* 253 (1860); White in *Journ. Linn. Soc.* xxvii, 383 (1890).

Icones :—A. et G. Camus *op. cit.*, *Atlas* t. 30, fig. S—Y, as × *S. multinervis.*

Camb. Brit. Fl. ii. *Plate 56.* (*a*) Shoot with staminate catkins. (*b*) Staminate flower. (*c*) Staminate flower (enlarged). Huntingdonshire (E. W. H.). *Plate 57.* (*a*) Shoot with pistillate catkins. (*b*) Barren shoot. (*c*) Pistillate flowers. (*d*) Pistillate flowers and bract (enlarged). Huntingdonshire (E. W. H.).

Exsiccata :—E. F. et W. R. Linton, 16, 17.

Shrub or small tree; very variable, every stage occurring from *S. aurita* to *S. cinerea*. *Laminae* more rugose than in *S. cinerea*, larger and more hairy than in *S. aurita*, very variable in shape, from short and obovate to elliptical-acute. *Catkins* intermediate in size. *Filaments* hairy. *Style* very short or absent. *Capsules* intermediate in size, stalked.

Common throughout the British Islands wherever the putative parents grow together.

Recorded for Scandinavia, Denmark, Germany, Belgium, France, central Europe, Russia; and doubtless as widespread as the putative parents.

S. aurita* × *herbacea Gürke *Plant. Eur.* ii, 37 (1897); A. et G. Camus *Classif. Saul.* ii, 153 (1905); × *S. margarita* White in *Journ. Linn. Soc.* xxvii, 441 (1890)!.

Exsiccata:—Herb. Kew. ("a beautiful Alpine willow found on Ben Challum, Perthshire, 1876, by J. Sadler" is referred by the Rev. E. F. Linton to this hybrid); E. F. et W. R. Linton, 91; herb. Marshall, 2957, 2958.

Dwarf undershrub. *Branches* slender, divaricate. *Petioles* slender, about a third as long as the laminae. *Laminae* more or less suborbicular, rounded to subcordate at the base, glandular, denticulate, about 1·5 to 2·5 long as a rule. *Pistillate catkins* lateral, on short leafy peduncles, small, about 0·5—1·5 cm. long. *Style* thick, rather long. *Stigmas* bifid. *Capsules* stalked, hairy. Staminate plants are unknown.

Scotland—Perthshire. Not recorded for any other country.

S. aurita × *lapponum* (see page 34); *S. aurita* × *myrsinites* (see page 32); *S. aurita* × *myrsinites* × *nigricans* (see page 32); *S. aurita* × *nigricans* (see page 43); *S. aurita* × *phylicifolia* (see page 46).

***S. aurita* × *phylicifolia* × *purpurea*?** A. et G. Camus *Classif. Saul.* ii, 276 (1905); × *S. sesquitertia* White in *Ann. Scott. Nat. Hist.* 66 (1892).

Exsiccata:—E. F. et W. R. Linton, 52.

A single plant—a shrub, nearly 2 m. high—of the above rather doubtful hybrid was described by White from specimens collected in Dumfriesshire. Linton's no. 52 is from the same locality. Not recorded for any other country.

S. aurita × *purpurea* (see page 66).

S. aurita* × *repens Wimmer *Fl. Schles.* 446 (1840), including *S. cinerea* × *repens*; in *Flora* xxviii, 437 (1845)!; A. et G. Camus *Classif. Saul.* 341 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 230 (1907); Rouy *Fl. France* xii, 242 (1910); *S. ambigua* Ehrhart *Beitr.* vi, 103 (1791)!; Smith in Rees' *Cyclop.* xxxi, no. 114 (1815)!; Hooker *Fl. Brit.* 421 (1830); Syme *Eng. Bot.* viii, 244 (1868); *S. spathulata* Willdenow *Sp. Pl.* iv, 700 (1805); × *S. ambigua* Döll *Fl. Baden* 521 (1859); Andersson in DC. *Prodr.* xvi, pt. ii, 238 (1868); White in *Journ. Linn. Soc.* xxvii, 392 (1890).

Icones:—Borrer in *Eng. Bot. Suppl.* t. 2733, as *S. ambigua*!; *Fl. Dan.* t. 2670, as *S. ambigua*; Reichenbach *Icon.* t. 592, fig. 1243 b, as *S. ambigua*; A. et G. Camus *op. cit., Atlas* t. 31, fig. A—I, as × *S. ambigua.*

Exsiccata:—Fries xi, 63, as *S. ambigua*; Leefe, iii, 61, as *S. ambigua*; E. F. et W. R. Linton, 60; herb. Marshall, 710, 716, 723; Wimmer (*H. S.*), 20, 35, 36; Wirtgen, xvii, 985.

Undershrub, up to about 2 m. high when well grown, though usually more dwarf and less than 1 m. high. *Stem* creeping. *Young branches* and *buds* glabrescent. *Stipules* often persistent, serrate. *Petioles* short. *Laminae* elliptical, lanceolate, or oboval-oblong, variable in size, somewhat rugose. *Catkins* subsessile, rather dense, rather small, appearing a little before the leaves; April and May. *Bracts* very hairy. *Filaments* pubescent towards the base. *Ovaries* pubescent. *Style* rather long. *Stigmas* emarginate. *Capsules* pubescent, stalked.

The local distribution of the plants referred to this parentage points strongly to their probable hybrid origin; for example, White (1890 b) states that they are widely distributed in Perthshire and "of almost certain occurrence where the parents grow in proximity."

Max Wichura (*op. cit.* (1854)) asserts that he crossed a staminate plant of "*S. ambigua* Ehrhart" with a pistillate one, and that the offspring resembled the parents[1]. However, Wichura does not appear to have allowed the offspring of this cross to grow to maturity, so that there was no chance of really establishing the conclusion that "*S. ambigua* Ehrhart" really breeds true. In fact, this conclusion is unlikely; and it is desirable that the experiment should be repeated, using all Wichura's preliminary precautions, but allowing the offspring to grow to the adult stage.

Widespread, but rather local; from Cornwall and Kent to Zetland; Ireland—co. Cork and co. Galway, and doubtless elsewhere.

Scandinavia, Denmark, Germany, France, central Europe, Russia.

S. aurita × *viminalis* (see page 61).

[1] Cf. page 17.

Section IV. *VIMEN*

Vimen Du Mortier in *Bijdr. Natuurk. Wetensch.* (14) 56 (1825) including *Helix*, p. 15; in *Bull. Bot. Soc. Belg.* i, 140 et 143 (1862) including *Helice*, pp. 140 et 145; Babington in *Journ. Bot.* i, 171 (1863) including *Helice*, p. 170; *Viminella* [Seringe *Sal. Rev.* ined., ex] Duby *Bot. Gall.* i, 424 (1828) including *S. daphnoïdes*; *Viminales* Fries *Fl. Suec. Mant.* i, 60 (1832) non Koch.

For characters, see page 14.

British series of *Vimen*

Series xiii. ***Daphnoïdes** (see below). Shrubs or small trees. *Laminae* lanceolate to narrowly oblong-elliptical, entire or faintly serrate, with silky hairs when young, upper surface glabrous at maturity. *Catkins* stouter than in the other series of *Vimen*, sessile or subsessile, very early flowering. *Bracts* discolorous. *Nectaries* long, linear, stalked. *Stamens* 2, large. *Filaments* free. *Anthers* free, golden yellow before dehiscence. *Styles* long or rather long. *Capsules* usually glabrous, sessile or shortly stalked.

[Series xiv. ***Incanae** (page 59). Shrubs of sub-Alpine distribution. *Laminae* linear-lanceolate, margin revolute, white with hairs underneath. *Catkins* subsessile. *Bracts* concolorous or discolorous. *Nectary* 1, yellow. *Stamens* 2. *Filaments* more or less united in the lower half. *Styles* long. *Stigmas* bifid. *Capsules* rather slender, elongate, glabrous or pubescent, stalked.]

Series xv. **Viminales** (p. 60). Shrubs, usually osiers of lowland distribution. *Young branches* long, straight, flexible. *Laminae* narrowly lanceolate, margin entire and more or less recurved, lower surface white with hairs. *Catkins* appearing before the leaves, sessile or on short peduncles, cylindrical, dense-flowered. *Nectaries* long, linear, stalked. *Stamens* 2. *Filaments* free. *Anthers* free, yellow. *Style* long. *Stigmas* long. *Capsules* pubescent, sessile or shortly stalked.

Series xvi. **Purpureae** (p. 65). Shrubs, osiers of lowland distribution. *Laminae* lanceolate. *Catkins* appearing before the leaves, sessile or subsessile, dense-flowered. *Nectaries* single, short. *Stamens* 2, but coherent and appearing as if only 1. *Filaments* wholly coherent, or (in the hybrids) more or less coherent. *Anthers* coherent or (in the hybrids) more or less free, purplish before dehiscence. *Style* short. *Capsules* broader than in any of the above series, pubescent, sessile or subsessile.

Series xiii. **Daphnoïdes*

Daphnoïdes nobis; *Pruinosae* Koch *Sal. Comment.* 22 (1828); A. et G. Camus *Classif. Saul.* 227 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 167 (1909).

This group connects the sections *Vimen* and *Vetrix*.

For characters, see above. Only British species:—**S. daphnoïdes*.

18. *SALIX DAPHNOÏDES. Plate 58

Salix daphnoïdes Villars *Hist. Pl. Dauph.* iii, 765 (1789); Andersson in DC. *Prodr.* xvi, pt. ii, 261 (1868) excluding syn. *S. cinerea* Smith[1]; A. et G. Camus *Classif. Saul.* 227 (1904) excluding syn. *S. cinerea* Smith[1]; v. Seemen in Ascherson und Graebner *Syn.* iv, 168 (1909) excluding syn. Smith[1]; Rouy *Fl. France* xii, 199 (1910).

Large shrub, attaining a height of 7—10 m. *Young branches* rather flexible and slender, more or less viscous when young, purplish at least on the exposed side, glabrous at maturity. *Stipules* usually caducous. *Laminae* about 5—8 times as long as broad, glandular-denticulate at least when young, acute to acuminate, usually glabrous at maturity, subglaucous underneath. *Catkins* rather dense-flowered; February and March, the first willow to come into flower in this country. *Staminate catkins* up to about 4 cm. long. *Bracts* oboval, very hairy. *Filaments* sometimes united a

[1] It is true that Smith (*Fl. Brit.* (1804), *Eng. Bot.* (1808), *Eng. Fl.* iv (1828)) cites *S. daphnoïdes* Villars under *S. cinerea*. Smith believed, on the evidence of a specimen sent to him by Villars himself, that *S. daphnoïdes* Villars was *S. cinerea* L. et auct. We have seen the specimen in question; and it is much too imperfect to be of any importance. Smith's citation of Villars' plant has caused no confusion in this country where *S. daphnoïdes* is not indigenous and where *S. cinerea* is the commonest species of the genus. Several continental authorities not only cite *S. cinerea* Smith as synonymous with *S. daphnoïdes* Villars; but they also cite *S. oleïfolia* Smith as synonymous with *S. cinerea* × *purpurea* (cf. A. et G. Camus *op. cit.*, p. 280), and *S. aquatica* Smith as synonymous with *S. caprea* × *cinerea* (cf. A. et G. Camus *op. cit.*, p. 326). They thus imply that Smith was practically unacquainted with the commonest species of *Salix* of his own country. This is only one, among many, illustrations which could be given to show that Salicologists in general have never properly studied Smith's works.

little at the base, long. *Pistillate catkins* narrower and rather shorter than the staminate ones. *Bracts* less hairy. *Stigmas* usually shorter than the style, variable in shape. *Capsules* broadly ovate, glabrous, subsessile or with short stalks; May and early June.

(*a*) ***S. daphnoïdes** var. **praecox** comb. nov.; *S. daphnoïdes* Villars *loc. cit.*, in sensu stricto; *S. praecox* [Hoppe ex] Willdenow *Sp. Pl.* iv, 670 (1805) non Salisbury.

Icones:—Host *Sal.* t. 26, t. 27, as *S. cinerea*; Forbes *Sal. Woburn.* t. 26, as *S. praecox*; Reichenbach, t. 602, fig. 1253, as *S. daphnoïdes*; Hartig *Forst. Culturpfl.* t. 43, as *S. daphnoïdes*; A. et G. Camus *op. cit.*, *Atlas* t. 21, fig. M—Q, as *S. daphnoïdes*.

Cambr. Brit. Fl. ii. *Plate 58.* (*a*) Shoot with staminate catkins. (*b*) Shoot with pistillate catkins. (*c*) Barren shoot. (*d*) Staminate flowers (enlarged). (*e*) Pistillate flowers (enlarged). Staminate plant from Huntingdonshire (E. W. H.). Pistillate plant from the Cambridge Botanic Garden (R. I. L.).

Exsiccata:—Billot, 1957, as *S. daphnoïdes*; Fries, vi, 54, as *S. daphnoïdes*; A. et J. Kerner, 25, 56, 57, as *S. daphnoïdes*; Leefe, i, 18, as *S. daphnoïdes*; E. F. et W. R. Linton, 4, as *S. daphnoïdes*; Reichenbach, 569, as *S. daphnoïdes*; Wirtgen, xi, 630 as *S. daphnoïdes*.

Laminae broader, *catkins* larger, and *style* usually stouter than in var. *acutifolia*. *Laminae* rather smaller, less suddenly acuminate, and *catkins* larger than in var. *pomeranica*.

As pointed out by Forbes (*loc. cit.*) the white hairs of the catkins begin to protrude from the buds even in the early days of October; and the catkins are often in full flower in February.

Planted in shrubberies on damp soil, as near Huntingdon, and in hedgerows, as near Hertford; Ireland, co. Down; and doubtless elsewhere.

(*b*) ***S. daphnoïdes** var. **pomeranica** Gürke *Plant. Eur.* ii, 24 (1897); A. et G. Camus *Classif. Saul.* ii, 94 (1905); *S. pomeranica* Link *Enum. Pl. Hort. Berol.* ii, 414 (1822); Forbes *Sal. Woburn.* 281 (1829).

Icones:—Reichenbach *Icon.* t. 602, fig. 1254, as *S. pomeranica*; *Fl. Dan.* t. 2919, as *S. daphnoïdes*; A. et G. Camus *op. cit.*, *Atlas* ii, t. 5 (38), fig. F—H as *S. pomeranica*.

Exsiccata:—Leefe i, 6, as *S. pomeranica*.

Buds pubescent, smaller than in var. *praecox*. *Laminae* rather larger, narrower, more abruptly acuminate. *Catkins* smaller and more slender; February and March.

Planted on sand-dunes, near Southport (*New Phyt.*, x, 319 et 328 (1911)). Known also in northern Germany.

(*c*) ***S. daphnoïdes** var. **acutifolia** Döll *Fl. Bad.* 492 (1859); *S. acutifolia* Willdenow *Sp. Pl.* iv, 668 (1806); *S. violacea* Andrews *Bot. Repos.* ix, no. 581; Smith in Rees' *Cyclop.* xxxi, no. 33 (1815)!; Babington *Manual* ed. 4, 299 (1856); Syme *Eng. Bot.* viii, 250 (1868); v. Seemen in Ascherson und Graebner *Syn.* iv, 171 (1909); *S. pruinosa* [Wendland ex] Reichenbach *Fl. Excurs.* 172 (1830); *S. daphnoïdes* subsp. *acutifolia* A. et G. Camus *Classif. Saul.* ii, 96 (1905).

Icones:—Andrews, *loc. cit.*; Forbes *Sal. Woburn.* t. 25, as *S. violacea*; *Fl. Dan.* t. 2602, as *S. acutifolia*; Reichenbach *Icon.* t. 603, fig. 1255, as *S. pruinosa*; Syme *Eng. Bot.* viii, t. 1366, as *S. acutifolia*; A. et G. Camus *op. cit.*, *Atlas* ii, t. 5 (38), fig. K—L', as *S. acutifolia*.

Exsiccata:—Fries, viii, 58, as *S. acutifolia*; Leefe, iii, 70, as *S. daphnoïdes*; Reichenbach, 1142, as *S. pruinosa*; Herb. *Fl. Ingric.* x, 560, as *S. acutifolia*.

Laminae narrower than in the other two varieties, about 1 cm. broad, more gradually acuminate.

Found by Mr Ward, in 1831, and later by Mr Mudd, in a wood near Great Ayton, N. R. Yorkshire (Baker, *North Yorks.* 250 (1863)).

"In woods, and by the sides of streams. Very rare, and perhaps not indigenous" (Syme, *op. cit.*).

Scandinavia and Denmark (not indigenous), Germany, central Europe (ascending to 1630 m. in the Tyrol), Russia; south-central Asia to Manchuria and Saghalien.

S. daphnoïdes is occasionally planted in the British Isles; Hertfordshire, Huntingdonshire, Lancashire, North Riding of Yorkshire, Roxburghshire, and doubtless elsewhere; Ireland.

Southern Scandinavia (? indigenous), Denmark (? indigenous), eastern France, central Europe (ascending to 1740 m. in the Alps), Russia, Italy; Asia (ascending to 5000 m. in the Himalayas) from the Ural mountains to Saghalien.

[Series xiv. **Incanae*]

Incanae Andersson in DC. *Prodr.* xvi, pt. ii, 302 (1868); A. et G. Camus *Classif. Saul.* 221 (1904); *Canae* A. Kerner *op. cit.*, p. (100).

For characters, see page 58. Only species recorded for the British Isles:—**S. incana*.

[*SALIX INCANA]

Salix incana Schrank *Baier Fl.* i, 230 (1789); A. et G. Camus *Classif. Saul.* 220 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 189 (1909); Rouy *Fl. France* xii, 198 (1910).

Icones:—Forbes *Sal. Woburn.* t. 89, as *S. linearis*; Reichenbach *Icon.* t. 596, fig. 1247; A. et G. Camus *op. cit.*, *Atlas* t. 21, fig. H—L.

Exsiccata:—Billot, 645, 645 bis; A. et J. Kerner, 3, 17; Reichenbach, 958; Wirtgen, ii, 95; xi, 631.

Small shrub, up to about 2 m. high. *Petioles* short. *Laminae* acuminate, up to about 10—15 cm. long and 5—10 mm. broad, lower surface white or grey with appressed hairs. *Catkins* shortly peduncled in fruit, about 1·5—2·0 cm. long, appearing a little before the leaves; April—May. *Bracts* concolorous, whitish, elliptical or oboval, hairy at the margin. *Filaments* pilose. *Style* distinct. *Stigmas* purple, rather short, bifid. *Capsules* glabrous or covered with short hairs, shortly stalked; June.

Ambleside, Cumberland (Rev. Dr F. R. Tennant).

Dr Tennant informs us (*in litt.*) that his specimen "was gathered at Ambleside in 1894. I cannot be absolutely certain as to the spot.....; but I am almost certain the bush grew on the edge of a stream, either the Rothay or a tributary, and quite close to the town. I cannot remember any garden being near, nor any signs indicating that the plant had escaped. .....I have never preserved any specimens of *Salix* that I have not gathered myself."

The distribution of the plant is rather against the view that *S. incana* is indigenous in the British Isles. We can only surmise that the plant, a pistillate one, seen by Dr Tennant was planted or that it is a descendant of a planted specimen.

Banks of streams in sub-Alpine and mountainous districts in central Europe (ascending to 1800 m. in France) and southern Europe (to 37° N. in Spain); Asia Minor.

Series xv. *VIMINALES*

Viminales Koch *Sal. Comment.* 27 (1828); Borrer in Hooker *Brit. Fl.* 423 (1830); Du Mortier in *Bull. Bot. Soc. Belg.* i, 143 (1862); A. et G. Camus *Classif. Saul.* 214 (1904) as a section; v. Seemen in Ascherson und Graebner *Syn.* iv, 173 (1909) excl. *S. lapponum.*

For characters, see page 58.

Species and hybrids of *Viminales*

19. **S. viminalis** (see below). *Young branches* long, straight, flexible, pubescent. *Laminae* longer and narrower than in the hybrids. *Catkins* smaller. *Capsules* sessile or subsessile.

S. aurita* × *viminalis (p. 61). *Young branches* less stout and less permanently pubescent than in *S. caprea* × *viminalis* and *S. cinerea* × *viminalis*. *Catkins* smaller. *Capsules* smaller and stalked.

S. caprea* × *viminalis (p. 62). *Young branches* stout and very pubescent. *Catkins* stout. *Capsules* rather stout, stalked.

S. cinerea* × *viminalis (p. 64). Very like *S. caprea* × *viminalis*. *Stipules* larger. *Laminae* often more hairy above and more tapering. *Catkins* rather narrower. *Capsules* stalked.

19. SALIX VIMINALIS. Common Osier. Plates 59, 60, 61; 27, 28, 62, 63, 64, 69

Salix folio longissimo Ray *Cat. Cantab.* 146 (1660); *Syn.* ed. 3, 450 (1724).

Salix viminalis L. *Sp. Pl.* 1021 (1753)!; Smith *Fl. Brit.* 1070 (1804); Syme *Eng. Bot.* viii, 223 (1868); A. et G. Camus *Classif. Saul.* 214 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 173 (1909); Rouy *Fl. France* xii, 200 (1910).

Shrub, attaining a height of about 4—8 m. *Branches* long, straight, flexible, slender, smooth and polished, pubescent at least when young. *Buds* pubescent. *Stipules* caducous or persistent, variable in size and shape, often linear-lanceolate, shorter than the petiole. *Petioles* about as long as the laminae are wide. *Laminae* linear-lanceolate or lanceolate, margin entire, more or less undulate and recurved, gradually attenuate to the apex, up to about 20—25 cm. long and 1 broad, upper surface glabrous, lower surface almost silvery white with close silky hairs. It holds its

leaves longer in autumn than any other of our indigenous willows. *Catkins* sessile, dense-flowered, appearing a little before the leaves; April and early May. *Staminate catkins* cylindrical, about 2·5—3·0 cm. long. *Bracts* elliptical-acute, blackish towards the apex, hairy. *Nectaries* yellow, long, sometimes bifid. *Filaments* long. *Pistillate catkins* shorter, lengthening to about 4—6 cm. in fruit. *Bracts* broader. *Nectaries* as long as in the staminate flowers, usually appressed. *Ovaries* sessile or subsessile, narrowly ovate, with silky hairs. *Style* long. *Stigmas* about as long or rather longer than the style, sometimes more or less bifid, pale yellow. *Capsules* sessile or subsessile, pubescent, ovate; May.

(*a*) **S. viminalis** var. **vulgaris** A. Kerner in *Verhandl. Zool.-Bot. Gesellsch. Wien* 211 (1860); *S. viminalis* var. *genuina* Syme *Engl. Bot.* viii, 224 (1868) including var. *intricata.*

Icones:—Smith *Eng. Bot.* t. 1898, as *S. viminalis*; Forbes *Sal. Woburn.* t. 133, as *S. viminalis*; *Fl. Dan.* t. 2485, as *S. viminalis*; Reichenbach *Icon.* t. 597, fig. 1248, as *S. viminalis*; Hartig *Forst. Culturpfl.* t. 46, as *S. viminalis*; A. et G. Camus *op. cit., Atlas* t. 21, fig. A, C—G as *S. viminalis.*

Cambr. Brit. Fl. ii. *Plate 59.* (*a*) Shoot with staminate catkins. (*b*) Barren shoot and leaves. (*c*) Staminate flowers (enlarged). (*d*) Staminate flowers. Huntingdonshire (E. W. H.). *Plate 60.* (*a*) Shoot with pistillate catkins. (*b*) Barren shoot. (*c*) Pistillate flowers (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 1958, as *S. viminalis*; Fries, i, 64, as *S. viminalis*; A. et J. Kerner (*H. S. A.*), 43, as *S. viminalis*; Leefe, 17, 18, 19, as *S. viminalis* var.; 20, as *S. viminalis*?; 22, as *S. viminalis* var.; 23, as *S. viminalis* var. *leptostachya*; 21, as *S. viminalis* var. *intricata*; 24, as *S. viminalis* var. *intricata*?; E. F. et W. R. Linton, 8, as *S. viminalis*; *Herb. Fl. Ingric.* x, 562 b, as *S. viminalis.*

A larger plant than var. *linearifolia*, with stouter branches, longer and broader leaves, and larger catkins.

This is the usual form of the common osier.

(*b*) **S. viminalis** var. **linearifolia** Wimmer et Grabowski *Fl. Siles.* ii, 368 (1829); *S. viminalis* var. *angustissima* Cosson et Germain *Fl. Env. Paris* 504 (1845); A. et G. Camus *Classif. Saul.* 219 (1904); Rouy *Fl. France* xii, 200 (1910); var. *tenuifolia* A. Kerner in *Verhandl. Z.-B. Gesellsch. Wien* 211 (1860).

Icones:—*Cambr. Brit. Fl.* ii. *Plate 61.* (*a*) Shoot with pistillate catkins. (*b*) Barren shoots. (*c*) Pistillate flowers (enlarged). Huntingdonshire (E. W. H.).

A smaller plant than var. *vulgaris*, with more slender branches, leaves, and catkins.

We have seen specimens from Suffolk, Cambridgeshire, and Shropshire. In Huntingdonshire, it grows side by side with var. *vulgaris*, on alluvial land which is subject to inundations in winter.

France, Germany (Hamburg, sp.), central Europe.

S. viminalis is common by streams and in damp alluvial meadows throughout the lowlands of England, eastern Scotland, and Ireland; rarely indigenous in hilly districts, though White (*Trans. Perthshire Soc. Nat. Sc.* i, pt. iv, 187 (1890)) states that it occurs "on the banks of streams in the Lowlands and in some of the Highland valleys" of Perthshire. Commonly cultivated as an osier.

Norway (to 64° 12″ N.), Sweden, Denmark, Germany, Holland, Belgium, France, central Europe, Spain, Portugal, Russia, the Balkans; Caucasia to Kashmir (3330 m.) and Japan; America (not indigenous).

S. aurita* × *viminalis Wimmer in *Flora* xxxi, 313 (1848) emend.; A. et G. Camus *Classif. Saul.* 320 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 274 (1909) excluding syn. Andersson; Rouy *Fl. France* xii, 238 (1910); *S. ferruginea* Forbes *Sal. Woburn.* 255 (1829); Hooker *Brit. Fl.* ed. 4, 364 (1838); Syme *Eng. Bot.* viii, 228 (1868); × *S. fruticosa* Döll *Fl. Baden.* 515 (1859); × *S. smithiana* var. *ferruginea* Andersson in DC. *Prodr.* xvi, pt. ii, 268 (1868); White in *Journ. Linn. Soc.* xxvii, 419 (1890) partim.

Icones:—Forbes *Sal. Woburn.* t. 128, as *S. ferruginea*; Borrer in *Eng. Bot. Suppl.* t. 2665, as *S. ferruginea*!; A. et G. Camus *op. cit.*, t. 29, fig. Q—X, as × *S. fruticosa.*

Cambr. Brit. Fl. ii. *Plate 62.* (*a*) Shoot with pistillate catkins. (*b*) Leaves of summer shoots. (*c*) Pistillate flowers. (*d*) Pistillate flowers (enlarged). Hort. (Rev. E. F. Linton).

Exsiccata:—Billot, 3678, as *S. ferruginea*; Engler (*Pl. Bresl.*) 30; Heidenreich (*Fl. Boruss. Orient.*); Leefe, [32, 33, et i, 22 as *S. rugosa* (some of these plants are probably complex hybrids)]; 35, 36, et iii, 63, et iv, 89 [received from Woburn], as *S. ferruginea*; E. F. et W. R. Linton, 11; herb. Marshall, 875.

Shrubs, about 3—4 m. high. *Young branches* and *buds* less stout than in the allied hybrids *S. caprea* × *viminalis* and *S. cinerea* × *viminalis*, hairy but less persistently so and less markedly so than in the allied hybrids. *Stipules* caducous or persistent, usually smaller than in the allied hybrids.

Petioles about 5—7 mm. long, hairy at least when young. *Laminae* broadly lanceolate to narrowly obovate, margin often reflexed when young and more or less crenate, acute to very acute, smaller and usually rather more rugose than in the allied hybrids, upper surface at maturity subglabrous or with minute but persistent hairs, more or less strongly hairy below. *Catkins* closely resembling those of the allied hybrids but usually smaller, about 2·5 cm. long as a rule, variable in width, subsessile or on short peduncles, rather leafy at the base; April. *Bracts* sub-ligulate, usually narrower than in the allied hybrids, rather strongly discolorous, pilose. *Filaments* glabrous or pilose towards the base. *Style* rather short but distinct. *Stigmas* stout, entire or bifid. *Capsules* rather narrow, more or less pubescent, stalked; late May.

The putative hybrids of *S. viminalis* with the members of the series *Capreae* (*S. caprea*, *S. cinerea*, and *S. aurita*) are difficult to separate from each other. In fact, no two Salicologists would agree in the allocation of putative parents to the plants in question. One difficulty is that the forms referred respectively to *S. caprea* × *viminalis*, *S. cinerea* × *viminalis*, and *S. aurita* × *viminalis* are all connected by intermediates which have probably originated by the re-crossing of the various hybrids among themselves and with the other putative parents, so that it is possible to find in certain plants any imaginable combination of the characters of the four species and the various crosses. Another difficulty is that the three members of the series *Capreae* are themselves closely allied, and, even when pure, are only separable by rather indefinite characters. Further, *S. viminalis* is very distinct from the three *Capreae*, and its characters are very strongly impressed on all the hybrids in question, thus rendering the indefinite characters of the species of the series *Capreae* still more vague in the various hybrid-forms. The final result is a group of hybrid-forms with characters so complicated and blended that they are incapable of satisfactory analysis by the morphological methods of the systematist. On this account, many of the synonyms, figures, and specimens of this group of hybrids are more or less doubtful.

There need be no doubt that hybrids of the *Capreae* with *S. viminalis* actually occur, for Max Wichura had no difficulty in artificially producing *S. caprea* × *viminalis*.

By systematists of the Victorian period, the existence of this group of complicated hybrids might have been held to justify the union of *S. caprea*, *S. cinerea*, and *S. aurita* in a single species; but such an argument would really have proved too much, for it would have involved the union of the very distinct *S. viminalis* in the same synthetic group.

In this work we retain the conventional hybrid groups *S. caprea* × *viminalis*, *S. cinerea* × *viminalis*, and *S. aurita* × *viminalis*; but this is not because we believe these groups are, at present, really separable, but because there is no better plan to offer. In fact, until the species in question have been subjected to artificial hybridisation, re-hybridisation, and cultivation on a large scale, we do not think any satisfactory treatment of these hybrid forms is possible.

S. aurita × *viminalis* is local, by stream-sides and in marshy places generally; in Great Britain, from Sussex to Fifeshire and Ross-shire.

Also recorded for southern Scandinavia, Germany, and France; and it is perhaps much more widespread than the records indicate, being included in the allied hybrids by many continental authors.

S. caprea* × *viminalis Wimmer in *Flora* xxxii, 41 (1849) excl. f. *stipularis* p. 42, incl. *S. dasyclados* p. 35; A. et G. Camus *Classif. Saul.* 309 (1904) including *S.* (*cinerea* × *viminalis*) *caprea* (ii, p. 265) et × *S. calodendron* (ii, p. 265); v. Seemen in Ascherson und Graebner *Syn.* iv, 268 (1909) including *S. caprea* × *viminalis* × *caprea* (p. 270) et *S. caprea* × *dasyclados* (p. 271); *S. affinis* Grenier et Godron *Fl. France* iii, 132 (1855).

S. caprea acuto longoque folio Sherard in Ray *Syn.* ed. 2, 293 (1696); ed. 3, 450 (1724).

Icones :—*Fl. Dan.* t. 2669, as *S. acuminata*; Hartig. *Forst. Culturpfl.* t. 44, as *S. acuminata*; A. et G. Camus *op. cit.*, *Atlas* t. 29, fig. A—F, as × *S. lanceolata*; ii, t. 16 (49) fig. A—E, as × *S. calodendron.*

Exsiccata :—Billot, xi, 60, as *S. acuminata*; Leefe, 30, 31, 32, 33, et i, 22 as *S. rugosa*; iv, 86 et iv, 101, as *S. smithiana*; 27, 29, as *S. smithiana*?; 34, as *S. rugosa* var. *stipularis*; E. F. et W. R. Linton, 12; 13, as *S. acuminata*; Herb. *Fl. Ingric.* ix, 563, as *S. acuminata.*

Shrubs or small trees, usually up to about 3—5 m. high. *Young branches* and *buds* stouter than in *S. aurita* × *viminalis*, more hairy, soft, almost velvety to the touch, dark. *Stipules* persistent or not, very variable in size and shape. *Petioles* about 1·3 cm. long, pubescent. *Laminae* lanceolate to ovate-lanceolate, margin sometimes entire or somewhat undulate and crenulate, acute to very acute, up to about 8—10 cm. long and about one-eighth to one-third as broad, subglabrous above, hairy underneath. *Catkins* sessile or subsessile or shortly peduncled, often more or less arched, rather stout, dense-flowered, rather handsome, about 3—4 cm. long, appearing before the leaves; late March and April. *Bracts* ovate to obovate, strongly discolorous, with numerous long hairs, variable in size. *Ovaries* stalked, the length of the stalk variable. *Style* variable in length, as a rule as long as the stigmas at maturity. *Stigmas* rather stout, usually entire. *Capsules* stout, very hairy, stalked; May.

Many continental authors make five or six subdivisions of this hybrid. They are defined by characters of the relative length and width of the laminae, the degree of hairyness of the laminae, the comparative length of the nectary and gynophore, and the comparative length of the style and stigmas. We have been unable to convince ourselves that these characters are correlated.

One of the forms, however, deserves special mention, as it was produced artificially by Max Wichura (*Jahr.-Ber. Schles. Gesellsch. Vaterl. Kult.* 160—164 (1853)). Wichura crossed *S. caprea* ♀ with *S. viminalis* ♂, and the result, he states, was *S. acuminata*. Several closely allied plants have been named *S. acuminata*; but, as Wichura worked in Wimmer's garden, the presumption is that the form produced was *S. viminalis-caprea* f. *acuminata* Wimmer in *Flora* xxxii, 42 (1849) which is referred by Kerner to his × *S. sericans*.

Wichura took very elaborate—but very necessary—precautions to ensure that no foreign pollen reached his pistillate plants. This is remarkable, for Wichura's work was done sixteen years before the publication of Mendel's results. No accidental hybrid-products could arise as a result of Wichura's experiments. Thus, we may be certain that, although *S. caprea* and *S. viminalis* are not at all closely related species, yet they form hybrids without difficulty.

Wichura adds that as the two parents (*S. caprea* and *S. viminalis*) differ greatly from each other, especially in the shape of the leaves, this willow (*S. caprea* × *viminalis*) appears, owing to its intermediate characters, to be, more than most hybrids, a distinct species. "The proof," he concludes, "of the hybridity of its nature is the most beautiful confirmation that the doctrine of hybrids among willows could receive." A French translation of Max Wichura's paper is to be found in Schultz's *Arch. de Flore*, pp. 91—99 (1855).

(B) × ***S. smithiana*** Wimmer *Sal. Eur.* 179 (1866) emend.; *S. smithiana*[1] Willdenow *Enum. Hort. Berol.* 1008 (1809); Smith *Eng. Fl.* iv, 229 (1828)!; Syme *Eng. Bot.* viii, 226 (1828)!; *S. mollissima* Smith *Fl. Brit.* 1070 (1804)[2]! non Ehrhart; *S. sericans* Tausch in *Flora* xxi, 754 (1838); × *S. sericans* A. Kerner in *Verhandl. Z.-B. Gesellsch. Wien* 214 (1860); × *S. smithiana* var. *sericans* Andersson in DC. *Prodr.* xvi, pt. ii, 267 (1868); White in *Journ. Linn. Soc.* xxvii, 417 (1890); *S. acuminata* auct. pl., nec Smith nec Koch.

Icones:—Smith *Eng. Bot.* t. 1509 (the catkins are very young; and the leaves are of a summer shoot) as *S. mollissima*; Forbes *Sal. Woburn.* t. 134, as *S. smithiana*; Reichenbach *Icon.* t. 600, fig. 1251, as *S. smithiana*.

Camb. Brit. Fl. ii. *Plate 63.* (*a*) Shoot with pistillate catkins. (*b*) Barren shoot. (*c*) Pistillate flowers (enlarged). (*d*) Bract (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Leefe, 25, 26, as *S. smithiana*; 27, 28, as *S. smithiana*?; Tausch (*Pl. Select. Boh.*) as *S. sericans*.

Bracts shorter in proportion to the length of the ovary than in × *S. acuminata*. *Style* longer in proportion to the length of the stigmas. The two forms (× *S. smithiana* and × *S. acuminata*), however, are connected by intermediates.

Smith (*Eng. Fl.* iv, 230 (1828)) states that this willow proves to be of no utility as an osier; and probably the remark is applicable to all the hybrids of *S. viminalis* with the members of the series *Capreae*.

(C) × ***S. acuminata*** Andersson in DC. *Prodr.* xvi, pt. ii, 268 (1868); White in *Journ. Linn. Soc.* xxvii, 420 (1890); non Wimmer; *S. acuminata* Smith *Fl. Brit.* 1068 (1804)! excluding syn. Miller et syn. Hoffman; *Eng. Fl.* iv, 227 (1828); Koch *Sal. Comment.* 30 (1828)[3]; Syme *Eng. Bot.* viii 229 (1868); *S. dasyclados* Wimmer in *Flora* xxxii, 35 (1849)!; v. Seemen in Ascherson und Graebner *Syn.* iv, 177 (1909) excluding subsp. *stipularis* p. 180; *S. caprea* × *dasyclados* Wimmer in *Denkschr. Schles. Gesellsch.* 163 (1853); v. Seemen in Ascherson und Graebner *Syn.* iv, 271 (1909); × *S. calodendron* Wimmer *Sal. Eur.* 187 (1866); *S.* (*cinerea* × *viminalis*) *caprea* A. et G. Camus *Classif. Saul.* ii, 265 (1905) including (B) × *S. calodendron*.

Icones:—Smith *Eng. Bot.* t. 1434, as *S. acuminata*; Forbes *Sal. Woburn.* t. 131, as *S. acuminata*.

Camb. Brit. Fl. ii. *Plate 64.* (*a*) Shoot with pistillate catkins. (*b*) Barren shoot. (*c*) Pistillate flowers. (*d*) Bract. (*e*) Pistillate flowers (enlarged). (*f*) Bract (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Leefe, 37 ("certissime *dasyclados*" Andersson[4]), ii, 27, as *S. acuminata*.

Bracts longer in proportion to the length of the ovary than in × *S. smithiana*. *Style* shorter in proportion to the length of the stigmas.

Both Andersson and White agree in including *S. dasyclados* Wimmer (which some authorities still treat as a distinct species) in × *S. acuminata*.

The plant is sometimes referred to *S. cinerea* × *viminalis*, and sometimes to a still more complicated parentage. Max Wichura (*op. cit.* (1865)) surmised that it was a cross of *S. caprea*, *S. cinerea*, and *S. viminalis*. In the absence of experimental evidence, any one opinion is almost as valuable as any other.

[*S. caprea* × *caprea* × *viminalis* A. et G. Camus *Classif. Saul.* ii, 264 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 270 (1909); herb. Marshall 3244.

[1] After Sir James Edward Smith (1759—1828), the most distinguished of Salicologists.

[2] Smith at first believed his *S. mollissima* to be *S. mollissima* Ehrhart. Smith acknowledges his error in *Eng. Fl.*, where he states (iv, 230) that he has lately discovered *S. mollissima* Ehrhart to be totally distinct from his own; "which Willdenow, first perceiving, was pleased to give to our English plant the appellation [*S. smithiana*] here adopted." It is therefore clear that *S. mollissima* Smith and *S. smithiana* Willdenow are synonymous.

[3] In some works, the citation "*S. acuminata* Koch non Smith" is found: in some other works "*S. acuminata* Koch" occurs under one plant and "*S. acuminata* Smith" under another. Koch himself states:—"*S. acuminata* Smith *Brit.* 1068 ex specimenibus anglicis authentis (nec Hoffmanni, nec Willdenowi, nec omnium authorum [*sic*] germanicorum)."

[4] Andersson examined some of Leefe's specimens in the herbarium of H. C. Watson. The latter published Andersson's notes in *Bot. Gaz.* iii, 57 (1851). Watson's plants are now in Herb. Kew. Andersson has also written notes on several other specimens in Herb. Kew.

Messrs Marshall and Shoolbred (*Journ. Bot.* xlvii, 222 (1909)) record a Sutherlandshire plant which the Rev. E. F. Linton suggested had the above parentage. We do not doubt that such complicated hybrids, and even hybrids still more complicated, occur in nature; but it appears to us that the results of very precise and very numerous experiments on hybrids by recent Mendelian workers have established beyond doubt that it is not possible to discover precisely the parents of such putative hybrids by morphological methods. The same parentage has also been ascribed to a plant collected in Germany.]

S. caprea × *viminalis*, although local, is rather widespread in England, rather rare in eastern Scotland, and "not unfrequent in Ireland" (Syme, under × *S. smithiana, op. cit.* p. 227); from Cornwall, Sussex, and Essex northwards to Perthshire and Ross-shire; co. Cork, co. Kildare.

Southern Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe, Russia; Asia eastwards to Japan.

S. cinerea* × *viminalis Wimmer in *Flora* xxviii, 437 (1845) emend.; in *Flora* xxxi, 318 (1848); in *Denkschr. Schles. Gesellsch.* 161 (1853) including *S. dasyclados* × *viminalis* p. 160, 162; *Sal. Eur.* 181 (1866) including × *S. stipularis* p. 184 et × *S. holosericea* p. 189; A. et G. Camus *Classif. Saul.* 314 (1904) including × *S. stipularis* p. 318, excluding syn. Forbes et syn. Koch and their equivalents; v. Seemen in Ascherson und Graebner *Syn.* iv, 266 (1909) including *S. dasyclados* subsp. *stipularis* p. 180, excluding syn. *S. ferruginea* Forbes et *S. smithiana* Forbes et syn. Leefe; Rouy *Fl. France* xii, 237 (1910).

Icones:—Forbes *Sal. Woburn.* t. 129, as *S. geminata*; t. 135, as *S. micheliana.*

Exsiccata:—E. F. et W. R. Linton, 10; Schultz x, 921; Wimmer et Krause (*H. S.*), 24.

Small tree or shrub. *Young branches* long, rather stout and coarse, persistently pubescent. *Stipules* caducous or persistent, very variable in size and shape, often large and sometimes stalked and serrate on the summer shoots and coppiced shoots. *Petioles* about 1·0—1·5 cm. long, pubescent. *Laminae* lanceolate, broadly lanceolate, or narrowly obovate, usually narrower than in *S. caprea* × *viminalis*, margin often somewhat incurved and crenulate, acute to acuminate or gradually tapering to the apex, covered with persistent hairs on both surfaces, very hairy underneath, from about 8—16 cm. long or rather longer, and 1·5 to 3·0 broad. *Catkins* smaller than those of *S. caprea* × *viminalis*, larger than those of *S. aurita* × *viminalis*; April. *Bracts* as in these hybrids. *Style and stigmas* variable, but usually long. *Capsules* pubescent, stalked; May.

(B) × ***S. holosericea*** Wimmer *Sal. Eur.* 189 (1866); A. et G. Camus *Classif. Saul.* 314 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 267 (1909); *S. holosericea* Willdenow *Berl. Baumz.* 458 (1796); Hooker *Brit. Fl.* ed. 4, 364 (1838); × *S. lancifolia* Döll *Fl. Baden.* 512 (1859); × *S. smithiana* var. *velutina*[1] Andersson in DC. *Prodr.* xvi, pt. ii, 268 (1868) excl. var. *ferruginea*; White in *Journ. Linn. Soc.* xxvii, 418 (1890).

Icones:—Reichenbach *Icon.* t. 579, fig. 2026 [1226], as *S. holosericea*; Hartig *Forst. Cult.* t. 112 (37 b), as *S. holosericea*; A. et G. Camus *op. cit.* t. 29, fig. M—R, as × *S. holosericea.*

Exsiccata:—Fries, xi, 61, as *S. holosericea.*

Stipules, when persistent, smaller than in × *S. stipularis.* *Laminae* shorter, up to about 8·0 cm. long and 1·5 broad, with grey or rust-coloured hairs underneath. *Catkins* smaller than in × *S. stipularis.* *Style* rather short but distinct. *Stigmas* entire or bifid.

(C) × ***S. stipularis*** A. Kerner in *Verhl. Z.-B. Gesellsch. Wien* (217) (1860); Wimmer *Sal. Eur.* 184 (1866); A. et G. Camus *Classif. Saul.* 318 (1904); *S. stipularis* Smith *Eng. Bot.* no. 1214 (1803)!; *Fl. Brit.* 1069 (1804); *Eng. Fl.* iv, 230 (1828); Syme *Eng. Bot.* viii, 225 (1868); *S. viminalis* × *dasyclados* Wimmer in *Denkschr. Schles. Gesellsch.* 160 (1853); × *S. smithiana* var. *stipularis* White in *Journ. Linn. Soc.* xxvii, 415 (1890); *S. dasyclados* subsp. *stipularis* Ascherson und Graebner *Syn.* iv, 180 (1909); *S. cinerea* × *viminalis* race *stipularis* Rouy *Fl. France* xii, 238 (1910).

Icones:—Smith *Eng. Bot.* t. 1214 (pistillate catkins immature, and leaves from summer shoots), as *S. stipularis*; Forbes *Sal. Woburn.* t. 130, t. 132, as *S. stipularis*; *Fl. Dan.* t. 2268, as *S. stipularis*; Reichenbach *Icon.* t. 598, fig. 1249, as *S. stipularis*; A. et G. Camus *op. cit., Atlas* t. 29, fig. J—K, as × *S. stipularis.*

Exsiccata:—Leefe, i, 15, as *S. stipularis*; E. F. et W. R. Linton, 9, 84, as *S. stipularis.*

Stipules often caducous on the normal leaves; those of the summer shoots persistent, more or less stalked, large, long, more or less coarsely serrate on the outer margin, often with a large tooth at the base, acute, pubescent underneath. *Laminae* longer and relatively more narrow than in × *S. holosericea*, up to about 17 cm. long and 2·5—3·0 broad, grey or white with hairs underneath. *Catkins* longer than those of × *S. acuminata* or × *S. smithiana.* *Style* variable in length. *Stigmas* linear, divided or not. Staminate plants appear to be rare.

[1] The name "*S. velutina* Schrader" would appear to be illegitimate. It seems to be based merely on a citation in synonymy by Koch (*Syn.* 650 (1837)) as follows:—"*S. velutina* Schrader secunda specimina ex horto Gottingensi in herbario Mertensio."

S. cinerea × *viminalis* is rather local but widespread in lowland localities, as in osier-beds, by stream-sides, and in hedgerows and woods on damp alluvial soils; from the Channel Isles, Cornwall, and Suffolk, northwards to Perthshire and Sutherlandshire.

Scandinavia, Denmark, Germany, Belgium, France, central Europe, Russia; Turkestan to the Amur region.

S. purpurea × *viminalis* (see page 68); *S. repens* × *viminalis* (see page 51); *S. triandra* × *viminalis* (see page 24).

Series xvi. *PURPUREAE*

Purpureae Koch *Sal. Comment.* 24 (1828); Grenier et Godron *Fl. France* iii, 128 (1855); A. et G. Camus *Classif. Saul.* 98 (1904) as a section; v. Seemen in Ascherson und Graebner *Syn.* iv, 60 (1908) et 192 (1909); *Monandrae* Borrer in Hooker *Brit. Fl.* 413 (1830).

This is the most specialised series of the genus *Salix*, as is shown by the remarkable androecium: it is natural therefore to place the series at the end of the genus.

For characters, see page 58.

Species and chief hybrid of *Purpureae*

20. **S. purpurea** (see below). *Filaments* wholly united.

S. purpurea* × *viminalis (p. 68). *Filaments* partially free.

20. SALIX PURPUREA. Purple Osier. Plates 65, 66, 67; 68, 69

Salix humilior foliis angustis subcaeruleis Ray *Cat. Cantab.* 144 (1660); ed. 3, 448 (1724).

Salix purpurea L. *Sp. Pl.* 1017 (1753) including *S. helix*; Syme *Eng. Bot.* viii, 217 (1868); A. et G. Camus *Classif. Saul.* 98 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 192 (1909); Rouy *Fl. France* xii, 196 (1910).

Icones:—A. et G. Camus *op. cit.*, *Atlas* t. 7.

Shrub, attaining a height of about 6—8 m. *Bark* bitter to the taste. *Young branches* slender, straight, some glabrous, shining, often reddish or purplish. *Buds* glabrous, acute. *Stipules* usually caducous. *Petioles* about 1 cm. long. *Laminae* lanceolate or broadly lanceolate or narrowly obovate, margin more or less denticulate, acute to acuminate, about 5—10 cm. long and 1—2 broad, rather thick, soon glabrous, often subopposite towards the end of the branches, often turning blackish on drying. *Catkins* sessile or subsessile, with a few small leaves at the base, suberect or spreading, dense-flowered especially the pistillate ones, about 2·0 to 3·5 cm. long, appearing before the leaves; late March and April. *Bracts* short, usually oboval or oblong-oval, hairy. *Ovaries* much broader than in the other species of the section *Vimen*. *Style* very short. *Stigmas* yellow or purple, spreading at maturity. *Capsules* broadly oval, pubescent; May.

(*a*) **S. purpurea** var. **vera** Ritschl *Fl. Posen* 206 (1850); *S. purpurea* L. *Sp. Pl.* 1017 (1753); Smith *Fl. Brit.* 1039 (1804)!; *S. purpurea* var. *gracilis* Grenier et Godron *Fl. France* iii, 129 (1855); A. et G. Camus *Classif. Saul.* 103 (1904); Rouy *Fl. France* xii, 197 (1910); *S. purpurea* var. *genuina* Syme *Eng. Bot.* viii, 217 (1868).

Icones:—Curtis *Fl. Lond.* ii, 198, as *S. monandra*; Smith *Eng. Bot.* t. 1388, as *S. purpurea*; Hartig *Forst. Culturpfl.* t. 2554, as *S. purpurea*; Reichenbach *Icon.* t. 582, fig. 2030 [1230], as *S. purpurea*.

Camb. Brit. Fl. ii. *Plate 65.* (*a*) Shoot with staminate catkins. (*b*) Barren shoot. (*c*) Staminate flowers (enlarged). Near Huntingdon (E. W. H.). *Plate 66.* (*a*) Shoot with pistillate catkins. (*b*) Barren shoot. (*c*) Ovaries and bract (enlarged). Near Huntingdon (E. W. H.).

Exsiccata:—Billot, 1956, as *S. purpurea*; Bourgeau (*Pyr. Esp.*), 671, as *S. purpurea*; Fries, ii, 56, as *S. purpurea*; Kerner (*H. S.*) 46, as *S. purpurea*; Leefe, i, 21 ("received from Mr Borrer as the plant of Smith"); ii, 48, as *S. purpurea*; E. F. et W. R. Linton, 34 ("represents the var. *ramulosa*"), 80, as *S. purpurea*; Reichenbach, 1141, as *S. purpurea*; Schultz x, 920, as *S. mirabilis*.

Bark intensely bitter. *Laminae* lanceolate-acute, about 6—8 cm. long and 1·0 to 1·5 broad, not broadening much above the middle. *Catkins* more slender than in var. *helix*.

(*b*) **S. purpurea** var. **lambertiana** Koch *Syn.* 647 (1837); Syme *Eng. Bot.* viii, 218 (1868) including var. *woollgariana*; A. et G. Camus *Classif. Saul.* 104 (1904); *S. lambertiana*[1] Smith *Fl. Brit.* 1041 (1804)!; *S. woollgariana* Borrer in *Eng. Bot. Suppl.* no. 2651 (1830)!.

[1] After Aylmer Bourke Lambert (1761—1842), of Boyton, Wiltshire.

Icones :—Smith *Eng. Bot.* t. 1359, as *S. lambertiana*; Forbes *Sal. Woburn.* t. 3, as *S. lambertiana*; Borrer in *Eng. Bot. Suppl.* t. 2651, as *S. woollgariana*[1].

The "var. *ramulosa* Leefe" (ined.) may perhaps be placed here: it seems intermediate between var. *vera* and var. *lambertiana*.

Camb. Brit. Fl. ii. *Plate 67, a.* (*a*) Shoot with pistillate catkins. (*b*) Leaves. (*c*) Pistillate flowers (enlarged). (*d*) Bract (enlarged). Cambridge Botanic Garden (R. I. L.).

Exsiccata :—Heurck, ii, 88, as *S. lambertiana*; Leefe, 11, 12, 13, et iii, 75, as *S. ramulosa*; 14, as *S. lambertiana*; iii, 76, as *S. woollgariana*; E. F. et W. R. Linton, 5, as *S. purpurea* var. *woollgariana*.

Laminae much broader (up to about 2 cm.) than in var. *gracilis*, especially above the middle, usually more rounded and sometimes more or less asymmetrical at the base, apex more abruptly acuminate. *Catkins* more slender than in var. *helix*.

Smith (*Engl. Fl.* iv, 190) mentions that this variety occurred "on the banks of the river Willy, at Boyton, Wilts., for the course of about 26 km." There is a specimen in Herb. Univ. Cantab. by W. Paite, dated September 1829, "from the tree (at Boyton, Wilts.) the drawing was taken from in *English Botany*." Northwards to Dumfriesshire.

(*c*) **S. purpurea** var. **helix** Koch *Syn.* 647 (1837); A. et G. Camus *Classif. Saul.* 104 (1904); *S. helix* L. *Sp. Pl.* 1017 (1753); Smith *Fl. Brit.* 1040 (1804)!; *Eng. Fl.* iv, 188 (1828); *S. rubra* var. *helix* Syme *Eng. Bot.* viii, 221 (1868).

Icones :—Smith *Eng. Bot.* t. 1343, as *S. helix* (Borrer remarks, see *Eng. Bot. Suppl.* no. 2651, that there is reason to believe that a pistillate catkin of × *S. forbyana* has been figured here); Forbes *Sal. Woburn.* t. 2, as *S. helix*; Reichenbach *Icon.* t. 583, fig. 2032 [1232]; Hartig *Forst. Culturpfl.* t. 52, as *S. helix*.

Exsiccata :—Leefe, 10, as *S. helix* ("the female is *S. forbyana*"); Tausch (*Pl. Sel. Bohem.*), as *S. helix*.

Differs from var. *vera*, its *branches* more upright, its young *branches* and *leaves* less bitter to the taste, its more strongly obovate and larger *laminae* (up to about 10—15 cm. long and 1·2—1·4 broad), its larger *catkins*, its longer *ovaries* and *styles*, and its bifid *stigmas*. The preceding variety is intermediate between this and var. *vera*.

Smith (see *Eng. Bot.* no. 1962) says that this variety breeds true.

S. purpurea occurs on banks of rivers, ponds, and ditches, in alluvial meadows and fens; and rarely in ash-oak woods; locally abundant in the lowlands of England, rare and not indigenous in upland hilly situations. Northwards to Perthshire (White in *Trans. Perthshire Soc. Nat. Sc.* i, pt. iv, 197 (1890)) and Ross-shire (Rev. E. S. Marshall, in *Journ. Bot.* xlviii, 138, 1910), with a decided preference for the lowlands of eastern Great Britain. "Looks native along many of the streams in the central plain" of Ireland (Praeger, *Irish. Top. Bot.* 286, 1901). Planted in osier-beds.

Scandinavia (to 59° 55′ N.), Denmark, Germany, central Europe (to 2350 m. in the Alps), southern Europe, Russia; northern Africa; western and central Asia to Korea, China and Japan; North America (naturalised).

S. aurita* × *purpurea Wimmer *Fl. Schles. Nachtr.* 478 (1845)!; in *Flora* xxviii, 436 (1845); A. et G. Camus *Classif. Saul.* 283 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 299 (1909); Rouy *Fl. France* xii, 230 (1910); × *S. dichroa* Döll *Fl. Baden.* 511 (1859); White in *Journ. Linn. Soc.* xxvii, 452 (1890); × *S. auritioïdes* A. Kerner *op. cit.* 257 (1860)!; × *S. pontederana* var. *dichroa* Andersson in DC. *Prodr.* xvi, pt. ii, 312 (1868).

Icones :—Reichenbach *Icon.* t. 599, fig. 1250, as *S. mollissima*; A. et G. Camus *op. cit.*, *Atlas* t. 27, fig. A—J, as × *S. dichroa*.

Exsiccata:—A. et J. Kerner (*H. S. A.*), 22, as *S. auritioïdes*; Reichenbach, 957, as *S. mollissima*.

Shrub. *Branches* spreading; young ones slender, glabrous and polished at maturity. *Stipules* persistent, subcordate at the base, narrow, acute. *Petioles* short, puberulent. *Laminae* oblong-elliptical, margin a little recurved and dentate towards the apex, acute to acuminate, lower surface puberulent, subglaucous, and a little rugose. *Catkins* appearing before the leaves, a little arched, subsessile or on short rather leafy peduncles, about 2·5 cm. long; pistillate ones twice as large when mature; April. *Bracts* broadly obovate or elliptical, strongly hairy. *Anthers* purplish. *Filaments* more or less united at least in the lower half. *Ovaries* stalked, elongate, tomentose. *Style* distinct. *Stigmas* as long as or longer than the style.

Rare; Northumberland (Leefe, *loc. cit.*), Dumfriesshire, Perthshire (herb. White).

France, Germany, and central Europe.

[1] After "Mr Thomas Woollgar [ca. 1800], an accurate and indefatigable worker in this his favourite genus of plants" (Borrer, *loc. cit.*).

S. cinerea* × *purpurea Wimmer *Fl. Schles. Nachtr.* 477 (1845)!; in *Flora* xxviii, 435 (1845); A. et G. Camus *Classif. Saul.* 275 (1904) excl. syn. *S. oleïfolia* Smith; v. Seemen in Ascherson und Graebner *Syn.* iv, 294 (1909); *S. pontederae* Villars *Pl. Dauph.* iii, 766 (1789); *S. pontederana* Willdenow *Sp. Pl.* iv, 661 (1805); × *S. sordida* Kerner in *Verhandl. Z.-B. Gesellsch. Wien* x, 257 (1860); White in *Journ. Linn. Soc.* xxvii, 450 (1890).

Icones :—Forbes *Sal. Woburn.* t. 43, as *S. pontederana*; Reichenbach *Icon.* t. 587, fig. 2037 [1237], as *S. pontederana.*

Camb. Brit. Fl. ii. *Plate 67, b.* (*a*) Shoot with pistillate catkins. (*b*) Leaves. (*c*) Pistillate flowers (enlarged). Cambridge Botanic Garden (R. I. L.).

Exsiccata :—Leefe, ii, 33; iii, 59, as *S. pontederana* (cf. *Journ. Bot.* x, p. 106 et 212); E. F. et W. R. Linton, 81; Reichenbach, 2326, as *S. pontederana.*

Shrub. *Young branches* often glabrous at maturity, long, straight. *Laminae* subglaucous underneath. *Catkins* on short leafy peduncles. *Nectary* yellowish or greenish-yellow. *Filaments* hairy towards the base, usually more or less connate. *Anthers* yellow or reddish-yellow. *Style* short or absent. *Stigmas* yellow, then reddish. *Ovaries* pubescent.

Where *S. cinerea* and *S. purpurea* grow together, intermediates between them appear to be not uncommon. Most of the intermediates are more like *S. cinerea* than *S. purpurea*; but it is usual to regard all such plants as of the above parentage which, no matter how close to *S. cinerea* they appear to be, have the filaments more or less united. Some forms of the hybrid are not infrequently mistaken for *S. cinerea* subvar. *oleïfolia.*

Here and there, with the putative parents, northwards to Perthshire.

Scandinavia, Denmark, Germany, France, central Europe.

S. nigricans* × *purpurea Wimmer in *Denkschr. Schles. Gesellsch.* 154 (1853); A. et G. Camus *Classif. Saul.* ii, 115 (1905); × *S. vaudensis* A. Kerner in *Verhandl. Z.-B. Gesellsch. Wien* x, 263 (1860); × *S. dubia* Andersson in DC. *Prodr.* xvi, pt. ii, 314 (1868).

Icones :—Forbes *Sal. Woburn.* t. 117, as *S. vaudensis*; A. et G. Camus *op. cit., Atlas* ii, t. 7 (40), fig. R—U, as × *S. dubia.*

Given in Druce's *List of British Plants* as having been found in Dumfriesshire.

It is recorded for Germany and Austria.

S. phylicifolia* × *purpurea A. et G. Camus *Classif. Saul.* ii, 116 (1905); × *S. secerneta* F. B. White in *Ann. Scott. Nat. Hist.* 65 (1892).

Icones :—*Camb. Brit. Fl.* ii. *Plate 68, a.* (*a*) Shoot with staminate catkins. (*b*) Barren shoot. (*c*) Staminate flowers (enlarged). Cambridge Botanic Garden (R. I. L.).

Exsiccata :—E. F. et W. R. Linton, 82.

Shrub. *Leaves* not unlike those of *S. phylicifolia. Staminate catkins* much narrower than in that species, and resembling those of *S. purpurea*, as also do the coherent *filaments*; May.

S. croweana Smith in *Trans. Linn. Soc.* vi, 117 (1802) is sometimes referred to this hybrid, on account of its more or less connate filaments. However, connate filaments may occur when there need be little or no suspicion of hybridisation with *S. purpurea*; and, in the absence of stronger evidence than the character in question, we prefer to follow White (*Journ. Linn. Soc.* xxvii, 398 (1890)), and regard *S. crowiana* as a form of *S. phylicifolia* (see page 43; and see also White in *Ann. Scott. Nat. Hist.* 65 (1892)). It has also been urged that *S. crowiana* is a hybrid of *S. arbuscula* and *S. phylicifolia.*

S. phylicifolia × *purpurea*, in the sense here defined, is a very rare and critical plant. It was described by White from specimens collected by Mr James Fingland, in Dumfriesshire; and Linton's no. 82 is also from this county. Not known elsewhere.

S. purpurea* × *repens Wimmer *Fl. Schles. Nachtr.* 482 (1845); in *Flora* xxviii, 435 (1845)!; A. et G. Camus *Classif. Saul.* 287 (1904); v. Seemen in Ascherson und Graebner *Syn.* iv, 302 (1909); Rouy *Fl. France* xii, 231 (1910); *S. doniana*[1] Smith *Eng. Fl.* iv, 213 (1828)!; Syme *Eng. Bot.* viii, 219 (1868); *S. parviflora* Host *Hist. Sal.* 49 (1828); × *S. parviflora* A. Kerner *op. cit.* p. 271.

Icones :—Host *Hist. Sal.* t. 49, as *S. parviflora*; Forbes *Sal. Woburn.* t. 85, as *S. doniana*; Borrer *Eng. Bot. Suppl.* t. 2599, as *S. doniana*!; Reichenbach *Icon.* t. 584, fig. 2033 [1233], as *S. purpurea* var. *sericea*; A. et G. Camus *op. cit., Atlas*, t. 27, fig. K—P, as × *S. doniana.*

Camb. Brit. Fl. ii. *Plate 68, b.* (*a*) Shoot with staminate catkins. (*b*) Barren shoot. (*c*) Staminate flowers. (*d*) Staminate flowers (enlarged). From a plant produced by crossing *S. purpurea* and *S. repens* (Rev. E. F. Linton).

[1] After George Don (1764—1814), of Forfar.

Exsiccata :—Leefe, i, 1; iv, 99; as *S. doniana*; E. F. et W. R. Linton, 6 (hort.), 83 (accidental garden hybrid).

"There can, I think, be no doubt that Leefe's *Sal. Exsicc.*, iv, 99, and our...no. 6, are actual descendants of Borrer's plant" (Rev. E. F. Linton, in *Bot. Exch. Club. Rep. for* 1909, p. 474 (1910)); and Borrer apparently supplied the plant to Sir J. E. Smith for description.

Undershrub, about 1—2 m. in height. *Twigs* glabrous at maturity. *Stipules* usually caducous. *Petioles* very short. *Laminae* more or less sub-opposite, narrowly or broadly lanceolate, attenuate below, broadest above the middle, margin subentire to serrulate, apiculate at the apex, dark green above and glaucous-grey underneath, glabrous at maturity, often subopposite. *Catkins* sessile or subsessile, elliptical, about 2 cm. long, opening before the leaves; April and May. *Bracts* usually obovate, ciliate, discolorous. *Filaments* variable as regards length and amount of cohesion, often coherent almost to the apex. *Staminate catkins* unknown in this country. *Pistillate catkins* shorter and stouter than in *S. purpurea*. *Stigmas* subsessile, short. *Capsules* (in continental specimens, at least) hairy or glabrous.

Very rare. "Sent from Scotland, as British, by the late Mr George Don" (Borrer in Smith *Eng. Fl.* iv, 213 (1828)); Perthshire.

Sweden, Denmark (not indigenous), Germany, France, central Europe.

[***S. purpurea* × *triandra*** Figert in *Deutsche Bot. Monatschr.* ix, 61 (1891); A. et G. Camus *Classif. Saul.* ii, 108 (1905).

Icones :—A. et G. Camus *op. cit.*, *Atlas* ii, t. 6 (39), fig. O, as × *S. leiophylla*.

A plant gathered by Mr Wolley Dod in Kent has been doubtfully referred to this parentage (Hanbury and Marshall, *Fl. Kent.* 319 (1899)).

It has been recorded also for Silesia.]

S. purpurea* × *viminalis Wimmer *Fl. Schles. Denkschr. Nachtr.* 476 (1845); in *Flora* xxxi, 312 (1848); A. et G. Camus *Classif. Saul.* 265 (1905); v. Seemen in Ascherson und Graebner *Syn.* iv, 312 (1909); Rouy *Fl. France* xii, 226 (1910); *S. rubra* Hudson *Fl. Angl.* 364 (1762); *S. fissa* Hoffman *Hist. Sal.* 61 (1787); Smith in *Trans. Linn. Soc.* vi, 115 (1802)!; Syme *Eng. Bot.* viii, 220 (1868); *S. forbyana*[1] Smith *Fl. Brit.* 1041 (1804); *S. purpurea-amygdalina* Wimmer in *Flora* xxviii, 436 (1845).

S. minime fragilis foliis longissimis utrinque viridibus non serratis Sherard in Ray *Syn.* ed. 3, 449 (1724).

Icones :—Hoffman *Hist. Sal.* t. 13, t. 14, as *S. fissa*; Smith *Eng. Bot.* t. 1145, as *S. rubra*; t. 1344, as *S. forbyana*; Forbes *Sal. Woburn.* t. 5, as *S. forbyana*; t. 6, as *S. rubra*; Host, t. 34, t. 35, as *S. concolor*; *Fl. Dan.* t. 2555, as *S. rubra*; Reichenbach *Icon.* t. 586, fig. 2036 [1236], as *S. rubra*; Hartig *Forst Culturpfl.* t. 119 (45 *b*), as *S. rubra*; t. 120 (45 c) as *S. rubra* var. *forbyana*; A. et G. Camus *op. cit.*, *Atlas* t. 25, fig. E—V, as × *S. rubra*.

Camb. Brit. Fl. ii. *Plate 69.* (*a*) Shoot with young leaves and pistillate catkins. (*b*) Leaves. (*c*) Pistillate flowers (enlarged). (*d*) Bract (enlarged). Cambridge Botanic Garden (R. I. L.).

Exsiccata :—Billot, 286, as *S. rubra*; Fries x, 60, as *S. rubra*; A. et J. Kerner (*H. S. A.*) 44, as *S. elaeagnifolia*; 45, as *S. rubra*; Leefe, 15, as *S. rubra* and as *S. rubra* var.; 16, as *S. rubra*; i, 23, as *S. forbyana*; E. F. et W. R. Linton, 7; 35, as *S. purpurea* × *viminalis*, var. *forbyana*; Tausch, as *S. elaeagnifolia*; Wirtgen, xvii, 982, as *S. fissa*.

Small shrub. *Petioles* about 0·5—1·0 cm. long. *Laminae* linear to lanceolate or lanceolate-oblong, margin more or less serrate or denticulate and often recurved when young, acute to acuminate, at maturity lacking the dense white pubescence underneath of *S. viminalis*. *Catkins* subsessile, leafy at the base, dense-flowered, appearing a little earlier than or with the leaves; April, a little later than *S. purpurea*. *Bracts* more or less oboval, discolorous, very hairy. *Stamens* 2. *Filaments* more or less coherent, often coherent for about half their length. *Anthers* bright red. *Style* much longer than in *S. purpurea*. *Stigmas* linear, as long as or longer than the style. *Capsules* subsessile or shortly stalked, covered with white hairs.

Alluvial meadows and osier holts, locally abundant; as far north as the North Riding of Yorkshire, chiefly in eastern England. Probably introduced further north and in Ireland.

Southern Scandinavia, Denmark, Germany, Belgium, France, central Europe, Russia, Spain, Italy; Caucasus to the Amur region and Manchuria.

[1] After J. Forby (fl. about 1800) who sent the original plant to Mr Crowe (Smith *Eng. Fl.* iv, 191 (1828)).

Order 2. MYRICALES

Myricales Engler *Pflanzenfam., Nachtr.* i, 345 (1897); *Syll.* ed. 2, 101 (1898).

Allied to *Juglandales* in which the order *Myricales* was for a time included by Engler.

For characters, see page 3. Only family:—*Myricaceae.*

Family 1. MYRICACEAE

Myricaceae Lindley *Nat. Syst.* ed. 2, 179 (1836) partim; Bentham and Hooker *Gen. Plant.* iii, 400 (1880); Ascherson und Graebner *Syn.* iv, 351 (1910).

Small trees, shrubs, or undershrubs. *Leaves* deciduous. *Catkins* appearing before or with the leaves. *Flowers* wind-pollinated. *Bracts* concave. *Bracteoles* usually 2 to each staminate flower, 2—8 to each pistillate flower. *Perianth* absent. *Stamens* 2—16. *Filaments* short, free or more or less united towards the base. *Anthers* with 2 loculi, basifixed, extrorse. *Ovary* sessile, with 1 loculus, each loculus with 1 ovule. *Stigmas* 2, filiform. *Fruit* drupoid.

2 genera, *Myrica* and *Comptonia*, the latter being monotypic. Only British genus:—*Myrica.*

Genus 1. Myrica

Myrica L. [*Gen. Pl.* ed. 1, 302 (1737)] *Sp. Pl.* 1024 (1753) et *Gen. Pl.* ed. 5, 449 (1754); Engler in *Pflanzenfam.* iii, pt. i, 26 (1894); *Gale* [Adanson *Fam. Pl.* ii, 345 (1763)] Chevalier in *Mém. Soc. Nat. Sc. et Math. Cherbourg* xxxii, 177 (1900—2) including *Gale.*

Small trees, shrubs, or undershrubs. *Stipules* absent or minute and caducous. *Laminae* entire or more or less serrate, usually glandular. *Staminate catkins* oblong-cylindrical. *Stamens* 4—8. *Pistillate catkins* ovoid or globular, very dense-flowered. *Bracts* persistent, glandular, usually persistent and enlarging in fruit and adhering to the achene, not becoming bristly. *Bracteoles* 2—4. *Achene* small, globular or shortly cylindrical.

About 40 species; western and northern Europe, Asia, Abyssinia, South Africa, America.

The only British species belongs to the subgenus *Gale* (Endlicher *Gen. Pl.* 272 (1836—1840) as a section; Ascherson und Graebner *Syn.* iv, 352 (1910)).

1. MYRICA GALE. Bog Myrtle or Sweet Gale. Plate 70

Myrtus brabantica sive elaeagnus cordi Gerard *Herball* 1228 (1597); *Gale frutex odoratus septentrionalium elaeagnus cordo* Ray *Syn.* ed. 3, 443 (1724).

Myrica gale L. *Sp. Pl.* 1024 (1753); Syme *Eng. Bot.* viii, 189 (1868); Ascherson und Graebner *Syn.* iv, 352 (1910); Rouy *Fl. France* xii, 262 (1910); *Gale palustris* Chevalier *Monogr.* in *Mém. Soc. Nat. Sc. et Math. Cherbourg* xxxii, 177 (1901—2).

Icones:—Smith *Eng. Bot.* t. 562 (1799); *Fl. Dan.* t. 327; Reichenbach *Icon.* t. 670, fig. 1277.

Camb. Brit. Fl. ii. *Plate 70.* (*a*) Twig with pistillate catkins. (*b*) Twig with staminate catkins. (*c*) Fertile shoot in autumn. (*d*) Bract and staminate flower (enlarged). (*e*) Pistillate catkin (enlarged). (*f*) Fruits (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 3900; van Heurck et Martinis, iv, 187; Reichenbach, 817; Schultz et Winter, ii, 147; Wirtgen, ix, 525; xi, 525 bis; *Herb. Fl. Ingric.* vi, 588.

Undershrub, about 0·5—1·5 m. high, glandular and odorous. *Roots* with tuberous branches. *Branches* usually erect, numerous, dark brown. *Petioles* short (about 1—3 mm.). *Laminae* oblanceolate, entire towards the base, toothed towards the apex, up to about 4 cm. long and 1 broad. *Catkins* either dioecious or monoecious and diclinous, sessile, appearing before the leaves. *Staminate catkins* ascending or spreading, cylindrical, rather lax-flowered, about 1—2 cm. long and 0·75 broad; late April and early May. *Bracts* broadly ovate, ciliate. *Stamens* 4. *Pistillate catkins* ascending, spreading in fruit, dense-flowered, much smaller, about 5 mm. long and 3 broad, up to about 1 cm. long in fruit; May. *Bracts* glandular, persistent. *Achene*, adherent to the enlarged connate bracts; August.

Professor Bottomley (in *Ann. Bot.* xxvi, 116 (1912)) states that the swollen root-branches of *Myrica gale* contain fungal filaments, and that these are identical with the organism of the root-nodules of Leguminous plants.

Locally abundant on wet siliceous and rather peaty hill-slopes and on lowland peat-moors; rather common on transitional moors; rather rare on fens and on strongly acidic moors. Cornwall and Kent to Orkney, but absent from most counties of the southern Midlands; ascending to 550 m. in the Highlands of Scotland; Ireland, every county except Carlow and Dublin.

Scandinavia (northwards to 68° 53′ N. lat.), Denmark, Germany, Holland, Belgium, France, northern Russia, Portugal, north-western Spain; central Asia to Kamtchatka; North America.

Order 3. *JUGLANDALES

Juglandales Engler *Syll.* 93 (1892) excluding *Myricaceae*; in *Pflanzenfam., Nachtr.* 345 (1897).
Allied on the one hand to *Myricales*, and, on the other, to the hemi-epigynous *Fagales*.

For characters, see page 3. Only family:—**Juglandaceae*.

Family 1. *JUGLANDACEAE.

Juglandaceae Lindley *Nat. Syst.* ed. 2, 180 (1836); Ascherson und Graebner *Syn.* iv, 355 (1910).

Trees. *Leaves* alternate, pinnate, exstipulate. *Catkins* monoecious and diclinous. *Flowers* wind-pollinated. *Staminate catkins* long and pendulous. *Perianth* irregularly lobed, adnate to the bract. *Stamens* 3—∞. *Anthers* erect, with 2 loculi dehiscing longitudinally. *Filaments* short. *Pistillate catkins* reduced to a few flowers, sessile. *Perianth* with 3—5, usually 4 segments, adnate to the ovary. *Ovary* bicarpellary, with 2—4 incomplete loculi, 1-ovular. *Stigmas* 2. *Ovules* orthotropous. *Placentation* basal. *Fruit* a pseudocarpous "drupe," the husk being the persistent and enlarged perianth, enclosing the hard nut with 2—4 incomplete loculi. *Endosperm* absent. *Integument* single.

Six genera; 40 species; north temperate and tropical Asia.

Only British genus:—**Juglans*.

Genus 1. *Juglans

Juglans L. *Sp. Pl.* 997 (1753) et *Gen. Pl.* ed. 5, 431 (1754); Engler in Engler und Prantl *Pflanzenfam.* iii, pt. i, 24 (1894). [*Nux* Tournefort *Inst.* 581, t. 346 (1719).]

Trees, odorous. *Laminae* unequally pinnate. *Perianth* of the staminate flowers, 3—6 lobed, of the pistillate ones 4-partite. *Stamens* 8—40, in 2 series. *Styles* very short. *Stigmas* 2, large, fimbriate. *Pseudo-drupe* large, with pseudexocarp rather fleshy, indehiscent. *Nut* with 2—4 imperfect loculi at the base, indehiscent or separating into 2 parts on drying. *Cotyledons of seedlings* epigeal.

About 8 species; north temperate, West Indies, South America.

Only British species:—**J. regia*.

1. *JUGLANS REGIA. Walnut

Nux juglans Gerard *Herball* 1252 (1597); Ray *Syn.* ed. 3, 438 (1724).

Juglans regia L. *Sp. Pl.* 997 (1753)!; Ascherson und Graebner *Syn.* iv, 359 (1910).

Tree, about 25—30 m. high. *Leaflets* 5—13; scarcely stalked, lateral ones entire (except in the seedling, where the leaflets are serrate), glabrous. *Stamens* about 14—26. *Stigmas* large.

Cultivated in the lowlands of England, and occasionally planted in semi-natural situations; rarely escaping from cultivation, and springing up from self-sown seed, as, for example, in Suffolk and Norfolk.

Indigenous in south-eastern Europe, and in western and central Asia, and perhaps in China and Japan. Cultivated and more or less spontaneous elsewhere, occurring at 1266 m. in the Tyrol.

Order 4. FAGALES

Fagales Engler *Fuhrer Bot. Gart. Bresl.* 31 (1886); in *Pflanzenfam., Nachtr.* 345 (1897); *Amentales* Lindley *Nat. Syst.* ed. 2, 169 (1836).

The frequent occurrence of simple catkins, the constant perianth, the somewhat indefinite number of the stamens and carpels, in the *Fagaceae*, prove to us that this is a more primitive family than either the *Corylaceae* or the *Betulaceae*. We regard the entomophilous nature of *Castanea* as secondary, and comparable therefore with the same feature in *Salix*.

The three families (*Fagaceae*, *Corylaceae*, and *Betulaceae*) are closely allied; and the *Corylaceae* occupies the intermediate position. Bentham and Hooker (*Gen. Pl.* iii, 403 (1880)) regarded them as being only of tribal rank; and in favour of this view, many arguments might be adduced. It is clear to us that the three groups are of equivalent rank; and we do not support a modern opinion that the *Betulaceae* and the *Corylaceae* should be united into a single family equivalent to the remaining family *Fagaceae*.

"*Amentales* pass distinctly into *Urticales* by *Garryaceae*" (Lindley, *op. cit.* p. 170), a North American family of plants.

For characters, see page 3.

Families of *Fagales*

Family 1. **Fagaceae** (see below). *Perianth* present in both staminate and pistillate flowers. *Involucre* well-defined. *Fruit* a nut, not winged.

Family 2. **Corylaceae** (p. 78). *Perianth* absent in the staminate, present in the pistillate flowers. *Involucre* more or less well-defined. *Fruit* a nut, not winged.

Family 3. **Betulaceae** (p. 80). *Perianth* present in the staminate, absent in the pistillate flowers. *Involucre* absent. *Fruit* a winged achene.

Family 1. FAGACEAE

Fagaceae A. Braun in Ascherson *Fl. Brandenb.* 62 et 615 (1864); Engler *Führer Bot. Gart. Bresl.* 32 (1886); Prantl in *Pflanzenfam.* iii, pt. i, 47 (1894); Ascherson und Graebner *Syn.* 433 (1911).

Trees, shrubs, or undershrubs. *Stipules* consisting of bud-scales, usually fugaceous. *Catkins* simple or compound; staminate ones usually pendulous. *Pollination* usually anemophilous. *Perianth* present in both staminate and pistillate flowers, usually more or less caducous in the staminate flowers. *Stamens* about 4—20, frequently 5 and opposite the perianth-segments. *Ovaries* with 2 to about 6—9 carpels and as many loculi, subinferior. *Ovules* 1—2 in each loculus but only 1 maturing, pendulous, anatropous. *Stigmas* either short and stout or long and filiform, as many as the carpels, purplish. *Fruit* a nut partly or wholly enclosed in an involucre or "cupule," nuts single or in groups within the involucre. *Endosperm* absent. *Integument* single or double.

5 genera; about 350 species; cosmopolitan, chiefly temperate.

Genera of *Fagaceae*

Genus 1. **Quercus** (see below). *Catkins* diclinous, simple. *Staminate catkins* pendulous, elongate. *Stigmas* 3—4, rarely 5, short, stout. *Nut* terete, 1 in each cupule, exserted from the cupule. *Cotyledons* smooth.

Genus 2. †**Castanea** (p. 76). *Catkins* usually diclinous and with pistillate cymes of usually 3 flowers at the base and staminate cymes of 3—7 flowers above, suberect or spreading. *Stigmas* 4—9, filiform. *Nuts* in groups usually of 3, each group enclosed in a prickly cupule. *Cotyledons* rugose.

Genus 3. **Fagus** (p. 77). *Catkins* diclinous, compound. *Staminate catkins* on long peduncles, the catkins proper being about as long as broad, pendulous. *Pistillate catkins* with 2-flowered cymes, spreading or ascending. *Stigmas* 3, filiform. *Fruits* trigonous, 2 in each cupule. *Cotyledons* smooth.

Genus 1. Quercus

Quercus [Tournefort *Instit.* 582, t. 349 (1719)] L. *Sp. Pl.* 994 (1753) et *Gen. Pl.* ed. 5, 431 (1754); Prantl in Engler und Prantl *Pflanzenfam.* iii, pt. i, 55 (1894); Ascherson und Graebner *Syn.* iv, 445 (1911).

Trees, shrubs, or undershrubs. *Leaves* evergreen or deciduous, often more or less deeply lobed. *Catkins* appearing with the leaves, simple. *Staminate catkins* lax-flowered, pendulous, elongate, peduncled. *Pistillate catkins* peduncled or sessile. *Flowers* wind-pollinated, protogynous. *Perianth* with 4—9, usually 5 segments. *Stamens* usually as many as the perianth-segments, and opposite them. *Carpels* 3—5, usually 3. *Stigmas* as many as the carpels, stouter than in *Fagus* or *Castanea*. *Fruiting involucre* (or "cupule") terete, not spiny, surrounding the base of a single nut. *Nut* (or "acorn") terete, exserted. *Cotyledons* smooth; of the seedling, hypogeal.

Of the species of *Quercus*, the evergreen ones are, in general, more primitive than the deciduous ones; and of the deciduous species, the more hairy ones are more primitive than the glabrous ones (e.g., *Q. robur*). Glabrous-leaved species have arisen independently in several sections of the genus.

About 200 species; Europe, Asia, Indo-Malaysia, Pacific coasts, northern Africa, North America.

All the British species belong to the section *Lepidobalanos* (Endlicher *Gen. Pl. Suppl.* iv, 24 (1847) part.; Prantl in Engler und Prantl *Pflanzenfam.* iii, pt. i, 57 (1894).

Subsections of *Lepidobalanos*

Subsection 1. ***Suber** (see below). *Leaves* evergreen, densely tomentose underneath. *Fruit* ripening in a single summer. *Fruiting involucre* or cupule with appressed or erect scales.

Subsection 2. ***Aegilops** (see below). *Leaves* deciduous, hairy underneath. *Fruit* taking two summers to ripen. *Fruiting involucre* with long, linear, reflexed scales.

Subsection 3. **Robur** (p. 73). *Leaves* deciduous, hairy or glabrous underneath. *Fruit* ripening in a single summer. *Fruiting involucre* more or less pubescent or glabrous, with imbricate scales.

Subsection 1. **SUBER*

Suber Reichenbach *Fl. Germ. Excurs.* 176 (1831) partim; *Ilex* Loudon *Arboret.* iii, 1899 (1838); Endlicher *Gen. Pl. Suppl.* iv, 25 (1847).

For characters, see above. Only British species:—**Q. ilex*.

1. *QUERCUS ILEX. Evergreen Oak. **Plate 71**

Ilex glandifera Gerard *Herball* 1161 (1597).

Quercus ilex L. *Sp. Pl.* 995 (1753)!; Rouy *Fl. France* xii, 320 (1910); Ascherson und Graebner *Syn.* iv, 470 (1911).

Icones:—Reichenbach *Icon.* t. 642, fig. 1307; Watson *Dendr. Brit.* t. 90.

Camb. Brit. Fl. ii. *Plate 71*. (*a*) Shoot in winter. (*b*) Leaf (under side). (*c*) Staminate catkins. (*d*) Portion of staminate catkin (enlarged). (*e*) Portion of pistillate catkin (enlarged). (*f*) Mature pistillate catkin. (*g*) Nut. Cornwall (F. H. D.).

Exsiccata:—Billot, 1328 bis et ter; Bourgeau (*Pl. d'Esp.*) 873; Reichenbach, 2418; Schultz (*F. I. E.*), 126.

Tree, attaining a height of about 30 m., suckers numerous. *Bark* not thick or suberous. *Young branches* very hairy. *Stipules* linear. *Petioles* about one-sixth as long as the laminae. *Laminae* coriaceous, glossy above, grey or almost white with matted hairs underneath. *Catkins* opening in late May. *Pistillate catkins* sessile. *Stigmas* 3—4. *Fruiting involucre* with appressed scales. *Nuts* 1—2 together, sessile or subsessile, subconical; September.

Naturalised in the south-west of England, as in Cornwall, by stream-sides, in woods where trees spring up from self-sown seeds; planted commonly in parklands and plantations in southern England; rare, even as a planted tree, north of the Midland counties.

Indigenous in southern France (ascending to 1500 m.), the Tyrol, southern Austria-Hungary, Portugal, Spain, Corsica, Italy, the Balkan peninsula to Greece; northern Africa; the Orient.

Subsection 2. **AEGILOPS*

Aegilops Reichenbach *Fl. Germ. Excurs.* 177 (1831); *Cerris* Loudon *Arboret.* iii, 1846 (1838); Ascherson und Graebner *Syn.* iv, 457 (1911).

For characters, see above. Only British species:—**Q. cerris*.

2. *QUERCUS CERRIS. Turkey Oak. Plate 72

Cerris Gerard *Herball* 1162 (1597).

Quercus cerris L. *Sp. Pl.* 997 (1753); Rouy *Fl. France* xii, 317 (1910); Ascherson und Graebner *Syn.* iv, 460 (1911).

Icones :—Hayne *Arzn. Gebr. Gewächse* xii, t. 48; Reichenbach *Icon.* t. 650, fig. 1316; Hartig *Forst. Culturpfl.* t. 14; Watson *Dendr. Brit.* t. 92; t. 93, as *Q. cerris* var. *dentata.*

Camb. Brit. Fl. ii. *Plate 72.* (*a*) Shoot with catkins and young leaves. (*b*) Mature leaves. (*c*) Portion of a leaf, upper surface (enlarged). (*d*) Portion of a leaf, lower surface (enlarged). (*e*) Portion of a staminate catkin (enlarged). (*f*) Pistillate flowers (enlarged). (*g*) Branchlet, with a ripe acorn. (*h*) Nut. (*i*) Portion of leaf, lower surface (much enlarged). (*j*) Winter-twig. (*k*) Portion of a one-year old twig (enlarged). Cambridgeshire (C. E. M.).

Exsiccata :—Billot, 2362; 2362 bis.

Tree, growing to a height of about 30 m. or rather more. *Timber* said to be of little value. *Young branches* hairy. *Buds* with long, setaceous, persistent, outer filamentous scales. *Petioles* about one-tenth as long as the laminae. *Laminae* attenuate or truncate or subcordate at the base, acutely lobed, obtuse, dark green, with numerous large multiple hairs underneath. *Catkins* appearing in May, a little later than those of the indigenous species. *Perianth* tomentose. *Stamens* 4. *Stigmas* 4. *Cupule* with long filamentous shaggy scales. *Nuts* solitary or 2—4 in a cluster, sessile or shortly peduncled, oval to elliptical; mature in the September of the second year after the flowers appear.

Naturalised in woods on dry sandy soils in southern England, where self-sown trees are locally abundant, as in Bedfordshire and Cambridgeshire; commonly planted in parklands and more rarely in woods in southern and central England; ascending, as a planted tree, in woods to 200 m. in the West Riding of Yorkshire.

Indigenous in south-central Europe, northern and central Spain, southern France, Italy, Sicily, the Balkan peninsula (ascending to 1600 m.); Asia Minor.

Subsection 3. *ROBUR*

Robur Reichenbach *Fl. Germ. Excurs.* 177 (1831); Loudon *Arboret.* iii, 1731 (1838); Ascherson und Graebner *Syn.* iv, 474 (1911).

For characters, see page 72.

British species and hybrid of *Robur*

3. **Quercus sessiliflora** (see below). *Laminae* without completely reflexed auricles at the base, with persistent multiple or bifid hairs underneath, which, however, may be very small. *Pistillate catkins* usually sessile.

4. **Quercus robur** (p. 75). *Laminae* with completely or almost completely reflexed auricles, with no multiple hairs underneath. *Pistillate catkins* usually pedunculate.

Q. robur* × *sessiliflora (p. 76). *Laminae* with reflexed auricles and with multiple hairs. *Pistillate catkins* usually pedunculate.

3. QUERCUS SESSILIFLORA. Durmast or Sessile-fruited Oak. Plates 73, 74, 75; 77

Quercus latifolia mas quae brevi pediculo est Ray *Syn.* ed. 3, 440 (1724).

Quercus sessiliflora Salisbury *Prodr.* 392 (1796); Smith *Fl. Brit.* 1026 (1804)!; D. Don in Leighton *Fl. Shropshire* 474 (1841)!, including *Q. intermedia*!, p. 473; Moss in *Journ. Bot.* xlviii, 1 (1910); *Q. robur* var. *β* L. *Fl. Suec.* ed. 2, 340 (1755); *Q. robur* Miller *Gard. Dict.* ed. 8, no. 1 (1768); Willdenow *Sp. Pl.* iv, 450 (1805); non L.; *Q. sessilis* Ehrhart *Beitr.* v, 142 et 161 (1790) nomen; Ascherson und Graebner *Syn.* iv, 510 (1911); Rouy *Fl. France* xii, 312 (1910); *Q. robur* var. *sessilis* Martyn *Fl. Rust.* no. 11 et no. 12 (1792); *Q. robur* var. *sessiliflora* Stokes *Bot. Mat. Med.* ii, 410 (1812); *Q. robur* subsp. *sessiliflora* Syme *Eng. Bot.* viii, 157 (1868).

Icones :—Smith *Eng. Bot.* t. 1845; Reichenbach *Icon.* t. 648, fig. 1309, as *Q. robur*; t. 1310, as *Q. conglomerata* et *Q. conglomerata* var. *aurea*; *Fl. Dan.* t. 2667, as *Q. sessiliflora*; Hartig *Forst. Culturpfl.* t. 11, as *Q. robur.*

Camb. Brit. Fl. ii. *Plate 73.* (*a*) Shoot with staminate catkins. (*b*) Leaf (lower surface). (*c*) Leaf (upper surface). (*d*) Portions of leaves, lower surface (enlarged). (*e*) Portion of staminate catkins (enlarged). (*f*) Pistillate catkin (enlarged). (*g*) Portion of branch, laminae cut away, with ripe fruit. (*h*) Ripe acorn. Cambridgeshire (C. E. M.). *Plate 74.* (*a*) Shoot with staminate catkins. Cambridge Botanic Garden (R. I. L.). (*b*) Shoot in autumn. (*c*) Fruit. Somerset (C. E. L.).

Exsiccata :—Reichenbach, 1514, as *Q. aurea.*

Specimens issued by Todaro (1269, as *Q. sessiliflora* var. *macrocarpa*, and 1270, as *Q. sessiliflora* var. *montana*) are *Q. pubescens* (= *Q. lanuginosa* Thuiller *Fl. Env. Paris* éd. 2, 502 (1799)), which is not a British plant, and which is not indigenous further north than Paris.

The only specimen of *Q. sessiliflora* in the herbarium of *Linnaeus* is named *Q. esculus*, a binominal which appears in the *Spec. Plant.* 996 (1753). The name refers to some obscure plant, and has dropped out of the cited synonymy of modern systematists. A specimen in the herbarium of the *Hort. Cliff.* (in Herb. Mus. Brit.) of *Q. pubescens* (= *Q. lanuginosa* Thuiller) is also named *Q. esculus.* Plants labelled *Q. esculus* in the Botanic Gardens at Cambridge and at Glasnevin, Dublin, are *Q. pubescens* × *sessiliflora*; and the same hybrid occurs occasionally as a planted tree in grounds, as in Hertfordshire.

Tree, attaining a height of nearly 35 m., and living to a very great age. *Root* less deep than in *Q. robur.* *Trunk* usually longer than in *Q. robur.* *Young branches* glabrous. *Petioles* usually longer than in *Q. robur.* *Laminae* very variable in shape, more or less elliptical, cuneate or broad at the base but with no completely reflexed auricles as in *Q. robur*, margin sinuate, sinuses usually shallower and lobes usually more obtuse than in *Q. robur*, obtuse, the larger veins usually ending in the lobes, with persistent multiple or bifid hairs underneath which may be either conspicuous or minute. *Catkins* appearing with the leaves; early May. *Pistillate catkins* usually sessile. *Stigmas* 3—4, sessile. *Ovaries* hairy. *Nuts* or acorns elliptical, oval, or subcuneate; October.

The branched hairs which distinguish this species from *Q. robur* are not developed on seedlings until about their third year.

This species (*Q. sessiliflora*) is not included in *Q. robur* L. *Sp. Pl.* 996 (1753); and those authors who cite it as "*Q. robur* L. *Sp. Pl.* partim" do so erroneously. It is introduced by Linnaeus into the second edition of *Fl. Suec.* as *Q. robur* var. β. Many authors, such as Miller and Willdenow, have erroneously used the name *Q. robur* L. for this species; but there is no justification for this procedure. Some recent authors have adopted the name *Q. sessilis* Ehrhart; but this is a mere name in a list and without a word of description: it cannot therefore be made the starting-point of a species. Salisbury's name, *Q. sessiliflora*, is the first valid binominal.

The numerous leaf-forms named by Lasch (in *Bot. Zeit.* xv, 409—420 (1857) are, in our opinion, either fluctuating variations and too unimportant to receive formal names, or hybrid-forms of *Q. robur* and *Q. sessiliflora.* The species is undoubtedly very variable; and we give below some of the more remarkable of the aberrant forms which we have observed in the British Isles.

(*a*) **Q. sessiliflora** var. **genuina** Willkomm in Willkomm et Lange *Prodr. Fl. Hispan.* i, 238 (1861).

Icones :—Martyn *Fl. Rust.* t. 11, as *Q. robur* var. *sessilis.*

Laminae with a very large number of minute hairs scattered all over the under surface, hairs usually bifid. *Pistillate catkins* sessile or nearly so.

(β) var. **genuina** subvar. **sphaerocarpa** nobis; *Q. sessiliflora* forma *castanoïdes* v. Vukotinović in *Oest. Bot. Zeit.* xxix, 187 (1879).

Acorns spherical or subspherical.

Hampshire (A. G. Tansley).

Germany, Austria (Croatia).

(*b*) **Q. sessiliflora** var. **pubescens** Loudon *Arboret.* iii, 1736 (1838); Willkomm in Willkomm et Lange *Prodr. Fl. Hisp.* i, 239 (1861); *Q. sessiliflora* var. β Smith *Fl. Brit.* iii, 1027 (1804); *Q. pubescens* Gray *Nat. Arr.* ii, 247 (1821) non Willdenow.

Icones :—Martyn *Fl. Rust.* t. 12, as *Q. robur* var. *sessilis.*

Laminae with minute scattered bifid and multiple hairs on the under surface and also with conspicuous tufts of multiple hairs especially in the axils of the midrib and larger veins. *Pistillate catkins* sessile, subsessile, or peduncled.

This variety seems to be commoner on wet than on dry soils, and is much commoner in western than in eastern Great Britain and Ireland. It may be regarded as transitional to *Q. pubescens* Willdenow which, however, has its young branches as well as its leaves pubescent.

(β) var. **pubescens** forma **longipeduncula** nobis.

Icones :—*Camb. Brit. Fl.* ii. *Plate 75.* (*a*) Shoot with pistillate catkins. (*b*) Portion of leaf, lower surface (enlarged). (*c*) Pistillate catkin. (*d*) Portion of pistillate catkin (enlarged). Cornwall (C. E. M.).

Pistillate catkins peduncled. *Stigmas* usually 4, large.

This is not a hybrid, as it occurs in localities from which *Q. robur* is absent; Cornwall, and western Galway, Ireland, and doubtless elsewhere.

Q. sessiliflora is dominant in woods on siliceous soils in the west and north of the British Isles, as far north as Caithness-shire; locally abundant in woods on sandy and gravelly soils in the south and east of England; local in woods on limestone; rare on chalk; absent, as an indigenous tree, on deep marls and clays; abundant in hedgerows; dominant up to 300 m. in the West Riding of Yorkshire, but occurring up to nearly 400 m. From Cornwall and Kent northwards to Caithness-shire; but it is local in eastern and central England and in Scotland north of the Caledonian Canal.

Central and southern Scandinavia (to 60° 11′), western Europe, central Europe, Russia, Portugal, northern Spain, southern Europe (local), Balkan peninsula (up to 1400 m.) to Greece; Orient, Caucasus, Persia.

Q. robur × *sessiliflora* (see page 76).

4. QUERCUS ROBUR. Common Oak. Plates 76; 77

Quercus vulgaris Gerard *Herb.* 1156 (1597); *Q. latifolia* Parkinson *Theatr. Bot.* 1385 (1636); Ray *Syn.* ed. 3, 440 (1724).

Quercus robur *L. Sp. Pl.* 996 (1753); Smith *Fl. Brit.* iii, 1026 (1804); Moss in *Journ. Bot.* xlviii, 6 (1910); Ascherson und Graebner *Syn.* iv, 495 (1911); *Q. femina* Miller *Gard. Dict.* ed. 8, no. 2 (1768); *Q. pedunculata* Ehrhart *Beitr.* v, 161 (1790) nomen; Willdenow *Sp. Pl.* iv, 450 (1805); Rouy *Fl. France* xii, 310 (1910); *Q. robur* var. *pedunculata* Martyn *Fl. Rust.* no. 10 (1792); *Q. robur* subsp. *pedunculata* Syme *Eng. Bot.* viii, 145 (1868).

Icones:—Martyn *Fl. Rust.* t. 10, as *Q. robur* var. *pedunculata*; Smith *Eng. Bot.* t. 1342, as *Q. robur*; *Sv. Bot.* t. 73, as *Q. robur*; *Fl. Dan.* t. 1180, as *Q. foemina*; Reichenbach *Icon.* t. 648, fig. 1313, as *Q. pedunculata*; Hartig *Forst. Culturpfl.* t. 12, as *Q. pedunculata.*

Camb. Brit. Fl. ii. *Plate 76.* (*a*) Shoot in autumn. Herefordshire (A. L.). (*b*) Leaf, lower surface. (*c*) Shoot with catkins. (*d*) Perianth (enlarged). (*e*) Base of leaf, lower surface. (*f*) Ripe fruit. Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 2532 bis, as *Q. pedunculata*; Wirtgen, xii, 713, as *Q. pedunculata*; *Herb. Fl. Ingric.* 552 (partim), as *Q. pedunculata.*

The specimen in the herbarium of Linnaeus named *Q. robur* is an American oak, probably *Q. alba* L. The specimen was sent to Linnaeus by Pehr Kalm who travelled and collected plants in many parts of the world, including North America.

Tree, attaining a height of about 30 m., and, like *Q. sessiliflora*, living to a very great age. *Root* deep. *Trunk* usually splitting into branches lower than that of *Q. sessiliflora*. *Young branches* glabrous. *Petioles* usually much shorter than in *Q. sessiliflora*, and sometimes almost absent. *Laminae* very variable in shape, more or less elliptical, obtuse or cuneate at the base, with two reflexed auricles at the base, the auricles being very small in the cuneate-leaved forms, margin sinuate, apex obtuse, the larger nerves usually ending in the sinuses in the lower half of the lamina, glabrous on both surfaces at maturity, multiple or bifid hairs absent even on the young laminae. *Catkins* appearing with the leaves; late April and early May. *Pistillate catkins* pedunculate, very rarely subsessile or sessile. *Stigmas* 3. *Nut* or achene elliptical or subcuneate, usually larger than in *Q. sessiliflora*; early October.

This species is often cited in botanical works, e.g., Rouy *Fl. France*, as *Q. pedunculata* Ehrhart; but this is a *nomen nudum.* Further, if the name *Q. robur* L. be rejected (though there is no reason why it should be), the next valid name is *Q. femina* Miller, as shown in the synonyms cited above. As, however, the name *Q. robur* L. *Sp. Pl.* 996 (1753) does not include *Q. sessiliflora* or any other plant, it is not merely a valid name, but an unassailable one.

Very common in the lowlands of the British Isles, as far north as Sutherlandshire, especially on clay; dominant in lowland woods on deep fine sand and on clay; more or less subdominant in ash-oak woods on marl and limestone; occasional to rare in woods on wet river-alluvium and fens; very rare on chalk and on shallow soils generally; ascending to about 268 m. in Kent; very common in hedgerows on clayey soils; commonly planted, up to nearly 335 m. on the Pennines, but not successful as a timber-tree at such altitudes.

Europe, northwards to 62° 55′ in Norway and ascending to 1250 m. in the Alps; western and south-western Asia.

Quercus robur* × *sessiliflora Gürke *Plant. Eur.* ii, 58 (1897); Moss in *Journ. Bot.* xlviii, 34 (1910); *Q. rosacea* Bechstein in *Sylven.* 66, t. 6 (1813) ex Schneider *loc. cit.*; *Q. pedunculata* var. *pubescens* Loudon *Arboret.* iii, 1731 (1838); *Q. robori-germanica* Lasch in *Bot. Zeit.* xv, 418 (1857) including *Q. subrobori-germanica*, et *Q. subgermanico-robur* p. 419; *Q. robur* × *sessilis* Schneider *Handb. Laubh.* i, 197 (1904); Ascherson und Graebner *Syn.* iv, 520 (1911); *Q. pedunculata* × *sessilis* Rouy *Fl. France* xii, 323 (1910) including *Q. sessilis* var. glabra p. 313.

Icones:—*Camb. Brit. Fl.* ii. *Plate* 77. (*a*) Shoot with catkins. (*b*) Leaf, upper surface. (*c*) Leaf, lower surface. (*d*) Portion of staminate catkin (enlarged). (*e*) Staminate flower (enlarged). (*f*) Perianth (enlarged). (*g*) Pistillate catkin (enlarged). (*h*) Base of leaf, upper surface (enlarged). (*i*) Portions of leaf, lower surface (enlarged). (*j*) Ripe fruit. (*k*) Acorn. Cambridgeshire (C. E. M.).

Exsiccata:—*Herb. Fl. Ingric.* 552 (partim), as *Q. pedunculata*; herb. Ehrhart (partim), as *Q. pedunculata.*

Differs from *Q. robur* in possessing multiple or bifid hairs on the lower surface of the *lamina*, and from *Q. sessiliflora* in having two reflexed auricles at the base of the *lamina* on the lower surface. *Petioles* and *peduncles* usually long. *Nuts* intermediate in size.

Common in Great Britain, wherever the putative parents grow together, and therefore most abundant on dry sandy and gravelly soils and in valley-bottoms in hilly districts. From Cornwall and Kent, northwards to Perthshire at least.

Germany, France, central Europe, Russia, and doubtless elsewhere.

Genus 2. †Castanea.

Castanea [Tournefort *Inst.* 584, t. 352 (1719)] Miller *Gard. Dict.* ed. 8 (1768); Gaertner *De Frnct.* i, 181 t. 37 (1788); Prantl *Pflanzenfam.* iii, pt. i, 54 (1894); Ascherson und Graebner *Syn.* iv, 440 (1911); *Fagus* L. *Sp. Pl.* 997 (1753) et *Gen. Pl.* 432 (1754) partim.

Trees. *Leaves* deciduous. *Catkins* appearing after the leaves, compound, usually with a few pistillate cymes at the base, and numerous staminate cymes above, sometimes wholly staminate, spreading or ascending. *Staminate cymes* of 3—7 flowers. *Pistillate cymes* of 3 flowers. *Flowers* insect-pollinated. *Perianth* with 5—8 divisions. *Stamens* about 12. *Carpels* and *stigmas* about 4—9. *Fruiting involucre* bristly, enclosing 3—5, usually 3 nuts. *Nut* terete. *Cotyledons* rugose; of the seedling, epigeal.

We think that the anemophilous habit is primitive among the *Amentiflorae*, and that *Castanea* is a more advanced type than *Quercus*.

Smith (*Eng. Bot.* no. 1846) objected to the removal of *Castanea* from the Linnaean genus *Fagus*. He held that Gaertner's "making the chestnut a distinct genus is one of those glaring errors of a great man, which should teach all naturalists caution, and more especially candour." Of course, Gaertner was only reverting to the view of Tournefort, Ray, Miller, Hill, and others, a view which is now universally accepted.

About 28 species; about 25 (tropical India) in the subgenus *Castanopsis*, and about 3 or 4 (north temperate zone) in the subgenus *Eu-Castanea.*

The only British species (**C. sativa*) belongs to *Eu-Castanea* Prantl in *Pflanzenfam.* iii, pt. i, 55 (1894).

1. †CASTANEA SATIVA. Sweet Chestnut or Spanish Chestnut. Plate 78

Castanea Gerard *Herball* 1253 (1597); Ray *Syn.* ed. 3, 440 (1724).

Castanea sativa Miller *Gard. Dict.* ed. 8, no. 1 (1768); Rouy *Fl. France* xii, 307 (1910); *Fagus castanea* L. *Sp. Pl.* 997 (1753)!; Smith *Fl. Brit.* 1027 (1804); *Eng. Fl.* iv, 151 (1828); *Castanea vulgaris* Lamarck *Encycl.* i, 708 (1783); Syme *Eng. Bot.* viii, 159 (1868); *C. vesca* Gaertner *De Fruct.* i, 181 (1788); *Castanea castanea* Karsten *Deutsche Fl.* 494 (1882); Ascherson und Graebner *Syn.* iv, 441 (1911).

Icones:—Smith *Eng. Bot.* t. 886, as *Fagus castanea*; Reichenbach *Icon.* t. 690, fig. 1305, as *C. vesca*; Hartig *Forst. Culturpfl.* t. 19 as *C. vesca.*

Camb. Brit. Fl. ii. *Plate 78.* (*a*) Shoot with catkins. (*b*) Ovary (enlarged). (*c*) Staminate flower (enlarged). (*d*) Leaf. (*e*) Fertile shoot in summer. (*f*) Nuts. Surrey (E. W. H.).

Exsiccata:—Billot, 2531, as *C. vulgaris*; v. Hayek, 520; Schultz, xxvi, 2585, as *C. vulgaris.*

Tree, attaining a height of about 30 m. *Old bark* furrowed. *Branches* spreading. *Winter-buds* obtuse, covered with 2 ovoid scales, glabrous. *Petioles* relatively short, distinct. *Laminae* narrowly ovate, serrate, acute to acuminate, about 10—20 cm. long and 3—6 broad. *Catkins* flowering after the leaves are fully formed; July. *Fruiting involucre* usually containing 3 nuts. *Nuts* large; October.

In spite of an emphatic dictum by Sir J. E. Smith (*loc. cit.*) that this species is "certainly a native of the south and western parts of this island," the majority of British systematists have been more or less doubtful as to whether or not the plant is really indigenous in this country. All we can state is that it may be indigenous. Gerard (*Herball* 1254 (1597)) states that "there be sundrie woods of Chestnuts in England, as a mile and a half from Feuersham in Kent, and in sundrie other places."

Very abundant in woods on sandy and gravelly soils in south-eastern England, especially in Kent, where the coppiced branches have long been used as hop-poles. The tree ripens its fruits in favourable seasons as far north as southern Cheshire. Planted throughout England, and in Scotland as far north as Aberdeenshire; but rare in hilly districts and on calcareous soils. Not indigenous in Ireland.

Denmark (not indigenous), Germany (not indigenous), Belgium (not indigenous), France (south-eastern and southern), central Europe (to 1170 metres in the Tyrol), southern Europe; Caucasus to Persia and northern India; north-western Africa (not indigenous).

Genus 3. **Fagus**

Fagus [Tournefort *Inst.* 584, t. 351 (1719)] L. *Sp. Pl.* 997 (1753) et *Gen. Pl.* ed. 5, 432 (1754) partim; Miller *Gard. Dict.* ed. 8 (1768); Prantl in Engler und Prantl *Pflanzenfam.* iii, pt. i, 53 (1894).

Trees. *Leaves* evergreen or deciduous. *Catkins* appearing with the leaves. *Staminate catkins* compound, dense-flowered, abbreviated, on long leafless peduncles. *Pistillate catkins* more or less spreading or ascending, with 2 flowers. *Flowers* wind-pollinated, protogynous. *Perianth* with 4—7, usually 5 segments. *Stamens* 8—∞. *Filaments* long. *Carpels* and *stigmas* 3. *Fruiting involucre* spiny, 4-partite when mature, enclosing 3 nuts. *Nut* trigonous. *Cotyledons* epigeal.

About 4 species, north temperate zone.

Nothofagus, with 12 species, Antarctic and southern Andes, is sometimes included in *Fagus*.

1. FAGUS SYLVATICA. Beech. Plate 79

Fagus Gerard *Herb.* 1255 (1597); Ray *Syn.* ed. 3, 439 (1724).

Fagus sylvatica L. *Sp. Pl.* 998 (1753)!; Syme *Eng. Bot.* viii, 164 (1868); Rouy *Fl. France* xii, 306 (1910); Ascherson und Graebner *Syn.* iv, 436 (1911).

Icones:—Smith *Eng. Bot.* t. 1846; Reichenbach *Icon.* t. 629, fig. 1304; Hartig *Forst. Culturpfl.* t. 20.

Camb. Brit. Fl. ii. *Plate 79.* (*a*) Winter-twig. (*b*) Shoot with staminate and pistillate catkins. (*c*) Fertile shoot in summer. (*d*) Staminate flowers (one enlarged). (*e*) Ovaries (one enlarged). (*f*) Cupule and nut. (*g*) Cupule. (*h*) Nut. Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 2137 (=subvar. *dentata* Rouy *loc. cit.*); Bourgeau, 692; Fries, i, 59.

Tree, up to about 35 m. high. *Bark* smooth. *Old branches* spreading or even descending towards the extremities. *Winter buds* elongate, glabrous. *Petioles* about one-fifth as long as the laminae, with silky hairs when young. *Laminae* oval or elliptical, ciliate when young, more or less undulate, subacute, about 7 cm. long and 4 broad. *Staminate catkins* on long hairy peduncles, *Stamens*? about 12. *Pistillate catkins* on stout peduncles which are hairy when young and much shorter than those of the staminate catkins. *Involucral bracts* with scattered bristly spines. *Nuts* about 1·7 cm. long, shining, smooth, brown. *Cotyledons of seedling* about 4 cm. broad and 2 long, sessile, white below.

There can be no doubt that the beech is indigenous in south-eastern England; but it is almost impossible to be certain of its western and northern limits. We regard it as indigenous beyond all doubt in an area included by lines connecting Chelmsford, Wisbech, Gloucester, and Bournemouth, and as being possibly indigenous in lowlands of all England and eastern Scotland northwards at least to Forfarshire.

Indigenous in southern and eastern England, about as far north as Cambridgeshire and about as far east as eastern Somerset. *Fagus sylvatica* is the dominant tree of the beech woods, including the beech "hangers," on the Chalk escarpments of Hampshire, Sussex, Kent, Surrey, Oxfordshire, Buckinghamshire, and Berkshire: in Buckinghamshire, the beech woods spread on to the non-chalky plateaux: in Hertfordshire and Cambridgeshire, beech woods are poor: in Gloucestershire, the tree is dominant in woods on Oolitic limestone; also dominant, but to a much smaller extent, in woods on the Greensand and on other sandy and gravelly soils from eastern Somerset to Kent. Planted extensively and *en masse* throughout Great Britain, as far north as Caithness-shire; ascending to 500 m. in Derbyshire; but at such altitudes the tree is not indigenous. The tree is said not to be indigenous in Ireland.

Southern Scandinavia (to 60° 31′ N.), Denmark, Germany, Holland, Belgium, France, central Europe (to 1915 m. in the Tyrol), Russia, southern Europe. A closely allied species (*F. orientalis* Lipsky in *Acta Hort. Petrop.* xiv, 300 (1897)) occurs from Asia Minor to Persia.

Family 2. CORYLACEAE

Corylaceae Mirbel *Elem.* ii, 906 (1815); Loudon *Arboret. Brit.* iii, 1715 (1838) excluding *Quercus*, *Fagus*, and *Castanea*; DC. *Prodr.* xvi, pt. ii, 124 (1864); *Coryleae* Meissner *Gen.* 257 (1842); Ascherson und Graebner *Syn.* iv, 370 (1910).

Trees, shrubs, or undershrubs. *Stipules* consisting of bud-scales, fugaceous. *Catkins* diclinous, compound; staminate ones pendulous, pistillate ones either elongate and pendulous or abbreviated and bud-like. *Staminate flowers* with no perianth. *Pistillate flowers* with a minute perianth. *True fruit* a nut, more or less enclosed in a herbaceous or membranous involucre of bracts.

4 genera; north temperate zone.

Genera of *Corylaceae*

Genus 1. **Carpinus** (see below). *Catkins* appearing with the leaves. *Pistillate catkins* elongate, drooping, lax-flowered. *Nut* much smaller than the 3-lobed bract or involucre.

Genus 2. **Corylus** (p. 79). *Catkins* appearing before the leaves. *Pistillate catkins* reduced, bud-like. *Nut* almost as long as the laciniate involucre.

Genus 1. Carpinus

Carpinus [Tournefort *Inst.* 582, t. 348 (1719)] L. *Sp. Pl.* 998 (1753) et *Gen. Pl.* ed. 5, 432 (1754) partim; Scopoli *Fl. Carn.* ii, 243 (1772); Prantl in *Pflanzenfam.* iii, pt. i, 42 (1894); Ascherson und Graebner *Syn.* iv, 371 (1910).

Trees or shrubs. *Leaves* deciduous. *Catkins* appearing with the leaves. *Staminate catkins* lateral, pendulous. *Perianth* absent. *Stamens* about 4—12 to each branch. *Filaments* branched almost from the base. (As both perianth and bracteoles are absent, it is scarcely possible to state whether 2 or 3 flowers are represented in each group of stamens.) *Pistillate catkins* terminal, pendulous. *Cymes* with 2 lateral flowers, the central one being suppressed, but all 6 bracteoles occur. *Perianth* minute. *Ovary* with 2 carpels, 2 loculi, and 2 stigmas. *Fruit* a small nut, at the base of a large 3-lobed involucre formed of the persistent, enlarged, and coherent bracteoles.

About 20 species; north temperate zone; Mexico and South America.

The only British species, *C. betulus*, belongs to the section *Eu-Carpinus* Sargant *Silva N. Amer.* ix, 40 (1896) distinguished by the broad scales of the staminate catkins and the leaf-like (not membranaceous) nature of the fruiting involucre.

1. CARPINUS BETULUS. Hornbeam. Plate 80

Betulus sive carpinus Gerard *Herball* 1296 (1597); *Ostrya ulmo similio fructu in umbilicus foliaceis* Ray *Syn.* ed. 3, 451 (1724).

Carpinus betulus L. *Sp. Pl.* 998 (1753)!; Smith *Fl. Brit.* 1029 (1804); *Eng. Fl.* iv, 156 (1828); Syme *Eng. Bot.* viii, 176 (1868); Ascherson und Graebner *Syn.* iv, 372 (1910); Rouy *Fl. France* xii, 303 (1910); *C. vulgaris* Miller *Gard. Dict.* ed. 8, no. 1 (1768).

Icones:—*Fl. Dan.* t. 1345; Reichenbach *Icon.* t. 632, fig. 1296.

Exsiccata:—Borbas 4695 (a cordate-leaved form); Dörfler, 4694 (a big-leaved form); Rauscher, 2285 (a cordate-leaved form); Reichenbach, 1637.

Tree, growing to a height of about 25—30 m. *Bark* smooth, dark grey. *Winter buds* rather long (ca. 7—8 mm.), pointed. *Petioles* long (ca. 1·5 cm.). *Laminae* ovate, rather unequal at the base, the larger side being nearer the branch (cf. *Ulmus*), doubly serrate, acute to acuminate, chief veins prominent and parallel and hairy on the lower surface. *Anthers* hairy at the top. *Catkins* appearing with the leaves; early to mid-April. *Nuts* about 0·6 cm. long and 0·4 broad.

(*a*) **C. betulus** var. **genuina** Syme *Eng. Bot.* viii, 176 (1868).

Icones:—Hartig, *Forst. Bot.* t. 21, as *Carpinus betulus.*

Camb. Brit. Fl. ii. *Plate 80.* (*a*) Twig in early spring. (*b*) Shoot with staminate and pistillate catkins. (*c*) Opening leaf-bud. (*d*) Groups of staminate flowers and bracts. (*e*) Fertile shoot in autumn. (*f*) Ripe fruits. Huntingdonshire (E. W. H.).

Laminae, when mature, larger (up to about 9 cm. long and 4 broad) and more acute or acuminate than in var. *provincialis*. *Central lobe* of the cupule entire or subentire, larger. *Nuts* larger (about 6 mm. long and 4 broad).

Further observations are necessary before the distribution of the two forms can be accurately stated.

(*b*) **C. betulus** var. **provincialis** [Gay ex] Grenier et Godron *Fl. France* iii, 121 (1855); Syme *Eng. Bot.* 176 (1868); Rouy *Fl. France* xii, 304 (1910).

Icones :—Smith *Eng. Bot.* t. 2032, as *Carpinus betulus*.

Exsiccata :—Billot, 460, as *C. betulus*; herb. Dillen. (*fide* Druce *Dill. Herb.* 130 (1907)).

Differs from var. *genuina* in its *laminae* being smaller, less gradually tapering in the upper half, and in the *central lobe of the involucre* having a few more or less conspicuous teeth on each margin.

Essex (Syme, *loc. cit.*), Huntingdonshire.

South-western France, and doubtless elsewhere.

Carpinus betulus is indigenous in oak woods, sometimes indeed being sub-dominant, in the south-east of England, chiefly on clayey and loamy soils; local in hedgerows from Cornwall and Kent northwards to the Midlands; planted as far north as Sutherlandshire. Abundant in the south of the Weald, in parts of Middlesex (e.g., Hadley Wood), Essex (e.g., Epping Forest), Hertfordshire (e.g., woods near Hitchin); rather rare in woods in Cambridgeshire, and doubtfully indigenous north of this county, and probably not indigenous in the west of England; not indigenous in Wales, Scotland, or Ireland.

Southern Sweden (northwards to 57° 11′ N.), Denmark, Germany, Holland, Belgium, France, central Europe (ascending to 1000 m.), Pyrenees, Italy, Balkan peninsula to Greece, central and southern Russia; Caucasus; northern Asia Minor; Persia.

Genus 2. **Corylus**

Corylus [Tournefort *Inst.* 581, t. 347 (1719)] L. *Sp. Pl.* 998 (1753) et *Gen. Pl.* ed. 5, 433 (1754); Prantl in *Pflanzenfam.* iii, pt. i, 43 (1894).

Trees or shrubs, freely suckering. *Leaves* deciduous. *Catkins* opening before the leaves. *Staminate catkins* visible all the winter before flowering, pendulous when in flower; cymes uniflorous, the 2 lateral flowers being suppressed. *Perianth* absent. *Stamens* 4, each branched nearly from the base, adnate to the 2 bracteoles. *Pistillate catkins* sessile, bud-like; cymes 2-flowered; the central one being suppressed. *Perianth* minute. *Ovary* almost indistinguishable during the flowering period. *Stigmas* long. *Fruit* a nut, each one surrounded by a herbaceous fruiting involucre or cupule.

About 8 species; north temperate zone.

The only British species (*C. avellana*) belongs to the section *Avellana* A. DC. in DC. *Prodr.* xvi, pt. ii, 129 (1864).

1. **CORYLUS AVELLANA.** Hazel. **Plate 81**

Corylus sylvestris Gerard *Herb.* 1250 (1597); Ray *Syn.* ed. 3, 439 (1724).

Corylus avellana L. *Sp. Pl.* 998 (1753); Syme *Eng. Bot.* viii, 170 (1868); Ascherson und Graebner *Syn.* iv, 379 (1910); Rouy *Fl. France* xii, 302 (1910).

Icones :—Smith *Eng. Bot.* t. 723; *Fl. Dan.* t. 1468; Reichenbach *Icon.* t. 636, fig. 1300; Hartig *Forst. Culturpfl.* t. 15.

Camb. Brit. Fl. ii. *Plate 81.* (*a*) Twig with staminate and pistillate catkins. (*b*) Pistillate catkin (enlarged). (*c*) Scale and staminate flower, upper and lower surfaces (enlarged). (*d*) Fertile shoot in autumn. (*e*) Nut. (*f*) Cotyledon of nut. Huntingdonshire (E. W. H.).

Exsiccata :—Billot, 459, 459 bis; *Herb. Fl. Ingric.* iv, 550.

Shrub, usually about 3 or 4 m. high, suckering freely. *Young branches* with gland-headed hairs. *Petioles* short (up to about 5 cm.), with glandular hairs. *Laminae* broadly oval or oboval to suborbicular, more or less cordate at the base, coarsely and doubly serrate, abruptly acuminate, with glandular hairs at least when young. *Catkins* opening long before the leaves; January to March. *Fruiting bracts* distinct, irregularly dentate or laciniate. *Nuts* usually about 3—5, rarely up to about 20, in a cluster; September and October.

Throughout the British Isles, northwards to Orkney; in woods, scrub and hedgerows; most abundant on calcareous soils, especially on limestone, rarest on dry sandy and gravelly soils; forming the principal shrubby undergrowth in almost all the oak woods and ash-oak woods on clayey and marly soils in southern England, and usually coppiced; ascending to about 600 m. in the Highlands.

Southern Scandinavia (to about 67° N.), Denmark, Germany, France, central Europe, central and southern Russia, Spain and Portugal (southwards to 38° 20′), Italy, Sicily, Balkan peninsula; Krim, Caucasus, Asia Minor; northern Africa (not indigenous).

Family 3. BETULACEAE

Betulaceae Agardh *Aphor.* 208 (1825); Bartling *Ord. Pl.* 99 (1830); Loudon *Arboret.* iii, 1677 (1838); Regel in DC. *Prodr.* xvi, pt. ii, 161 (1838); *Betuleae* Prantl in *Pflanzenfam.* iii, pt. i, 38 (1894); Ascherson und Graebner *Syn.* iv, 369 (1910).

Trees or shrubs. *Leaves* deciduous, simple, alternate, stipulate; *stipules* consisting of bud-scales, caducous. *Catkins* compound. *Staminate catkins* compound, the branches being cymes with 3 flowers. *Perianth* present in the staminate flowers, absent in the pistillate ones. *Stamens* 2—4. *Filaments* entire or branched. *Pistillate catkins* compound, the branches being cymes with 2—3 flowers. *Ovary* of 2 carpels. *Stigmas* 2, filiform, purplish. *Ovary* with 2 loculi. *Ovules* pendulous, 1 in each loculus, only 1 in each ovary maturing, with 1 integument. *True fruit* an achene, hidden among the scales of the ripe catkin, usually winged. *Cupule* absent.

2 genera; north temperate zone, Andes.

Genera of *Betulaceae*

Genus 1. **Betula** (see below). Stamens 2, each bifurcated and each branch terminating in a half-anther. *Pistillate catkins* falling at the end of the summer with the achenes; cymes 3-flowered. *Bracts* 3-lobed, herbaceous.

Genus 2. **Alnus** (p. 86). *Stamens* 4, not branched. *Pistillate catkins* remaining on the tree for several months after the achenes have been shed; cymes 2-flowered. *Bracts* 5-lobed, lignified.

Genus 1. Betula

By the Rev. E. S. MARSHALL, M.A., F.L.S.

Betula [Tournefort *Inst.* 588, t. 360 (1719)] L. *Sp. Pl.* 982 (1753) et *Gen. Pl.* ed. 5, 422 (1754) partim; Miller *Abridg. Gard. Dict.* ed. 6 (1771); Prantl in *Pflanzenfam.* iii, pt. i, 43 (1894); Winkler in *Pflanzenr.* iv, pt. 61, 56 (1904).

Small trees, shrubs, or undershrubs. *Catkins* cylindrical, flowering immediately after the appearing of the young leaves; *cymes* with 3 flowers to each bract. *Staminate catkins* usually pendulous. *Perianth* with 1—3 segments, minute. *Stamens* 2, each split nearly to the base, the lateral ones suppressed. *Pistillate catkins* very slender, much longer than broad. *Perianth* absent. *Ovary* 2-locular, 1-seeded. *Fruiting catkins* with herbaceous scales which are shaped like the heraldic *fleur-de-lis*, not persisting on the plant after the fruits have been shed.

Linnaeus, in his *Gen. Pl.* ed. 1, 285 (1737), followed Tournefort in keeping *Betula* and *Alnus* as distinct genera. Later, he united them; but in this he is not followed by modern botanists.

About 40 species, in the north temperate and Arctic zones.

The British species belong to the subgenus *Eu-Betula* Regel in *Mém. Soc. Nat. Mosc.* xiii (16) (1861); in DC. *Prodr.* xvi, pt. ii, 162 (1868).

British series of *Betula*

Series i. **Albae** (p. 81). Small trees or shrubs. *Leaves* not crowded, acute to acuminate, longer than broad. *Achene* with a more or less conspicuous wing.

Series ii. **Nanae** (p. 86). Dwarf undershrubs of Arctic-Alpine distribution. *Leaves* crowded, suborbicular, broader than long. *Achene* with the wing rudimentary or absent.

There is a recent account of the Scandinavian forms of *Betula*, by N. C. Kindberg, in *Botaniska Notiser* pp. 113—132 (1909). Kindberg recognises 22 species, 6 subspecies, 10 varieties, and 3 *formae*. There can be no doubt that *Betula* is far more variable in the British Isles, and especially in Scotland, than previous British floras have indicated; and it may well be that one or two of the birches here placed as varieties of *B. pubescens* will ultimately be found to be worthy of specific rank. However, the number of species allowed by Kindberg would be extravagantly large for the British Isles. I have very little doubt that several of the plants to which Kindberg has given binominals are hybrids; and others I think ought to be reduced to varieties or *formae*.

Series i. *Albae*

Albae Regel in DC. *Prodr.* xvi, pt. ii, 162 (1868); Ascherson und Graebner *Syn.* iv, 390 (1910).

For characters, see page 80.

British species and hybrid of *Albae*

1. **Betula alba** (see below). *Young branches* and branches of the sucker-shoots with resinous, peltate glands, hairs absent. *Laminae* acuminate, doubly serrate. *Lateral lobes of bracts* more or less falcate.

B. alba* × *pubescens (p. 82). *Young branches* usually with small resinous glands and hairs. *Laminae* and *lateral lobes of bracts* intermediate in shape.

2. **B. pubescens** (p. 82). *Young branches* and branches of the sucker-shoots with hairs, resinous glands absent or more or less rudimentary. *Laminae* not acuminate (except in var. *sudetica*), irregularly serrate. *Lateral lobes of bracts* spreading to erect.

1. BETULA ALBA. White Birch. Plates 82, 83; 84

Betula alba L. *Sp. Pl.* 982 (1753) partim; Roth *Tent. Fl. Germ.* i, 404 (1788) partim; Willdenow *Sp. Pl.* iv, 462 (1805); Koch *Syn.* 662 (1837); Fries *Fl. Suec. Mant.* ii, 60 (1839); Babington *Man.* 282 (1843); *B. verrucosa* Ehrhart *Beitr.* vi, 98 (1791); Ascherson und Graebner *Syn.* iv, 391 (1910); Rouy *Fl. France* xii, 254 (1910); *B. alba* var. *communis* Hartman *Skand. Fl.* 341 (1820); *B. alba* var. *vulgaris* Spach in *Ann. Sc. Nat.* sér. 2, xv, 186 (1841); *B. alba* subsp. *verrucosa* Syme *Eng. Bot.* viii, 182 (1868); *B. alba* subsp. *verrucosa* var. *vulgaris* Regel in DC. *Prodr.* xvi, pt. ii, 163 (1868); *B. verrucosa* var. *vulgaris* Winkler in Engler *Pflanzenr.* iv, pt. 61, 75 (1904).

Icones:—Reichenbach *Icon.* t. 626, fig. 1288, as *B. odorata*; *Fl. Dan.* t. 2549, as *B. verrucosa*; Syme *Eng. Bot.* viii, t. 1295, as *B. verrucosa*.

Camb. Brit. Fl. ii. *Plate 82.* (*a*) Branch of sucker in spring. (*b*) Branch of sucker in autumn. (*c*) Leaf (lower surface). Huntingdonshire (E. W. H.). *Plate 83.* (*a*) Shoot with staminate catkins. (*b*) Shoot with pistillate catkin. (*c*) Fertile shoot in autumn. (*d*) Fruiting bracts (one enlarged). (*e*) Winged achenes (one enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 463; Fries, ii, 53; Schultz, 520 bis; *Herb. Fl. Ingric.* viii, 582 c, as *B. alba* var. *verrucosa*; herb. Marshall, 3380.

Tree, growing to a height of about 20—25 m. *Bark* flaky, usually whitish or pale brownish grey, often very rugged and black at the base of the trunk in old trees. *Young branches* of the normal twigs glabrous except for the presence of small peltate glands; of the suckers, with numerous and large peltate glands. *Petioles* relatively longer than in *B. pubescens*. *Laminae* rhomboid-acuminate, acutely biserrate with the primary serrations acuminate, about 3—7 cm. long and 2·5—3·5 broad, glandular, slightly hairy when young, ultimately free of hairs, thinner than in *B. pubescens*, with raised veins on the upper surface; of the suckers, often much larger. *Catkins* on short (0·5—1·0 cm.) peduncles; April and early May. *Staminate catkins* cylindrical, pendulous, about 3—6 cm. long and 6—8 mm. broad. *Bracts* with the peltate heads with pale margins, ciliate, more or less glandular. *Pistillate catkins* not lengthening much in fruit, stout at maturity when they are about 2—3 cm. long and 1 broad, pendulous or ascending. *Stigmas* purplish. *Mature bracts* with a prominent central lobe which gradually narrows to an obtuse apex; lateral lobes smaller, spreading, more or less falcate and sometimes strongly so; August and September. *Wing* of fruits twice or thrice the diameter of the nutlets.

I do not hesitate to retain the Linnaean name *B. alba* for this species, as it is the member of the series *Albae* which answers best to the diagnosis ("foliis acuminatis") given by Linnaeus in his *Species Plantarum*, p. 982 (1753). There can, however, be no doubt that Linnaeus, the early British botanists, and also the two brothers Bauhin regarded *B. alba* and *B. pubescens* as constituting a single species.

(*β*) forma **pendula** E. S. Marshall in Moss *Camb. Brit. Fl.* ii, 81; *B. pendula* Roth *Fl. Germ.* i, 405 (1788) partim; *B. alba* var. *pendula* Aiton *Hort. Kew.* iii, 336 (1789) partim.

Differs only in its terminal branches becoming pendulous and drooping at maturity.

Eastern and central Highlands, from Perthshire to Ross-shire, and doubtless elsewhere. Frequently planted, as it is a graceful and beautiful tree.

Europe (incl. Corsica); Asia.

B. alba is indigenous and locally abundant in woods, though very rarely a dominant element; commonest on dry sandy or gravelly soils; locally abundant on lowland peat—both fen peat (as in Huntingdonshire) and moor peat (as in north Lancashire), on limestone (as on the Malvern Hills), and on clay (as in the Weald). Much more generally distributed in the eastern and southern parts of Great Britain than in the northern and western. In hilly districts it fails to ascend to such high altitudes as some of the varieties of *B. pubescens*: in the Highlands, for example, it occurs only up to about 300 m. In Great Britain, from Cornwall and Kent to Orkney, but absent from large tracts in the west. In Ireland, it is apparently absent north of counties Leitrim, Cavan, and Meath: elsewhere it is native, generally round the edges of the peat-moors and on the margins of lakes and rivers in the limestone plain. Frequently planted, but less so than *B. pubescens*.

Europe, northwards to 65° N. in Sweden, and ascending to 1830 m. in the Tyrol; Asia, eastwards to Japan; North America (locally southwards to Illinois).

Betula alba* × *pubescens E. S. Marshall in Moss *Camb. Brit. Fl.* ii, 82; *B. pubescens* × *verrucosa* Winkler in Engler *Pflanzenr.* iv, pt. 61, 94 (1904); Ascherson und Graebner *Syn.* iv, 403 (1911).

Icones:—Smith *Eng. Bot.* t. 2198, as *B. alba*; Reichenbach *Icon.* xii, t. 623, fig. 1282, as *B. alba*; t. 625, fig. 1287, as *B. pendula*; Syme *Eng. Bot.* viii, t. 1296, excluding the upper branch, the bract, and the fruit, as *B. glutinosa*.

Camb. Brit. Fl. ii. *Plate 84.* (*a*) Shoot with ripening pistillate catkins. (*b*) Leaf, lower surface. (*c*) Leaf-margin (enlarged). (*d*) Leaf-base (enlarged). Ross-shire (E. W. H.) (*e*) Terminal portion of twig (enlarged). (*f*) Winged achenes (one enlarged). (*g*) Fruiting bracts (one enlarged). (*f*) and (*g*) drawn from dried specimens.

Exsiccata:—Billot, 464, as *B. pubescens*; herb. Marshall, 3381, 3382; *Herb. Fl. Ingric.*, 584, as *B. alba* var. *pendula*.

Trees, in habit usually approaching *B. alba*. *Young branches* with small peltate glands (as in *B. alba*), and often with hairs (as in *B. pubescens*). *Laminae* less acuminate than in *B. alba*, and with the marginal serrations less unequal in size and often less acute. *Bracts* of the fruit with lateral lobes usually less falcate than in *B. alba*. Very variable, all stages occurring between the putative parents.

Common wherever *B. alba* and *B. pubescens* grow together, as on the dry, gravelly and sandy soils of southern and eastern England and on the lower slopes of the siliceous hills of northern and western Great Britain; as far northwards at least as Ross-shire; not yet recorded for Wales or Ireland, but it doubtless occurs there. Commonly planted.

Scandinavia, Germany, central Europe, and doubtless elsewhere.

2. BETULA PUBESCENS. Common Birch. Plates 85, 86; 84, 87

Betula Gerard *Herball* 1295 (1597); Ray *Syn.* ed. 3, 443 (1724).

Betula pubescens Ehrhart *Beitr.* vi, 98 (1791); Winkler in *Pflanzenr.* iv, pt. 61, 81 (1904); Ascherson und Graebner *Syn.* iv, 398 (1910); Rouy *Fl. France* xii, 254 (1910); *B. alba* L. *Sp. Pl.* 982 (1753) partim; *B. tomentosa* Reiter und Abel *Abbild.* 17, t. 15 (1803) partim[1]; *B. alba* var. *pubescens* Hartman *Skand. Fl.* 341 (1820); Loudon *Arboret.* iii, 1691 (1838); *B. glutinosa* Babington *Man.* 282 (1843); *B. alba* subsp. *glutinosa* Syme *Eng. Bot.* viii, 187 (1868).

Icones:—*Camb. Brit. Fl.* ii. *Plate 85.* (*a*) Coppiced shoot. (*b*) Leaf, lower side. (*c*) Portion of leaf (enlarged). Huntingdonshire (E. W. H.). *Plate 86.* (*a*) Shoot with ripening pistillate catkins. (*b*) Shoot with staminate and pistillate catkins. (*c*) Pistillate catkin (rather older than the one in (*b*)). Huntingdonshire (E. W. H.). (*d*) Fruiting bracts (one enlarged). (*e*) Fruits (one enlarged). *a*—*e* = var. *vestita*. (*f*) Fruiting bracts of var. *glabrata* (one enlarged). (*g*) Winged achenes of var. *glabrata* (one enlarged). (*h*) Fruiting bracts of var. *microphylla* (one enlarged). (*i*) Winged achenes of var. *microphylla* (one enlarged). (*j*) Fruiting bracts of var. *sudetica* (one enlarged). (*k*) Winged achenes of var. *sudetica* (one enlarged). (*d*) to (*k*) inclusive drawn from dried specimens.

Tree, usually rather less tall than *B. alba*, and often a mere shrub in its more exposed, northern, and sub-Alpine stations. *Bark* flaky, whitish or brown and smooth and shining. *Young branches* usually more or less hairy, often densely pubescent, not infrequently with small or rudimentary verrucosities, suberect or spreading, rarely pendulous, dark brown in colour; of the

[1] The plate here cited is partly an illustration of *B. alba* × *pubescens*.

suckers, densely pubescent. *Winter buds* ovate, broader than in *B. alba*. *Petioles* relatively shorter than in *B. alba*. *Laminae* ovate to rhomboid-ovate, usually truncate to subcordate at the base, coarsely and often irregularly serrate, serrations less acute than in *B. alba*, acute to subacuminate, more or less hairy when young, often glabrous or subglabrous at maturity, with raised veins on the lower surface. *Catkins* late April and early May, a little later than in *B. alba*. *Staminate catkins* about 3·0—4·5 cm. long and 5—7 mm. broad. *Bracts* with peltate heads dark brown in colour, greenish near the margin, ciliate. *Pistillate catkins* about 1·3—4·0 cm. long and 0·5—1·0 broad when in flower, usually narrower than in *B. alba*. *Stigmas* ? purplish. *Fruiting bracts* ciliate, central lobe very prominent, obtuse; lateral lobes patent to suberect or even erect, usually shorter than the central lobe, usually less spreading than in *B. alba*; August and September. *Wing of fruit* as broad as or a little broader than the achene.

(*a*) **B. pubescens** var. **vestita** Grenier et Godron *Fl. France* iii, 148 (1855); *B. pubescens* Wallroth *Sched. Crit.* 499 (1822); *B. glutinosa* var. *pubescens* Babington *Man.* 282 (1843); *B. alba* subsp. *glutinosa* var. *pubescens* Syme *Eng. Bot.* viii, 187 (1868); *B. odorata* [Bechstein ex] Kindberg *Bot. Notiser* 116 (1909).

Icones :—Hartig *Forst. Culturpfl.* t. 27, as *B. alba*; t. 28, as *B. pubescens*.

Camb. Brit. Fl. ii. *Plate 85. Plate 86, a—e.*

Exsiccata :—Reichenbach, 1635, as *B. ambigua*; v. Heurck, i, 3, as *B. pubescens*.

Bark resembling that of *B. alba*, but less black and corky at the base of the trunk. *Young branches* usually hairy, scarcely verrucose. *Laminae* subrotund to cuneate-rotund at the base, usually pubescent; of the suckers, cordate. *Lateral lobes* of the fruiting scales rather shorter than in *B. alba*, somewhat arched. *Achene* relatively broader than in *B. alba*.

This variety is common in the lowlands of England.

(*b*) **B. pubescens** var. **glabrata** Wahlenberg *Fl. Carpat.* 306 (1814); *B. carpatica* [Waldstein et Kitaibel ex] Willdenow[1] *Sp. Pl.* iv, 464 (1805); *B. glutinosa* Wallroth *Sched. Crit.* 497 (1822); Fries *Veg. Scand.* 212 (1846)!; *B. pubescens* var. *carpatica* Koch *Syn.* 662 (1837); Winkler in *Pflanzenr.* iv, pt. 61, 81 (1904); Rouy *Fl. France* xii, 255 (1910); *B. rhombifolia* Tausch in *Flora* xxi, 752 (1838); *B. carpatica* var. *hercynica* Reichenbach *Icon.* xii, 2 (1850); *B. pubescens* var. *denudata* Grenier et Godron *Fl. France* iii, 147 (1855); *B. alba* lusus *carpatica* Regel *Monogr. Betul.* 21 (1861); *B. alba* subsp. *glutinosa* var. *denudata* Syme *Eng. Bot.* viii, 186 (1868); *B. alba* subsp. *pubescens* var. *carpatica* Regel in DC. *Prodr.* xvi, pt. ii, 168 (1868) partim; *B. odorata* subsp. *rhombifolia* Lange *Haandb. Danske Fl.* 241 (1886—8); *B. pubescens* race *carpatica* Ascherson und Graebner *Syn.* iv, 401 (1911).

Icones :—Reichenbach *Icon.* xii, t. 624, fig. 1286, as *B. carpatica* var. *hercynica*; *Fl. Dan.* t. 1467, as *B. alba*; t. 2851, as *B. odorata* var. *rhombifolia*; Hartig *Forst. Culturpfl.* t. 29, as *B. pubescens* var. *carpatica*.

Camb. Brit. Fl. ii. *Plate 86.* (*f*) Fruiting bracts (one enlarged). (*g*) Achenes (one enlarged).

Exsiccata :—Billot, 521 bis, as *B. pubescens*; Fries, ii, 54, as *B. glutinosa*; van Heurck et Martinis, v, 232, as *B. verrucosa*; Reichenbach, 1321, as *B. carpatica*; 1635 (? partim), as *B. ambigua*; *Herb. Fl. Ingric.* x, 583, as *B. glutinosa*; Tausch, as *B. carpatica*.

Tree, growing as tall as var. *vestita* in favourable situations but remaining shrubby in exposed localities. *Bark* brown, shining. *Young branches* much darker than in var. *vestita*, pubescent or glabrous at maturity, with small verrucosities. *Laminae* rhomboidal or subrhomboidal or subovate, more or less cuneate at the base, simply or doubly toothed, serrations not acuminate, often glabrous or only hairy below in the axils of the chief veins at maturity, usually rather larger than in var. *vestita* and darker green. *Pistillate catkins* stouter than in var. *vestita*. *Lateral lobes* of the bracts usually less spreading and shorter than in var. *vestita*. *Achene* as in var. *vestita*.

Throughout the British Isles, northwards at least to Sutherlandshire (Professor J. W. H. Traill, in *Ann. Scot. Nat. Hist.* 180 (1906)), but commoner among the hills of the west and north of Great Britain than in the lowlands of the south and east; on lowland peat-moors in the north of England; common on the Pennines.

Scandinavia, Denmark, Germany, France, central Europe, Russia, and doubtless elsewhere.

(*c*) **B. pubescens** var. **alpigena** Blytt *Norg. Fl.* 402 (1861); *B. davurica* Ledebour *Fl. Alt.* iv, 245 (1833) non Pallas; *B. tortuosa* Ledebour *Fl. Ross.* iii, 652 (1849); *B. alba* subsp. *tortuosa* var. *genuina* Regel in DC. *Prodr.* xvi, pt. ii, 169 (1868); *B. pubescens* var. *tortuosa* Koehne *Deutsche Dendrol.* 109 (1893); *B. pubescens* race *tortuosa* Ascherson und Graebner *Syn.* iv, 402 (1911).

Icones :—*Fl. Dan.* t. 2918, as *B. odorata* var. *tortuosa*; Syme *Eng. Bot.* viii, t. 1296, excluding the lower branch and single leaf, as *B. glutinosa*.

[1] The name *B. carpatica* does not appear in the work (Waldstein et Kitaibel *Pl. Rar. Hung.*) cited by Willdenow, which was published at a later date than Willdenow's *Species Plantarum*. Cf. *Atriplex microsperma*.

Exsiccata :—Fellmann, 208, as *B. tortuosa* var. *kusmischeffii*; Herb. Marshall, 420, 421, 423, 425, 426, 427 [some of these were named var. *carpatica* and others var. *parvifolia* by Professor J. Lange].

Low tree or shrub. *Branches* tortuous. *Petioles* about half as long as the laminae. *Laminae* subrotund or rhomboid-ovate, margin deeply but simply or doubly dentate. *Lateral lobes* of the bracts erect. *Achene* about as wide as the wings.

Hilly districts in Scotland usually between 500 and 700 m., especially on the banks of sub-Alpine streams; Cheviot (near Dunsdale), Argyllshire (northern side of Clach Leathad, near Kingshouse), Forfarshire (Glen Fiagh, Clova), Aberdeenshire, Perthshire (Ben More), western Inverness-shire (Stob Ban, Glen Nevis).

Iceland, Scandinavia, mountains of central Europe and Asia; Greenland, and doubtless elsewhere.

(*d*) **B. pubescens** var. **microphylla** E. S. Marshall in Moss *Camb. Brit. Fl.* ii, 84; *B. alba* var. *microphylla* Hartman *Handb. Skand. Fl.* 341 (1820); *B. alba* subsp. *pubescens* var. *parvifolia* Regel in DC. *Prodr.* xvi, pt. ii, 167 (1868) partim; *B. odorata* var. *parvifolia* Lange *Haandb. Danske Fl.* 241 (1886) partim; *B. pubescens* race *vulgaris* var. *eu-pubescens* subvar. *parvifolia* Ascherson und Graebner *Syn.* iv, 400 (1910).

Icones :—Reichenbach *Icon.* xii, t. 624, fig. 1284, as *B. carpatica*; *Fl. Dan.* t. 2917, as *B. odorata* var. *parvifolia*.

Camb. Brit. Fl. ii. *Plate 86.* (*h*) Fruiting bracts (enlarged). (*i*) Winged achenes (enlarged).

Exsiccata :—*Herb. Fl. Ingric.* x, 583 b, as *B. intermedia*; herb. Marshall, 3383.

Small tree, growing under very favourable circumstances to a height of about 12—15 m., of very graceful habit, sometimes pendulous, often remaining shrubby. *Bark* brown and shining, not flaked with white, that of the young branches not so dark as in var. *carpatica*. *Petioles* relatively shorter than in var. *vestita*. *Laminae* subrotund to oval or rhomboidal, much smaller (1·5—3·0 cm. long and 1—2 broad) than in any of the preceding varieties, less hairy, with small brown circular glands on the lower surface. *Fruiting catkins* suberect, stout, short (1·5—2·0 cm. long), and about twice as long as the peduncles. *Achene* as in var. *vestita*. *Lateral lobes* of the bracts ascending.

Some forms of this variety show a strong resemblance to × *B. intermedia* (p. 85).

Rare in England and Wales (Carnarvonshire, Shropshire, Derbyshire, West Riding of Yorkshire); locally abundant in Scotland (Argyllshire, Forfarshire, Perthshire, Inverness-shire, Sutherlandshire, Caithness-shire, Orkney).

It is impossible to state its distribution abroad with any approach to accuracy; but it occurs in northern Europe and among the mountains of central Europe.

(*e*) **B. pubescens** var. **sudetica** E. S. Marshall in Moss *Camb. Brit. Fl.* ii, 84; *B. carpatica* var. *sudetica* Reichenbach *Icon.* xii, 2 (1850); *B. alba* subsp. *pubescens* var. *parvifolia* Regel in DC. *Prodr.* xvi, pt. ii, 167 (1868) partim; *B. odorata* var. *parvifolia* Lange *Haandb. Danske Fl.* 241 (1886) partim; *B. verrucosa* var. *oycowiensis* Winkler in *Pflanzenr.* iv, pt. 61, 77 (1904) partim.

Icones :—Reichenbach *Icon.* xii, t. 624, fig. 1285, as *B. carpatica* var. *sudetica*.

Camb. Brit. Fl. ii. *Plate 86.* (*j*) Fruiting bracts (enlarged). (*k*) Winged achenes (enlarged).

Exsiccata :—Herb. Marshall, 361, 3564, 3565.

Shrub. *Laminae* narrowly rhomboidal, cuneate at the base, serrate, acute to acuminate, rather longer and narrower than in var. *microphylla*. *Lateral lobes* of the bract ascending. *Achene* much broader than the wings.

I think Winkler (*loc. cit.*) errs in referring this plant to *B. alba* (= *B. verrucosa*), although the acute to acuminate laminae afford a certain amount of justification for his view. This var. *sudetica* and the var. *microphylla* together are almost sufficiently distinct from the other forms of *B. pubescens* to justify their being regarded as a separate species.

Apparently rare, in hilly and sub-Alpine localities, from about 120 to 600 m.; Derbyshire (leg. C. Bailey, 1884, as *B. verrucosa*), Inverness-shire (ascent of Stof Ban from Glen Nevis; Allt a' Choire Dheirg, Glen Nevis; Allt an t' Sluie, near Dalwhinnie); Sutherlandshire (foot of Ben Laoghal).

Sweden (Lindberg, in Herb. Univ. Cantab. as *B. carpatica*), central Europe (Reichenbach *loc. cit.*) and doubtless elsewhere.

B. pubescens occurs throughout the British Isles, from Cornwall and Kent northwards to Orkney, ascending to 760 m. in the Highlands. It is common in most parts of the British Isles, except on clayey and calcareous soils on which it is local. In the south and east of England it is very abundant in woods and heaths with dry sandy or gravelly soils. In these situations, it exists in company with *B. alba* and with the hybrids *B. alba* × *pubescens*. Locally abundant on fens and lowland peat-moors, but absent from mountain moors. On the higher hills of the western and northern parts of Great Britain, the species ascends much higher than the oak (*Quercus sessiliflora*), and forms a more or less definite zone of birch woods above the oak woods. On

limestone soils, it becomes abundant at the higher altitudes only, as a rule. On chalk rock, it is absent. Frequent in Ireland, both in the plain and on the hills. Commonly planted.

Arctic and northern Europe, northwards to Lat. 67° 40′ N.; central Europe (up to 2050 m.); northern Portugal, north-western Spain, northern Italy; Asia Minor; northern Asia; North America, southwards to the great lakes and New England. This species reaches further northwards than any other tree in Europe.

B. nana* × *pubescens Gürke *Plant. Eur.* ii, 50 (1897); Winkler in *Pflanzenr.* iv, pt. 61, 93 (1904); Ascherson und Graebner *Syn.* iv, 410 (1911).

Icones:—*Camb. Brit. Fl.* ii. *Plate 87.*

Two forms of this hybrid may be distinguished, (A) × *B. intermedia* and (B) × *B. alpestris.*

(A) × ***B. intermedia*** Gürke *Plant. Eur.* ii, 50 (1897); Winkler in *Pflanzenr.* iv, pt. 61, 93 (1904); Ascherson und Graebner *Syn.* iv, 411 (1911); *B. alba* var. *intermedia* Wahlenberg *Fl. Suec.* ii, 624 (1826); *B. nana* var. *intermedia* Hartman *Handb. Skand. Fl.* 341 (1820); *B. intermedia* [Thomas ex] Gaudin *Fl. Helv.* vi, 176 (1830); Regel in DC. *Prodr.* xvi, pt. ii, 170 (1868).

Icones:—Reichenbach *Icon.* xii, t. 624, fig. 1283, as *B. intermedia*; *Fl. Dan.* t. 2852, as *B. intermedia.*

Camb. Brit. Fl. ii. *Plate 87.* (*a*) Shoot with ripening catkins. Forfarshire (E. S. M.). (*b*) Fruiting bracts (one enlarged). (*c*) Winged achenes (one enlarged). (*d—e*) See × *B. alpestris.*

Exsiccata:—v. Hayek (*Fl. Stir. Exsicc.*), 521, as *B. intermedia*; *Herb. Fl. Ingric.* ix, 584 (partim), as *B. alpestris*; herb. Marshall, 361 g, 1887, 2823, 2949, 2950, 3384.

Small tree or large shrub, attaining a height of about 2·5—4 m., much branched, usually densely branched. *Bark* dark brown, usually shining. *Young branches* usually glabrous except at the tips which are pubescent and glandular. *Petioles* about a third to half as long as the laminae. *Laminae* suborbicular or suborbicular-rhomboidal, sometimes broader than long, truncate or broadly cuneate at the base, sharply and irregularly dentate, acute or obtuse, about 1·5—1·8 cm. long and 1·0 to 1·5 broad, ultimately glabrous, subcoriaceous, dark green above, grey-green and strongly reticulate underneath. *Staminate catkins* not seen. *Pistillate catkins* usually numerous, pedunculate, about twice to four times as long as the peduncles, erect or ascending, short and rather stout (about 1·5—2·0 cm. long and 1·2 broad). *Stigmas* purple, one-third to one-half as long as the ripening ovary. *Bracts* small (about 3 mm. broad), rather cuneate towards the base; lobes ciliate, obtuse, lateral ones ovate or rounded, ascending. *Achene* and wing variable, sometimes as in *B. pubescens* and sometimes much narrower.

Rare, and hitherto only found in Scotland as isolated individuals; ascending to 650—700 m. in the Grampians; more frequent than × *B. alpestris.* Argyllshire (Professor J. W. H. Traill in *Ann. Scot. Nat. Hist.* 180 (1906)), Forfarshire (stream, near Bachnagairn, Clova), Aberdeenshire (near the head of the burn in Glen Callater, Glen Slugain, Invercauld Forest, Braemar), Ross-shire (bank of a tributary of the Garbad burn, Wyvis Forest, near Garve), Sutherlandshire (close to the ferry at Cashil Dhu, at the head of Loch Hope).

Iceland, Scandinavia, Germany (one station), Switzerland (Jura).

(B) × ***B. alpestris*** Gürke *Plant. Eur.* ii, 50 (1897); Winkler in *Pflanzenr.* iv, pt. 61, 93 (1904); Ascherson und Graebner *Syn.* iv, 411 (1911); *B. humilis* Hartman *Handb. Skand. Fl.* 328 (1838) non Schrank; *B. alpestris* Fries *Veg. Scand.* i, 212 (1846); Regel in DC. *Prodr.* xvi, pt. ii, 172 (1868) partim; Kindberg in *Bot. Notiser* 121 (1909); *B. nana* var. *alpestris* Regel *Monogr. Betul.* 45 (1861) partim; *B. humilis* var. *Watsoni* Spach in *Ann. Sc. Nat.* sér. 2, xv, 194 (1841).

Icones:—Watson *Dendrol. Brit.* ii, t. 154, as *B. fruticosa*; Reichenbach *Icon.* xii, t. 622, fig. 1280, as *B. fruticosa* var. *humilis.*

Camb. Brit. Fl. ii. *Plate 87.* (*d*) Fruiting bracts (one enlarged). (*e*) Winged achenes (one enlarged).

Exsiccata:—Ahlberg, as *B. alpestris*; Fries, v, 60, as *B. humilis*; *Herb. Fl. Ingric.* ix, 584 (part.) as *B. alpestris*; herb. Marshall 494, 2449, 2951.

Shrub or undershrub, scarcely attaining a height of 2 m. and usually much lower. Bark dark brown, shining. *Internodes* short. *Young branches* glabrous, rugose and slightly glandular at the tips, shorter than in × *B. intermedia.* *Laminae* rather smaller than in × *B. intermedia*, serrations more regular, shallower, blunter. *Staminate catkins* not seen. *Pistillate catkins* pedunculate, smaller than in × *B. intermedia.* *Bracts* scarcely differing from those of *B. nana.* *Wing* of fruit narrower than the achene, sometimes rudimentary or even absent.

Very rare; Perthshire (Rannoch Moor, near Kingshouse, at 300 m.), ? Aberdeenshire (wet peaty ground, Lochnagar, descending towards the Dhu Loch, at 840 m.), Sutherlandshire (at the northern base of Ben Laoghal, near Tongue, at about 250 m.).

Of the above plants the first two agree with the description of *B. alpestris* var. *communis* Regel in DC. *Prodr.* xvi, pt. ii, 173 (1868), and the third with *B. alpestris* var. *typica* Regel *op. cit.*, p. 172. In cultivation, the Aberdeenshire plant approaches *B. pubescens* in its vegetative characters: it has not yet flowered.

Iceland, Scandinavia, northern and central Russia, Greenland.

Series ii. *NANAE*

Nanae Regel in DC. *Prodr.* xvi, pt. ii, 162 et 171 (1868); Winkler in *Pflanzenr.* iv, pt. 61, 69 (1904); Ascherson und Graebner *Syn.* iv, 404 (1911); *Humiles* Koehne *Deutsche Dendrol.* 107 (1893); Prantl in *Pflanzenfam.* iii, pt. i, 45 (1894).

For characters, see page 80.

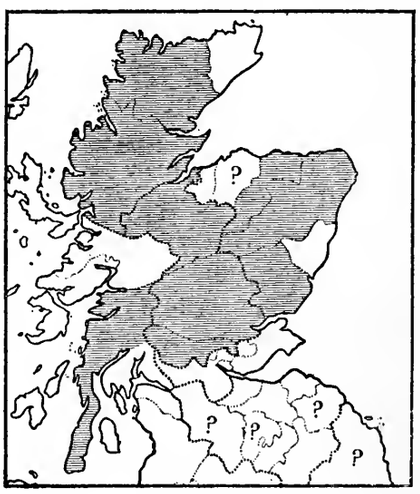
3. BETULA NANA. Dwarf Birch. Plates 88; 87

Betula nana L. *Sp. Pl.* 983 (1753); Lightfoot *Fl. Scot.* 575 (1777); Syme *Eng. Bot.* viii, 187 (1868); Rouy *Fl. France* xii, 255 (1910); Ascherson und Graebner *Syn.* iv, 406 (1911); *B. nana* var. *europaea* Ledebour *Fl. Ross.* iii, 654 (1849).

Icones:—Smith *Eng. Bot.* t. 2326; Reichenbach *Icon.* xii, t. 621, fig. 1278; Hartig *Forst. Culturpfl.* t. 31. *Camb. Brit. Fl.* ii. *Plate 88.* (*a*) Fertile and barren shoots in summer. Forfarshire (E. S. M.). (*b*) Fruiting bracts (one enlarged). (*c*) Winged achenes (one enlarged). (*b*) and (*c*) drawn from dried specimens.

Exsiccata:—Fries, ii, 55; Reichenbach, 1634; Schultz, x, 943; Tausch.

Undershrub, either prostrate and attaining a length of about 1·5 m. or erect and nearly a metre high. *Trunk* in old plants sometimes attaining a thickness of 5 cm., often misshapen owing to the browsing of animals. *Bark* dull brown. *Branches* rigid, ascending, eglandular, internodes short especially towards the end. *Young branches* pubescent. *Petioles* very short. *Laminae* subrotund (about 1—2 cm. long), the lower ones often broader than long, strongly crenate, subcoriaceous, shining and dark green above, glabrous at maturity, strongly reticulated. *Catkins* small, sessile or subsessile; May. *Staminate catkins* about 8 mm. long. *Bracts* with peltate heads paler at the margin, ciliate. *Pistillate catkins* about 10 mm. long and 5 broad. *Stigmas* about as long as the ovary. *Fruiting bracts* small (about 2 mm. broad), cuneate below; lateral lobes long, narrow, suberect. *Wing* of achene variable in breadth, often rudimentary.



Map 11. *Betula nana* occurs in the counties which are shaded; and there are more or less doubtful records of it for the counties marked "?"

Peat moors, where the peat is very acidic, sometimes among *Calluna vulgaris*, sometimes on denuding peat; from Argyllshire to Perthshire and Sutherland; from 250 to 823 metres. Records from southern Scotland and northern England are all doubtful.

Iceland, Scandinavia, Germany, eastern France, central Europe (ascending to 1980 m.), Russia; northern Asia; North America, Greenland.

B. nana × *pubescens* (page 85).

Genus 2. Alnus.

Alnus [Tournefort *Inst.* 587, t. 359 (1719)] Miller *Abridg. Gard. Dict.* ed. 6 (1771); Gaertner *De Fruct.* ii, 54, t. 90, fig. 2 (1791); Engler in *Pflanzenfam.* iii, pt. i, 45 (1894).

Trees or shrubs. *Catkins* flowering before the leaves appear. *Staminate catkins* pendulous, with 3-flowered cymes. *Perianth* 4-partite, larger than in *Betula*. *Stamens* 4. *Pistillate catkins* stout, ovoid or elliptical, with 2-flowered cymes. *Perianth* absent. *Ovary* 2-locular, 1-seeded. *Fruiting catkins* very stout, persisting on the tree long after the seeds have been shed. *Scales* 5-lobed.

About 17 species; Europe, central and northern Asia, northern Africa, North and South America.

The only British species, *A. glutinosa*, belongs to the section *Gymnothyrsus* Spach in *Ann. Sc. Nat.* sér. 2, xv, 204 (1841).

1. ALNUS GLUTINOSA. Alder. Plate 89

Alnus Gerard *Herball* 1249 (1597); Ray *Syn.* ed. 3, 442 (1724); *A. vulgaris sub-conis ligulis membranaceis rubris donata* Dillenius in Ray *loc. cit.*

Alnus glutinosa Gaertner *De Fruct.* ii, 54 (1791); Smith *Eng. Fl.* iv, 132 (1828); Syme *Eng. Bot.* viii, 178 (1868); Rouy *Fl. France* xii, 259 (1910); Ascherson und Graebner *Syn.* iv, 416 (1911); *Betula alnus* var. *glutinosa* L. *Sp. Pl.* 983 (1753); *Betula alnus* L. *Fl. Angl.* (1754) non *Syst. Nat.*; Smith *Fl. Brit.* 1013 (1804); *Betula glutinosa* L. *Syst. Veg.* ed. 10, 1265 (1759); *Alnus rotundifolia* Miller *Abr. Gard. Dict.* ed. 6, no. 1 (1771).

Tree, attaining a height of about 25—28 m. *Petioles* about a quarter as long as the laminae. *Laminae* oboval to suborbicular, more or less cuneate at the base, serrate, more or less undulate, obtuse, truncate, often emarginate more or less glutinous when young. *Staminate catkins* long, cylindrical, pendulous. *Pistillate catkins* short, oval to cylindrical, suberect or spreading, lengthening in fruit, persisting through the following winter. *Achenes* winged.

The botanical name of the alder has, in recent years, been unnecessarily confused. Some authorities have resuscitated the name *Alnus rotundifolia* (Miller *Abr. Gard. Dict.* ed. 6, no. 1 (1771)); but this name is invalid on account of the existence of an earlier trivial name in *Betula glutinosa* L. *Syst. Veg.* ed. 10, 1265 (1759). As the plant is now invariably placed in the genus *Alnus*, Gaertner's familiar name *Alnus glutinosa* is correct.

The synonym *Alnus rotundifolia* is sometimes incorrectly cited as of Miller *Gardener's Dict.* ed. 8 (1768); but no such name appears in this edition. Sometimes too the same synonym is cited as of Miller *Gard. Dict.* ed. 7 (1759); but this also is an erroneous citation. These errors can only be due to an unfortunate habit which many botanists evidently have of citing names without taking the trouble to consult the works in which the names are alleged to appear.

In Fernald and Robinson's edition of Gray's *New Manual of Botany* 337 (1908), the name *Alnus vulgaris* Hill is used for the plant. This name occurs in Hill's *Herb. Brit.* 510 (1756); but this work (like the first seven editions of Miller's *Gardener's Dictionary*, and like the first five editions of the *Abridgment* of this great work) does not adopt the binominal system of nomenclature: the names in it are therefore not available for citation except among works of the pre-Linnaean era. If the names of such works are adopted, much confusion will result.

(*a*) **A. glutinosa** var. **macrocarpa** Loudon *Arboret.* iii, 1678 (1838); Grenier et Godron *Fl. France* iii, 150 (1855); Rouy *Fl. France* xii, 260 (1910); *A. glutinosa* race *vulgaris* var. *macrocarpa* Ascherson und Graebner *Syn.* iv, 419 (1911).

Laminae larger than in var. *typica*, about as long as broad (7—8 cm.), and with larger and coarser serrations. *Pistillate catkins* at maturity and before the seeds have been shed about 3 cm. long.

Very rare; Chippenham Fen, Cambridgeshire.

France, and perhaps elsewhere.

(*b*) **A. glutinosa** var. **typica** comb. nov.; *A. glutinosa* var. *vulgaris* f. *typica* [Callier ex] Schneider *Ill. Handb. Laubh.* i, 129 (1904); *A. glutinosa* race *vulgaris* var. *typica* Ascherson und Graebner *Syn.* iv, 418 (1911).

Icones:—Smith *Eng. Bot.* t. 1508, as *Betula alnus*; Hartig *Forst. Culturpfl.* t. 23, as *A. glutinosa.*

Camb. Brit. Fl. ii. *Plate 89.* (*a*) Twig with staminate and pistillate catkins. (*b*) Fertile shoot in autumn. (*c*) Pistillate catkin (enlarged). (*d*) Persistent, empty cone. Huntingdonshire (E. W. H.).

Laminae intermediate in size and shape between the other two varieties, about 5—6 cm. long and 4—5 broad. *Staminate catkins* about 6—12 cm. long. *Pistillate catkins* about 0·5 to 1·0 cm. long when in flower, and about 1·7—2·0 cm. long and 1·0—1·4 broad when in fruit.

We believe this to be the common southern and lowland form; Suffolk, Norfolk, Cambridgeshire, Huntingdonshire, Somerset, and doubtless elsewhere. Not yet known for Wales, Scotland, or Ireland. It will doubtless prove to be rare or absent in hilly and northern districts.

Central and southern Europe; Algeria (!).

(*c*) **A. glutinosa** var. **microcarpa** Rouy *Fl. France* xii, 260 (1910); *A. glutinosa* var. *vulgaris* f. *microcarpa* [Uechtritz in Sched. ex] Callier in *Jahresber. Schlesw. Gesellsch. Vaterl. Cult.* xix, pt. ii, 6 (1891); Callier *ibid.* 74 (1892).

Icones:—*Sv. Bot.* t. 128, as *Betula alnus*; *Fl. Dan.* t. 2301, as *A. glutinosa*; Reichenbach *Icon.* xii, t. 631, fig. 1295, as *A. glutinosa.*

Exsiccata:—Billot, 647, as *A. glutinosa*; *Herb. Fl. Ingric.* iv, 587, as *A. glutinosa.*

Laminae smaller (about 4·5 cm. long and 3·5—4·0 broad), and with smaller and finer serrations. *Catkins* shorter. *Pistillate catkins* about 4—5 mm. long and 3 broad, enlarging in fruit up to about 1·5 cm. long and 1·0 broad.

This is the common form of hilly and northern localities, though it also occurs to some extent in southern England, at least as far south as Somerset and Suffolk; West Riding of Yorkshire, northwards at least to Caithness-shire.

Sweden, Denmark, Germany, France, Austria-Hungary, and doubtless elsewhere.

Alnus glutinosa occurs throughout the British Isles, northwards to Zetland; in wet places, by stream-sides, in alluvial meadows, and in fens; not growing well unless its roots are supplied with water which is well aërated, rare in places where the water is stagnant, and not thriving where the water is markedly acidic; ascending to about 330 m. (doubtless as var. *microcarpa*) in Perthshire. Often planted.

Europe (northwards to 63° 47′ N. in Norway); Caucasus to Japan; northern Africa (as var. *vulgaris*); North America (not indigenous).

Order 5. URTICALES

Urticales Lindley [*Nixus Plant.* 16 (1833) pro minima parte] *Nat. Syst.* ed. 2, 172 (1836) partim; Engler *Syll.* 95 (1892); in *Pflanzenfam. Nachtr.* 346 (1897); *Urticaceae* Bentham and Hooker *Gen. Plant.* iii, 341 (1880).

The *Urticales* connect the *Amentiflorae* with the *Centrospermae*.

For characters, see page 3.

Families of *Urticales*

Family 1. **Ulmaceae** (see below). Trees. *Flowers* monoclinous, in more or less abbreviated cymose clusters. *Filaments* erect. *Fruit* (in the only British genus) a winged achene.

*Family 2. **Cannabaceae** (p. 97). Herbs. *Flowers* diclinous. *Filaments* not bent inwards in bud. *Fruit* an achene.

Family 3. **Urticaceae** (p. 98). Herbs (in the British species) with no latex. *Flowers* diclinous. *Filaments* bent inwards in bud, springing back violently when ripe. *Fruit* an achene (in the British species).

Family 1. ULMACEAE

Ulmaceae Mirbel *Élém.* ii, 905 (1815); Lindley *Nat. Syst.* ed. 2, 178 (1836); Engler in Engler und Prantl *Pflanzenfam.* iii, pt. i, 59 (1894).

Trees, with no latex. *Buds* distichous. *Leaves* distichous, more or less unequal at the base, serrate. *Stipules* caducous. *Flowers* monoclinous, in abbreviated axillary cymose clusters. *Perianth* with 4—7, usually 4—5 segments. *Stamens* as many as the perianth-segments. *Ovary* of 2 carpels, usually unilocular, rarely bilocular and the second loculus aborting. *Ovules* 1 to each loculus, pendulous from the apex of the ovary, anatropous or amphitropous. *Style* very short. *Stigmas* 2, free. *Fruit* (in the only British genus) a winged achene. *Endosperm* absent.

Only the subfamily *Ulmoïdeae* (Engler in *Pflanzenfam.* iii, pt. i, 61 (1894)) is represented in the British flora: it is distinguished by its clusters of flowers, its pedicels in axils of scale-bracts, its extrorse anthers, its winged achene, and its straight ovary.

13 genera and about 130 species, tropical and temperate zones. Only British genus:—*Ulmus*.

Genus 1. Ulmus.

Ulmus [Tournefort *Inst.* 601, t. 372 (1719)] L. *Sp. Pl.* 225 (1753) et *Gen. Pl.* ed. 5, 106 (1754); Engler in Engler und Prantl *Pflanzenfam.* iii, pt. i, 62 (1894).

Trees, usually with suckers. *Laminae* more or less asymmetrical at the base, the bigger side facing the axis (cf. *Carpinus*), serrate, acute to acuminate; rough or smooth above; of the suckers, coppiced shoots, and summer-leaves, always rough above; hairy below at least in the axils of the chief veins. *Flowers* protandrous, borne in the axil of one or two caducous bracts, the lowest

bracts destitute of flowers, appearing before the leaves. *Perianth* campanulate, persistent, with 4—9, usually 4—5 divisions. *Anthers* reddish before dehiscence. *Ovary* usually unilocular, compressed. *Stigmas* 2. *Fruit* a winged achene, i.e., a samara. *Wing* broad, green, more or less notched at the apex.

About 20 species; north temperate zone, mountains of tropical Asia.

The British species belong to the subgenus *Dryoptelea* (Spach in *Ann. Sci. Nat.* sér. 2, xv, 361 (1841); Engler in *Pflanzenfam.* iii, pt. i, 62 (1894)).

British series of *Ulmus*

Series i. **Nitentes** (see below). *Petioles* long or rather long. *Laminae* of normal leaves smooth above at maturity; of the suckers, adventitious shoots, and of the summer-shoots rough above. *Fruit* usually obovate. *Seed* placed between the middle of the fruit and the apical notch.

Series ii. **Campestres** (p. 94). *Petioles* rather long. *Laminae* of all the leaves rough above. *Fruit* small, suborbicular. *Seed* placed as in *Nitentes*.

Series iii. **Glabrae** (p. 95). *Petioles* short or very short. *Laminae* of all the leaves very rough above. *Fruit* large, elliptical to obovate. *Seed* placed in the centre of the fruit.

Series i. *Nitentes*

Nitentes nobis.

For characters, see above.

Species of *Nitentes*

1. **U. nitens** (see below). Large tree. *Lower branches* wide-spreading. *Laminae* very unequal at the base, very smooth and shining above. *Fruit* obovate.

U. glabra* × *nitens (p. 91). Large trees. *Laminae* larger than in *U. nitens*, usually smooth and shining above. *Fruit* larger than in *U. nitens*.

2. †**U. stricta** (p. 92). Tree rather small, pyramidal. *Branches* short, more or less ascending. *Laminae* not very unequal at the base, smaller than in *U. nitens*. *Fruit* as in *U. nitens*.

3. **U. sativa** (p. 93). Tree rather small. *Branches* rather short, lower ones wide-spreading. *Laminae* not very unequal at the base, smaller than in *U. nitens*. *Fruit* smaller than in *U. nitens*, oblong-elliptical to obovate.

1. ULMUS NITENS. Smooth-leaved Elm. Plates 90, 91, 92, 93; 94, 95, 96, 97

Ulmus folio glabro Goodyer in Johnson's Gerard *Herb.* ed. 2, 1481 (1636); Parkinson *Theatr. Bot.* 1403 (1640); Ray *Syn.* ed. 3, 469 (1724).

Ulmus nitens Moench *Meth. Plant.* 333 (1794); Moss in *Gard. Chron.* ser. 3, li, 199 et 217 (1912); *U. glabra* var. *β* Hudson *Fl. Angl.* 95 (1762); *U. glabra* Miller *Gard. Dict.* ed. 8, no. 4 (1768) non Hudson; Lindley *Syn.* 226 (1829)!; *U. campestris* var. *glabra* Aiton *Hort. Kew.* i, 319 (1789); *U. surculosa* var. *glabra* Stokes *Bot. Mat. Med.* ii, 35 (1812); *U. campestris* var. *laevis* Spach in *Ann. Sc. Nat.* sér. 2, xv, 362 (1841); *U. suberosa* var. *glabra* Syme *Eng. Bot.* viii, 138 (1868); *U. vulgaris*[1] var. *carpinifolia*[2] Rouy *Fl. France* xii, 266 (1910); *U. campestris* race *glabra* Ascherson und Graebner *Syn.* v, 553 (1911) partim.

Icones:—*Fl. Dan.* t. 632, as *U. campestris*; Duhamel *Traité des Arbres* iii, t. 42, as *U. campestris*.

Exsiccata:—Billot, 1763 (partim) as *U. campestris*; Fries, viii, 57, as *U. campestris* var. *glabra*.

Tree, attaining a height of about 30—35 m. *Timber* said to be valuable. *Bark* of old trees often striated by long oblique ridges and furrows. *Branches* large, lower ones wide-spreading, upper ones ascending, terminal ones frequently drooping. *Young branches* much more slender than in *U. glabra* or in *U. campestris* or in *U. glabra* × *nitens*, smooth during the first year,

[1] *U. vulgaris* Pallas *Reise* iii, 135 (1776) is a name in a list and without any description.

[2] We have been unable to find the name *U. carpinifolia* in Ehrhart's *Beiträge*.

becoming striate in the second, often hairy at first, usually pale brown and glabrous in the second year, suberous or not. *Petioles* about 1 cm. long, often hairy when young, usually glabrous at maturity. *Laminae* ovate or elliptical, usually very asymmetrical at the base, doubly serrate, acute to acuminate, terminal ones about 6—8 cm. long and 3—4 broad, often hairy when young, becoming very smooth and very shining above at maturity, sometimes microglandular; unfolding later than in *U. glabra*, *U. campestris*, and most forms of *U. glabra* × *nitens*. *Inflorescences* or flower-clusters rather small. *Outer scales* of the flower-buds as long as or a little longer than broad, fringed on the upper margin with short hairs. *Flowers* opening from January to March, the first species to come into flower. *Perianth* pale green, tipped with pale pink; segments 4—5, usually 5, slightly hairy. *Filaments* protruding by about the length of the whole perianth. *Stigmas* just protruding from the perianth, very pale red in colour. *Fruits* oblong to obovate, about 1·5—1·8 cm. long and 1·0—1·2 broad; May. *Seed* between the centre and the apical notch; notch reaching down nearly to the seed-cavity.

The two following varieties of *U. nitens* were made known to us by our collaborator, Mr E. W. Hunnybun. The first of them is the one he has figured for the present work (see Plates 90—93); and the second is the one figured by James Sowerby in the *English Botany* (t. 2248). It affords us very great pleasure to name these varieties after the two artists mentioned, one whose work is well known and justly admired, and the other whose work will, we venture to say, be similarly eulogised by botanists of future generations.

(*a*) **U. nitens** var. **hunnybuni** var. nov.

A taller and more handsome tree than var. *sowerbyi*. *Branches* longer, lower ones spreading at right angles, upper ones less tortuous. *Laminae* longer, even more asymmetrical at the base, more acuminate. *Fruits* rather larger, more markedly obovate.

Icones:—*Camb. Brit. Fl.* ii. *Plate 90*. (*a*) Winter-twig. (*b*) Flowering twig. (*c*) Twig with ripe fruits. (*d*) Flowers (enlarged). (*e*) Ovary (enlarged). (*f*) Outer scales of flowering bud (enlarged). (*g*) Fruits. (*h*) Apices of fruits (enlarged). *Plate 91*. Barren shoot. Huntingdonshire (E. W. H.).

Hedgerows and parklands in Essex, Cambridgeshire, Huntingdonshire, and doubtless elsewhere. Often planted, as in the grounds of St John's College, Cambridge.

(*β*) var. **hunnybuni** subvar. **pseudo-stricta** subvar. nov.

Icones:—*Camb. Brit. Fl.* ii. *Plate 92*. (*a*) Winter-twig. (*b*) Flowering twig. (*c*) Flowers and perianth (enlarged). (*d*) Ovary (enlarged). (*e*) Twig with fruits. (*f*) Fruits. (*g*) Apices of fruits (enlarged). (*h*) Outer scale of flower-bud (enlarged). *Plate 93*. Huntingdonshire (E. W. H.).

Differs in the shorter internodes of the young twigs which tend to remain in one plane, giving the trees a rather striking appearance.

This subvariety is sometimes gathered in error for *Ulmus stricta*.

(*b*) **U. nitens** var. **sowerbyi** var. nov.; *U. glabra* Smith *loc. cit.*, in sensu stricto; *U. tortuosa* Host *Fl. Austr.* i, 330 (1827)!.

Icones:—Smith *Eng. Bot.* t. 2248, as *U. glabra*.

A smaller tree than var. *hunnybuni*. *Branches* shorter, upper ones very tortuous. *Laminae* smaller, acute. *Fruits* rather smaller, obovate to elliptical.

Smith (*loc. cit.*) refers to this variety as the "Norfolk Elm."

Hedgerows and woods in Norfolk, Cambridgeshire, Huntingdonshire, and doubtless elsewhere. Often planted, as on Christ's Pieces, Cambridge.

Woods (rare), hedgerows (rather common), and parklands in eastern England and in the eastern Midlands, chiefly on clayey and alluvial soils; rarer in southern England; not indigenous in western or northern England. The occurrence and distribution of the species of this genus in Ireland have not been studied. Probably indigenous in Essex, Suffolk, Cambridgeshire, Huntingdonshire, Northamptonshire, and a few other eastern and south-eastern English counties. Planted as far north as central Scotland, but always very rare in hilly districts.

Southern Scandinavia (? indigenous), Denmark (? indigenous), Germany, France, central Europe (ascending to 1200 m. in the Alps), Russia, southern Europe; northern Africa; Asia Minor and westwards to central Asia; North America (not indigenous).

†***U. glabra* × *nitens*** Moss in *Gard. Chron.* ser. 3, li, 198 (1912); *U. latifolia* Moench *Meth. Plant.* 333 (1794); *U. carpinifolia* Lindley *Syn.* 226 (1829); *U. glabra* var. *latifolia* Lindley *op. cit.* p. 227; *U. montana* var. *nitida* Fries *Fl. Suec., Mant.* iii, 20 (1842) excluding syn. Lindley; Syme *Eng. Bot.* ed. 3. viii, 142 (1868); *U. glabra* × *scabra* Schneider *Ill. Handb. Laubh.* i, 218 (1904); *U. campestris* × *scabra* Ascherson und Graebner *Syn.* iv, 565 (1911).

Trees, suckering freely as in *U. nitens*. *Young branches* stouter and usually more hairy than in *U. nitens*, striated or not in the second year. *Winter-buds* stouter than in *U. nitens*, rather hairy. *Petioles* longer than in *U. glabra*, often hairy. *Laminae* larger than in *U. nitens*, often nearly as large as in *U. glabra*; of the normal leaves, smooth above as in *U. nitens*. *Fruits* larger than in *U. nitens*, often nearly as large as in *U. glabra*. *Seed* variously placed, usually between the centre and the notch as in *U. nitens*, rarely in the centre as in *U. glabra*.

Several of the older botanists (e.g., Martyn in *Gard. Dict.* ed. 9) and foresters (e.g., Loudon *Arboret.* iii) were aware that seeds gathered from certain elms gave rise to plants which differed from those from which the seeds were gathered. Botanists like Bentham (*Handb.* 467 (1858)) regarded this phenomenon as a justification for uniting the British elms into a single species. It is now known that seeds of a good species, when it is pollinated by another good species or by a hybrid, may yield seeds which produce mixed seedlings. Recently, Professor A. Henry has informed us that he has found that *U. nitens*, *U. stricta*, *U. campestris* (from Spain), and *U. glabra*, are true to seed.

We believe that hybrids in this genus, as in many other genera where wind-pollination obtains, are very numerous; but it is almost impossible to be sure of the parents of putative natural hybrids in genera where more than two species grow together.

We here give descriptions of two elms which, so far as can be judged from their characters, appear to be due to the crossing of *U. glabra* and *U. nitens*; but until these hybrids have been produced artificially, and by exact methods, there can be no certainty that the plants in question have the affinities suggested. There is much more doubt in cases like these, where the trees are commonly planted, than in those where the natural distribution of the supposititious hybrids may be more satisfactorily studied.

(B) ×****U. vegeta*** Schneider *Ill. Handb.* i, 218 (1904); Ascherson und Graebner *Syn.* iv, 566 (1911); Moss in *Gard. Chron.* ser. 3, li, 198 et 235 (1912); *U. glabra* var. *vegeta* Loudon *Arboret.* iii, 1404 (1838); *U. vegeta* Ley in *Journ. Bot.* xlviii, 68 (1910)!. Huntingdon Elm.

Icones:—*Camb. Brit. Fl.* ii. *Plate 94.* (*a*) Winter-twig. (*b*) Flowering twig. (*c*) Flower. (*d*) Flowers (enlarged). (*e*) Ovary (enlarged). (*f*) Outer scale of flower-bud (enlarged). (*g*) Fruits. (*h*) Apices of fruits (enlarged). *Plate 95.* Summer-shoot. Huntingdon (E. W. H.).

Exsiccata:—Herb. Lindley (in Herb. Univ. Cantab.), as *U. vegeta* (nomen).

Tree, attaining a height of about 30—36 m., very quick-growing. *Branches* ascending at a narrow angle (about 30°) from a short bole; ultimate branches descending. *Petioles* about 1·0—1·5 cm. long. *Laminae* nearly the same size and shape as those of *U. glabra*, doubly and coarsely serrate, acute to acuminate, very smooth and very shining above, terminal ones about 10—12 cm. long and 5—6 broad; of the suckers, summer-twigs, and of twigs produced from adventitious leaves of the main trunk, rough above; unfolding its leaves a little later than *U. glabra* and *U. campestris*. *Inflorescences* rather large. *Outer scales* of the flower-buds larger than in *U. nitens*, about as broad as long, obtuse and undivided at the apex, with fine hairs at the margin. *Flowers* appearing a few days later than in *U. nitens*. *Perianth* with 4—5, usually 4 segments, greenish, tipped with red, larger than in *U. nitens*. *Stamens* protruding as in *U. nitens*. *Stigmas* rose-red, suberect, longer and more protruding than in the other elms. *Fruits* larger than in *U. nitens*, about 2·0—2·7 mm. long and about three-quarters as broad, obovate, obtuse. *Seed* between the centre and the notch; seed-cavity and notch more or less separated.

Said to have been raised from seed in a nursery at Huntingdon, about 1747 to 1756 (Loudon *loc. cit.*); but if it is a hybrid, it may have originated in more than one locality and many times over.

Rather local in hedgerows in Essex, Cambridgeshire, Huntingdonshire, and the Midlands; planted from Oxford westwards to Essex and Lincolnshire. By the aid of the nurserymen, the Huntingdon elm is spreading rapidly in England, usually as a tree of parks and gardens.

Southern Scandinavia, Germany, Switzerland, and doubtless elsewhere.

(C) ×†***U. hollandica*** Moss in *Gard. Chron.* ser. 3, li, 199 et 217 (1912); *U. hollandica* Miller *Gard. Dict.* ed. 8, no. 5 (1768); *U. campestris* var. *fungosa* Aiton *Hort. Kew.* i, 319 (1789); *U. major* Smith *Eng. Bot.* no. 2542 (1814) non auctorum plurorum; *U. montana* var. *major* Syme *Eng. Bot.* viii, 142 (1868); ? *U. vulgaris* var. *suberosa* Rouy *Fl. France* xii, 266 (1910). Dutch Elm.

Ulmus major hollandica angustis et magis acuminatis samarris folio latissimo scabro Plukenet *Almagest. Bot.* 393 (1696)?.

Icones:—Smith *Eng. Bot.* t. 2542, as *U. major* (cited, but not repeated in Syme *Eng. Bot., loc. cit.*).

Camb. Brit. Fl. ii. *Plate 96.* (*a*) Suberous branch. (*b*) Twig with normal leaves. (*c*) Leaf of a sucker. (*d*) Flowers (enlarged). (*e*) Outer scales of flower-bud (enlarged). (*f*) Fruits. (*g*) Apex of ripe fruits (enlarged). Cambridge (C. E. M.). *Plate 97.* (*a*) Suberous branch. (*b*) Suberous twig with flowers. (*c*) Twig with ripening fruits. (*d*) Barren shoot. (*e*) Leaf. (*f*) Fruits. (*g*) Apex of ripe fruit (enlarged). (*h*) Outer scales of flower-bud (enlarged). (*i*) Flowers (enlarged). Radnorshire (Rev. A. Ley).

Tree, attaining a height of about 20—28 m., suckering freely. *Timber* said to be of poor quality. *Branches*—lower ones wide-spreading, large, long; upper ones ascending; young ones glabrous or slightly hairy, striated by the end of the second year, intermediate in colour between those of *U. nitens* and *U. campestris*, more often suberous (especially on sucker-shoots and on shoots produced from adventitious buds of the main trunk) than in any other elm. *Petioles* about 0·5—1·0 cm. long, usually hairy. *Laminae* broadly ovate, doubly and more or less irregularly and rather obtusely serrate, acute, rather smaller than in × *U. vegeta*, rather hairy when young, becoming glabrous above; of the suckers, etc., rough above, rarely tricuspidate; unfolding a little later than in × *U. vegeta*. *Inflorescences* rather large. *Outer scales* of the flower-buds large, deeply notched, with shaggy hairs at the margin. *Flowers* appearing a little later than in × *U. vegeta*. *Perianth* with 4—5 segments. *Filaments* shorter than in × *U. vegeta*. *Fruit* oblong to obovate, slightly cloven, variable in size (up to rather more than 2·0 cm. long and 1·5 broad). *Seed* variously placed, notch usually reaching down to the seed.

There can be no doubt that *U. hollandica* Miller is precisely *U. major* Smith, for the latter authority cites Miller's name and even uses some of the phrases which Miller himself employed when originally describing the plant.

A form intermediate between × *U. hollandica* and *U. glabra* occurs in hedgerows here and there near Cambridge. Professor A. Henry informs us that he proposes to name it (in *Trees of Great Britain and Ireland*, vol. vii (1913)) *U. mossi*, after ourselves, as we first drew his attention to it. It is probably one of the numerous hybrid-forms of *U. glabra* × *nitens*.

Locally abundant in southern England, chiefly in hedgerows; abundant in western Cornwall, and it is the *U. campestris* of Davey's *Flora of Cornwall*; the late Rev. A. Ley informed us (*in litt.*) that it occurred in Somerset, Monmouthshire, Herefordshire, Worcestershire, and Radnorshire; locally abundant in Essex, Suffolk, Cambridgeshire, and Huntingdonshire; it is by far the most abundant tree in the avenues by the road-sides east of Newmarket, in Suffolk. A closely allied form occurs rarely in woods in Cambridgeshire.

We have no certain record of it from abroad, though closely allied forms certainly occur in foreign countries.

U. glabra × *nitens* occurs in many parts of western and southern Europe; but as the putative parents rarely grow together, the hybrid-forms are little known as indubitably indigenous trees.

2. †ULMUS STRICTA. Cornish Elm. Plates 98, 99

Ulmus stricta Lindley *Syn.* 227 (1829)!; Moss in *Gard. Chron.* ser. 3, li, 199 et 234 (1912); *U. campestris* var. *stricta* Aiton *Hort. Kew.* i, 319 (1789) partim, propter nom. vernac.; *U. surculosa* var. *parvifolia* Stokes *Bot. Mat. Med.* ii, 38 (1812); *U. campestris* var. *cornubiensis* Loudon *Arboret.* iii, 1376 (1838); *U. suberosa* var. *fastigiata* Hooker and Arnott *Brit. Fl.* 376 (1850); *U. glabra* var. *stricta* Ley in *Journ. Bot.* xlviii, 70 (1910)!; *U. vulgaris* var. *campestris* Rouy *Fl. France* xii, 266 (1910); *U. campestris* race *glabra* var. *stricta* Ascherson und Graebner *Syn.* iv, 554 (1911).

Icones:—*Camb. Brit. Fl.* ii. *Plate 98.* (*a*) Flowering twig. (*b*) Twig with fruits. (*c*) Outer scale of flower-bud (enlarged). (*d*) Flowers (enlarged). (*e*) Ovaries (enlarged). (*b*) from Devonshire (Rev. A. Ley). (*a*) and (*c*) to (*e*) from Cornwall (A. H.). *Plate 99.* (*a*) Barren shoots. (*b*) Shoot from a sucker. (*c*) Fruits. (*d*) Apex of fruit (enlarged). Devonshire (Rev. A. Ley).

Tree, growing to a height of about 20—25 m., of pyramidal outline, suckering freely. *Branches* short, all ascending or even subfastigiate; young ones stouter than in *U. sativa*; often suberous. *Winter-buds* stouter than in *U. sativa*. *Petioles* as in *U. sativa*. *Laminae* ovate to elliptical, only slightly asymmetrical at the base, doubly and rather obtusely serrate, obtuse or subobtuse, bent inwards on the midrib, up to about 6 cm. long and 3 broad; unfolding about the same time as *U. sativa*, remaining on the tree as late as in *U. campestris*; of the suckers, often much larger. *Inflorescences* small. *Outer scales* of the flower-buds larger than in *U. sativa*, scarcely notched, more or less ciliate on the upper margin. *Flowers* usually 4-partite; appearing as late as in *U. sativa*; March. *Filaments* short, as in *U. sativa*. *Stigmas* not or scarcely protruding from the perianth.

A variety (*U. stricta* var. *sarniensis* Moss in *Gard. Chron.* li, 199 (1912); *U. campestris* var. *sarniensis* Loudon *Arboret.* iii, 1376 (1838)) is commonly planted in avenues and boulevards in the towns of the south coast of England and the Channel Isles, and rarely further north, as near Cambridge. This, the Jersey elm, differs from the Cornish elm in flowering earlier, in its *branches* ascending at a rather wider angle, and in its broader *laminae* which are quite flat and not folded inwards. *Fruits* obovate, as large as in *U. nitens*, strongly notched. It is perhaps a hybrid of *U. stricta* and *U. nitens*. Lindley has two specimens of it in Herb. Univ. Cantab., one being named *U. stricta* and the other *U. sarniensis*.

Lindley has also a specimen of another elm in Herb. Univ. Cantab. named by him *U. stricta* var. *parvifolia*, a name which he published in his *Synopsis* p. 227 (1829): we should refer the specimen to *U. sativa* and not to *U. stricta*.

U. stricta occurs abundantly in hedgerows and on the borders of woods in western Cornwall and in northern Devonshire. It also occurs rarely throughout southern England in general. Professor A. Henry informs us that it also occurs in southern Ireland. Abroad, we can only record it for northern France. It is difficult to decide whether or not it is an indigenous species, endemic to south-western England, southern Ireland, and Brittany, or whether it is merely of garden origin. In Brittany, we ourselves have only seen it in localities where it was obviously planted. If indigenous at all, it is an example of an interesting class of plants of very local west-European distribution (cf. *Rumex rupestris*).

3. ULMUS SATIVA. Small-leaved Elm. Plates 100, 101

Ulmus minor folio angusto scabro Goodyer in Gerard *Herb.* ed. 2, 1478 [bis] (1636); Ray *Syn.* ed. 3, 469 (1724); *U. minor* Parkinson *Theatr. Bot.* 1405 (1640).

Ulmus sativa Miller *Gard. Dict.* ed. 8, no. 3 (1768); Duroi *Harbk. Wilde Baumz.* 502 (1772); Moss in *Gard. Chron.* ser. 3, li, 199 et 216 (1912); *U. campestris* var. *β* Hudson *Fl. Angl.* 95 (1762); Smith *Fl. Brit.* 281 (1800); *U. campestris* Smith *Eng. Bot.* no. 1886 (1808)!; Lindley *Syn.* 226 (1829); Loudon *Arboret. Brit.* iii, 1374 (1838) partim; non L.; *U. suberosa* Ehrhart *Beitr.* vi, 87 (1791) partim; Gray *Nat. Arr.* ii, 250 (1821); non Mönch; *U. surculosa* var. *argutifolia* Stokes *Bot. Mat. Med.* ii, 36 (1812); *U. campestris* var. *suberosa* Wahlenberg *Fl. Carpat.* 71 (1814) partim; *U. campestris* var. *parvifolia* Spach in *Ann. Sc. Nat.* sér. 2, xv, 362 (1841); *U. minor* Boreau *Fl. Centr. France* ii, 576 (1857) including *U. suberosa*, non Miller; *U. suberosa* var. *genuina* Syme *Eng. Bot.* viii, 138 (1868); excl. syn. Miller et *Eng. Bot.* no. 2161; *U. sativa* var. *locki* Druce in *Brit. Bot. Exch. Club for 1907*, 258 (1908); *U. vulgaris* race *minor* Rouy *Fl. France* xii, 267 (1910); *U. glabra* var. *minor* Ley in *Journ. Bot.* xlviii, 70 (1910)!; *U. ploti*[1] Druce in *Northamptonshire Nat. Hist. Soc.* xvi, 107 (1911)!; *U. campestris* race *suberosa* Ascherson und Graebner *Syn.* iv, 559 (1911) partim.

Icones:—Smith *Eng. Bot.* t. 1886, as *U. campestris*; Reichenbach *Icon.* xii, t. 660, fig. 1330, as *U. minor*; t. 663, fig. 1333, as *U. suberosa*; *Fl. Dan.* t. 2829, as *U. suberosa*.

Camb. Brit. Fl. ii. *Plate 100.* (*a*) Winter-twig. (*b*) Flowering twig. (*c*) Shoot from a coppiced tree. (*d*) Flowers (enlarged). (*e*) Ovary (enlarged). (*f*) Outer scales of flower-bud. (*g*) Fruit. (*h*) Apex of fruit (enlarged). *Plate 101.* Barren shoot. Cambridge (C. E. M.).

Exsiccata:—Billot, 1763 (partim) as *U. campestris*; 3203, as *U. suberosa*; Fries, iv, 80, as *U. suberosa*; Hansen, 1214, as *U. suberosa*; Wirtgen, ii, 93, as *U. campestris* var. *microphylla*.

Tree, attaining a height of about 20—30 m., suckering freely. *Timber* said to be of excellent quality. *Branches* rather short, lower ones more or less spreading, upper ones ascending or suberect; terminal ones slender, interlacing, sometimes drooping; young ones smooth in the first year, becoming striate in the second, usually more or less hairy. *Winter-buds* the smallest of any of our elms. *Petioles* usually rather short (ca. 5 mm.), usually rather hairy when young. *Laminae* ovate, usually less asymmetrical at the base than in any other of our elms, doubly and rather obtusely serrate, subobtuse or acute, often rather hairy above when young, smaller than in any other elm, often about 6·0—6·5 cm. long and 2·5 to 3·0 broad; of the suckers, etc., rough above, often twice as big; this, *U. nitens*, and *U. stricta* are the last of our elms to unfold their leaves. *Inflorescences* small. *Outer scales* of the flower-buds small, with a few scattered hairs on the margin. *Flowers* relatively small; this and *U. stricta* are the last of our elms to flower; March. *Perianth* green, tipped with red, segments 4—5, usually 4, ciliate. *Filaments* relatively short. *Stigmas* almost or quite hidden by the perianth, pale pink in colour. *Fruits* oblong-elliptical to obovate, smaller (ca. 1·2—1·5 cm. long) than in any other elm. *Seed* near the notch, rarely ripening; May.

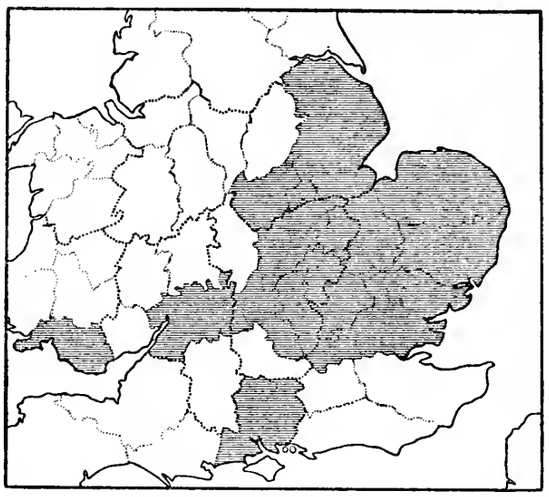
[1] After Dr Robert Plot, author of *Hist. Agric. Oxon.* (1677) and other works. For an account of the elm (*U. folio angusto glabro* Plot *op. cit.* p. 158, t. 10, fig. 1 (1677) = *U. folio glabro* var. *U. folio angusto glabro acuminato* Ray *Hist. Pl.* ii, 1426 (1688) = *U. minor* Miller *Gard. Dict.* ed. 8, no. 6 (1768)) actually described by Plot (not *U. ploti* Druce), see Moss in *Gard. Chron.* ser. 3, li, 234 (1912). The real Plot's elm has recently been found in a hedgerow, in Cambridgeshire. It has, as Miller (*loc. cit.*) states, narrower, smoother, and more pointed leaves than the English elm; and it differs conspicuously from *U. sativa*.

A form with smaller leaves than usual was named *U. stricta* var. *parvifolia* by Lindley *Syn.* 227 (1829)!: most of our elms have analogous small-leaved forms.

The earliest varietal name for this tree is var. *argutifolia* by Stokes (*loc. cit.*, 1812), though it is sometimes cited as var. *suberosa* Wahlenberg *Fl. Carpat.* 71 (1814). All our elms except *U. glabra* are sometimes suberous; and therefore every name referring to this character is to be mistrusted unless other distinguishing characters are clearly described.

In his account (*loc. cit.*) of *U. sativa*, Miller states that "it is not a native of England"; but opinions on the indigenousness or otherwise of plants by eighteenth century botanists, especially by those with horticultural leanings like Miller, are not, as a rule, to be taken very seriously. For example, in the first edition of his *Dictionary* (1731) Miller states of our elms that "it is generally believed that neither of 'em were originally Natives of this Country," although everyone nowadays agrees that the wych elm (*U. glabra*) at least is unmistakably indigenous.

Miller also states that *U. sativa* was, in his day, "commonly known in the nursery gardens by the title of the English elm," but rightly adds that this "is far from being a right appellation."



Map 12. Distribution of *Ulmus sativa* in England and Wales

Local, in southern England; from Hampshire, Gloucestershire, and Glamorganshire to Essex and Lincolnshire, but chiefly in eastern England.

Western Europe (local), central and southern Europe; western Asia.

Series ii. *CAMPESTRES*

Campestres nobis.

For characters, see page 89. Only species:—*U. campestris.*

4. ULMUS CAMPESTRIS. English Elm. Plates 102, 103

Ulmus Gerard *Herb.* 1296 (1597); *U. vulgatissima folio lato scabro* Goodyer in Gerard *Herb.* ed. 2, 1478 [bis] (1636); Ray *Syn.* ed. 3, 468 (1724); *U. vulgaris* Parkinson *Theatr. Bot.* 1403 (1640).

Ulmus campestris L. *Sp. Pl.* 225 (1753) partim; *Fl. Angl.* 13 (1754); Hudson *Fl. Angl.* 94 (1762) excl. var. *β*; Miller *Gard. Dict.* ed. 8, no. 1 (1768); Gray *Nat. Arr.* ii, 250 (1821); Moss in *Gard. Chron.* ser. 3, li, 199 (1912); *U. campestris* var. *vulgaris* Aiton *Hort. Kew.* i, 319 (1789); *U. procera* Salisbury *Prodr.* 391 (1796); *U. suberosa* Smith *Eng. Bot.* xxxi, no. 2161 (1810) excl. syn. Gerard et syn. Willdenow et syn. Ehrhart; *U. surculosa* var. *latifolia* Stokes *Bot. Mat. Med.* ii, 36 (1812); *Ulmus atinea* Walker *Essays Nat. Hist.* 70 (1812); *U. suberosa* var. *vulgaris* Hooker and Arnott *Brit. Fl.* 376 (1850) partim; *U. surculosa* Ley in *Journ. Bot.* xlviii, 72 (1910).

Icones:—Smith *Eng. Bot.* t. 2161 as *U. suberosa*: this figure, though good, is one of the few illustrations of *Eng. Bot.* ed. 1 not repeated by Syme in *Eng. Bot.* ed. 3.

Camb. Brit. Fl. ii. *Plate 102.* (*a*) Winter-twig. (*b*) Flowering twig. (*c*) Flowers (enlarged). (*d*) Ovary. (*e*) Outer scale of flower-bud (enlarged). (*f*) Fruits. (*g*) Twig with fruits. *Plate 103.* Shoot with leaves. Huntingdonshire. (E. W. H.).

Exsiccata:—Ehrhart *Arb.* 142 (from Holland); in herb. Lindley, Herb. Univ. Cantab., labelled "Aranjuez, [Spain] Capt. Cooke."

Tree attaining a height of nearly 40 m., suckering freely. This and ×*Populus serotina* are the tallest British trees. *Trunk* long and straight. *Timber* reddish, said to be of excellent quality. *Bark* rough and furrowed. *Branches*—lower ones very large and wide-spreading, usually lopped; upper ones ascending; all the main branches ending in great masses of dense and heavy foliage in summer. *Young branches* rather stout, hairy, becoming more or less striate in the second year. *Winter-buds* large and hairy. *Petioles* about 0·4 cm. long, hairy. *Laminae*—terminal ones elliptical-ovate, about 6 cm. long and 4·5 broad; lower ones suborbicular, subcordate and asymmetrical at the base, doubly serrate, rather acuminate, hairy and rough above, softly hairy underneath; of the suckers, much smaller, narrower, and rougher above. One of the last of our elms to shed its foliage in autumn. *Inflorescence* rather large, with the flowers crowded. *Bracts* much longer than broad, fringed with fine hairs. *Pedicels* very short. *Flowers* opening in February or early March. *Perianth* with 4 segments, green, tipped with red, segments ciliate. *Stamens* 4. *Filaments* reddish.

Anthers large, dark purple. *Fruit* suborbicular, small (about 1·2—1·5 cm. in diameter). *Seed* between the centre and the notch; notch conspicuous, its aperture closed, not angled but evenly curved at the base, reaching almost to the seed.

It is most remarkable that Syme does not include the English elm in his edition of *Eng. Bot.*, and that he even excludes Smith's excellent figure of it (*Eng. Bot.* ed. 1, t. 2161).

Various conjectures have from time to time been hazarded to the effect that the English elm was brought into this country from some foreign land. It has been stated, for example, that it was brought from Palestine by the Crusaders (Hooker and Arnott *Brit. Fl.* ed. 5, p. 376). However, the tree is not known to occur in Palestine. It is said to occur in the royal gardens of Spain; and Evelyn (*Sylva* ed. 4 (1706)) states that these trees were taken there from England in the sixteenth century. There is a Spanish specimen by Lindley from Aranjuez in Herb. Univ. Cantab. The foliage specimen in Herb. Smith of *U. suberosa* by Ehrhart (*Arb.* no. 142), from Holland, is also the English elm or a plant very closely resembling it. It was doubtless because of the name which Ehrhart attached to this specimen that Smith named the English elm *U. suberosa*; and it was then a natural consequence that Smith should reserve the name *U. campestris* for the *U. campestris* var. β of his *Fl. Brit.*, i.e., for *U. sativa* Miller.

Professor A. Henry informs us that he obtained fruits from the Spanish trees, and that their seeds germinated; but the samarae with which we were supplied were obovate and not subrotund as in the English elm: he also states that he raised four seedlings from English trees in 1909.

Very common in copses, hedgerows, and parklands in the lowlands of southern England, especially in the Thames valley, in Somerset, and in the western Midlands; very rare in Cornwall; local in East Anglia; rare on the Pennines where, as a planted tree, it occurs up to about 140 m.; very rare in southern and eastern Scotland where it only grows to about half its normal size; no certain record for Wales or Ireland. The tree appears to prefer deep, damp soils, especially alluvial deposits; and indeed we suspect it may have been a constituent of the original forests—now almost entirely destroyed—of such alluvial soils.

Holland (? indigenous), Spain (? indigenous).

Series iii. *GLABRAE*

Glabrae nobis.

For characters, see page 89. Only British species:—*U. glabra.*

5. ULMUS GLABRA. Wych Elm. Plates 104, 105; 94, 95, 96, 97

Ulmus latifolia Gerard *Herb.* 1297 (1597); *U. folio latissimo scabro* Goodyer in Gerard *Herb.* ed. 2, 1481 (1636); Ray *Syn.* ed. 3, 469 (1724); *U. latioris* Parkinson *Theatr. Bot.* 1403 (1640); *U. montana* C. Bauhin *Pinax* 427 (1671).

Ulmus glabra Hudson *Fl. Angl.* 95 (1762) excluding var. β; Moss in *Gard. Chron.* ser. 3, li, 199 et 217 (1912); *U. scabra* Miller *Gard. Dict.* ed. 8, no. 2 (1768); Ascherson und Graebner *Syn.* iv, 560 (1911) excl. syn. Miller et syn. Smith p. 565; *U. campestris* Duroi *Harbk. Wilde Baumz.* 495 (1772); Pallas *Fl. Ross.* i, 75 (1784); Hooker *Brit. Fl.* ed. 6, 376 (1850); non L.; *U. montana* Stokes in Withering *Arr. Brit. Pl.* ed. 2, i, 259 (1787); *U. effusa* Sibthorp *Fl. Oxon.* 87 (1794); Abbot *Fl. Bedf.* 55 (1798); non Willdenow; *U. campestris* var. *latifolia* Aiton *Hort. Kew.* i, 319 (1789); *U. montana* var. *genuina* Syme *Eng. Bot.* viii, 142 (1868) excluding tab. 1287; *U. scabra* var. *montana* Rouy *Fl. France* xii, 267 (1910).

Icones:—*Sv. Bot.* t. 13, as *U. campestris*; Reichenbach *Icon.* t. 661, fig. 1331, as *U. campestris*; t. 662, fig. 1332, as *U. montana*; *Fl. Dan.* t. 2532, as *U. montana.*

The young branch of the figure in Smith t. 1887, as *U. montana*, belongs either to a shade-grown form of this species or to a different species.

Camb. Brit. Fl. ii. *Plate 104.* (*a*) Flowering twig. (*b*) Flowers (enlarged). (*c*) Ovary (enlarged). (*d*) Twig with ripe fruits. (*e*) Outer scales of flower-bud (enlarged). (*f*) Apex of fruit (enlarged). *Plate 105.* Shoot with leaves. Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 1764, as *U. montana*; Fries, xii, 63, as *U. montana*; Kerner (*Fl. Exs. Austr.*), 264, as *U. campestris*; *Herb. Fl. Ingric.* ix, 580, as *U. montana.*

Tree, attaining a height of about 30 m., usually without suckers. *Timber* said to be not very serviceable. *Bark* of young trees smooth, of old trees rough. *Branches* somewhat spreading, more or less arched and drooping at the extremities. *Young branches* thick, hairy, remaining smooth (i.e., not striate) in the second year, not becoming suberous, pale brown in colour. *Winter-buds* large and hairy. *Petioles* shorter than in any of the preceding species, usually hidden by the base

of the lamina, longer in shade-grown plants, hairy. *Laminae* large, thick, obovate, very asymmetrical at the base, doubly and coarsely serrate, acuminate, sometimes tricuspidate, about 11—12 cm. long and 4·5—5·5 broad, scabrous and hairy above, softly hairy below, hairs sometimes microglandular; the first of our elms to unfold its leaves in spring, and the first to shed them in autumn. *Inflorescences* large, crowded, pale red in colour. *Flowers* produced on younger trees than in the preceding species; late February and early March. *Pedicels* short. *Perianth* larger than in any of the preceding species, transversely and unevenly furrowed, with 4—7 usually 5—6 segments, ciliate. *Stamens* 4—7, usually 5—6, much exserted. *Filaments* rosy. *Anthers* dark purple. *Stigmas* deep red, very hairy. *Fruits* large, up to nearly 3 cm. long and nearly 2 broad, usually slightly ovate, sometimes elliptical-acute. *Seed* in the centre of the fruit; sinus small, open or closed; when open basal angle very acute reaching only a quarter of the way down to the seed. *Seedlings* differing from those of the preceding species in having the first few pairs of leaves opposite and the later ones alternate, not uncommon in damp woods.

Hudson's name *Ulmus glabra* refers to the character of the young bark remaining smooth (i.e., not becoming striate) in its second year: Hudson's expression is "cortice glabro." Miller's name *U. glabra*, given later to another species, refers to the leaves—"Ulmus folio glabro," and is a synonym of *U. nitens*. In reverting to the name *U. glabra* for the wych elm, we are following Rendle and Britten's *List of British Seed Plants* (1907), and the 10th edition of *The London Catalogue of British Plants* (1908). This usage is unfortunately rendered necessary by the international rules of botanical nomenclature, which demand the retention of the earliest trivial name applied to a species, beginning with the first edition of Linné's *Species Plantarum* of 1753. The more familiar name *Ulmus montana* of Stokes has, we regret to state, no claims to acceptance by those botanists who follow the international rules; and the name *Ulmus scabra* of Miller, which some authorities have recently adopted in lieu of Hudson's, seems to us an illogical compromise.

Some writers have avoided the difficulty by limiting the Linnaean name *U. campestris* to this species; but this position is untenable owing to the fact that Linnaeus, in his references to *U. campestris*, does not cite the pre-Linnaean name of the wych elm, namely, *U. montana* Bauhin *Pinax* p. 427, although he cites another synonym of this authority, namely, *U. campestris et theophrasti*. Further, in *Fl. Suec.* p. 81 (1755), Linnaeus says of the timber of his *U. campestris* "lignum durum, tenax"; and this does not apply to the wych elm. Finally, the only occasion on which Linnaeus definitely restricts his name *U. campestris* to a single plant is in his *Flora Anglica* (1754), where he applies the name to the English elm and to this plant alone.

Regarding the plant of the Linnaean herbarium, Bromfield (*Fl. Vect.* 451—452) states that the specimen in the Linnaean herbarium "is rather our *U. montana* or some one of its varieties." This somewhat guarded statement is made more definite than it really is by Hooker and Arnott (*Brit. Fl.*, ed. 5, 377), where it is stated that the specimen "is certainly" the *U. montana* Stokes (= *U. glabra* Hudson) "as...Bromfield has proved." In our own judgment, the specimen in the Linnaean herbarium should be referred to a form of *U. glabra* × *nitens*.

U. glabra, at the present time, is known as the wych elm in most parts of the British Isles, but was formerly designated the wych hazel or "witch hasell." Formerly there were two wych elms, (1) the rough-leaved wych elm (*U. campestris*), now known as the English elm, and (2) the smooth-leaved wych elm (*U. nitens*). In eastern England, *U. nitens* and those hybrid-elms approaching *U. nitens*, are still known as wych elms. The name wych hazel still persists in eastern England for *Carpinus betulus*.

(β) forma **grandidentata** comb. nov.; *U. corylacea* var. *grandidentata* Du Mortier *Fl. Belg.* 25 (1827); *U. major* Reichenbach fil. *Icon.* xii, 13 (1850) non Smith, excl. omn. syn. auct. angl.; *U. montana* var. *tridens* Lange *Haandb. Danske Fl.* 267 (1886—8); *U. scabra* var. *major* Rouy *Fl. France* xii, 267 (1910) excl. syn. Smith; *U. scabra* race *major* Ascherson und Graebner *Syn.* iv, 565 (1911) excl. syn. Miller et syn. Smith.

Icones:—Reichenbach *Icon.* t. 665, fig. 1335, as *U. major*.

Young branches and *buds* stouter, larger, and more hairy than in the common form. *Laminae* larger, thicker, and more hairy than in the common form, often with 1 or more very large teeth on each side of the central one.

We have only seen this *forma* in cultivation.

Damp woods and hedgerows; from the Channel Islands, Cornwall, and Kent northwards to Caithness; attaining an altitude of 305 m. as an indigenous tree in Derbyshire, and commonly planted in the same county up to 457 m.; commonest in the west and north of Great Britain, particularly on the fissured limestones; much less common in southern England in the beech woods on chalk and in the oak woods on the damper greensands; rare or absent on clay and marl; rare in central and eastern England, in many parts of which the tree is not indigenous; indigenous in western and northern Ireland; perhaps only planted in eastern Ireland.

Europe, northwards to 67° N. in Scandinavia, and ascending to 1300 m. in the Tyrol; north-western and northern Asia to the Amur region; northern Africa (? indigenous).

Family 2. CANNABACEAE.

Cannabaceae Engler *Führer* 33 (1886); *Cannabineae* Gaudichaud *Voy. Aut. Monde* 507 (1826); *Cannaboïdeae* Engler in *Pflanzenfam.* iii, pt. i, 96 (1894); Ascherson und Graebner *Syn.* iv, 595 (1911).

Herbs, strong-smelling owing to the presence of numerous glands, without latex. *Leaves*, palmatinerved; lower ones opposite and decussate; upper ones usually alternate; stipulate. *Petioles* long. *Laminae* palmatinerved, more or less divided, more or less hairy. *Inflorescences* dioecious, of compound cymes. *Staminate inflorescences* larger than the pistillate ones, lax-flowered. *Pistillate inflorescences* dense-flowered. *Flowers* wind-pollinated, protogynous. *Bracts* persistent; of the staminate flowers small, subulate. *Perianth* of the staminate flowers with 5 deeply cut segments; of the pistillate flowers entire or with a slit on one side, persistent, adhering to the fruit. *Stamens* 5, short, straight. *Filaments* short, erect in bud, attached to the base of the sepals. *Ovary* of 2 superior, united carpels, with 1 loculus, 1 ovuled. *Stigmas* 2. *Ovules* pendulous, anatropous, becoming curved. *Fruit* an achene. *Embryo* curved or rolled.

2 genera and 3 species; north temperate zone.

Genera of *Cannabaceae*

Genus 1. **Humulus** (see below). Perennial. *Stem* twining. *Laminae* palmatilobed, cordate. *Pistillate inflorescences* peduncled.

Genus 2. ***Cannabis** (p. 98). Annual. *Stem* erect. *Laminae* palmatisect. *Pistillate inflorescences* sessile.

Genus 1. Humulus

Humulus L. [*Gen. Plant.* 304 (1737)] *Sp. Pl.* 1028 (1753) et *Gen. Pl.* ed. 5, 453 (1754); Engler in *Pflanzenfam.* iii, pt. i, 96 (1894). [*Lupulus* Tournefort *Inst.* 535, t. 309 (1719); Miller *Abr. Gard. Dict.* ed. 4 (1754).]

Herbs with perennial rhizomes, twining stems, and yellow glands. *Stems* turning to the right, with small hooked prickles. *Stipules* large, ovate-acute. *Laminae* palmatilobed. *Peduncles* of pistillate flowers curved. *Bracts* of two kinds: (1) outer or stipular "bracts" each bearing 2 flowers, the lateral axis suppressed; (2) inner or true bracts, each with 1 flower, at first shorter than the outer ones, ultimately larger and projecting beyond them, imbricate, suborbicular. *Stigmas* linear-acute. *Seeds* frequently not formed, as the staminate and pistillate plants rarely grow together. *Embryo* spirally coiled.

2 species; north temperate zone. Only British species, *H. lupulus*.

1. HUMULUS LUPULUS. Hop. Plate 106

Lupulus salictarius Gerard *Herb.* 737 (1597) including *L. sylvestris*; *Lupulus mas et foemina* Ray *Syn.* ed. 3, 137 (1724).

Humulus lupulus L. *Sp. Pl.* 1028 (1753); Syme *Eng. Bot.* viii, 133 (1868); Rouy *Fl. France* xii, 269 (1910); Ascherson und Graebner *Syn.* iv, 596 (1911); *Lupulus humulus* Miller *Gard. Dict.* ed. 8, no. 1 (1768).

Icones:—Smith *Eng. Bot.* t. 427; *Fl. Dan.* t. 1239; Reichenbach *Icon.* xii, t. 656, fig. 1326.

Camb. Brit. Fl. ii. *Plate 106.* (*a*) Shoot with pistillate catkins. (*b*) Shoot with staminate flowers, (*c*) Pistillate flowers (enlarged). (*d*) Staminate flowers (enlarged). (*e*) Fertile shoot in autumn. (*f*) Mature bracts and fruits. Cambridgeshire (E. W. H.).

Exsiccata:—Billot, 2741; *Herb. Fl. Ingric.* v, 577.

A twining herb up to about 5 m. high. *Rhizome* stout, branched. *Stem* subhispid. *Stipules* united in pairs. *Petioles* about half as long as the laminae, stout. *Laminae*—lower ones cordate, 5-lobed, lobes ovate, with large simple serrations, up to about 10 cm. long and nearly as broad; upper ones ovate, subcordate at the base, serrate, acute. *Pistillate inflorescences* peduncled.

Hedgerows and near houses and cottages; perhaps indigenous in southern England; as a relic of cultivation, it occurs northwards to Elginshire; ascending to about 300 m. in Scotland, though rare and not indigenous at such altitudes. Established in most of the southern counties of Ireland, rare and not indigenous in the north.

Europe, except Arctic and sub-Arctic, ascending to 1540 m. in Switzerland; central and northern Asia; North America.

Genus 2. *Cannabis

Cannabis [Tournefort *Inst.* 535, t. 309 (1719)] L. *Sp. Pl.* 1027 (1753) et *Gen. Pl.* ed. 5, 453 (1754); Engler in Engler und Prantl *Pflanzenfam.* iii, pt. i, 97 (1894).

Annual herbs. *Stems* erect, not prickly. *Laminae* palmatisect. *Inflorescence* of pistillate flowers sessile or almost so, consisting of an opposite pair of branches with secondary shoots, each bearing 2 inflorescences, and therefore whorled. *Bracts* of pistillate flowers as in *Humulus*, except that the related axis is here a repeatedly branched leafy shoot. *Ovary* elongate. *Stigmas* elongate. *Seeds* smaller than in *Humulus*. *Embryo* curved.

Only species:—**C. sativa*.

1. *CANNABIS SATIVA. Hemp

Cannabis Gerard *Herb.* 572 (1597) including *C. spuria*; *C. sativa* Ray *Syn.* ed. 3, 138 (1724).

***Cannabis sativa** L. *Sp. Pl.* 1027 (1753); Syme *Eng. Bot.* viii, 131 (1868); Ascherson und Graebner *Syn.* iv, 598 (1911).

Icones:—Reichenbach *Icon.* t. 655, fig. 1325; Syme *Eng. Bot.* t. 1283 (1868).

Annual, up to nearly 1 m. in height. *Stem* usually much branched, rather hairy. *Laminae* opposite and decussate, palmatisect, with 7 narrow serrate segments, scabrous, glandular. *Inflorescences* dioecious; July and August. *Staminate inflorescences* more or less lax-flowered. *Pistillate inflorescences* sessile or subsessile, dense-flowered.

We suppose the British plant is always *C. sativa* var. *indica*.

Waste places and cultivated ground only, chiefly in southern England.

Indigenous in the steppe region of south-eastern Europe and Asia. Cultivated in most of the warmer countries of the earth, and escaping from cultivation into waste places.

Family 3. URTICACEAE

Urticaceae Lindley *Nat. Syst.* ed. 2, 175 (1836) partim; Endlicher *Gen. Plant.* 282 (1837); Weddell *Monogr. Fam. Urticées* in *Arch. Muséum d'Hist. Nat.* ix, 49 (1856—7); Engler in *Pflanzenfam.* iii, pt. i, 98 (1894); *Urticae* Jussieu *Gen.* 400 (1789) partim; *Urticeae* Mirbel *Élém.* ii, 904 (1815).

Shrubs (rarely), or perennial or (rarely) annual herbs; latex absent; stinging-hairs often present. *Stipules* usually present, sometimes united in pairs between the petioles. *Laminae* simple. *Inflorescences* dioecious or diclinous, catkinate or cymose. *Perianth* usually 4-partite. *Filaments* bent inwards in bud, suddenly straightening at maturity and thus bursting the anthers and scattering the pollen. *Ovary* of 1 superior carpel, unilocular, adherent to the perianth. *Ovules* 1 to each loculus, basal, anatropous. *Fruit* a nutlet (in the British species), enclosed either by the 4 perianth-segments or by the 2 inner perianth-segments. *Embryo* straight.

About 41 genera and 460 species; tropical and temperate zones.

British tribes of *Urticaceae*

Tribe 1. **Urereae** (see below). *Stinging hairs* present. *Leaves* opposite. *Pistillate perianth* 4-partite.

Tribe 2. **Parietariëae** (p. 101). *Stinging hairs* absent. *Leaves* alternate. *Pistillate perianth* tubular.

Tribe 1. *UREREAE*

Urereae Gaudichaud *Voy. Aut. Monde* 496 (1826); Engler in Engler und Prantl *Pflanzenfam.* iii, pt. i, 103 (1894).

For characters, see above. Only British genus:—*Urtica*.

Genus 1. **Urtica**

Urtica [Tournefort *Inst.* 534, t. 308 (1719)] L. *Sp. Pl.* 983 (1753) et *Gen. Pl.* ed. 5, 423 (1754); Engler in Engler und Prantl *Pflanzenfam.* iii, pt. i, 104 (1894).

Shrubs (rarely); or herbs, perennial or (rarely) annual; with stinging hairs. *Leaves* opposite and decussate, stipulate, simple. *Inflorescences* of compound catkins, sometimes agglomerated into subspherical heads. *Bracts* absent. *Flowers* dioecious or diclinous. *Perianth* 4-partite, segments imbricate in bud (as in *Ulmus*), persistent, of the staminate flowers concave, of the pistillate flowers flat. *Stamens* 4. *Anthers* reniform. *Stigmas* subsessile, penicillate. *Fruit* a compressed achene.

About 30 species; temperate zones.

British species of *Urtica*

1. **U. dioïca** (see below). Perennial. *Inflorescences* catkinate, dioecious.

2. **U. urens** (p. 100). Annual. *Inflorescences* catkinate, diclinous, each with staminate and pistillate flowers.

3. †**U. pilulifera** (p. 100). Annual. *Inflorescences* diclinous; staminate ones lax-flowered; pistillate ones peduncled, flowers agglomerated in a globose head.

1. URTICA DIOÏCA. Common Stinging Nettle. Plate 107

Urtica urens Gerard *Herb.* 570 (1597); *U. racemifera major perennis* Ray *Syn.* ed. 3, 139 (1724).

Urtica dioïca L. *Sp. Pl.* 984 (1753); Syme *Eng. Bot.* viii, 127 (1868); Rouy *Fl. France* xii, 272 (1910); Ascherson und Graebner *Syn.* iv, 607 (1911).

Icones:—Curtis *Fl. Lond.* i, t. 196; Smith *Eng. Bot.* t. 1750 (1807); *Fl. Dan.* t. 746 (1782); Reichenbach *Icon.* xii, t. 654, fig. 1324 (left-hand drawing).

Camb. Brit. Fl. ii. *Plate 107.* (*a*) Shoot with staminate catkins. (*b*) Shoot (of f. *angustifolia*) with pistillate catkins. (*c*) Staminate flowers (enlarged). (*d*) Pistillate flower, pistil, and fruits (enlarged). Huntingdon (E. W. H.).

Exsiccata:—Billot, 457; *Herb. Fl. Ingric.* iv, 579.

Perennial. *Rhizome* stout. *Stem* up to about 1 m. high, erect, more or less branched. *Petioles* long (1—4 cm.). *Laminae* broadly or narrowly ovate, cordate or rounded at the base, strongly serrate, acute to acuminate, up to about 12 cm. long and 9 broad. *Catkins* dioecious. *Staminate catkins* spreading. *Pistillate catkins* descending. July to September.

(β) forma **angustifolia** comb. nov.; *U. dioïca* var. *angustifolia* Wimmer et Grabowski *Fl. Silic.* iii, 336 (1829); Ledebour *Fl. Alt.* iv, 241 (1833).

Icones:—Reichenbach *Icon.* t. 654, fig. 1324 (middle drawing), as *U. dioïca.*

Camb. Brit. Fl. ii. *Plate 107.* (*b*) Shoot with pistillate catkins.

Laminae much narrower.

A form of sunny situations and dry soils.

(γ) forma **microphylla** comb. nov.; *U. dioïca* var. *microphylla* Hausmann *Fl. Tir.* 771 (1854).

Laminae as narrow as in *f. angustifolia* but much shorter.

A form of sunny situations and very dry soils.

Other forms are said to vary with regard to the degree of venomousness.

It is curious that this species, and others with nitrophilous tendencies, will grow well either in somewhat exposed situations when the nitrogen-content of the soil is high, or in shady places where the nitrogen-content of the soil is apparently low.

Indigenous throughout the British Isles, in waste places and on roadsides, in damp woods, hedgerows, and plantations, and in sheltered places on mountain-sides where sheep and cattle lie; ascending to about 840 m. in Perthshire; nitrophilous.

Europe, ascending to 2380 m. in the Alps; Asia; northern Africa; Polynesia; America (not indigenous).

2. URTICA URENS. Small Stinging Nettle. Plate 108

Urtica minor Gerard *Herb.* 570 (1597); Ray *Syn.* ed. 3, 140 (1724).

Urtica urens L. *Sp. Pl.* 984 (1753); Syme *Eng. Bot.* viii, 130 (1868); Rouy *Fl. France* xii, 274 (1910); Ascherson und Graebner *Syn.* iv, 603 (1911).

Icones :—Curtis *Fl. Lond.* i, 197; Smith *Eng. Bot.* t. 1236; *Sv. Bot.* t. 206; *Fl. Dan.* t. 739; Reichenbach *Icon.* xii, t. 652, fig. 1320.

Camb. Brit. Fl. ii. *Plate 108.* (*a*) Shoot with catkins. (*b*) Staminate flower (enlarged). (*c*) Pistillate flower (enlarged). (*d*) Fruit with persisting perianth (enlarged). Huntingdon (E. W. H.).

Exsiccata :—Billot, 456; Todaro, 993; Welwitsch, 240; *Herb. Fl. Ingric.* iv, 578.

Annual. *Stem* about 2—5 dm. high, usually much branched. *Petioles* about 1·5—2·0 cm. long. *Laminae* elliptical-ovate, rounded or truncate at the base, deeply and often irregularly serrate, acute, about 3·0—4·5 cm. long and about half as broad. *Inflorescences* catkinate, diclinous, with staminate and pistillate flowers on each branch, the pistillate more numerous than the staminate, branched from the base; branches usually in pairs, usually shorter than the petioles, ascending or spreading; June to October. *Seeds* smaller than in *U. dioïca*, larger than in *U. pilulifera*.

Waste places and roadsides throughout the British Isles, common in lowland localities, ascending to about 460 m. in Perthshire; nitrophilous.

Europe (except the extreme north, ascending to 2215 m. in the Tyrol); Asia; northern Africa; Abyssinia; America (not indigenous).

3. †URTICA PILULIFERA. Roman Nettle. Plate 109

Urtica romana Gerard *Herb.* 570 (1597); *U. pilulifera folio profundius urticae majoris in modum serrato semine magno lini* Ray *Syn.* ed. 3, 140 (1724).

Urtica pilulifera L. *Sp. Pl.* 983 (1753); Syme *Eng. Bot.* viii, 129 (1868); Rouy *Fl. France* xii, 271 (1910); Ascherson und Graebner *Syn.* iv, 605 (1911).

Icones :—Reichenbach *Icon.* xii, 653, fig. 1302 [*bis* = 1322].

Camb. Brit. Fl. ii. *Plate 109.* (*a*) Flowering shoot. (*b*) Leaf of *U. pilulifera* var. *dodarti.* (*c*) Staminate flower above and hemi-hermaphrodite flower below. (*d*) Pistillate flower. Grown from Swiss seed (E. W. H.).

Annual, up to nearly 1 m. high. *Stem* erect, more or less branched. *Petioles* long (ca. 3—4 cm.). *Laminae* ovate, subcordate to rounded at the base, serrate or entire, acute, up to about 6 cm. long and 4 broad. *Inflorescences* diclinous. *Flowers* late June and July. *Staminate inflorescences* pedunculate, lax-flowered; peduncles ascending. *Pistillate inflorescence* on shorter peduncles, agglomerated into dense-flowered globular heads; peduncles simple and with 1 head, or branched and with 2; peduncles ascending at first, ultimately descending. *Fruits* July to October.

(*a*) subvar. **genuina** comb. nov.; *U. pilulifera* var. *genuina* Wilkomm et Lange *Prodr. Fl. Hisp.* i, 252 (1861); Syme *Eng. Bot.* viii, 129 (1868).

Icones :—Smith *Eng. Bot.* t. 148 (1794).

Exsiccata :—Reichenbach, 22, as *U. pilulifera.*

Laminae strongly serrate.

(*b*) subvar. **dodarti** comb. nov.; *U. dodartii* L. *Syst. Nat.* ed. 10, 1265 (1759); *U. pilulifera* var. *dodarti* Ascherson *Fl. Brandenb.* 608 (1864); Syme *Eng. Bot.* 129 (1868).

U. romana seu pilulifera altera pariëtariae foliis Ray *Hist.* i, 161 (1686).

Icones :—Reichenbach *Icon.* t. 653, fig. 1303 [*bis* = 1323], as *U. dodarti*; Syme *Eng. Bot.* t. 1281 (we have not seen specimens with such strongly cordate leaves as are shown in Syme's figure).

Laminae entire or nearly so.

Roadsides and waste places, near towns and villages, chiefly in eastern England, very rare and perhaps extinct; elsewhere it is adventitious.

Parkinson (*loc. cit.*), in 1633, states that *U. pilulifera* "hath beene found naturally growing time out of minde, both at the town of Lidde by Romney, and in the streets of the towne of Romney, in Kent"; and he refers to the tradition that seeds of the plant were brought here by the soldiers of Julius Caesar, who had been "told before they came from home that the climate of Brittaine was so extreame cold that it was not to be endured without some friction or rubbing to warme their bloods and to stirre up natural heat, from which time it is thought it hath continued there, rising yearly of its own sowing." The plant was also plentiful on the coast of Suffolk (near Aldeburgh) and Norfolk (near Yarmouth) in the time of Ray (*Syn.* 29 (1690)), but is now very rare or extinct there.

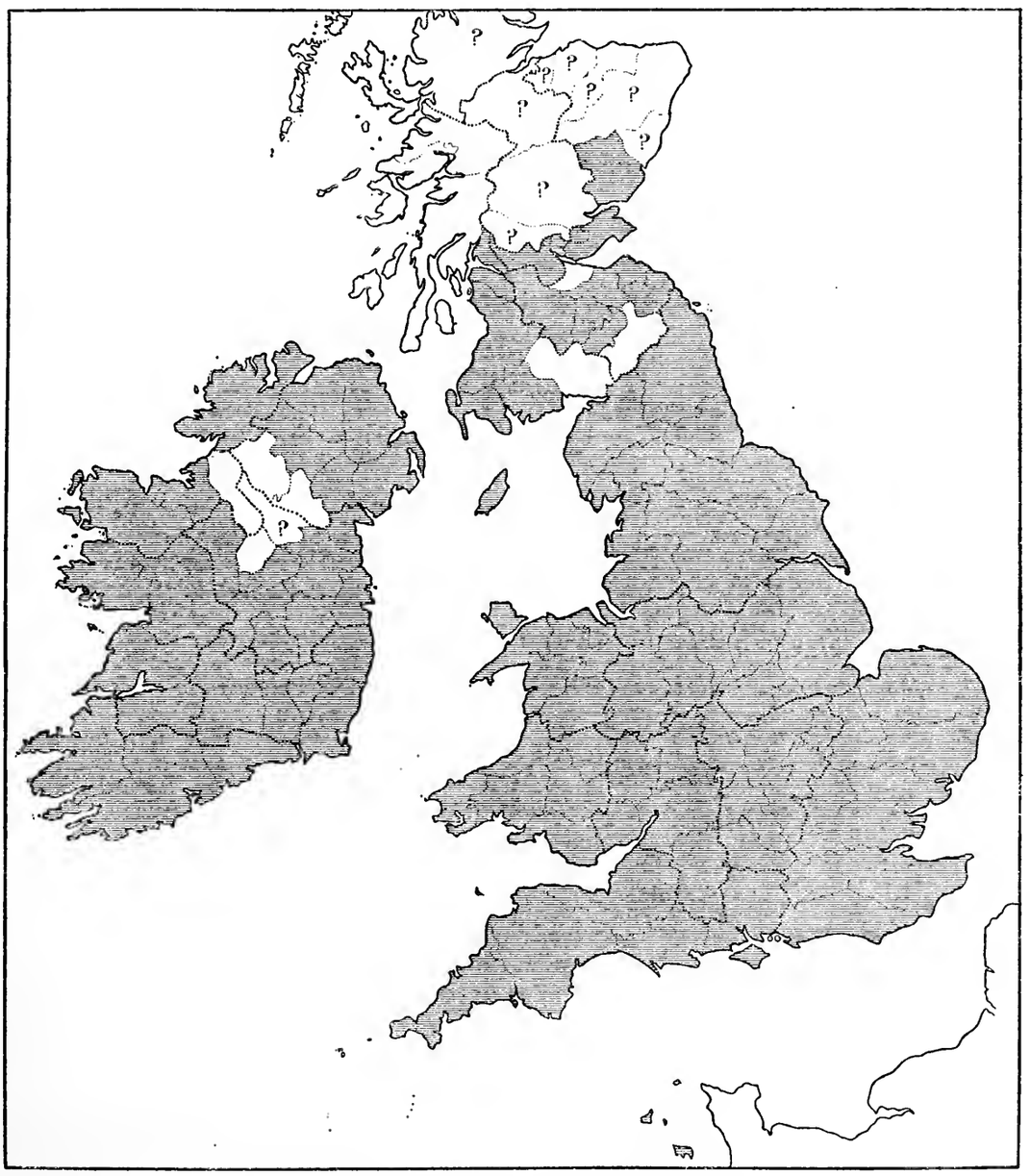
Linnaeus, in his *Observ.* (vide *Mantissa* 495 (1767)) remarks that "varietates fere sunt *U. pilulifera*, *balearica*, *dodarti*, constantes tamen; qui vult has conjungere potest"; and Smith (*Eng. Fl.* iv, 134 (1828)) states that *U. balearica* L. *Syst. Nat.* ed. 10, 1265 (1759) is merely a variety of *U. pilulifera* with cordate leaves (cf. Syme's figure, *loc. cit.*).

South-western France, southern Europe; northern Africa; Asia Minor and western Asia.

Tribe 2. *PARIËTARIËAE*

Pariëtariëae Weddel in *Arch. Mus. Hist. Nat. Paris* ix, 502 (1856); Engler in Engler und Prantl *Pflanzenfam.* iii, pt. i, 103 et 115 (1894).

For characters, see page 98. Only British genus:—*Pariëtaria* (see page 102).



Map 13. Distribution of *Pariëtaria officinalis* in the British Isles

Genus 1. Pariëtaria

Pariëtaria [Tournefort *Inst.* 509, t. 289 (1719)] L. *Sp. Pl.* 1052 (1753) et *Gen. Pl.* ed. 5, 471 (1754); Engler in Engler und Prantl *Pflanzenfam.* iii, pt. i, 115 (1894).

Undershrubs or herbs. *Leaves* alternate, petiolate, simple, exstipulate. *Inflorescences* consisting of dense axillary cymes. *Flowers* wind-pollinated, polygamous, the terminal one pistillate and the lowest ones staminate, and the intermediate ones (the great majority) monoclinous. *Perianths* mostly tubular, with 3—5, usually 4, segments. *Stamens* 3—5, usually 4. *Stigmas* falling before the anthers of the same flower have dehisced. *Endosperm* sparse or copious. *Cotyledons* ovate.

About 10 species; temperate and tropical zones. Only British species:—*P. officinalis* (see below).

1. PARIËTARIA OFFICINALIS. Pellitory of the Wall. Plate 110

Pariëtaria Gerard *Herb.* 261 (1597); Ray *Syn.* ed. 3, 158 (1724); *P. vulgaris* Parkinson *Theatr. Bot.* 436 (1640) including *P. minor*, p. 437.

Pariëtaria officinalis L. *Sp. Pl.* 1052 (1753)!; Hudson *Fl. Angl.* 376 (1762); *P. judaica* Miller *Gard. Dict.* ed. 8, no. 2 (1768) non L.; *P. ramiflora* Moench *Meth. Pl.* 327 (1794); Rouy *Fl. France* xii, 276 (1910); *P. diffusa* Mertens und Koch *Deutschl. Fl.* i, 827 (1823); Syme *Eng. Bot.* viii, 126 (1868); *P. officinalis* var. *diffusa* Weddel in *Arch. Mus. Hist. Nat. Paris* ix, 507 (1857); *P. officinalis* race *ramiflora* Ascherson und Graebner *Syn.* iv, 623 (1911).

Icones:—Curtis *Fl. Lond.* iv, t. 63; Smith *Eng. Bot.* t. 879; *Fl. Dan.* t. 521; Reichenbach *Icon.* xii, t. 651, fig. 1318, as *P. diffusa.*

Camb. Brit. Fl. ii. *Plate 110.* (*a*) Flowering shoot of *P. officinalis* var. *ramosa.* (*b*) Pistillate flower (enlarged). (*c*) Ripening ovary, with perianth partly dissected (enlarged). (*d*) Persistent perianths enclosing ripening ovaries. (*e*) Flowering shoot of *P. officinalis* var. *simplex.* (*a—d*) from Somerset (E. W. H.). (*e*) from Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 644.

Perennial. *Stem* erect, ascending, or decumbent, more or less branched. *Petioles* short. *Laminae* oval or elliptical, cuneate at the base, subentire or entire, acute to subacute. *Bracts* with 2 chief divisions each of which is segmented, green with translucent glandular hairs. *Flowers* polygamous. *Perianth* purplish, glandular-hairy; of the central monoclinous flowers with the tube as long as or longer than the segments; of the lateral imperfect flowers with the segments longer than the tube. *Stamens* very sensitive.

(*a*) **P. officinalis** var. **genuina** Syme *Eng. Bot.* viii, 126 (1868).

Stems ascending or decumbent, with longer branches than in var. *simplex.* *Laminae* broader and shorter, more rugose especially when young.

This is the common form of the species in England.

(*b*) **P. officinalis** var. **simplex** comb. nov.; *P. diffusa* var. *simplex* Bach in *Flora* xxiv, 735 (1841); *P. diffusa* var. *fallax* Grenier et Godron *Fl. France* iii, 110 (1855); *P. ramiflora* var. *fallax* Gürke *Plant. Eur.* ii, 80 (1897); Rouy *Fl. France* xii, 276 (1910).

Stems erect, much less branched. *Laminae* narrower, longer, and less rugose than in var. *genuina.*

Local; Somerset, Suffolk, Huntingdonshire, and doubtless elsewhere.

France, Germany, Spain.

The allied species *P. erecta* (Mertens und Koch *Deutschl. Fl.* i, 825 (1823)) is a larger plant, erect, with larger and broader leaves, and with a shorter tube to the monoclinous flowers: it is not known as a British plant.

Old walls, rocks, and hedge banks, preferring calcareous soil. Recorded for every county in England and Wales; but rare in non-calcareous districts where it occurs rooted in the mortar of old walls: rare also in eastern England where the rainfall and atmospheric humidity are low. Local and rather rare in southern Scotland: not indigenous in the Highlands of Scotland. In Ireland, absent from or rare in many of the central and drier counties, rare in the west, frequent in the south, east, and north.

France, Iberian peninsula, Italy (up to 1000 m.), Balkan peninsula, southern Russia; Asia Minor (up to 2000 m.) to Turkestan; northern Africa; Madeira; Canary Isles.

Subclass 2. *PETALOÏDEAE*

Petaloïdeae nobis; *Archichlamydeae* b Engler *Syll.* ed. 2, 105 (1898).

For characters, see page 2.

British orders of *Petaloïdeae*

Order 1. **Santalales** (see below). *Flowers* cyclic, "calyculus" present or not, usually homochlamydeous. *Perianth* usually petaloid, sometimes sepaloid. *Stamens* usually as many as the perianth-segments and antisepalous, sometimes twice as many. *Ovary* subinferior or inferior, with 1—3, usually 2—3 carpels, loculi as many as the carpels. *Ovules* either 1—4 to each loculus and pendulous from the apex or from a central placenta, or not differentiated and *embryo-sacs* filling up the interior of the ovary.

Order 2. **Aristolochiales** (p. 106). *Flowers* cyclic, homochlamydeous, actinomorphic or zygomorphic. *Perianth* petaloid. *Ovary* usually inferior, either with 3—6 loculi and axile placentation or 1 loculus and parietal placentation. *Ovules* ∞ to each loculus.

Order 3. **Polygonales** (p. 108). *Leaves* usually with stipular sheaths or "ochreae." *Flowers* either partly spiral or cyclic, actinomorphic. *Perianth* homochlamydeous or heterochlamydeous, petaloid or sepaloid. *Ovary* superior, unilocular, uniovulate. *Ovules* basal, orthotropous, rarely anatropous, with 2 integuments. *True fruit* an achene.

Order 1. SANTALALES

Santalales Lindley *Nat. Syst.* ed. 2, 192 (1836); Engler *Syll.* ed. 1, 98 (1892); in *Pflanzenfam., Nachtr.* 346 (1897); Ascherson und Graebner *Syn.* iv, 640 (1911).

For characters, see above.

British families of *Santalales*

Family 1. **Santalaceae** (see below). *Ovules* 1 to each loculus, pendulous from the apex or from a free-central placenta.

Family 2. **Loranthaceae** (p. 105). *Ovules* and placentae not differentiated from the placenta, and the embryo-sacs in the tissue filling up the interior of the ovary.

Family 1. SANTALACEAE

Santalaceae R. Brown *Prodr. Fl. Nov.-Holl.* 350 (1810); Lindley *Nat. Syst.* ed. 2, 193 (1836); Hieronymus in Engler und Prantl *Pflanzenfam.* iii, pt. i, 202 (1889); Ascherson und Graebner *Syn.* iv, 641 (1912).

Trees, shrubs, or herbs; hemiparasitic, some being stem-parasites and others root-parasites. *Leaves* alternate or opposite, entire, exstipulate. *Inflorescence* various, but primitively cymose. *Flowers* monoecious or dioecious, usually with an epigynous disc. *Perianth* monochlamydeous, petaloid (in the British species) or sepaloid, with 4 or 5 divisions. *Stamens* equal in number to the sepals, epiphyllous. *Ovary* semi-inferior, with 1 loculus. *Placentation* free-central. *Ovules* suspended, 1—4 in each loculus, all but 1 aborting; *integument* absent. *Fruit* an achene or drupe. *Seeds* 1 to each ovary. *Testa* absent. *Endosperm* present.

26 genera; 250 species; tropical and temperate zones. Only British genus:—*Thesium.*

Genus 1. Thesium

Thesium L. [*Gen. Pl.* ed. 1, 60 (1737)] *Sp. Pl.* 207 (1753) et *Gen. Pl.* ed. 5, 97 (1754); Hieronymus in Engler und Prantl *Pflanzenfam.* iii, pt. i, 212 et 223 (1894); Ascherson und Graebner *Syn.* iv, 644 (1912).

Hemiparasitic herbs. *Roots* attached to the host-plants by means of suckers. *Leaves* alternate, narrow, decurrent. *Flowers* monoclinous. *Disc* minute or absent. *Bract* adnate to the peduncle, and, with the 2 bracteoles, usually forming a kind of involucre. *Perianth* petaloid, with 3—5, usually 5 segments. *Fruit* a nutlet.

115 species; old world, chiefly in the north temperate zone.

British species of *Thesium*

1. **T. humifusum** (see below). Perennial. *Bracts* and *bracteoles* often subequal. *Perianth* with simple veins, segments flat.

2. [†**T. humile** (see below). Annual. *Bract* twice as long as the bracteoles. *Perianth* with veins with conspicuous branches, segments incurved.]

1. THESIUM HUMIFUSUM. Bastard Toad-flax. Plate 111

Linaria adulterina Johnson in Gerard *Herb.* ed. 2, 555 (1633); Ray *Syn.* ed. 3, 202 (1724).

Thesium humifusum DC. *Fl. France Suppl.* v [*ou* vi], 366 (1815); Syme *Eng. Bot.* viii, 88 (1868); Rouy *Fl. France* xii, 293 (1910); Ascherson und Graebner *Syn.* iv, 657 (1912); *T. divaricatum* var. *humifusum* Duby *Bot. Gall.* 408 (1828).

Icones :—Smith *Eng. Bot.* t. 247, as *T. linophyllum*; Reichenbach *Icon.* xi, t. 542, fig. 1153.

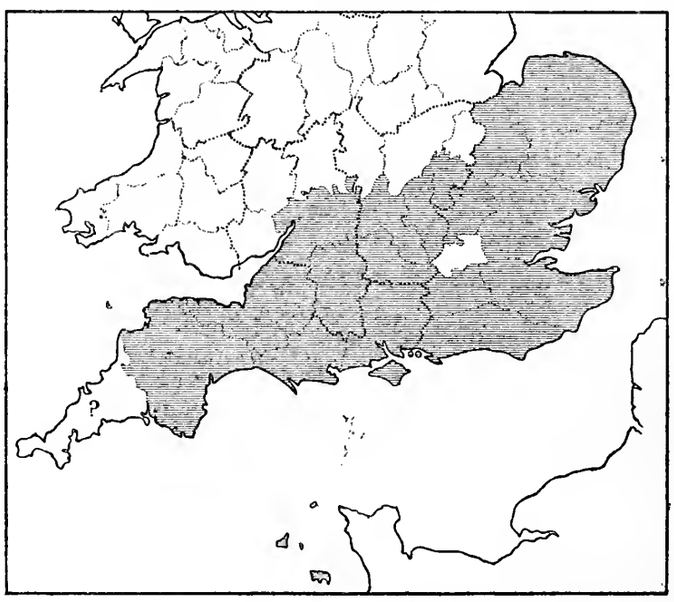
Camb. Brit. Fl. ii. *Plate 111.* (*a*) Flowering branches. (*b*) Flowers (3 enlarged). Cambridgeshire (A. H.).

Exsiccata :—Billot, 636.

Perennial, hemiparasitic herb. *Roots* slender, much branched, with suckers attached to various host-plants. *Stem* more or less branched, decumbent, up to about 15 cm. long, angular, ridges rather rough. *Laminae* linear, entire, acute, 1-nerved or feebly 3-nerved, rather glaucous. *Bracts* and *bracteoles* often subequal, leaf-like. *Flowers* pedicelled; June to August. *Perianth* white, persistent, about 5 mm. in diameter at the top when open; segments 5, about as long as the tube, flat when in flower, incurved in fruit, each with a tooth on each side near the base. *Stamens* 5, antisepalous. *Style* rather long. *Stigmas* 2 or 3, very small. *Seeds* oval to subglobular, 5-angled, striate.

Calcareous pasture, on Chalk, calcareous sands, and Oolitic limestone. From the Channel Isles, Devonshire, and Kent to Gloucestershire and Norfolk.

Belgium, Lorraine, France, Spain. The allied *T. italicum* DC. *Prodr.* xiv, 644 (1857) occurs in Corsica, Italy, and Sardinia.



Map 14. Distribution of *Thesium humifusum* in England

[2. †THESIUM HUMILE]

Thesium humile Vahl *Symb. Bot.* iii, 43 (1794); Babington *Manual* 261 (1843)!; Rouy *Fl. France* xii, 288 (1910); Ascherson und Graebner *Syn.* iv, 661 (1912).

Icones :—Reichenbach *Icon.* t. 542, fig. 1153.

Exsiccata :—Bourgeau (*Pl. Esp.*), 436; Huter, 1143; Porta et Rigo, 318; Sintensis et Rigo, 7; Todaro, 282; herb. Babington in Herb. Univ. Cantab.

Annual. *Stem* decumbent or ascending, grooved, much branched from below. *Branches* very leafy, suberect. *Laminae* short, linear, 1-nerved, denticulate above. *Flowers* solitary, subsessile; May and June. *Bract* twice as long as the bracteoles. *Perianth-segments* with conspicuously branched veins. *Achene* elliptical, shortly pedicelled.

Two specimens of this species were gathered by Babington, in 1829, near Dawlish, Devonshire. Syme (*Eng. Bot.* viii, 89 (1868)) does not regard it as indigenous.

Mediterranean region: Spain to Asia Minor, northern Africa, and the Canary Islands.

Family 2. LORANTHACEAE

Loranthaceae [D. Don *Prodr. Fl. Nepal.* 142 (1825) nomen] Lindley *Nat. Syst.* ed. 2, 49 (1836); Engler in *Pflanzenfam.* iii, pt. i, 156 (1894); Ascherson und Graebner *Syn.* iv, 664 (1912).

Hemiparasitic, evergreen shrubs or undershrubs. *Laminae* rather thick, usually opposite and exstipulate. *Inflorescence* usually in small cymes of 2 or 3 flowers. *Flowers* monoclinous or diclinous. "*Calyculus*" (a calyx-like structure below the true perianth) present or rudimentary or absent. *Perianth* arising from the margin of a hollow receptacle, homochlamydeous, sepaloid (as in the British species) or petaloid, usually with 4 segments. *Stamens* epiphyllous. *Anthers* with numerous loculi at least when young. *Ovary* subinferior, unilocular, usually with several embryo-sacs only one of which is fertile. *Ovules* not differentiated from the low free-central placenta. *Fruit* succulent, the succulent part being usually formed from the receptacle, 1 seeded. *Seed* surrounded by a sticky substance—viscin.

21 genera; 520 species; tropical and temperate zones. Only British genus:—*Viscum*.

Genus 1. Viscum

Viscum [Tournefort *Inst.* 609, t. 380 (1719)] L. *Sp. Pl.* 1023 (1753) et *Gen. Pl.* ed. 5, 448 (1754); Engler in Engler und Prantl *Pflanzenfam.* iii, pt. i, 193 (1894); Ascherson und Graebner *Syn.* iv, 669 (1912).

Flowers dioecious or monoecious. "*Calyculus*" absent or rudimentary. *Perianth* sepaloid; segments usually 4, thick. *Anthers* sessile, opening by pores. *Stigmas* sessile. *Pseudo-drupe* spherical or ellipsoid; the so-called "mesocarp" white, viscous; the so-called "endocarp" green, adherent to the seed.

About 20 species; old world. Only British species:—*V. album*.

1. VISCUM ALBUM. Mistletoe. Plate 112

Viscum Gerard *Herb.* 1168 (1597); Ray *Syn.* ed. 3, 464 (1724).

Viscum album L. *Sp. Pl.* 1023 (1753); Syme *Eng. Bot.* iv, 189 (1865); Rouy *Fl. France* xii, 285 (1910); Ascherson und Graebner *Syn.* iv, 670 (1912).

Icones:—Smith *Eng. Bot.* t. 1470; *Fl. Dan.* t. 1657; Beck in Reichenbach *Icon.* xxiv, t. 139, fig. 1—7; t. 140, fig. 8.

Camb. Brit. Fl. ii. *Plate 112.* (*a*) Flowering shoots. (*b*) Staminate flowers (enlarged). (*c*) Pistillate flowers (single flower on the right enlarged). (*d*) Fruiting branches. Suffolk (E. W. H.).

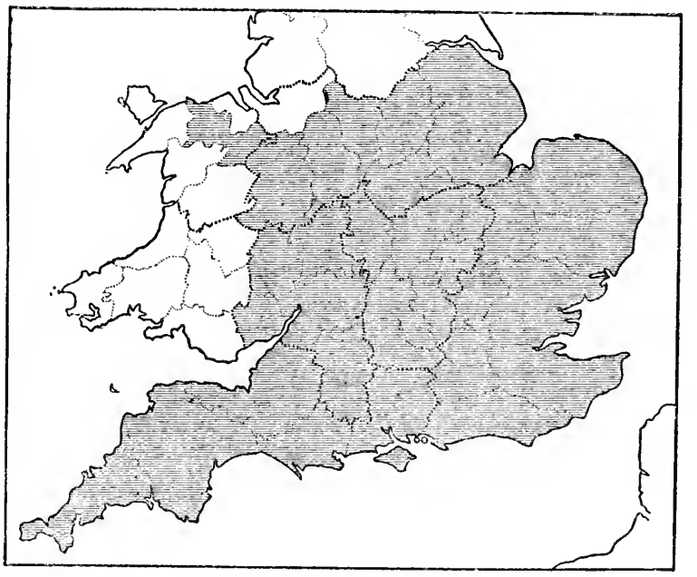
Exsiccata:—Billot, 566; Todaro, 599.

Hemiparasitic, evergreen undershrub. *Stem* yellowish green, much branched, up to about 1 m. high; branches dichasial. *Laminae* yellowish green, opposite, narrowly oboval, often about 3 cm. long and 8 mm. broad, evergreen, many falling in late October or early November. *Inflorescence* cymose, of usually 3—5 flowers. *Bracts* united to the pedicels. *Flowers* usually dioecious; February to April.

The British plant is the var. *platyspermum* Keller in *Bot. Centralbl.* xliv, 283 (1890) = var. *typicum* Beck *Fl. N.-Oest.* 604 (1892).

On deciduous trees and shrubs; very rarely (*vide* Bull in *Journ. Bot.* ii, 361 (1864)) on coniferous trees. From Cornwall and Kent northwards to Denbighshire and Yorkshire; not recorded for Scotland or Ireland.

Dr Bull (*loc. cit.*) records the mistletoe as occurring in this country on the following trees and shrubs:—*Acer campestre, A. pseudoplatanus, Aesculus flavus, A. hippocastanus, Alnus glutinosa, Betula alba, Buxus sempervirens, Carpinus betulus, Catalpa syringaefolia, Cornus sanguinea, Corylus avellana, Crataegus oxyacantha, Cytisus laburnum,*



Map 15. Distribution of *Viscum album* in England and Wales

Fagus sylvatica, Fraxinus excelsior, Ilex aquifolium, Juglans regia, Platanus occidentalis, P. orientalis, Populus alba, "P. canadensis," P. canescens, P. italica, P. nigra, × P. serotina, P. tacamahacca, P. tremula, Prunus avium, P. domestica, P. laurocerasus, P. padus, P. spinosa, Pyrus aucuparia, P. domestica, P. communis, P. malus, P. malus var. *americana, Quercus robur, Rhamnus catharticus, Ribes grossularia, Robinia pseudacacia, Rosa canina, Salix alba, S. caprea, Tilia europaea, Ulmus campestris, U. montana, U. montana* var. *erecta; Cedrus libani, Taxus baccata, Sequoia sempervirens, Larix decidua.*

Southern Scandinavia, Denmark, Belgium, France, Germany; central Europe (ascending to 1000 m.), central and southern Russia, southern Europe; northern Africa; Caucasus; Asia Minor to Persia and Afghanistan; central Asia to the Amur region and Japan.

Order 2. †ARISTOLOCHIALES

Aristolochiales Lindley *Nixus Plant.* 26 (1833); *Nat. Syst.* ed. 2, 205 (1836); Engler *Syll.* ed. 1, 100 (1892); *Pflanzenfam., Nachtr.* 346 (1897); Ascherson und Graebner *Syn.* iv, 677 (1912); *Asarales* Lindley *Veg. Kingd.* 786 (1846) partim.

For characters, see page 103. Only British family:—*Aristolochiaceae.*

Family 1. †ARISTOLOCHIACEAE

Aristolochiaceae Lindley *Nat. Syst.* ed. 2, 205 (1836); Solereder in *Pflanzenfam.* iii, pt. i, 264 (1894); Ascherson und Graebner *Syn.* iv, 677 (1912); *Asaraceae* Link *Enum.* ii, 1 (1822) nomen.

Lianes or perennial herbs. *Leaves* alternate, long-petioled, exstipulate, simple. *Laminae* usually cordate or reniform, usually entire, rarely lobed. *Flowers* monoclinous, entomophilous or autophilous, protogynous, honeyless, epigynous or hemi-epigynous. *Perianth* with usually 3 segments, petaloid, actinomorphic or zygomorphic, more or less persistent and adnate to the ovary. *Stamens* 6—36, usually 6—12, either free or more or less adherent to the style. *Anthers* adnate, extrorse. *Ovary* of 4—6, usually 6 carpels, with as many loculi and stigmas. *Ovules* ∞ to each loculus, anatropous, horizontal, or pendulous. *Placentation* axile. *Raphe* large. *Embryo* small. *Endosperm* present. *Fruit* a capsule. *Seeds* with 2 integuments.

5 genera; 200 species; tropical and warm temperate zones, except Australia.

British tribes of *Aristolochiaceae*

Tribe 1. †**Asareae** (see below). *Aërial stems* short. *Laminae* reniform. *Flowers* actinomorphic. *Stamens* 12.

Tribe 2. ***Aristolochiëae** (p. 107). *Aërial stems* erect, 3—6 dm. high, leafy. *Laminae* cordate. *Flowers* zygomorphic. *Stamens* 6.

Tribe 1. †*ASAREAE*

Asareae Spach *Hist. Nat. Vég. Phan.* x, 560 (1841); Solereder in *Pflanzenfam.* iii, pt. i, 271 (1894); Ascherson und Graebner *Syn.* iv, 678 (1912).

For characters, see above. Only British genus:—†*Asarum.*

Genus 1. †Asarum

Asarum [Tournefort *Inst.* 501, t. 286 (1719)] L. *Sp. Pl.* 442 (1753) et *Gen. Pl.* ed. 5, 201 (1754); Solereder in Engler und Prantl *Pflanzenfam.* iii, pt. i, 271 (1894); Ascherson und Graebner *Syn.* iv, 678 (1912).

Geophilous, perennial herbs. *Rhizome* creeping, pungent. *Inflorescence* solitary. *Flowers* pedicelled. *Perianth* actinomorphic, with 3 segments, sometimes with 3 additional alternating segments. *Stamens* 12; connectives usually continued beyond the anthers. *Ovary* with 6 carpels. *Capsule* subglobular, with irregular or loculicidal dehiscence. *Seeds* large.

13 species; north temperate zone.

1. †ASARUM EUROPAEUM. Asarabacca. Plate 113

Asarum Gerard *Herb.* 688 [bis] (1597); Ray *Syn.* ed. 3, 158 (1724); *Asarum vulgare* Parkinson *Theatr. Bot.* 266 (1640).

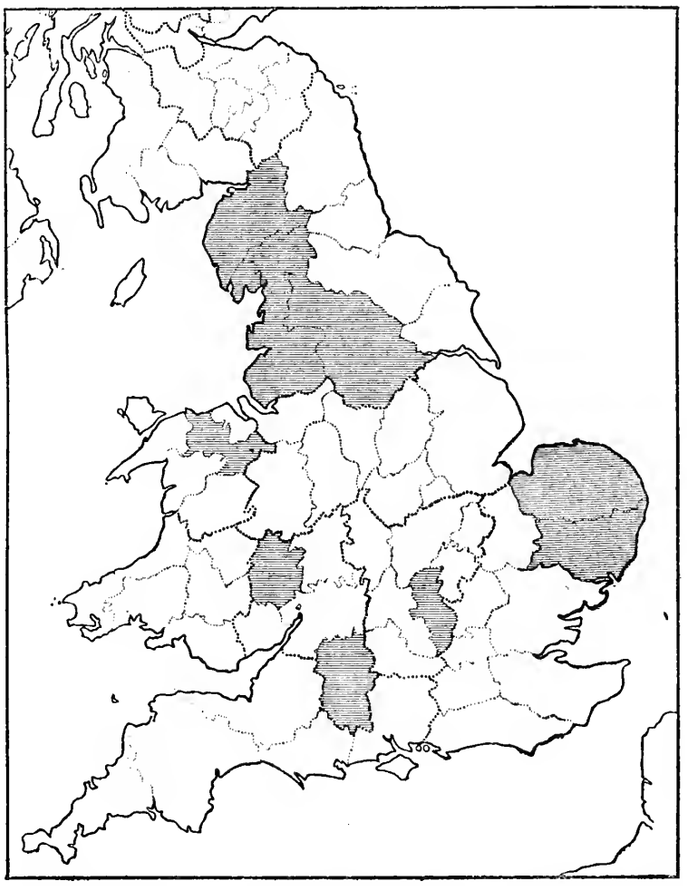
Asarum europaeum L. *Sp. Pl.* 442 (1753)!; Syme *Eng. Bot.* viii, 90 (1868); Rouy *Fl. France* xii, 296 (1910); Ascherson und Graebner *Syn.* iv, 679.

Icones:—*Fl. Dan.* t. 633; Smith *Eng. Bot.* t. 1083; Reichenbach *Icon.* xii, 668, fig. 1339.

Camb. Brit. Fl. ii. *Plate 113.* (*a*) Flowering plant. (*b*) Flower, with portion of perianth removed. (*c*) Upper portion of ovary (enlarged). (*d*) Transverse section of ovary (enlarged). (*e*) Stamen (enlarged). Hort., origin Westmorland (F. J. H.).

Exsiccata:—Billot, 450; Fries, xi, 55; v. Heurck et Martinis, vii, 333; Thielens et Devos, iv, 383; *Herb. Fl. Ingric.* iv, 549.

Geophilous, perennial herb, more or less hairy. *Roots* fibrous. *Rhizome* much branched, spreading quickly, odour strong. *Aërial stems* short, terete, each with 2 leaves. *Petioles* very much longer than the laminae. *Laminae* reniform, cordate at the base, entire or nearly so, about 3—4 cm. long and 6—8 broad. *Flowers* terminal, solitary, with a resinous odour. *Perianth* campanulate, segments incurved at first but straightening later, purplish, tinged with green on the outside, of a darker purple inside. *Style* furrowed. *Stigmas* large. *Capsule* subglobose. *Seeds* ∞ to each loculus, obovate.



Map 16. Distribution of †*Asarum europaeum* in England and Wales

The irregular occurrence of this plant in Great Britain (see Map 16) is perhaps explained by supposing that the plant is not indigenous here, since native species, especially shade-preferring plants whose habitats are widespread and of common occurrence, have usually a more definite area of distribution than is the case with *Asarum europaeum*. The plant was formerly cultivated as a simple. Once introduced into a suitable station, it spreads rapidly by means of its rhizomes, though in some localities, e.g., in a wood near Halifax where it was formerly abundant, this power of rapidly spreading has been unable to hold its own against the rapacity of herbalists and other collectors.

Local, in woods and other shady places, from Devonshire and Suffolk to central Scotland; a relic of cultivation usually, and perhaps not indigenous anywhere in Great Britain; not recorded for Ireland.

Southern Scandinavia (? indigenous), France, Germany, southern Europe, central and southern Russia, central Europe; Caucasus; Ural district. Ascends to 1400 m. in Vallis, Switzerland (Jaccard) and 1800 m. in Herzegovina (Handel-Mazzetti).

Tribe 2. **ARISTOLOCHIËAE*

Aristolochiëae Meisner *Plant. Vasc. Gen.* 334 (1841); Solereder in *Pflanzenfam.* iii, pt. i, 271 et 272 (1894); Ascherson und Graebner *Syn.* iv, 680 (1912).

For characters, see page 106. Only British genus:—**Aristolochia.*

Genus 2. *Aristolochia

Aristolochia [Tournefort *Inst.* 162, t. 71 (1719)] L. *Sp. Pl.* 960 (1753) et *Gen. Pl.* ed. 5, 410 (1754); Solereder in Engler und Prantl *Pflanzenfam.* iii, pt. i, 272 (1894); Ascherson und Graebner *Syn.* iv, 680 (1912).

Lianes or perennial herbs with rhizomes. *Laminae* usually simple and cordate, rarely lobed, stipule-like leaf. *Inflorescence* solitary. *Perianth* with tube dilated at the base, contracted above the base, dilated and obliquely 1—2 lipped at the top, hairy inside. *Stamens* usually 6, rarely 4 or more than 6, in a single whorl, adnate to the style. *Anthers* subsessile; connectives

modified into stigmatic lobes. *Ovary* oblong, 6-ridged. *Style* short, *Stigmas* 6, united into a subglobular concave head. *Capsule* large, subglobular, and with 6 loculi, with septicidal dehiscence. *Seeds* ∞ in each loculus, horizontal, 3-sided, compressed. *Endosperm* heart-shaped.

About 160 species, chiefly in the tropical and warm temperate zones. Only British species :—**A. clematitis.*

1. *ARISTOLOCHIA CLEMATITIS. Birthwort or Pipewort. **Plate 114**

Aristolochia clematis Gerard *Herb.* 697 (1597).

Aristolochia clematitis L. *Sp. Pl.* 962 (1753); Smith *Fl. Brit.* 947 (1804); Syme *Eng. Bot.* viii, 91 (1868); Rouy *Fl. France* xii, 300 (1910); Ascherson und Graebner *Syn.* iv, 684 (1912).

Icones :—Smith *Eng. Bot.* t. 398; *Fl. Dan.* t. 1235; *Fl. Lond.* ed. 2, t. 149; Reichenbach *Icon.* t. 669, fig. 1340.

Camb. Brit. Fl. ii. *Plate 114.* Cambridgeshire (E. W. H.).

Exsiccata :—Billot, 449; v. Heurck et Martinis, vii, 334; Reichenbach, 1148.

Perennial, glabrous herb. *Roots* fibrous. *Rhizome* long, slender, creeping, rather deep in the ground. *Aërial stems* erect, striate, not or little branched, leafy, about 3—6 dm. high. *Petioles* about 3—5 cm. long. *Laminae* cordate, entire, undulate, obtuse, rather thick, up to about 7 cm. long and 4—5 broad. *Inflorescence* axillary, with about 2—8 flowers. *Flowers* pedicelled; May to July. *Pedicels* ascending or erect, reflexed in fruit. *Perianth* pale yellow or buff or greenish yellow. *Capsule* pedicelled, pendant; August.

Naturalised, in the vicinity of ruins chiefly, from Kent to Suffolk, Oxfordshire, Yorkshire.

Naturalised in southern Scandinavia, Denmark, and western and north-central Europe, south-central Europe, southern Europe, Balkan peninsula (up to 500 m.); central and southern Russia; Asia Minor to central Asia.

Order 3. POLYGONALES

Polygonales Lindley *Nixus Plant.* 16 (1833); *Nat. Syst.* ed. 2, 210 (1836); Engler *Syll.* 101 (1892); in *Pflanzenfam. Nachtr.* 346 (1897); Ascherson und Graebner *Syn.* iv, 692 (1912); *Ochreatae* Engler *Führer* 35 (1886).

In some ways, the *Polygonales* serve as a connecting link of the *Petaloïdae* and the *Centrospermae*; and, in fact, some authorities (*e.g.*, Wettstein *Handb. Syst. Bot.* ed. 2 (1911)) include the *Polygonales* in the *Centrospermae.*

For characters, see page 103. Only family :—*Polygonaceae.*

Family 1. POLYGONACEAE

Polygonaceae Lindley *Nat. Syst.* ed. 2, 211 (1836); Dammer in *Pflanzenfam.* iii, pt. i a, 1 (1893); Ascherson und Graebner *Syn.* iv, 692 (1912); *Polygoneae* Jussieu *Gen. Pl.* 82 (1789).

Shrubs, undershrubs, or herbs. *Leaves* simple, usually alternate, and (in the British forms) with stipular sheaths (=ochreae) which clasp the stem and axillary bud. *Perianth* with 3—6 segments, wholly or partially persistent, becoming more or less adherent to the achene. *Inflorescences* compound, the ultimate branches usually cymose or reduced to a single flower. *Stamens* perigynous, 4—9. *Stigmas* 2 or 3, tufted or capitate. *Ovary* superior, unilocular, uniovulate. *Ovule* basal, orthotropous. *Achenes* trigonous (when 3 stigmas are present), or bifacial (when 2 stigmas are present). *Embryo* curved or straight. *Endosperm* present, usually copious.

About 30 genera and 750 species; cosmopolitan, but chiefly in the north temperate zone.

British subfamilies of *Polygonaceae*

Subfamily 1. **Polygonoïdeae** (p. 109). *Ochreae* present. *Perianth* monochlamydeous, usually petaloid, with 3—6, usually 5 spirally arranged segments; segments subequal in size.

Subfamily 2. **Rumicoïdeae** (p. 127). *Ochreae* present (in the British forms), or not. *Perianth* heterochlamydeous, 2-whorled, each whorl with 2 or 3, usually 3 segments, petaloid or sepaloid, inner whorl with larger segments than the outer whorl.

A third subfamily (*Coccolobioïdeae* Dammer *op. cit.* pp. 8 et 30 (1893)), having the endosperm fissured, is not British.

We place the *Polygonoïdeae* before the *Rumicoïdeae* as we regard the heterochlamydeous and cyclically arranged perianth of the latter group, as well as its anemophilous habit and its unusual fruit-characters, as indicating that it is more specialised and less primitive than the former.

Subfamily 1. *POLYGONOÏDEAE*

Polygonoïdeae Dammer in Engler und Prantl *Pflanzenfam.* iii, pt. 1 a, 8 (1893); Ascherson und Graebner *Syn.* iv, 798 (1912).

For characters, see page 108. Only British genus:—*Polygonum.*

Genus 1. Polygonum

Polygonum [Tournefort *Inst.* 510, t. 290 (1719) incl. *Persicaria* p. 509, t. 290, et *Fagopyrum* p. 511, t. 290, et *Bistorta* p. 511, t. 291] L. *Sp. Pl.* 359 (1753) et *Gen. Pl.* ed. 5, 170 (1754); Dammer in Engler und Prantl *Pflanzenfam.* iii, pt. 1 a, 25 (1893); Ascherson und Graebner *Syn.* iv, 800 (1912).

Undershrubs (rarely), or perennial or annual herbs. *Leaves* usually smaller than in *Rumex*, with ochreae which sometimes enclose cleistogamous flowers. *Flowers* entomophilous. *Bracteoles* 2. *Perianth* monochlamydeous, usually petaloid, acyclic, segments 3—6 usually 5, subequal in size, gamosepalous, persistent, not enlarging much in fruit, not becoming tubercled. *Stamens* 5—8, usually 8, honey-glands often present at the bases of the stamens and alternating with them. *Anthers* versatile. *Stigmas* usually capitate. *Achenes* more or less enclosed by the persistent perianth. *Embryo* usually lateral, rarely central.

About 150 species; cosmopolitan, but chiefly in the temperate zones.

Sections of *Polygonum*

Section I. ***Fagopyrum** (see below). Annual or perennial. *Stems* erect. *Laminae* cordate at the base. *Perianth* petaloid. *Stamens* 8. *Stigmas* 3. *Embryo* central. *Cotyledons* broad, folded.

Section II. **Tiniaria** (p. 110). Annual or perennial. *Stem* usually twining. *Ochreae* truncate, upper margin entire. *Laminae* cordate at the base. *Inflorescence* axillary. *Perianth* more or less sepaloid, sometimes becoming keeled or winged in fruit. *Stamens* 8. *Style* short. *Achenes* triquetrous. *Cotyledons* narrow, flat.

Section III. ***Echinocaulon** (p. 112). Annual herbs. *Stem* weak, 4-gonous, with reflexed prickles. *Ochreae* truncate. *Petioles* long. *Laminae* cordate at the base. *Perianth* petaloid. *Stamens* 5—8. *Styles* as long as the stigmas. *Stigmas* 2—3. *Achenes* lenticular or triquetrous. *Cotyledons* accumbent, thin, flat.

Section IV. **Bistorta** (p. 112). Perennial herbs with rhizomes. *Aërial stem* erect, unbranched. *Ochreae* truncate at the top. *Petioles* long. *Laminae* often oblong. *Inflorescence* terminal, spicate, cylindrical, dense-flowered. *Perianth* petaloid. *Stamens* 8. *Styles* long. *Achenes* triquetrous. *Cotyledons* thin, flat, accumbent.

Section V. **Persicaria** (p. 114). Annual or rarely perennial herbs. *Stems* erect or decumbent. *Ochreae* truncate, subentire. *Petioles* very short or distinct. *Inflorescences* spicate. *Pedicels* jointed at the top. *Perianth* petaloid. *Flowers* sometimes cleistogamous. *Stamens* 4—8. *Filaments* filiform. *Achenes* trigonous or bilaterally compressed. *Cotyledons* accumbent, thin, flat.

Section VI. **Centinode** (p. 122). Perennial or annual herbs. *Stems* prostrate or ultimately decumbent, rarely remaining erect, striate. *Ochreae* ultimately more or less silvery or membranous, ultimately lacerate, sometimes containing cleistogamous flowers. *Petioles* very short. *Inflorescences* axillary, few-flowered. *Pedicels* jointed at the top. *Perianth* petaloid. *Stamens* 5—8. *Inner filaments* broad at the base. *Achenes* trigonous or subtrigonous. *Cotyledons* incumbent, thin, flat.

Section I. **FAGOPYRUM*

Fagopyrum [Tournefort *Inst.* 511, t. 290 (1719) as a genus, partim] Meisner *Monogr. Polyg.* 43 et 61 (1826); Dammer in Engler und Prantl *Pflanzenfam.* iii, pt. 1 a, 29 (1893) as a genus; Rouy *Fl. France* xii, 92 (1910).

For characters, see above. Only British species:—**P. fagopyrum.*

1. *POLYGONUM FAGOPYRUM. Buckwheat. Plate 115

Tragopyrum Gerard *Herb.* 82 (1597); *Fegopyrum* Ray *Syn.* ed. 3, 144 (1724).

Polygonum fagopyrum L. *Sp. Pl.* 364 (1753)!; Martyn *Fl. Rust.* no. 46 (1792); Syme *Eng. Bot.* viii, 59 (1868); Rouy *Fl. France* xii, 93 (1910); *Fagopyrum sagittatum* Gilibert *Exerc. Phyt.* ii, 435 (1792); *F. esculentum* Moench *Meth. Pl.* 290 (1794); *Fagopyrum fagopyrum* Karsten *Deut. Fl.* 522 (1883).

Icones :—Miller *Illustr. Syst.*; *Eng. Bot.* t. 1044; Beck in Reichenbach *Icon.* t. 227, as *Fagopyrum sagittatum.*

Camb. Brit. Fl. ii. *Plate 115.* (*a*) Flowering shoot. (*b*) Flowers (enlarged). (*c*) Persistent perianth and achene (enlarged). (*d*) Pistil (enlarged). Huntingdonshire (E. W. H.).

Annual. *Stem* erect, not climbing, about 3—4 dm. high. *Ochreae* short. *Petioles* of lower leaves long, of upper leaves short or none. *Laminae* cordate, acute. *Inflorescence* rather lax. *Flowers* dimorphic, long-styled or short-styled; July and August. *Perianth* white or pink; segments as long as the tube, with yellow glands at the base. *Stamens* 5—8. *Styles* 3, long, ultimately reflexed. *Achenes* triquetrous. *Seeds* brown.

Locally a common crop, as in the cultivated parts of the Fen District, and spreading into adjoining waste places; also in woods and plantations, where the seeds are scattered as food for the game; northwards to central Scotland.

More or less naturalised in Europe (excl. Arctic) and occurring up to 1200 m. in the Tyrol; said to be indigenous in central Asia.

Section II. *TINIARIA*

Tiniaria Meisner *Monogr. Polyg.* 43 et 62 (1826); in DC. *Prodr.* xiv, 135 (1856); Dammer in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 29 (1893). [*Fagopyrum* Tournefort *Inst.* 511, t. 290 (1719) as a genus, partim.]

For characters, see page 109.

British species of *Tiniaria*

2. **P. convolvulus** (see below). *Outer perianth segments* not or only narrowly winged, rounded or obtuse at the base. *Achenes* dull, punctate.

3. **P. dumetorum** (p. 111). *Outer perianth segments* broadly winged, attenuate at the base. *Achenes* shining.

2. POLYGONUM CONVOLVULUS. Black Bindweed. Plates 116, 117

Volubilis nigra Gerard *Herb.* 713 (1597); *Convolvulus minor atriplicis folio* Parkinson *Theatr. Bot.* 171 (1640); *Fegopyrum scandens sylvestre* Ray *Syn.* ed. 3, 144 (1724).

Polygonum convolvulus L. *Sp. Pl.* 364 (1753)!; Syme *Eng. Bot.* viii, 61 (1868); Rouy *Fl. France* xii, 93 (1910).

Annual. *Stem* about 5—10 dm. in length, climbing, slender, angular, ridges puberulous. *Petioles* shorter than the laminae. *Laminae* cordate-sagittate, acute to acuminate. *Inflorescence* peduncled, interrupted; partial inflorescences 3—6 flowered. *Pedicel* shorter than the fruit, jointed above the middle. *Flowers* July to September. *Perianth* greenish-white or pinkish, segments obtuse, white at the margin, eventually 5 mm. long, remaining wingless or becoming narrowly winged in fruit. *Anthers* violet. *Achenes* enclosed by the persistent perianth, which is wingless or narrowly winged, punctate, broader than in *P. dumetorum* and sides less concave, dull, blackish.

(*a*) **P. convolvulus** var. **genuinum** Syme *Eng. Bot.* viii, 61 (1868).

Icones :—Curtis *Fl. Lond.* ii, t. 82, as *P. convolvulus*; Smith *Eng. Bot.* t. 941, as *P. convolvulus*; *Fl. Dan.* t. 744, as *P. convolvulus*; Beck in Reichenbach *Icon.* t. 222, as *P. convolvulus.*

Camb. Brit. Fl. ii. *Plate 116.* (*a*) Flowering shoot. (*b*) Persistent perianths (enlarged), enclosing ripening achenes. Huntingdonshire (E. W. H.).

Exsiccata :—Linn. herb., as *P. convolvulus*; Billot, 1545, as *P. convolvulus*; Todaro, 766, as *P. convolvulus*; *Herb. Fl. Ingric.* iv, 545, as *P. convolvulus.*

Stem about 5—6 dm. *Laminae* about as long as broad. *Inflorescence* few-flowered. *Perianth segments* wingless.

Throughout the British Isles, chiefly in arable land and waste places.

(*b*) **P. convolvulus** var. **subalatum** Lejeune et Courtois *Comp. Fl. Belg.* ii, 59 (1831); Rouy *Fl. France* xii, 93 (1910); *P. convolvulus* var. *pseudo-dumetorum* H. C. Watson in *Lond. Cat. Brit. Plants* ed. 6, 19 (1861) nomen; Syme *Eng. Bot.* viii, 61 (1868); *P. convolvulus* × *dumetorum* Gürke *Pl. Europ.* ii, 124 (1897).

Icones:—*Fl. Dan.* t. 756, as *P. dumetorum.*

Camb. Brit. Fl. ii. *Plate 117.* (*a*) Shoot with ripening fruits. (*b*) Flowers (one enlarged). (*c*) Persistent perianth (enlarged), enclosing ripe achene. Cambridgeshire (E. W. H.).

Laminae about twice as long as broad. *Inflorescence* many-flowered. *Exterior perianth-segments* eventually narrowly winged.

Though this variety is intermediate between *P. dumetorum* and *P. convolvulus* var. *genuinum*, there is, if we may judge by its distribution, no reason to regard it as a hybrid, though some authorities do so. It is not infrequently mistaken for *P. dumetorum.*

Less widely distributed than var. *genuinum*, but common in the south and east of England; partial to light soils, and occurring on sand-dunes; from Cornwall and Kent to Shropshire and the West Riding of Yorkshire; Glamorganshire; Ireland; not recorded for Scotland.

Finland, Denmark, Germany, Belgium, France, Switzerland, and doubtless elsewhere.

Arable land, waste places, hedgerows, copses, and bushy places on sand-dunes; generally distributed throughout the British Isles, as far north as Orkney; local in western and northern Scotland, and in uncultivated, upland districts generally; ascending to 410 m. on the Pennines, but only adventitious at the higher altitudes in its more northerly stations.

Europe (excl. Arctic), ascending to 2300 m. in the Alps; northern Africa; Asia; naturalised in North America and in South Africa.

3. POLYGONUM DUMETORUM. Plate 118

Polygonum dumetorum L. *Sp. Pl.* ed. 2, 522 (1762)!; Babington in *Trans. Linn. Soc.* xvii, 459 (1836); Syme *Eng. Bot.* viii, 62 (1868); Rouy *Fl. France* xii, 94 (1910); *P. scandens* var. *β* L. *Sp. Pl.* 365 (1753).

Icones:—Babington in *Eng. Bot. Suppl.* t. 2811; Beck in Reichenbach *Icon.* t. 223, fig. 1—4.

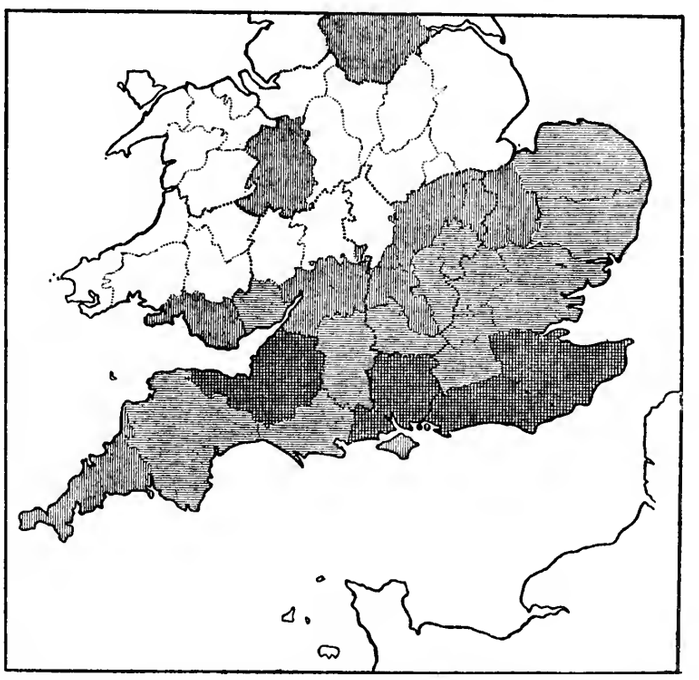
Camb. Brit. Fl. ii. *Plate 118.* (*a*) Shoot with ripening fruits. (*b*) Persistent perianths (enlarged), each enclosing a ripe achene. (*c*) Ripe achenes (enlarged). Surrey.

Exsiccata:—Billot, 843; Fries, xiii, 67; Todaro, 670; *Herb. Fl. Ingric.* vi, 546.

Annual. *Stem* climbing, 8 or 9 dm. high, roundish in outline, striate, smooth. *Petioles* about half as long as the laminae. *Laminae* cordate-sagittate, acute to acuminate, smaller than in *P. convolvulus*, relatively broader than in *P. convolvulus* var. *subalatum. Inflorescences* lax-flowered, more floriferous than in *P. convolvulus*; partial inflorescences very numerous. *Pedicels* about as long as the fruits, capillary, jointed below the middle, reflexed in fruit. *Flowers* July and August. *Outer perianth-segments* becoming broadly winged in fruit, obovate, about 3 mm. long and 2 broad, decurrent on the pedicel. *Achenes* black, shining, sides concave.

"It was abundant near Chilworth, Surrey, festooning bushes in a wood, in 1910. In 1911, there was not a sign of a single plant; yet the conditions appeared to be identical" (C. E. Salmon, *in litt.*).

Hedgebanks, bushy places, and woods; local; Hampshire, Dorset, Devonshire, Somerset, Sussex, Kent, Surrey, Essex, Hertfordshire, Wiltshire, Monmouthshire, Berkshire, Buckinghamshire.



Map 17. *P. dumetorum* occurs in the counties which are darkly shaded, and *P. convolvulus* var. *subalatum* in all the shaded counties

Southern Scandinavia, Denmark, Germany, France, central Europe (ascending to 1250 m. in Switzerland), Russia, southern Europe; Asia; North America (fide Gray's *New Man.* 363 (1908)).

Section III. *ECHINOCAULON

Echinocaulon Meisner in Wallich *Plant. Asiat. Rar.* iii, 58 (1832); Meisner in DC. *Prodr.* xiv, 84 et 131 (1856); Dammer in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 28 (1893) as a subsection.

For characters, see page 109. Only British species:—**P. sagittatum.*

4. *POLYGONUM SAGITTATUM. American Tear-thumb. Plate 119

Polygonum sagittatum L. *Sp. Pl.* 363 (1753)!; Robinson and Fernald in Gray *New Man.* 362 (1908).

Icones:—*Camb. Brit. Fl.* ii. *Plate 119.* (*a*) Flowering shoot. (*b*) Portion of leaf (enlarged). (*c*) Ochrea (enlarged) cut open and laid flat. (*d*) Portions of stem (enlarged). (*e*) Flower (enlarged). (*f*) Pistil (enlarged). (*g*) Achenes (one enlarged). Co. Kerry (G. C. D.).

Annual. *Stem* 4-angled. *Petioles* about a fifth as long as the laminae. *Laminae* narrowly sagittate, margin more or less bristly, midrib prickly underneath. *Peduncles* short, not bristly. *Stamens* usually 8. *Stigmas* 3. *Achenes* trigonous.

First recorded by Mr R. W. Scully (in *Bot. Exch. Club Rep. for 1906*, 26 (1907)) as *P. arifolium* L. The name was corrected later (*op. cit.*, p. 384). *P. arifolium* has longer petioles, broader laminae, and larger achenes than *P. sagittatum*, and peduncles which are glandular-bristly, and only 6 stamens.

Abundant in the stony bed of a small stream, just above tidal influence, at Castle Cove, Kenmare Bay, co. Kerry, Ireland; abundant also in a small damp hollow, a mile further north, at about 60 m. above sea-level. Said to have been accidentally introduced into the first locality, owing to the wreck on the adjacent coast of a small vessel laden with Indian corn (*Zea maïs*), and to have been carried to the second by cattle; now quite established (see *Bot. Exch. Club Report for 1906*, ii, 241—2 (1907)).

Indigenous in North America (as var. *americanum* Meisner in DC. *Prodr.* xiv, 132 (1856)) and in central Asia (as var. *sibiricum* Meisner *loc. cit.*).

Section IV. *BISTORTA*

Bistorta [Tournefort *Inst.* 511, t. 291 (1719) as a genus] DC. *Fl. France* iii, 364 (1815); Don *Prodr. Fl. Nepal.* 69 (1825); Meisner *Polyg. Monogr.* 43 et 50 (1826); in DC. *Prodr.* xiv, 101 (1856); Dammer in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 27 (1893) as a subsection.

For characters, see page 109.

British species of *Bistorta*

5. **P. bistorta** (see below). *Laminae* decurrent on to the petiole. *Spikes* stout.
6. **P. viviparum** (p. 113). *Laminae* not decurrent. *Spikes* slender.

5. POLYGONUM BISTORTA. Bistort or Snake-root. Plate 120

Bistorta major Gerard *Herb.* 222 (1597) including *B. latifolia*; Ray *Syn.* ed. 3, 147 (1724).

Polygonum bistorta L. *Sp. Pl.* 360 (1753)!; Syme *Eng. Bot.* viii, 78 (1868); Rouy *Fl. France* xii, 95 (1910).

Icones:—Curtis *Fl. Lond.* i, t. 71; Smith *Eng. Bot.* t. 509; *Fl. Dan.* t. 421; Beck in Reichenbach *Icon.* xxiv, t. 219, as *P. bistorta.*

Camb. Brit. Fl. ii. *Plate 120.* (*a*) Flowering scape. (*b*) Lower leaf. (*c*) Portion of plant, with rhizome and roots. (*d*) Ochrea (enlarged). (*e*) Flower (enlarged). (*f*) Pistil (enlarged). West Riding of Yorkshire (J. N.).

Exsiccata:—Billot, 2357, 2357 bis; Bourgeau, 65; Fries, xi, 52; Reichenbach, 480.

Perennial. *Rhizome* stout, contorted, creeping. *Aërial stem* erect, 2—5 dm. high, slender, unbranched. *Petiole* long (10—30 cm.). *Laminae* of the ground-leaves oval-oblong to oblong, decurrent below, obtuse to subacute at the apex, about 7·5—15·0 cm. long and 4—7 broad, glaucous underneath; of the stem-leaves subsessile, acute. *Spike* about 3·8—5·0 cm. long and 1·5 broad, dense-flowered, cylindrical. *Flowers* honeyed, protandrous; June, and a second display in September. *Perianth* about 4 mm. in diameter, pink, rarely white; segments 5, rounded. *Stamens* 8, exserted. *Anthers* small. *Achenes* trigonous, angles prominent, brown, shining.

Formerly used medicinally, and still gathered, under the name of "Pash dock" or Passion dock, in the north of England for culinary purposes. In many districts, it exists merely as a relic of cultivation; but it is difficult to resist the conclusion that it is indigenous on the siliceous soils of the Pennines (and doubtless elsewhere), where it simulates its occurrence in the Swiss sub-Alpine manured pastures. It is a nitrophilous or heminitrophilous plant.

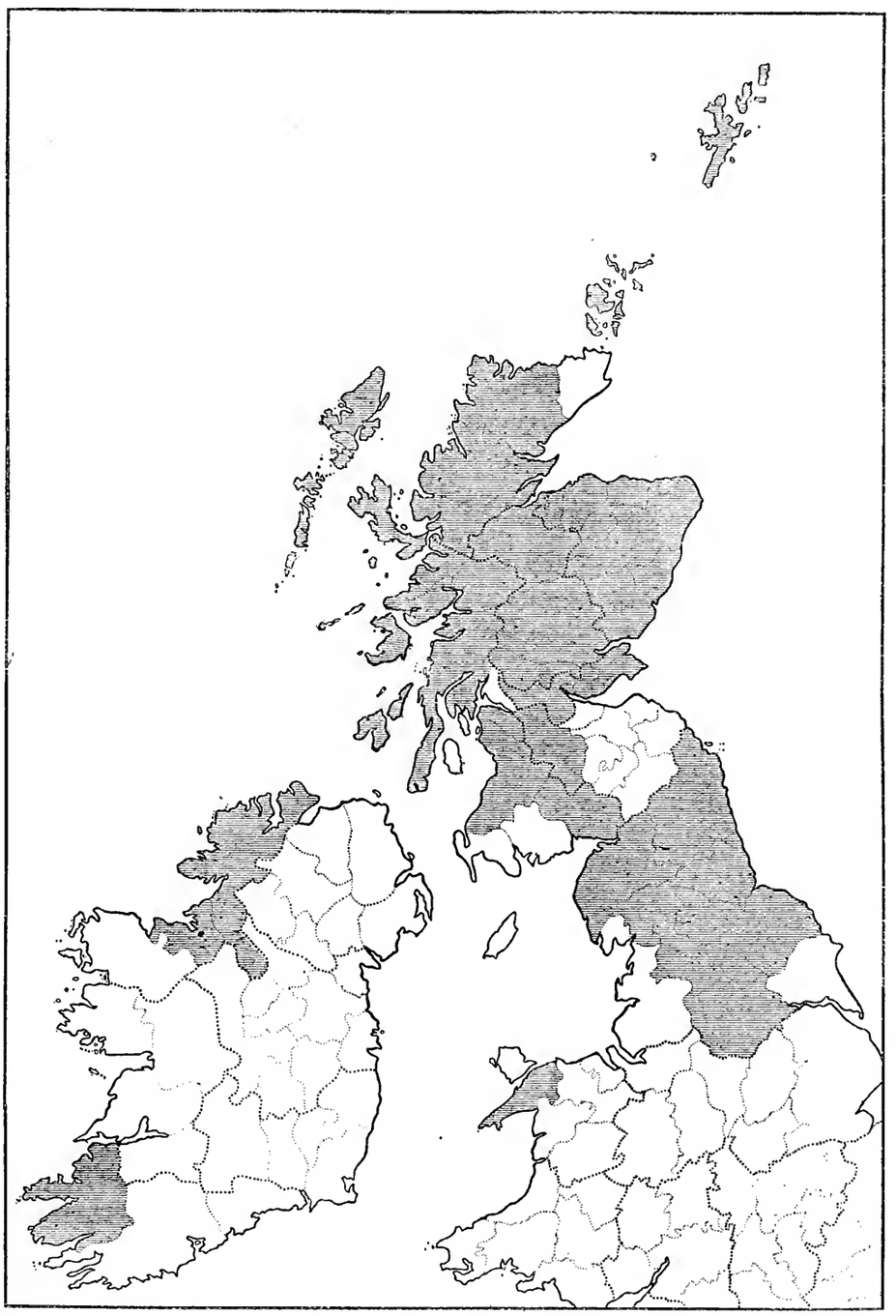
Damp pastures of cultivated land where it is locally, as on the lower slopes of the Pennines, a social plant, and also by stream-sides and in grassy woods; most abundant on siliceous soils. Rather local, but occurring throughout almost the whole of England and Wales, and southern and north-eastern Scotland; rare in western and northern Scotland; rather local in Ireland, except the north-east; ascending to 330 m. in the West Riding of Yorkshire.

Scandinavia, Denmark, Germany, France, central Europe (to 2400 m. in the Alps), mountains of southern Europe; Asia Minor, central Asia.

6. POLYGONUM VIVIPARUM. Alpine Bistort. Plate 121

Bistorta minor Gerard *Herb.* 322 (1597); Ray *Syn.* ed. 3, 147 (1724).

Polygonum viviparum L. *Sp. Pl.* 360 (1753)!; Syme *Eng. Bot.* viii, 80 (1868); Rouy *Fl. France* xii, 95 (1910).



Map 18. Distribution of *Polygonum viviparum* in the British Isles

Icones :—Hooker in Curtis *Fl. Lond.* ed. 2, iv, 81 ; Smith *Eng. Bot.* t. 669 ; *Fl. Dan.* t. 13 ; Beck in Reichenbach *Icon.* xxiv, t. 220.

Camb. Brit. Fl. ii. *Plate 121.* (*a*) Plants with flowers and bulbils. (*b*) Flowers (one enlarged). (*c*) Pistils (one enlarged). (*d*) Bulbils (one enlarged). Forfarshire (E. S. M.).

Exsiccata :—Billot, 3463 ; 3463 bis ; Reichenbach, 1045 ; *Herb. Fl. Ingric.* iv, 537.

Perennial. *Rhizome* much more slender than in *P. bistorta.* *Aërial stem* up to 3 dm. high, unbranched. *Petiole* relatively shorter than in *P. bistorta.* *Laminae* of ground-leaves usually narrowly elliptical, about 5—7 cm. long and 0·6—1·0 wide, attenuate at both ends, not decurrent, margins revolute, rather glaucous underneath ; stem-leaves few. *Spike* long (2·5—7·5 cm.) and slender (0·7 cm.), cylindrical, rather lax-flowered, frequently with reddish bulbils below which sometimes germinate *in situ.* *Flowers* frequently replaced by bulbils ; June to August. *Perianth* white or flesh-coloured. *Stigmas* as long as the stamens, obtuse. *Achenes* trigonous, frequently abortive.

(*β*) forma **alpinum** nobis ; *P. viviparum* var. *alpinum* Wahlenberg *Fl. Lapp.* 99 (1812).

Bistorta alpina pumila et alpina pumila varia Parkinson *Theatr. Bot.* 392 (1640) ; *B. minima alpina foliis imis subrotundis et minutissime serratis* D. Llwyd in Ray *Syn.* ed. 3, 147 (1724).

A smaller plant of exposed situations. *Rhizome* relatively stouter. *Laminae* of the lower leaves oval or even subrotund, relatively much broader.

Carnarvonshire (Llwyd, *loc. cit.*), Forfarshire (herb. Tennant in Herb. Univ. Cantab.), Hebrides (Babington *Man.* ed. 9, p. 361), Shetland (R. Tate in Herb. Univ. Cantab. (1865)).

Sweden, Finland, Spitzbergen, and doubtless elsewhere.

Damp, mountainous grassland, and grassy ledges of mountainous cliffs, chiefly on calcareous soil. Wales—Carnarvonshire ; central and northern Pennines ; south-western, central, and southern Scotland ; Ireland—counties Kerry, Sligo, Leitrim, and Donegal ; ascending to 1220 m. in Scotland.

Arctic and sub-Arctic, Alpine and sub-Alpine districts in Europe, ascending to 2850 m. in Switzerland ; Asia (including Asia Minor) and America.

Section V. *PERSICARIA*

Persicaria [Tournefort *Inst.* 511, t. 290 (1719) as a genus] DC. *Fl. France* iii, 365 (1815) ; Meisner *Polyg. Prodr.* 43 et 66 (1826) ; in DC. *Prodr.* xiv, 101 (1856) ; *Persicariae typicae* Bentham and Hooker *Gen. Plant.* iii, 98 (1883) ; Dammer in Engler und Prantl *Pflanzenfam.* iii, pt. 1a, 27 (1893) as a subsection.

For characters, see page 109.

British series of *Persicaria*

Series i. **Amphibia** (see below). Perennial herbs. *Ochreae* usually not, rarely shortly ciliate. *Peduncles* eglandular. *Flowers* often heterostylous. *Spikes* cylindrical, stout, dense-flowered, erect. *Perianths* eglandular. *Achenes* bifacial ; faces convex.

Series ii. **Persicariae** (p. 115). Annuals. *Ochreae* often with short appressed pubescence, ciliate. *Peduncles* eglandular. *Spikes* rather stout, dense-flowered, erect. *Flowers* often cleistogamous. *Perianth* eglandular. *Achenes* bifacial or trigonous.

Series iii. **Lapathifolia** (p. 116). Annuals. *Ochreae* pubescent, not or slightly ciliate. *Peduncles* glandular. *Spikes* more or less stout, dense-flowered, erect. *Flowers* often cleistogamous. *Perianth* glandular. *Achenes* bifacial.

Series iv. **Hydropiperes** (p. 118). Annuals. *Ochreae* rather ciliate. *Peduncles* glandular. *Spikes* more slender than in the preceding series, rather lax-flowered, drooping. *Flowers* often cleistogamous. *Perianth* glandular. *Achenes* bifacial or trigonous.

Series v. **Minores** (p. 119). Annuals. *Ochreae* ciliate. *Spikes* more slender than in *Hydropiperes*, lax-flowered, erect or somewhat drooping. *Peduncles* slender, eglandular. *Flowers* often cleistogamous. *Perianth* eglandular. *Achenes* bifacial or trigonous.

Series i. *Amphibia*

Amphibia nobis. For characters, see above. Only British species :—*P. amphibium.*

7. POLYGONUM AMPHIBIUM. Amphibious Bistort. Plate 122

Potamogiton angustifolium Gerard *Herb.* 675 (1597); *Persicaria salicis folio perennis potamogiton angustifolium dicta* Ray *Syn.* ed. 3, 145 (1724).

Polygonum amphibium L. *Sp. Pl.* 361 (1753)!; Syme *Eng. Bot.* viii, 77 (1868); Rouy *Fl. France* xii, 96 (1910).

Icones :—Curtis, *Fl. Lond.* ii, t. 81; Smith *Eng. Bot.* t. 436; *Fl. Dan.* t. 182; Beck in Reichenbach *Icon.* xxiv.

Camb. Brit. Fl. ii. *Plate 122.* (*a*) Flowering shoot of *P. amphibium.* (*b*) Young shoot of *P. amphibium* f. *terrestre.* (*c*) Flowers (enlarged), one with perianth dissected. (*d*) Pistil (enlarged). Huntingdon (E. W. H.).

Exsiccata :—Billot, 1061, as *P. amphibium* var. *natans*; 1061 bis; Todaro, 1074; *Herb. Fl. Ingric.* vi, 538 *b*, as *P. amphibium* var. *caenosum.*

Perennial. *Rhizome* long, slender, branched. *Aërial stem* erect, not or little branched. *Ochreae* large (8—10 cm. long), appressed to the stem, entire at first, ultimately more or less laciniate. *Laminae* usually floating on the water, subcordate at the base, large, up to 10—12 cm. long and 3 broad. *Peduncle* stout, longer than the spike, up to 5 or 6 cm. long, eglandular. *Spike* solitary or subsolitary, about 4 cm. long. *Bracts* ovate. *Flowers* crowded; July to September. *Perianth* subsessile, deeply cleft; segments about 4 mm. long, not obviously nerved, rosy red. *Stamens* 5, as long as the perianth. *Style* as long as the stigmas. *Stigmas* 2, large, stout. *Achenes* broadly obovate, much shorter than the persistent perianth, about 3 mm. long and 2 broad.

(*β*) forma **terrestre** nobis; *P. amphibium* var. *terrestre* Leysser *Fl. Hal.* 391 (1761); Leers *Fl. Herborn.* ed. 2, 99 (1799); Stokes *Bot. Mat. Med.* ii, 391 (1812); Rouy *Fl. France* xii, 96 (1910).

Icones :—Syme *Eng. Bot.* t. 1241, as "*P. amphibium, terrestre.*"

Exsiccata :—*Herb. Fl. Ingric.* ix, 538 *b*, as *P. amphibium* var. *terrestre.*

A state of damp or dry soils. *Stem* more or less hairy, about 3—10 dm. high. *Ochreae* ciliate. *Petioles* shorter than in the water-form. *Laminae* larger and more hairy.

Ponds, ditches, and marshes; waste places, arable land, and road-sides; locally abundant throughout the British Isles, chiefly in lowland districts.

Faeröes, Scandinavia, Denmark, Germany, France, central Europe, Russia, southern Europe; Asia; North America; South Africa.

Series ii. *PERSICARIAE*

Persicariae nobis.

For characters, see page 114. Only British species :—*P. persicaria.*

8. POLYGONUM PERSICARIA. Common Persicaria. Plate 123

Persicaria maculosa Gerard *Herb.* 361 (1597); Ray *Syn.* ed. 3, 145 (1724).

Polygonum persicaria L. *Sp. Pl.* 361 (1753)!; Smith *Fl. Brit.* 424 (1800); *Engl. Fl.* ii, 233 (1824); Syme *Eng. Bot.* viii, 74 (1868); Rouy *Fl. France* xii, 97 (1910); *P. ruderale* Salisbury *Prodr.* 259 (1796); *Persicaria maculosa* Gray *Nat. Arr.* ii, 269 (1821); *P. biforme* Wahlenberg *Fl. Suec.* i, 242 (1826).

Camb. Brit. Fl. ii. *Plate 123.* (*a*) Flowering shoot. (*b*) Part of stem, with leaf, of *P. persicaria* var. *elatum.* (*c*) Lower part of stem of var. *elatum.* (*d*) Ochrea (enlarged) of var. *elatum.* (*e*) Achenes (enlarged). (*f*) Persistent perianths (enlarged), enclosing nutlets. (*g*) Peduncle (enlarged). Huntingdonshire (E. W. H.).

Annual. *Stem* erect and up to about 2—5 dm. high or decumbent, branched; branches more or less divaricate and remote; nodes more or less swollen. *Ochreae* loose, short, ciliate with long hairs. *Petioles* short. *Laminae* ovate-lanceolate, frequently with a dark blotch, more or less pubescent underneath, eglandular, upper ones subsessile. *Peduncles* short, punctate, eglandular. *Spike* cylindrical, erect or suberect, lateral ones subsessile. *Perianth* eglandular or only minutely glandular, pink, rarely white; early July to October. *Stamens* 5—8, shorter than the perianth. *Anthers* small, oval, those of the outer stamens extrorse. *Style* as long as the *stigmas.* *Stigmas* 2—3, ultimately divaricate, globose, stout. *Achenes* bifacial or trigonous, suborbicular-acute, about 2·5 mm. long and 2·0 broad, equal in length to the persistent perianth, nearly black.

(*a*) **P. persicaria** var. **elatum** Grenier et Godron *Fl. France* iii, 48 (1855); Syme *Eng. Bot.* viii, 74 (1868) excl. syn. Persoon et syn. Meisner; *P. persicaria* subsp. *biforme* Fries *Fl. Suec. Mant.* ii, 28 (1839)!; *P. persicaria* var. *elatius* Meisner in DC. *Prodr.* xiv, 118 (1856); *P. persicaria* subsp. *nodosum* Dyer and Trimen in *Journ. Bot.* ix, 37 (1871) partim; *P. persicaria* race *biforme* Rouy *Fl. France* xii, 97 (1910).

Icones :—Curtis *Fl. Lond.* i, t. 72 as *P. persicaria*; Smith *Eng. Bot.* t. 756, as *P. persicaria.*

Camb. Brit. Fl. ii. *Plate 123.* (*b, c, d.*)

Exsiccata :—Fries, x, 57, as *P. persicaria* var. *biforme*; Reichenbach, 773, as *P. persicaria*; v. Heurck et Martinis, iv, 185.

Stem tall (3—10 dm.), branches less divaricate than in the succeeding varieties. *Laminae* lanceolate-acuminate, longer and relatively narrower. *Ochreae* rather closely appressed. *Spikes* less divaricate, longer, lateral ones peduncled.

Chiefly in damp places; ditch banks and arable land. Cornwall, Sussex, Surrey, Middlesex, Cambridgeshire, Essex, Northamptonshire, Herefordshire, Warwickshire, North Riding of Yorkshire; Glamorganshire; Perthshire, and doubtless elsewhere.

Europe.

(*b*) **P. persicaria** var. **agreste** Meisner in DC. *Prodr.* xiv, 118 (1856); *P. persicaria* subsp. *agreste* Fries *Fl. Suec. Mant.* ii, 27 (1839)!; *P. persicaria* var. *genuinum* Grenier et Godron *Fl. France* iii, 48 (1855); Syme *Eng. Bot.* viii, 74 (1868) ? excl. syn. Persoon; *P. persicaria* subsp. *persicaria-verum* Dyer and Trimen in *Journ. Bot.* ix, 37 (1871) excl. syn. Syme; *P. persicaria* race *agreste* Rouy *Fl. France* xii, 97 (1910).

Icones :—*Fl. Dan.* t. 702, as *P. persicaria*; Syme *Eng. Bot.* viii, t. 1237, as *P. persicaria* var. *genuinum*; Reichenbach *Iconogr.* t. 491, fig. 684, as *P. persicaria.*

Camb. Brit. Fl. ii. *Plate 123.* (*a, e, f, g.*)

Exsiccata :—Billot, 1063, as *P. persicaria*; Fries, iv, 74, as *P. persicaria.*

Plant smaller than var. *elatum.* *Ochreae* looser. *Laminae* larger. *Spikes* shorter. *Pedicels* shorter.

This is the common form of the species in the British Isles.

(*c*) **P. persicaria** var. **ruderale** Meisner in DC. *Prodr.* xiv, 118 (1856); *P. persicaria* race *ruderale* Rouy *Fl. France* xii, 98 (1910).

The smallest of the three varieties. *Stem* decumbent, branched from the base; branches diffuse; nodes little swollen. *Laminae* narrowly lanceolate or oblong, about 2·5—4·0 cm. long and relatively narrower than in the other varieties, usually pubescent on both sides, often not blotched. *Spikes* short, often interrupted below.

We suspect this to be merely a state of dry habitats.

Usually in dry waste places; Cornwall, Berkshire, and doubtless elsewhere.

Europe.

Faeröes, Iceland, Scandinavia, Denmark, Germany, France, central Europe, Russia; southern Europe; northern Africa; Asia; America.

P. hydropiper × *persicaria* (p. 119); *P. laxiflorum* × *persicaria* (p. 120); *P. minus* × *persicaria* (p. 122).

Series iii. *Lapathifolia*

Lapathifolia nobis.

For characters, see page 114.

British species of *Persicariae*

9. **P. lapathifolium** (see below). *Laminae* usually blotched. *Peduncles* glandular. *Perianth* usually green, glandular.

10. **P. nodosum** (p. 117). *Laminae* usually not blotched. *Peduncles* glandular. *Perianth* pink or pink and greenish, glandular.

9. POLYGONUM LAPATHIFOLIUM. Pale-flowered Persicaria. Plate 124

Persicaria mitis major foliis pallidioribus Bobart in Ray *Syn.* ed. 3, 145 (1724).

Polygonum lapathifolium L. *Sp. Pl.* 360 (1753) partim; Aiton *Hort. Kew.* ii, 30 (1789) excl. var. β; Smith, *Fl. Brit.* 425 (1800)!; *Eng. Fl.* ii, 234 (1824); *P. pennsylvanicum* Hudson *Fl. Angl.* 148 (1762); *P. persicaria* var. *pennsylvanicum* Hudson *Fl. Angl.* ed. 2, 170 (1778); *P. pallidum* Withering *Bot. Arr.* ed. 3,

ii, 381 (1796) excl. var. 2 et var. 3; *P. persicaria* var. β Wahlenberg *Fl. Upsal.* 132 (1820) non L.; *P. lapathifolium* subsp. *pallidum* Fries *Fl. Suec. Mant.* ii, 24 (1839)!; *P. lapathifolium* var. *genuinum* Grenier et Godron *Fl. France* iii, 47 (1855); Syme *Eng. Bot.* viii, 76 (1868); *P. lapathifolium* subsp. *lapathifolium verum* Dyer and Trimen in *Journ. Bot.* ix, 36 (1871); *P. lapathifolium* race *pallidum* Rouy *Fl. France* xii, 99 (1910).

Icones:—Curtis *Fl. Lond.* i, 73, as *P. pennsylvanicum*; Smith *Eng. Bot.* t. 1382; Reichenbach *Iconogr. Crit.* t. 495, fig. 688 as *P. lapathifolium*; *Fl. Dan.* t. 2412, as *P. pallidum.*

Camb. Brit. Fl. ii. *Plate 124.* (*a*) Flowering shoot. (*b*) Lower part of stem. (*c*) Lower leaf. (*d*) Portion of leaf, lower side (enlarged). (*e*) Persistent perianths (enlarged). (*f*) Achenes (enlarged). (*g*) Peduncle (enlarged). Huntingdonshire (E. W. H.).

Annual. *Stem* erect, 3—9 dm., often becoming decumbent and then rooting near the base, much branched, glandular or subglandular, nodes rather swollen. *Ochreae* loose, not or only slightly ciliate. *Petioles* short. *Laminae* usually ovate to ovate-lanceolate, about 10—15 cm. long, attenuate at both ends, often with a dark blotch, more or less hairy and glandular. *Peduncles* strongly glandular. *Spikes* about 2·5—3·5 cm. long, stout. *Perianth* more or less glandular, greenish; early July to September. *Stamens* 6. *Styles* 2, free almost to the base, ultimately reflexed. *Achenes* bifacial, suborbicular, large (about 3 mm. long and 2·5 broad), scarcely longer than the persistent perianth, smooth, shining, nearly black.

Moist, rich, waste places, and arable land; common throughout the British Isles, but local or rare in hilly districts; ascending to over 300 metres in Derbyshire.

Iceland, Scandinavia, Denmark, Germany, France, central Europe (ascending to 1810 m.), Russia, southern Europe; Asia; America; Malaysia; South Africa.

10. POLYGONUM NODOSUM. Plate 125

Persicaria latifolia geniculata caulibus maculatis Rand in Ray *Syn.* ed. 3, 145 (1724); *P. maculosa procumbens foliis subtus incanis* Dillenius in Ray *Syn.* ed. 3, 146 (1724) [= forma *salicifolium*]; *P. folio subtus incano* Dillenius in Ray *Syn.* ed. 3, 145 (1724) [= forma *salicifolium*]; *P. foliis salicis albae vulgaris* Dillenius in Ray *Syn.* ed. 3, 145 (1724) [= forma *salicifolium*].

Polygonum nodosum Persoon *Syn.* i, 440 (1805); Reichenbach *Iconogr. Crit.* v, 59 (1827); Borrer in Hooker *Brit. Fl.* ed. 4, 165 (1838); Babington *Man.* ed. 5, 285 (1862); *P. lapathifolium* var. *petecticale* Stokes in Withering *Bot. Arr.* ed. 2, i, 412 (1787); *P. lapathifolium* var. *maculatum* Sibthorp *Fl. Oxon.* 129 (1794); *Persicaria maculata* Gray *Nat. Arr.* ii, 270 (1821) incl. *P. salicifolia*; *Polygonum lapathifolium* var. *nodosum* Babington *Man.* 257 (1843); Grenier et Godron *Fl. France* iii, 47 (1855); Syme *Eng. Bot.* viii, 76 (1868); *P. lapathifolium* subsp. *maculatum* Dyer and Trimen in *Journ. Bot.* ix, 36 (1871), including *P. persicaria* subsp. *nodosum* p. 37 partim; *P. maculatum* Babington *Man.* ed. 7, 301 (1874); *P. lapathifolium* race *nodosum* Rouy *Fl. France* xii, 99 (1910) including race *turgidum.*

Icones:—Curtis *Fl. Lond.* i, 74, as *P. pennsylvanicum* var.; Babington in *Eng. Bot. Suppl.* t. 2822, as *P. laxum*; Reichenbach *Iconogr. Crit.* t. 496, fig. 689; *Fl. Dan.* t. 2648; Beck in Reichenbach *Icon.* t. 216.

Camb. Brit. Fl. ii. *Plate 125.* (*a*) Flowering shoot. (*b*) Lower part of stem, with leaves. (*c*) Portion of under side of leaf (enlarged). (*d*) Persistent perianth (enlarged). (*e*) Achene (enlarged). (*f*) Ochrea (enlarged), dissected and spread out. (*g*) Portion of peduncle (enlarged). (*h*) Petiole (enlarged). Huntingdonshire (*a* and *b*) (E. W. H.). Cambridgeshire (*e*—*h*) (A. H.).

Exsiccata:—Billot, 1062, et 1062 bis, as *P. lapathifolium*; *Herb. Fl. Ingric.* iv, 540, as *P. lapathifolium.*

Annual. *Stem* erect or decumbent, usually more or less spotted with red, especially near the nodes, more or less branched; nodes more or less swollen. *Ochreae* shortly ciliate, truncate. *Petioles* short. *Laminae* very variable in size and shape, ovate to oblong, acute to acuminate, glandular beneath, sometimes with a dark blotch. *Peduncle* glandular. *Spikes* very variable in arrangement and size, cylindrical. *Flowers* early July to October. *Perianth* glandular, pink or pink and greenish. *Achenes* usually rather smaller and rather more acute than in *P. lapathifolium*, usually rather shorter than the persistent perianth.

(β) forma **salicifolium** comb. nov.; *P. persicaria* var. ζ Hudson *Fl. Angl.* 148 (1762); *P. persicaria* var. γ L. *Sp. Pl.* ed. 2, 518 (1762); *P. lapathifolium* var. *salicifolium* Sibthorp *Fl. Oxon.* 129 (1794); *P. persicaria* subsp. *tomentosum* Schrank *Fl. Baier.* i, 669 (1789); *P. incanum* Willdenow *Sp. Pl.* ii, 446 (1800); *Persicaria salicifolia* Gray *Nat. Arr.* ii, 270 (1821).

Icones:—Beck in Reichenbach *Icon.* t. 217, fig. 1—3, as *P. tomentosum.*

Exsiccata:—Fries, iv, 73, as *P. incanum*; Wirtgen, xi, 626, as *P. pallidum*; *Herb. Fl. Ingric.* viii, 540 b, as *P. lapathifolium* var. *incanum.*

A smaller plant, usually of drier soils. *Laminae* smaller, relatively narrower, whitish underneath.

This is a very variable species; but we are unable to classify the British forms and varieties. In fact, we suspect that most of the British plants named *P. nodosum* or *P. maculatum* are hybrids formed by the crossing of *P. persicaria* and *P. lapathifolium*.

Sides of ponds, ditches, and rivers, and also in rich arable and waste land in the lowlands. Local but widespread in southern, central, and eastern England; rare in Wales and northern England; recorded for southern Scotland (northwards to Perthshire); rare in hilly districts generally; rare (or not distinguished) in Ireland—counties Kerry, Cork, Wexford, Carlow, Westmeath, and Down.

Scandinavia, Denmark, Germany, France, central Europe, Russia, southern Europe; northern Africa; Asia; America; South Africa.

P. hydropiper* × *nodosum Grenier et Godron *Fl. France* iii, 49 (1855); Rouy *Fl. France* xii, 104 (1910); *P. laxum* Reichenbach *Iconogr. Crit.* v, 56 (1827); × *P. laxum* Reichenbach *Fl. Germ. Excurs.* 572 (1830); *P. hydropiper* × *tomentosum* Beckhaus *Fl. Westf.* 774 (1893); *P. hydropiper* × *lapathifolium* Gürke *Pl. Europ.* ii, 120 (1897).

Icones:—Reichenbach *Iconogr. Crit.* t. 492, fig. 685, as *P. laxum*.

Stem erect or decumbent, with the terminal branches usually suberect. *Ochreae* lax, long, shortly ciliate. *Petioles* short. *Laminae* broadly lanceolate, wavy, attenuate at each end. *Peduncles* not or scarcely glandular. *Spikes* attenuate before flowering, ultimately subcylindrical, dense-flowered, not or scarcely interrupted. *Perianths* pink, not or scarcely glandular; August and September. *Stamens* 5. *Style* as long as the stigmas. *Stigmas* 2, ultimately spreading. *Achenes* bifacial, suborbicular-acute.

Cambridgeshire, Huntingdonshire.

Scandinavia, Germany.

Series iv. *HYDROPIPERES*

Hydropiperes nobis.

For characters, see page 114. Only British species:—*P. hydropiper*.

11. POLYGONUM HYDROPIPER. Water Pepper. Plate 126

Persicaria hydropiper Gerard *Herb.* 361 (1597); *P. vulgaris acris seu hydropiper* Ray *Syn.* ed. 3, 144 (1724).

Polygonum hydropiper L. *Sp. Pl.* 361 (1753); Smith *Fl. Brit.* 426 (1800)!; Syme *Eng. Bot.* 70 (1868); Rouy *Fl. France* xii, 100 (1910).

Icones:—Curtis *Fl. Lond.* i, 75; Smith *Eng. Bot.*, t. 989; *Fl. Dan.* t. 1576; Reichenbach *Iconogr. Crit.* t. 494, fig. 687; Beck in Reichenbach *Icon.* t. 211.

Camb. Brit. Fl. ii. *Plate 126.* (*a*) Flowering branches. (*b*) Lower part of stem. (*c*) Leaves from lower part of stem. (*d*) Lower part of stem, with ochrea (enlarged). (*e*) Persistent perianths (enlarged), enclosing achenes. (*f*) Achenes (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 72; *Herb. Fl. Ingric.*, iv, 544.

Annual, very acrid to the taste. *Stem* erect or decumbent, 2—8 dm., branched, sometimes rooting at the base. *Ochreae* large, somewhat inflated, glabrous or nearly so, upper margin slightly ciliate. *Petioles* very short. *Laminae* lanceolate-acuminate, attenuate at each end, margin more or less wavy, about 5—10 cm. long, broadest below the middle, upper ones sessile. *Spikes* rather slender and interrupted, drooping. *Flowers* July to October. *Perianth* glandular, without conspicuous nerves, greenish or pinkish; segments 5, about as long as the tube. *Stamens* 5—8, usually 6, shorter than the perianth. *Style* very short. *Stigmas* 2—3, globose, projecting beyond the stamens. *Achenes* large (about 2·5—3·0 cm. long), ovate-acute, punctate, dull, flat on one side, convex on the other, as long as the persistent perianth.

According to Praeger, *R. hydropiper* is "strongly calcifuge" in Ireland (see *Irish Top. Bot.*, p. 271); but this does not apply to its occurrence in England.

Shallow ditches, and damp and watery places in general; common throughout the whole of England, Wales, southern and eastern Scotland and Ireland; local in western and northern Scotland; ascending to nearly 400 m. in the Lake District.

Europe; northern Africa; Asia; North America.

P. hydropiper* × *minus [Wilms ex] Beckhaus *Fl. Westf.* 773 (1893); Figert in *Allg. Bot. Zeitschr.* i, 28 (1895); Rouy *Fl. France* xii, 106 (1910); ×*P. martinianum* Hy in *Bull. Bot. Soc. France* lvi, 546 (1909); ×*P. subglandulosum* Rouy *loc. cit.*

Stem erect. *Ochreae* lax, with short appressed pubescence; ciliate. *Laminae* lanceolate, shining, about 1·3 mm. broad. *Peduncles* eglandular. *Spikes* rather slender, lax-flowered, interrupted, acute. *Perianth* small, pink, feebly glandular. *Stamens* 6. *Achenes* rarely formed, rather shining, about 3—4 mm. long.

Berkshire, Worcestershire.
Germany, France, central Europe.

P. hydropiper × *nodosum* (p. 118).

P. hydropiper* × *persicaria Figert in *Allg. Bot. Zeitschr.* i, 29 (1895); Rouy *Fl. France* xii, 104 (1910); *P. hybridum* St Amans *Fl. Agen.* 163 (1821); ×*P. hybridum* Rouy *loc. cit.*

Habit approaching that of *P. laxiflorum*, not or scarcely acrid. *Stem* erect or decumbent, 6—7 dm. *Branches* divaricate. *Ochreae* ciliate. *Laminae* oblong-lanceolate. *Spikes* rather stout. *Perianth* pink. *Achenes* rarely formed, rather larger than in *P. laxiflorum*.

Oxfordshire, Berkshire, Derbyshire.
France, Germany, Switzerland.

Series v. *Minores*

Minores nobis.

For characters, see page 114.

British species of *Minores*

12. **P. laxiflorum** (see below). *Spikes* more or less drooping, stout. *Achenes* large (3 mm. long).

13. **P. minus** (p. 120). *Spikes* erect or nearly so, slender. *Achenes* small (1·5 mm. long).

12. POLYGONUM LAXIFLORUM. Plate 127

Polygonum laxiflorum Weihe in *Flora* ix, 746 (1826)[1]; *P. mite* Hooker *Fl. Brit.* ed. 4, 165 (1838) non Schrank nec Persoon; Boreau *Fl. Centr. France* ii, 558 (1857); Syme *Eng. Bot.* viii, 73 (1868); Rouy *Fl. France* xii, 101 (1910); et auct. pl. sed non Persoon; *P. mite* subsp. *laxiflorum* Fries *Fl. Suec. Mant.* ii, 31 (1839).

Icones:—Babington in *Eng. Bot. Suppl.* t. 2867, excl. uncoloured figure; *Fl. Dan.* t. 2958, as *P. laxiflorum*. *Camb. Brit. Fl.* ii. *Plate 127.* (*a*) Flowering branches. (*b*) Leaves. (*c*) Ochrea. (*d*) Pistils. (*e*) Persistent perianth (enlarged), enclosing achene. (*f*) Achenes (enlarged). Huntingdonshire (E. W. H.).

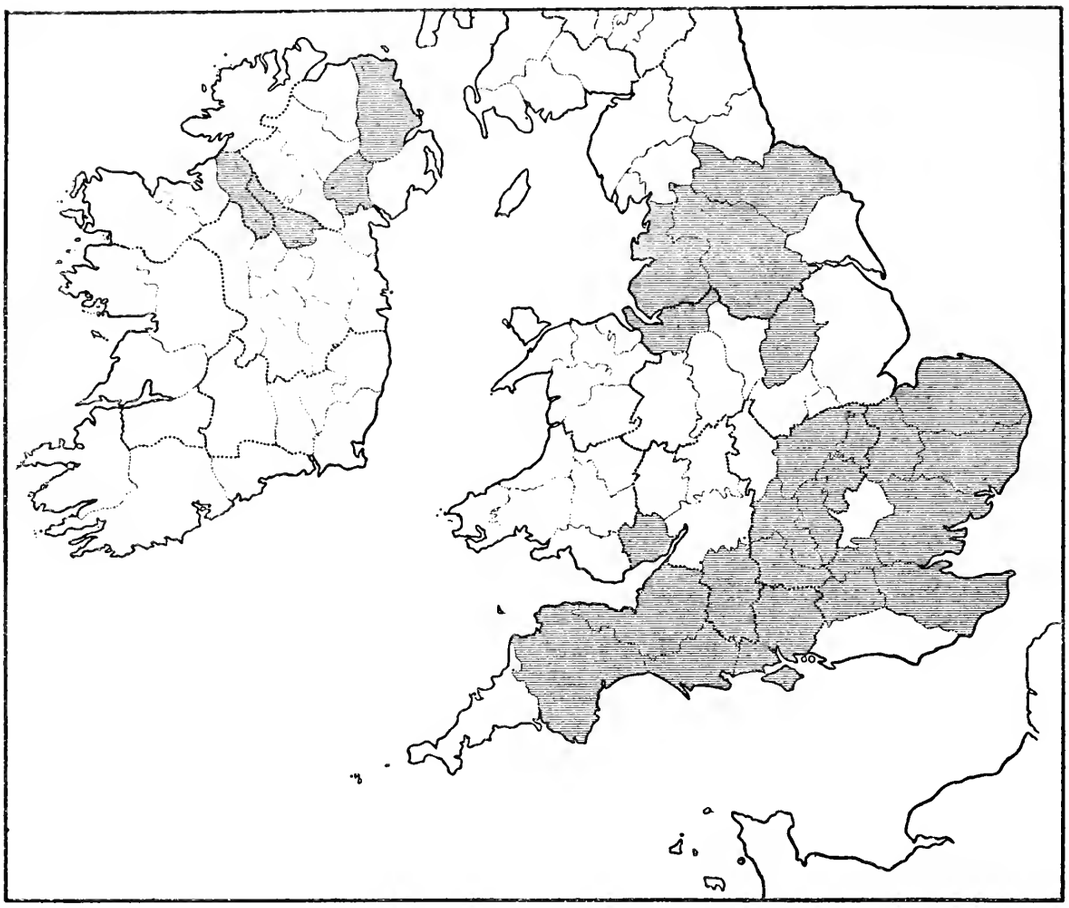
Exsiccata:—Billot, 1064, et 1064 quater, as *P. mite*; Braun (*Fl. Austr.-H.*), 1833, as *P. mite*; Hansen, 1219, as *P. intermedium*; v. Heurck et Martinis, iv, 186, as *P. dubium*; Reichenbach, 286, as *P. laxiflorum*; Schultz, ii, 140, as *P. mite*.

Annual. *Stem* erect or suberect, 3—6 dm. high, often eventually decumbent and rooting at the base, branched. *Ochreae* loose, strongly ciliate. *Petioles* almost absent. *Laminae* broadly lanceolate, broadest below the middle, gradually attenuate above, subtruncate at the base, margin rather wavy, acute to acuminate, about 5—10 cm. long. *Spikes* more or less interrupted, rather lax-flowered, much stouter and more pendant than in *P. minus*. *Flowers* July to September. *Perianth* pink, rarely white, nerves faint. *Stamens* 5—6. *Style* swollen below. *Stigmas* 2, rarely 3. *Achenes* much larger than in *P. minus*, about 3 mm. long, as long as the persistent perianth, ovate, shining, black.

Often confused with *P. minus* var. *elatum*, from which, however, it may easily be distinguished by its more pendant spikes and its larger achenes.

River-banks, marshes, shallow ditches in rich soil, in lowland districts; rather rare, but widespread in eastern England and the south-eastern Midlands, reaching westwards to Dorset, Devonshire, and Monmouthshire, and northwards to Nottinghamshire, Cheshire, Lancashire and Yorkshire; not certainly known in Wales and Scotland, and only from counties Limerick, Cavan, Leitrim, Armagh and Antrim in Ireland.

[1] This is often erroneously cited as "*P. mite* Schrank" (cf. page 121)



Map 19. Distribution of *P. laxiflorum* in the British Isles

Southern Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe, Russia, southern Europe; Asia Minor.

P. laxiflorum* × *minus comb. nov.; *P. minus* × *mite* Uechtritz in Fiek *Fl. Schles.* 380 (1881); [Wilms ex] Beckhaus *Fl. Westf.* 773 (1893); Gürke *Pl. Europ.* ii, 117 (1897); Rouy *Fl. France* xii, 106 (1910); × *P. intermedium* Hy *loc. cit.*; × *P. digeneum* Rouy *loc. cit.*

Habit of *P. minus* var. *elatum*. *Stem* erect or decumbent, branched. *Ochreae* with appressed pubescence, ciliate. *Laminae* narrowly lanceolate, acuminate. *Spikes* narrowly cylindrical, lax-flowered, interrupted, more or less nodding. *Perianth* pink. *Stamens* 5—6. *Achenes* rarely formed, about 3 mm. long, as in *P. laxiflorum*.

Berkshire (herb. Druce!), Oxfordshire (herb. Druce!).

France, Germany.

P. laxiflorum* × *persicaria comb. nov.; *P. mite* × *persicaria* Gürke *Pl. Europ.* ii, 119 (1897); Rouy *Fl. France* xii, 105 (1910); × *P. condensatum* Rouy *loc. cit.*

Exsiccata:—Fiori et Beguinot (*Fl. Ital.*) ii, 1258, as *P. axillare*; Schultz, ii, 139, as *P. miti-persicaria*; herb. Druce: Mr Druce says that Professor Lange considered it correctly named.

Stem erect, tall, much branched. *Ochreae* hairy, ciliate, longer than in *P. persicaria*. *Laminae* lanceolate, attenuate at both ends. *Peduncles* eglandular. *Spikes* slender, cylindrical, more or less interrupted. *Perianth* pink, eglandular. *Achenes* as long as those of *P. mite*, but broader.

Berkshire, Oxfordshire.

France, Germany, central Europe, Italy.

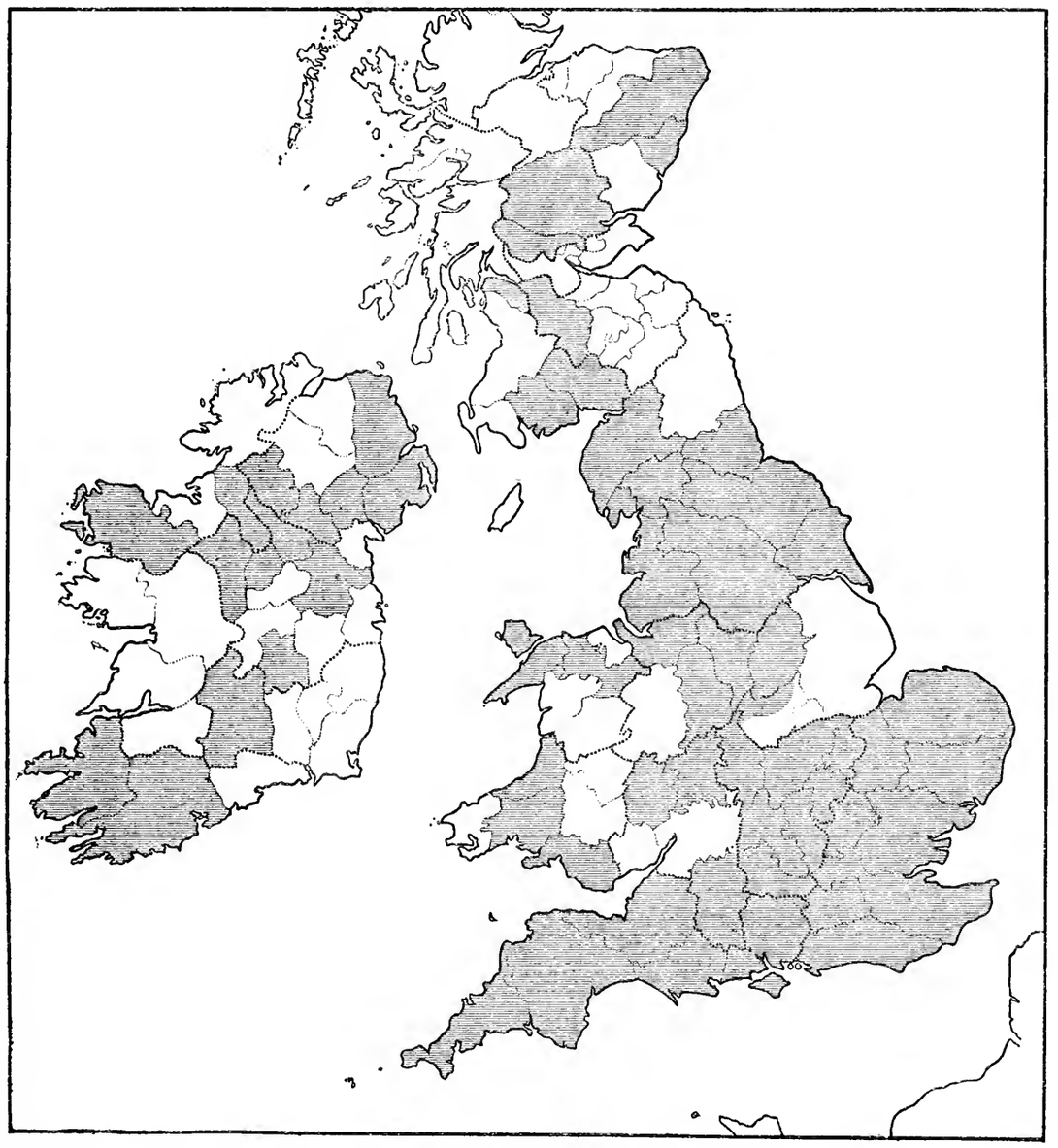
13. POLYGONUM MINUS. Plates 128, 129

Persicaria pusilla repens Johnson in Gerard *Herb.* ed. 2, 446 (1636); Ray *Syn.* ed. 3, 145 (1724); *P. angustifolia ex singulis geniculis florens* Ray *loc. cit.*

Polygonum minus Hudson *Fl. Angl.* 148 (1762); Smith *Fl. Brit.* 426 (1800)!; *Eng. Fl.* ii, 235 (1824); Syme *Eng. Bot.* viii, 72 (1868); Rouy *Fl. France* xii, 102 (1910); *P. persicaria* var. β L. *Sp. Pl.* ed. 2, 518 (1762); *P. pusillum* Lamarck *Fl. France* iii, 235 (1778); *P. strictum* Allione *Fl. Ped.* 207 (1785); *P. persicaria*

subsp. *mite* Schrank[1] *Fl. Baier.* i, 668 (1789); *P. mite* subsp. *strictum* Fries *Fl. Suec. Mant.* i, 32 (1839); *P. mite* var. *minus* Cosson et Germain *Fl. Env. Paris* i, 166 (1855).

Annual. *Stem* slender, erect or decumbent, 1·5—8·0 dm., branched, often rooting towards the base. *Ochreae* more or less lax, ciliate. *Petioles* short or almost absent. *Laminae* lanceolate, usually broadest at or below the middle, margin more or less ciliate, flat, acuminate. *Spikes* slender, often more or less interrupted, erect or only a little inclined. *Flowers* July to September. *Perianth* usually pink, rarely white, about 2·5 mm. in diameter, segments longer than the tube. *Stamens* 5—6. *Style* rather longer than the stigmas, undivided. *Stigmas* 2—3, globose. *Achenes* about half as large as those of *P. mite*, as long as the persistent perianth, black, shining; September and October.



Map 20. Distribution of *P. minus* in the British Isles

(*a*) **P. minus** var. **elatum** comb. nov.; *P. intermedium* Ehrhart *Beitr.* vi, 142 (1791)! nomen; *P. dubium* A. Braun in *Flora* vii, 359 (1824); Boreau *Fl. Centr. France* ii, 558 (1857); *P. brauni* Bluff et Fingerhuth *Fl. Germ.* i, 509 (1825); *P. minus* subsp. *strictum* var. *elatum* Fries *Fl. Suec. Mant.* ii, 32 (1839); *P. strictum* var. *interruptum* Meisner in Wallich *Pl. Asiat. Rar.* iii, 57 (1832); Rouy *Fl. France* xii, 103 (1910).

Icones:—Reichenbach *Iconogr. Crit.* t. 493, fig. 686, as *P. minus*; *Fl. Dan.* t. 2956, as *P. strictum* var. *elatum*; Beck in Reichenbach *Icon.* t. 212, as *P. mite*.

Camb. Brit. Fl. ii. *Plate 128.* (*a*, *b*) Flowering branches. (*c*) Ochreae (enlarged). (*d*) Persistent perianths (enlarged), enclosing achenes. (*e*) Achenes (enlarged). Isle of Wight (E. W. H.).

[1] Schrank's name, though usually cited as a binominal, is obviously of some lower rank. It is perhaps arguable whether it ought to be cited as a subspecies or as a variety; but that it is not a binominal is obvious both from the page above cited and also from the index of the same work. The application of Schrank's name to the previous species is apparently based on an error of Hooker (*loc. cit.*). Persoon's *P. mite* refers to an American species.

Exsiccata :—Fries, iv, 75, as *P. minus*; iv, 76, as *P. mite* subsp. *laxiflorum*; vii, 53, as *P. mite* var.; xi, 53, as *P. mite* subsp. *strictum*; Fiori et Beguinot, ii, 1265, as *P. minus*; v. Heurck, i, 18, as *P. minus*; Reichenbach, 285, as *P. minus*; Thielens et Devos, iv, 333, as *P. mite*; Wirtgen, viii, 400, as *P. mite* var. *longiflorum*; *Herb. Fl. Ingric.* vii, 543 (partim), as *P. minus*; "herb. Miller" (in Herb. Mus. Brit.) as *P. persicaria.*

Habit approaching that of *P. laxiflorum.* *Stem* 2·5 to 8·0 dm. *Ochreae* ciliate with long hairs. *Laminae* larger and relatively broader than in var. *subcontiguum.* *Spikes* larger and usually more interrupted, rather pendulous. *Perianth* rather larger. *Achenes* rather larger.

From the Channel Isles, Isle of Wight, Dorset, and Sussex northwards to Carnarvonshire, Cheshire, and the North Riding of Yorkshire; chiefly in eastern England; Ireland—counties Cork, Meath, Monaghan, Leitrim, Cavan, Down, Mayo.

Europe.

(*b*) **P. minus** var. **subcontiguum** Wallich *Pl. Asiat. Rar.* iii, 57 (1832); Rouy *Fl. France* xii, 102 (1910); *P. mite* subsp. *strictum* var. *pusillum* Fries *Fl. Suec. Mant.* ii, 32 (1839).

Icones :—Curtis *Fl. Lond.* i, t. 77, as *P. minus*; Smith *Eng. Bot.* t. 1043, as *P. minus*; *Fl. Dan.* t. 2230, as *P. strictum* var. *pusillum*; Beck in Reichenbach *Icon.* t. 213, fig. 2—6, as *P. minus.*

Camb. Brit. Fl. ii. *Plate 129.* (*a*) Flowering branches. (*b*) Flowering branches of f. *aquaticum.* (*c*) Ochreae (enlarged). (*d*) Pistils (enlarged). (*e*) Achenes (3 enlarged). Middlesex (W. H. B.), and (*b*) Cambridgeshire (C. E. M.).

Exsiccata :—Billot, 2358, as *P. minus*; Thielens et Devos, iv, 332, as *P. minus*; Wirtgen, xi, 627, as *P. minus* forma; *Herb. Fl. Ingric.* vii, 543 (partim), as *P. minus.*

Stem more slender, 1·5—3·0 dm. *Ochreae* less inflated, ciliate. *Laminae* lanceolate-acuminate, gradually attenuate below the middle, ciliolate, about 2·5—5·0 cm. long. *Spikes* shorter, less inclined, and less interrupted than in var. *elatum.* *Perianth* and achenes rather smaller.

(*β*) var. **subcontiguum** forma **aquaticum** comb. nov.; *P. minus* var. *erectum* Rouy *Fl. France* xii, 103 (1910).

Stem erect, taller, subsimple. *Laminae* longer and narrower.

This is the water-form of the species. In the river Ouse, Cambridgeshire, and doubtless elsewhere.

France and doubtless elsewhere.

Dorset and Sussex to Cumberland; Ireland—counties Down, Roscommon, Queen's county, and Cavan.

Grenier and Godron (*Fl. France* iii, 49 (1855)) state that *P. minus* is a plant of siliceous soils; and Praeger (*Irish Top. Bot.* 272 (1901)) also describes its stations as being "off the limestone." However, these statements (which we in no way doubt) are not applicable to the plant as it occurs in East Anglia.

Margins and banks of ponds, lakes, and ditches; from the Channel Isles, Cornwall, Kent, northwards to Dumbartonshire and Aberdeenshire; local in Wales, the north of England, central and eastern Scotland, and Ireland.

Europe (northwards to central Scandinavia and Finland); Asia; Malaysia; Chile.

P. laxiflorum × *minus* (p. 120); *P. hydropiper* × *minus* (p. 119).

P. minus* × *persicaria A. Braun in *Flora* vii, 359 (1824); Reichenbach *Fl. Germ. Excurs.* ii, 571 (1830); Grenier et Godron *Fl. France* iii, 50 (1855); Gürke *Pl. Europ.* ii, 119 (1897); Rouy *Fl. France* xii, 106 (1910);

Icones :—*Fl. Dan.* t. 2959, as *P. minori-persicaria.*

Exsiccata :—Billot, 1320, as *P. dubio-persicaria.*

Stem, erect or decumbent, longer than *P. minus*, even than *P. minus* var. *elatum*, branched. *Ochreae* ciliate. *Laminae* lanceolate-acute. *Spikes* cylindrical, narrower than in *P. persicaria*, a little interrupted towards the base, larger than in *P. minus.* *Perianth* pink, smaller than in *P. persicaria.* *Stamens* 6. *Achenes* rarely formed, about 3 mm. long.

Hampshire, Sussex, Berkshire.

Denmark, Belgium, France, Germany, northern Italy.

Section VI. *CENTINODE*

Centinode DC. *Fl. France* iii, 368 (1815); *Avicularia* Meisner *Monogr. Polyg. Prodr.* 43 et 65 (1826); Dammer in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 27 (1893). [*Polygonum* Tournefort *Inst.* 510 t. 290 (1719) as a genus.]

For characters, see page 109.

BRITISH SERIES OF *Centinode*

Series i. **Maritima** (see below). Perennial, biennial, or annual. *Root* more or less stout. *Laminae* more or less glaucous, sometimes with margins recurved. *Achenes* large (about 4—5 mm. long), much exserted from the persistent perianth, smooth.

Series ii. **Avicularia** (p. 124). Annual. *Root* slender. *Laminae* not or scarcely glaucous, flat. *Achenes* small (about 2—3 mm. long), included within the persistent perianth or only a little exserted, often punctate or striate.

Series i. *MARITIMA*

Maritima nobis; Group *a*, Rouy *Fl. France* xii, 109 (1910).

For characters, see above.

BRITISH SPECIES OF *Maritima*

14. **P. maritimum** (see below). Perennial. *Ochreae* often longer than the internodes, usually very silvery. *Laminae* glaucous, rather thick, margins recurved.

15. **P. raii** (p. 124). Biennial or annual. *Ochreae* much shorter than the internodes, more or less silvery towards the top. *Laminae* rather glaucous, margins not or scarcely recurved at maturity.

14. POLYGONUM MARITIMUM. Plate 130

Polygonum marinum Ray *Syn.* ed. 3, 147 (1724) partim.

Polygonum maritimum L. *Sp. Pl.* 361 (1753)!; Babington in *Trans. Linn. Soc.* xvii, 457 (1836)!; Syme *Eng. Bot.* viii, 69 (1868); Rouy *Fl. France* xii, 110 (1910).

Icones:—Babington in *Eng. Bot. Suppl.* t. 2804; Beck in Reichenbach *Icon.* t. 203.

Camb. Brit. Fl. ii. *Plate 130.* (*a*) Fruiting branches. (*b*, *c*) Laminae. (*d*) Achenes. (*e*) Persistent perianth, enclosing achene (enlarged). (*f*) Achene (enlarged). Hampshire (E. F. L.).

Exsiccata:—Billott, 632 et 632 bis; Bourgeau, 160; Lange, 177; Todaro; Welwitsch, 159.

Perennial. *Root* comparatively stout, though usually less so in British specimens than in many from the Mediterranean region. *Stem* prostrate, perennial at the base, much branched, branches short, glaucous, 1—4 dm. *Ochreae* large, very conspicuous and silvery white above, brown below, 2-lobed at first, eventually lacerate, with 6—12 strong and branched veins, usually longer than the internodes. *Petioles* of the lower leaves distinct, of the upper leaves very short or absent. *Laminae* elliptical-acute to narrowly obovate, inrolled at the margins, thick, glaucous, strongly veined underneath, about 6—10 mm. long. *Inflorescence* of 1—4 flowers. *Pedicels* about as long as the achene, jointed close to the perianth. *Flowers* about twice as large as those of *P. aviculare*; July to September. *Perianth* pink, or pink and white, or greenish and white; segments usually 5, broadly obovate, spreading a little in fruit. *Stamens* usually 8, nearly half as long as the perianth. *Filaments* dilated below. *Stigmas* usually 3, very short. *Achenes* large (4 mm. long and 2·5 broad), much exserted from the persistent perianth, smooth, shining, not punctate, reddish brown.

Rare; on unstable sand or shingle, usually just at or just above the limit of the high spring tides. Channel Isles—Jersey, Guernsey, Herm; Sussex, Hampshire, Devonshire, Cornwall, Somerset.

The species reaches its northern limit in the above localities, and, as in the case of many other plants at their geographical limits, is often not quite typical. Possibly some of the British plants should be referred to *P. maritimum* var. *confusum* Rouy *Fl. France* xii, 110 (1910). *P. maritimum* is one of the maritime Mediterranean-British species whose distribution in this country is western rather than eastern: examples of such eastern species are *Suaeda fruticosa*, *Salicornia perennis*, *Frankenia laevis*.

Map 21. Distribution of *Polygonum maritimum* in England

Western France and southern Europe; northern Africa; Asia Minor; the Atlantic Islands; Cape Colony (rare); North America (Mass. to Fla.); South America.

15. POLYGONUM RAII. Plate 131

Polygonum marinum Ray *Syn.* ed. 3, 147 (1724) partim.

Polygonum raii[1] Babington in *Trans. Linn. Soc.* xvii, 458 (1834)!; Syme *Eng. Bot.* viii, 68 (1868); Rouy *Fl. France* xii, 109 (1910); *P. dubium* Deakin *Florigr. Brit.* ii, 576, t. 656 (1845) non A. Braun; *P. litorale* var. *latifolium* Grenier et Godron *Fl. France* iii, 52 (1855); *P. maritimum* var. *raii* Lloyd *Fl. Ouest. France* éd. 2, 430 (1868).

Icones:—Babington in *Eng. Bot. Suppl.* t. 2805; *Fl. Dan.* t. 2772; Beck in Reichenbach *Icon.* xxiv, t. 204. *Camb. Brit. Fl.* ii. *Plate 131.* (*a*) Fruiting branches. (*b*) Persistent perianth enclosing achene (enlarged). (*c*) Achene (enlarged). (*d*) Portion of stem, with ochrea (enlarged). Hampshire (E. W. H.).

Exsiccata:—Dörfler, 3076.

Annual or biennial. *Root* long. *Stem* prostrate, branched; branches long (up to nearly 1 metre). *Ochreae* much shorter than the internodes, scarious and silvery above, at first 2-cleft, becoming laciniate, with about 6 simple nerves. *Petioles* distinct. *Laminae* elliptical acute, margin not or only very slightly recurved at maturity, rather glaucous, rather thick, about 2—4 cm. long and 0·4—0·7 wide, veins rather conspicuous underneath. *Inflorescences* of 2—6 flowers. *Pedicels* short. *Perianth* pink, or greenish-white, often with a broad white margin; segments 5, rarely 4, overlapping a little; July to October. *Stamens* 8, about half as long as the perianth. *Filaments* dilated below. *Anthers* small. *Style* very short. *Stigmas* very small. *Achenes* large, about 4—6 mm. long and 2·5—3·5 broad, much exserted, faces almost flat, smooth, shining, reddish-brown.

Often confused with *P. aviculare* var. *litorale* from which it may be at once distinguished by its markedly exserted achenes.

Rather local; on the loose sand of the foreshore, a little above the limit of the high spring tides. Recorded for nearly all the maritime counties of Great Britain, from the Channel Isles, Cornwall, and Kent to western Inverness-shire and the Hebrides, and for nearly all the maritime counties of Ireland.

Southern Scandinavia, Denmark, Germany, Belgium, France, northern Russia, Spain, Italy; west coast of North America.

Series ii. *AVICULARIA*

Aviculare nobis non Meisner; group "oo" Rouy *Fl. France* xii, 111 (1910).

For characters, see page 123.

BRITISH SPECIES AND HYBRID OF *Aviculare*

16. **P. aviculare** (p. 125). Annuals. *Laminae* heterophyllous, the larger ones about 2·5—3·5 cm. long, and the smaller ones about half this size or less; often caducous, especially the larger ones; smaller ones usually alone on the apices of the flowering shoots. *Stamens* 5—8, often 8. *Achenes* trigonous, with sides concave, usually a little exserted from the persistent perianth.

17. **P. rurivagum** (p. 126). *Ochreae* longer and more silvery than in *P. aviculare*. *Laminae* narrower and more acute. *Flowers* smaller. *Achenes* usually a little exserted.

18. **P. aequale** (p. 126). *Laminae* subequal in size, nearly as large at the apices of the flowering branches as below, more or less crowded at the apices of the branches. *Stamens* 5—8, usually 5. *Achenes* usually trigonous, sides concave to subconvex, usually included within the persistent perianth.

P. aequale*×*aviculare (p. 127). *Laminae* usually more or less heterophyllous, the larger ones often persistent at the apices of the branches, usually more or less crowded at the apices of the branches. *Stamens* 5—8. *Fruit* exserted or not.

19. **P. calcatum** (p. 127). *Laminae* almost homophyllous. *Stamens* 5. *Achenes* subtrigonous to sub-bifacial (i.e., with two sides much wider than the third), sides convex, usually not exserted.

[1] After John Ray (1627—1705).

16. POLYGONUM AVICULARE. Common Knotgrass. Plates 132, 133, 134

Polygonum mas vulgare Gerard *Herb.* 451 (1597); Ray *Syn.* ed. 3, 146 (1724); *P. mas minus* Gerard *loc. cit.*; *P. oblongo angusto folio* Ray *loc. cit.*; partim.

Polygonum aviculare L. *Sp. Pl.* 362 (1753) partim; Boreau *Fl. Centr. France* ii, 559 (1857) including *P. agrestinum*, *P. polychnemiforme*, *P. denudatum*, *P. humifusum* p. 560, partim; Syme *Eng. Bot.* viii, 63 (1868) partim; Rouy *Fl. France* xii, 111 (1910) partim; *P. heterophyllum* Lindman in *Svensk Bot. Tidskrift* vi, 690 (1912).

Annual. *Stem*—central one erect when young, much branched; branches long (up to 6 dm.), decumbent, lower internodes often about 3—5 cm. long. *Ochreae* more or less scarious above, lacerate at maturity, brown at the base, more or less silvery at the top. *Petioles* shorter than the ochreae. *Laminae* heterophyllous, broadly elliptical to sublinear; larger ones on the main branches up to 4—5 cm. long, subtending the smaller branches, more or less caducous; smaller ones on the axillary branches, about half the size or less, often rather minute at the apices of the branches, occasionally caducous. *Inflorescences* few-flowered to 1-flowered. *Pedicels* short. *Flowers*, early July to October. *Perianth* polysepalous or almost so, usually pink with a white margin. *Stamens* usually 8. *Achenes* trigonous, ovate to subelliptical, 2—3 mm. long and about half as broad; the sides channelled or almost smooth, concave, the broadest side usually symmetrical, projecting a little from the persistent perianth or enclosed by it, chestnut or dark brown in colour, rarely almost black.

Professor C. Lindman, of Stockholm, has recently elucidated the forms of knotgrasses (in *Svensk Bot. Tidskrift*, vi, 673—696 (1912)). We have here adopted his arrangement, but with a few modifications. For example, we retain the Linnaean name *P. aviculare* for Lindman's *P. heterophyllum*: we retain Jordan's *P. rurivagum* (which Lindman reduces to a subspecies) as a species; and we refer two of Lindman's varieties to the putative hybrid *P. aviculare* × *aequale*. Lindman's treatment of the group is the only one which we have found to be of any real value. The only account with which it may be reasonably compared is that by Boreau (*Fl. Centr. France* ii, pp. 559—560 (1857)); but Boreau subdivides the group into too many species whose distinguishing characters are, in several cases, unsatisfactory.

(*a*) **P. aviculare** var. **vulgare** Desvaux *Observ. Pl. Angers* 98 (1818); *P. aviculare* Boreau *loc. cit.*, including *P. agrestinum*, *P. denudatum*, et *P. humifusum*; *P. aviculare* Norman in *Trans. Tyneside Nat. Field Club* v, 142 (1863)!, incl. *P. agrestinum*!; *P. aviculare* f. *agrestinum* Syme *Eng. Bot.* viii, 64 (1868) including f. *vulgatum* p. 65; *P. heterophyllum* Lindman excl. vars.!.

Icones:—Smith *Eng. Bot.* t. 1252, as *P. aviculare*; Curtis *Fl. Lond.* i, 76, as *P. aviculare*; Martin *Fl. Rust.*, t. 91, as *P. aviculare*; *Fl. Dan.* t. 803, as *P. aviculare*; Beck in Reichenbach *Icon.* t. 207, as *P. aviculare*.

Camb. Brit. Fl. ii. *Plate 132.* (*a*) Flowering branches. (*b*) Flowers (both enlarged). (*c*) Persistent perianth, enclosing ripening achene (enlarged). (*d*) Achene (enlarged). Huntingdon (E. W. H.).

Exsiccata:—Billot, 73, as *P. aviculare*; Reichenbach, 925, as *P. aviculare* var. *erectum*.

Branches commonly 5 or 6 dm. long. *Laminae*—the larger ones up to 4—5 cm. long and half as broad. *Achene* about 3 mm. long, included or nearly so.

Arable land, road-sides, and waste places, northwards to Zetland.

Europe.

(*b*) **P. aviculare** var. **angustissimum** Meisner in DC. *Prodr.* xiv, 98 (1856); *P. heterophyllum* var. *angustissimum* Lindman *op. cit.* p. 691!.

Icones:—*Camb. Brit. Fl.* ii. *Plate 133.* (*a*) Flowering branches. (*b*) Portion of fruiting branch, with stipular sheath, persistent perianth, and achene (enlarged). (*c*) Achene (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—*Herb. Fl. Ingric.* iv, 547, as *P. aviculare* var. *angustifolium*.

Stem and *branches* rather slender. *Ochreae* up to 13 mm. long, rather silvery towards the top. *Laminae* linear-lanceolate, much narrower than in the preceding varieties.

On river-gravel, near Huntingdon; and doubtless elsewhere.

Europe.

(*c*) **P. aviculare** var. **litorale** Koch *Syn.* 618 (1837); *P. aviculare* race *litorale* Rouy *Fl. France* xii, 113 (1910); *P. heterophyllum* var. *litorale* Lindman *op. cit.*, p. 691 (1912)!.

Icones:—Beck in Reichenbach *Icon.* t. 208, fig. 3—4.

Camb. Brit. Fl. ii. *Plate 134.* (*a*) Flowering branches. (*b*) Lower part of stem. (*c*) Fruits and persistent perianth (one enlarged). (*d*) Flowers (one enlarged). (*e*) Achenes (one enlarged). (*f*) Portion of stem with ochrea (enlarged). Isle of Wight (E. W. H.).

Laminae usually more obtuse at the apex than in any of the other varieties, often larger towards the apices of the branches, and rather more succulent. *Achenes* a little exserted.

On sand-dunes, northwards to Arran and Fifeshire; Ireland—counties Dublin and Waterford.

Europe (excl. Arctic); northern Africa; Asia; North America.

Waste places, roadsides, field-borders, cultivated land, sand-dunes, and river-gravels liable to floods; common throughout the British Isles.

Almost the whole world (excl. the Arctic and Antarctic regions), ascending to 2745 m. in the Alps (as var. *nanum*); perhaps not indigenous in the southern hemisphere.

P. aequale × *aviculare* (p. 127).

17. POLYGONUM RURIVAGUM. Plate 135

Polygonum rurivagum [Jordan ex] Boreau *Fl. Centr. France* ii, 560 (1857), incl. *P. microspermum* partim; Norman in *Trans. Tyneside Nat. Field Club* v, 141 (1863), ? including *P. microspermum* p. 142 partim; *P. aviculare* var. *longifolium* Desvaux *Observ. Pl. Angers* 98 (1818); *P. aviculare* f. *rurivagum* Syme *Eng. Bot.* viii, 67 (1868); *P. aviculare* race *rurivagum* Rouy *Fl. France* xii, 114 (1912) incl. race *microspermum* p. 113; *P. heterophyllum* subsp. *rurivagum* Lindman *op. cit.*, p. 691, t. 23, fig. 8, t. 25, fig. 4 (1912)!.

Icones:—Syme *Eng. Bot.* viii, t. 1231, as *P. aviculare* f. *rurivagum.*

Camb. Brit. Fl. ii. *Plate 135.* (*a*) Fruiting branches. (*b*) Persistent perianths enclosing achenes (enlarged). (*c*) Achenes (one enlarged). Cambridgeshire (C. E. M.).

Exsiccata:—Billot, 3769 (a small form), as *P. microspermum.*

Root very slender. *Stem* erect when young, decumbent at maturity, more or less branched; branches often very divaricate, up to 6 dm. long but often much shorter; internodes usually elongate. *Ochreae* brownish red below, silvery and lacerate above at maturity, longer than in the other species of the series *Avicularia*. *Petiole* distinct. *Laminae* heterophyllous, as in *P. aviculare*, very narrowly elliptical or even linear-acute, about 1·5—3·5 cm. long and a third or a quarter as broad, narrower than in *P. aviculare* var. *angustissimum*, veins conspicuous below. *Pedicels* very short. *Flowers* often solitary, July to September. *Perianth* smaller than in *P. aviculare*, pink or white, usually strongly veined in fruit. *Achenes* smaller than in *P. aviculare*, up to about 2·5 mm. long, narrow, a little exserted, sides concave, scarcely shining.

Small forms of this, of *P. aviculare*, and of *P. aequale* are often named *P. microspermum.*

Local; cornfields and waste places; from Cornwall and Kent to Norfolk, Leicestershire, Cheshire, Durham, Dumbartonshire and Perthshire; chiefly in south-eastern, eastern and central England; perhaps commonest on chalky soils; not recorded for Ireland.

Europe.

18. POLYGONUM AEQUALE. Plate 136

Polygonum folio rotundo Dillenius in Ray *Syn.* ed. 3, 146 (1724).

Polygonum aequale Lindman in *Svensk Bot. Tids.* vi, 692, t. 23, figs. 10—13, fig. 26, figs. 1—3 et 5 (1912)!; *P. aviculare* L. *loc. cit.*, et auct. pl., partim; *P. aviculare* var. *rotundifolium* Gray *Nat. Arr.* ii, 271 (1821); *P. arenastrum* Boreau *Fl. Centr. France* ii, 559 (1857) partim, non Norman in *Trans. Tyneside Nat. Field Club* v, 143 (1863); *P. aviculare* f. *arenastrum* Syme *Eng. Bot.* viii, 65 (1868); *P. aviculare* var. *arenastrum* Rouy *Fl. France* xii, 112 (1910).

Icones:—*Fl. Dan.* t. 3017, as *P. aviculare* var. *angustissimum*; Syme *Eng. Bot.* viii, t. 1230, as *P. aviculare* f. *arenastrum*; Beck in Reichenbach *Icon.* t. 206, as *P. aviculare* f. *procumbens.*

Camb. Brit. Fl. ii. *Plate 136.* (*a*) Flowering branches. (*b*) Persistent perianth with mature achene (enlarged). (*c*) Mature achene (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 2733, as *P. arenastrum*; Heldreich, 879 a, et 879 b, as *P. litorale*; Sintensis et Rigo, 667, as *P. aviculare* var. *litorale*; Todaro, as *P. gussonei*, et 879, as *P. dissitiflorum*; *Herb. Fl. Ingric.* iv, 547, as *P. aviculare.*

Annual. *Stem* erect or ascending at least when young, much branched; branches often more or less crowded, subsimple, 1—4 dm. long; basal internodes 1—3 cm. long, upper internodes often much shorter. *Ochreae* often shorter than in *P. aviculare*, more or less scarious at

the top. *Laminae* much less heterophyllous than in *P. aviculare* and *P. rurivagum*, broadly or narrowly elliptical, obtuse, about 1·0—2·0 cm. long, often more or less crowded towards the ends of the branches. *Flowers* in few-flowered, axillary cymes; July to October. *Perianth* polypetalous, usually white or greenish white, sometimes pink or red. *Stamens* 5—8, usually 5. *Achenes* rather small, usually about 2·0—2·5 mm. long, three-sided; sides indistinctly striate or punctulate, rather shining, usually dark brown to nearly black in colour, not or only a little exserted.

According to Lindman (*loc. cit.*) specimens of *P. aequale* in herb. Boreau (in Herb. Paris) are variously named *P. agrestinum*, *P. arenastrum*, and *P. humifusum*.

Roadsides and waste places, locally abundant. Cornwall and Kent to Northumberland, Ayrshire, Fifeshire, Aberdeenshire.

France, Sicily, and doubtless elsewhere.

(*β*) subvar. **parvulum** nobis.

Icones :—*Camb. Brit. Fl.* ii. *Plate 136.* (*d*) Fruiting branches. (*e*) Persistent perianths with mature achenes (enlarged). Dorset (C. E. M.).

Differs in its smaller *leaves* and *achenes*.

Found by the Rev. E. F. Linton on sandy soil, growing along with full-sized plants, in Poole Harbour, Dorset. Specimens were distributed by Mr Linton through the Watson Botanical Exchange Club, in 1912.

P. aequale occurs on roadsides and in waste places; locally abundant, northwards at least to Aberdeenshire; not recorded for Ireland, but doubtless it occurs there.

Europe, and perhaps elsewhere.

P. aequale* × *aviculare comb. nov.; *P. aviculare* var. *depressum* Meisner in DC. *Prodr.* xiv, 98 (1856); *P. heterophyllum* var. *caespitosum* Lindman *op. cit.* p. 691, t. 25, fig. 5; *P. aequale* subsp. *oedocarpum* Lindman *op. cit.* p. 693, t. 23, fig. 14, et t. 26, fig. 4, 6, 7; *P. aequale* × *heterophyllum ?*, Lindman *op. cit.* t. 23, fig. 9.

Icones :—Lindman *loc. cit.*; Beck in Reichenbach *Icon.* t. 211, fig. 5.

Laminae usually more or less heterophyllous, the larger ones often persistent at the apices of the branches, usually more or less crowded at the apices of the branches. *Stamens* 5—8. *Fruit* exserted or not.

Cambridgeshire, and doubtless elsewhere.

Europe, and perhaps elsewhere.

19. POLYGONUM CALCATUM

Polygonum calcatum Lindman in *Bot. Notiser* 139 (1904).

Annual, a smaller plant than any of the preceding species of *Avicularia*. *Stem* prostrate, and branched; branches short, usually closely appressed to the ground. *Laminae* almost homophyllous, elliptical, obtuse, subequal in size, smaller than in the preceding species of *Avicularia*. *Inflorescences* axillary, few-flowered. *Flowers* July to September. *Perianth* gamosepalous, small; segments about as long as the tube, greenish-white with a whitish margin. *Stamens* 5. *Achenes* shining, small, about 2·0—2·5 mm. long, compressed-trigonous, with two of the sides much wider than the third; sides convex, smooth or rarely punctulate, dark-coloured.

The undescribed hybrid *P. aequale* × *calcatum* occurs (*fide* Professor Lindman) in three or four English counties: it seems likely, therefore, that *P. calcatum* will prove to be a widespread, though perhaps a local plant, in this country.

Grassy roadsides. At present only known, as a British plant, on Arthur's Seat, Edinburgh, where it was discovered in September, 1912.

Scandinavia, Germany, Russia; Asia.

Subfamily 2. *RUMICOÏDEAE*

Rumicoïdeae Dammer in *Pflanzenfam.* iii, pt. i a, 8 (1892); Ascherson und Graebner *Syn.* iv, 693 (1912).

For characters, see page 108.

In the non-British tribe *Eriogoneae*, ochreae are absent.

British tribes of *Rumicoïdeae*

Tribe 1. **Rhabarbareae** (see below). *Flowers* monoclinous or polygamous, entomophilous. *Perianth* usually more or less petaloid, segments 4—6. *Stamens* 6—9, in two whorls. *Anthers* versatile. *Achenes* usually not enclosed by the persistent calyx, bifacial or triquetrous, with a membranous wing at each angle. *Embryo* axile.

Tribe 2. **Rumiceae** (p. 130). Flowers monoclinous, polygamous, or dioecious. *Perianth* usually sepaloid, segments 6, in two whorls of 3 segments each. *Stamens* usually 6, in a single whorl. *Anthers* basified. *Achenes* often enclosed by persistent perianth-segments. *Embryo* lateral or rarely axile.

Tribe 1. *RHABARBAREAE*

Rhabarbareae Meisner in DC. *Prodr.* xiv, 30 (1856) as a subtribe; Ascherson und Graebner *Syn.* iv, 789 (1912).

For characters, see above. Only British genus :—*Rheum.*

Genus 1. **Rheum**

Rheum L. [*Gen. Pl.* 120 (1737)] *Sp. Pl.* 371 (1753) et *Gen. Pl.* ed. 5, 174 (1754); Wahlenberg *Fl. Lapp.* 101 (1812); Ascherson und Graebner *Syn.* iv, 791 (1912) including *Oxyria.* [*Rhabarbarum* Tournefort *Inst.* 89, t. 18 (1719) including *Acetosa* partim.]

Perennial herbs, with a sour taste. *Leaves* relatively broad, palmatinerved, with ochreae. *Perianth* dichlamydeous, more or less petaloid, in two whorls each consisting of n segments, not enlarging much in fruit, not tubercled. *Stamens* $2n+n$, outer whorl antisepalous, inner whorl antipetalous, introrse. *Stigmas* n, feathery. *Achenes* of n carpels, with n wings. (n is usually 3, rarely—as in the British species—2.)

When founding the genus *Oxyria*, Hill (*loc. cit.*) remarked that "this is a perfectly artificial genus. Nature declares the plant to be a kind of sorrel [or *Acetosa*]; but the structure of its flower [which Hill did not understand] requires its being also here." Having founded a genus for the reception of its only species, it would be expected that Hill would place the species in that genus. Instead of doing so, however, Hill (*op. cit.* p. 24) described the plant under its Linnaean name *Rumex digynus*, and repeated this (*op. cit.* p. 41) when dealing in the same volume with the genus *Rumex*. It cannot be denied that this is a poor beginning for any genus. Even when Hill does actually name the plant *Oxyria digyna* (in *Hort. Kew.* p. 158 (1769)), the appellation is virtually a *nomen nudum*, there being no description but only a footnote adding "*Rumex digynus* auctorum." Thus both the genus *Oxyria* and its only species begin their respective lives under highly adverse circumstances.

When Smith (*Eng. Fl.* ii, pp. 188—189 (1824)) took up Hill's genus, he remarked:—"Sir John Hill, it seems, first separated this plant from *Rumex*"; but this ignores Miller, who (*Gard. Dict.* ed. 8, no. 4 (1768)) named the plant *Acetosa digyna* the year before the publication of the name *Oxyria digyna.* Referring to Hill, Smith continues:—"Sometimes, as Linnaeus says, a blind hen meets with a grain of corn." In our opinion, this grain of corn was really only a husk, the kernel having aborted, as the botanical differences between *Oxyria* and the Linnaean genus *Rheum* are of no importance.

Oxyria has the parts of its flowers in 2's, *Rheum* in 3's; and thus Wahlenberg (*loc. cit.*) was justified in placing the plant in the latter genus. The case is analogous with *Tillaea* and *Crassula*; and *Tillaea* was reduced to *Crassula* by Schönland in *Pflanzenfamilien* iii, pt. 2 a, 77 (1891).

Tournefort (*loc. cit.*) placed the plant in his pre-Linnaean genus *Acetosa.* Linnaeus (*loc. cit.*) reduced the two Tournefortian genera *Acetosa* and *Lapathum* to *Rumex*, but erred in referring the plant to *Rumex.* The resemblance of the androecium of the plant to that of *Rumex* is merely superficial: both have 6 stamens, it is true; but the arrangement of these is quite different, as is shown in our descriptions.

If the plant be not placed in the genus *Rheum*, it is a nice question for nomenclators whether or not *Acetosa* has prior claim to *Oxyria.*

About 40 species, chiefly Asiatic. Only British species :—*R. digynum.*

1. **RHEUM DIGYNUM.** Mountain Sorrel. **Plate 137**

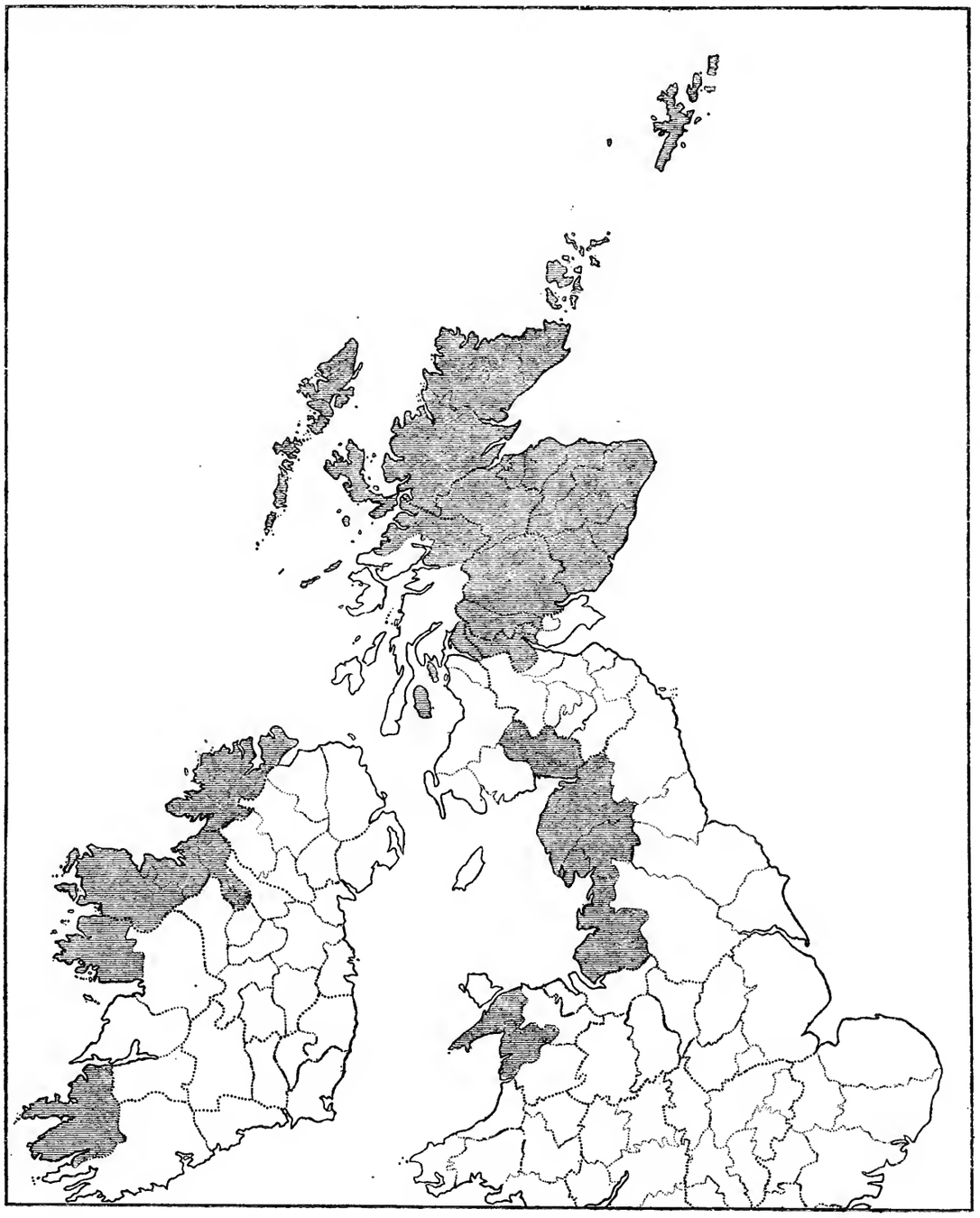
Acetosa cambro-britannica montana Parkinson *Theatr. Bot.* 745 (1640); *A. rotundifolia repens eboracensis folio in medio deliquium patiente* Morison *Hist. Oxon.* 583 (1672); Ray *Syn.* ed. 3, 143 (1724).

Rheum digynum Wahlenberg *Fl. Lapp.* 101, t. 9, fig. 2 (1812); *Rumex digynus* L. *Sp. Pl.* 337 (1753)!; Hill *Veg. Syst.* x, 24 et 41 (1765); Smith *Fl. Brit.* 395 (1800)!; *Acetosa digyna* Miller *Gard. Dict.* ed. 8, no. 4 (1768); *Oxyria digyna* Hill *Hort. Kew.* 158 (1769); Rouy *Fl. France* xii, 68 (1910); Ascherson und Graebner *Syn.* iv, 790 (1912); *Oxyria reniformis* Hooker *Fl. Scot.* i, 111 (1821); Smith *Eng. Fl.* ii, 188 (1824); Syme *Eng. Bot.* viii, 57 (1868).

Icones :—Smith *Eng. Bot.* t. 910, as *Rumex digynus*; *Fl. Dan.* t. 14, as *R. digynus*; *Svensk Bot.* t. 692, as *Rheum digynum*; Beck in Reichenbach *Icon.* xxiv, t. 202, fig. 1—4, as *Oxyria digyna.*

Camb. Brit. Fl. ii. *Plate 137.* (*a*) Ground-leaves and also flowering shoot. (*b*) Fruits (enlarged). (*c*) Flower (enlarged). Scotland (E. S. M.).

Exsiccata :—Fries, v, 56, as *Oxyria digyna*; Reichenbach, 1267, as *O. digyna*; Rostan, 30, as *O. digyna.*



Map 22. Distribution of *Rheum digynum* in the British Isles

Perennial. *Rhizome* tufted. *Aërial stem* about 1—3 dm. high, almost leafless, slender. *Petioles* of the ground leaves four or five times as long as the laminae. *Laminae* of the ground-leaves usually reniform, 2—4 cm. broad as a rule, margin crenulate and rather wavy. *Inflorescence* leafless, branches suberect. *Pedicels* slender, jointed at the middle. *Flowers* in July and August. *Perianth*—outer segments spreading; inner ones spathulate, becoming about 1 cm. long. *Achene* suborbicular, winged, wing about as broad as the achene itself and much larger than the fruiting perianth-segments.

Sides of sub-Alpine and Alpine streams on siliceous soils, locally abundant; North Wales, the Lake District, southern and central Scotland, Perthshire to Shetland; ascending to 1190 m. in Perthshire; western Ireland.

Spitzbergen, Jan Mayen Island, Nova Zembla, northern Russia, Iceland, Faeröes, Scandinavia, mountains of central and southern Europe; Asia Minor; Caucasus; northern and central Asia; North America (boreal); Greenland. Ascends to 3800 m. in Switzerland.

Tribe 2. *RUMICEAE*

Rumiceae Du Mortier *Anal. Fam.* 18 (1829) partim; Bentham and Hooker *Gen. Plant.* iii, 90 (1880); Dammer in Engler und Prantl *Pflanzenfam.* iii, pt. i, 16 (1893); Ascherson und Graebner *Syn.* iv, 697 (1912).

For characters, see page 128. Only British genus:—*Rumex.*

Genus 2. Rumex

Rumex L. [*Gen. Pl.* ed. 1, 105 (1737)] *Sp. Pl.* 359 (1753) et *Gen. Pl.* ed. 5, 156 (1754); Dammer in Engler und Prantl *Pflanzenfam.* iii, pt. i, 17 (1893); Ascherson und Graebner *Syn.* iv, 698 (1912).

Perennial herbs, rarely biennial, with or without a sour taste. *Leaves* relatively narrow, as a rule, and pinnately nerved. *Perianth* dichlamydeous, more or less sepaloid, in two whorls each consisting of 3 segments, inner segments often enlarging in fruit and often tubercled (i.e., thickened towards the base of the midrib). *Stamens* 6, in a single whorl. *Anthers* basifixed. *Stigmas* 3, feathery. *Achenes* of 3 carpels, not winged.

About 100 species; temperate (especially north temperate) zones.

We place the section *Acetosa* before the section *Lapathum* because it seems clear that the former section is more closely allied to *Rheum*, as is seen in the characters of the perianth. Doubtless, the dioecious members of the section *Acetosa*, such as *Rumex acetosa* and *R. acetosella*, have been derived from the polygamous ones. It seems to us that the species of *Lapathum* are extremely specialised, and that it is therefore proper to place them after the species of *Acetosa*.

Sections of *Rumex*

Section I. **Acetosa** (see below). Herbs with an acid taste, as in *Rheum*. *Laminae* often broad and hastate. *Flowers* polygamous or, as a rule, dioecious. *Perianth* somewhat petaloid. *Inner perianth-segments* not or only slightly enlarging in fruit, not or only a little tubercled.

Section II. **Lapathum** (p. 133). Herbs with acid taste not pronounced or absent. *Laminae* usually relatively narrow, not hastate. *Flowers* polygamous or, as a rule, monoclinous. *Perianth* sepaloid. *Inner perianth-segments* enlarging in fruit (and then termed *fruiting segments*), persistent, clasping the achene, usually more or less tubercled.

Section I. *ACETOSA*

Acetosa [Tournefort *Inst.* 510, t. 290 (1719) partim, as a genus] Meisner in DC. *Prodr.* xiv, 64 (1856) including *Acetosella* p. 63; Bentham and Hooker *Gen. Plant.* iii, 101 (1880); Rouy *Fl. France* xii, 82 (1910) incl. *Acetosella* p. 81; Ascherson und Graebner *Syn.* iv, 765 (1912) incl. *Acetosella* p. 782.

This section, which perhaps ought to be elevated to the rank of a subgenus, is intermediate in many respects between *Rheum* and the section *Lapathum*. There is more reason for separating *Acetosa* as a genus from *Rumex* than there is for separating *Oxyria* from *Rheum*.

For characters, see above.

British series of *Acetosa*

Series i. ***Scutati** (see below). *Laminae* usually at least as broad as long. *Flowers* polygamous. *Perianth* with outer segments ultimately reflexed; inner segments enlarging in fruit, larger than and enclosing the achene.

Series ii. **Acetosae** (p. 131). *Laminae* usually longer than broad. *Flowers* mostly dioecious. *Perianth* with outer segments early becoming reflexed; inner segments enlarging in fruit, larger than and enclosing the achene.

Series iii. **Acetosellae** (p. 132). *Laminae* longer than broad. *Flowers* mostly dioecious. *Perianth* with all the segments applied to the achene, segments scarcely enlarging in fruit.

Series i. **Scutati*

Scutati nobis.

For characters, see above.

1. *RUMEX SCUTATUS. Roman Sorrel. **Plate 138**

Oxalis franca seu romana Gerard *Herb.* 320 (1597).

Rumex scutatus L. *Sp. Pl.* 337 (1753)!; Syme *Eng. Bot.* viii, 54 (1868); Rouy *Fl. France* xii, 83 (1910); Ascherson und Graebner *Syn.* iv, 766 (1912); *Acetosa scutata* Miller *Gard. Dict.* ed. 8, no. 3 (1768).

Perennial, glaucous herb. *Rhizome* slender. *Stem* eventually erect, rather flexuous. *Petioles* of the ground-leaves more than twice as long as the laminae. *Laminae* of the ground-leaves hastate or cordate, more or less constricted about the middle of the stem-leaves, more or less hastate or sagittate, with petioles of about the same length. *Inflorescence* leafless, except sometimes at the base; a little branched; whorls few-flowered. *Flowers* polygamous, protogynous; May to August. *Perianth*—outer segments ultimately reflexed, applied to the base of the inner ones; inner segments enlarging in fruit. *Fruiting segments* orbicular-cordate, entire, larger than and enclosing the achene. *Achenes* pale brown.

(*a*) ***R. scutatus** var. **hastilis** Koch *Syn.* 615 (1837); *R. scutatus* var. *vulgaris* Meisner in DC. *Prodr.* xiv, 70 (1856); Rouy *Fl. France* xii, 83 (1910); *R. scutatus* race *typicus* Ascherson und Graebner *Syn.* iv, 767 (1912).

Icones:—Syme *Eng. Bot.* viii, t. 1222, as *R. scutatus.*

Exsiccata:—Billot, 2356, as *R. scutatus.*

Laminae sagittate, usually longer and narrower than in var. *glaucus*, lateral sinuses usually well marked, basal lobes acute, usually longer than broad, less glaucous.

We do not know whence the specimen drawn in *Eng. Bot.* (ed. 3) was obtained.

(*b*) ***R. scutatus** var. **glaucus** Gaudin *Fl. Helv.* ii, 589 (1828); Meisner *loc. cit.*; Rouy *Fl. France* xii, 83 (1910); *R. scutatus* race *glaucus* Ascherson und Graebner *Syn.* iv, 768 (1912).

Icones:—Jacquin *Icon. Rar.* i, t. 67, as *R. glaucus.*

Camb. Brit. Fl. ii. *Plate 138.* Cumberland (M. H.).

Exsiccata:—Todaro, 674, as *R. scutatus.*

More glaucous than in the preceding variety. *Laminae* of the ground-leaves cordate, basal lobes very obtuse, lateral sinuses almost absent.

Miller (*Gard. Dict.* ed. 8 (1768)) doubtless supplies the reason for the introduction of *R. scutatus* into this country. He states that it is "much preferable to the common sorrel [*R. acetosa*] for soups, so many persons have of late years cultivated it in their gardens, since the use of sorrel has been greatly increased in England, by the introduction of French cookery, it being an ingredient in many of their sauces and soups." The use of sorrel for culinary purposes, that Miller here alludes to, seems to have, in this country, almost entirely died out, though it is still continued in France.

Rouy (*op. cit.*) states that the var. *glaucus* is rare in France, and occurs chiefly in the east. It is the only form mentioned by Battandier et Trabut in their *Fl. d'Algerie.*

Naturalised near old castles, on walls, and near outbuildings of farms. A calcicolous plant; but Rouy (*op. cit.*) mentions a form which prefers siliceous soils. Sussex, Kent, Monmouthshire, West Riding of Yorkshire (ascending to about 300 m.), Lancashire, Cumberland, Edinburghshire, Fifeshire; Ireland, co. Clare.

Indigenous in the Mediterranean region.

R. scutatus is indigenous in France, south-central Europe (ascending to 2750 m. in the Alps), southern Europe; northern Africa; south-western Asia.

Series ii. *ACETOSAE*

Acetosae nobis. For characters, see page 130.

2. RUMEX ACETOSA. Common Sorrel. **Plate 139**

Oxalis seu Acetosa Gerard *Herb.* 319 (1597); *Acetosa vulgaris* Parkinson *Theatr. Bot.* 742 (1640); *Lapathum acetosum vulgare* Ray *Syn.* ed. 3, 143 (1724).

Rumex acetosa L. *Sp. Pl.* 337 (1753); Syme *Eng. Bot.* viii, 54 (1868); Rouy *Fl. France* xii, 86 (1910); Ascherson und Graebner *Syn.* iv, 776 (1912); *Acetosa pratensis* Miller *Gard. Dict.* ed. 8, no. 1 (1768).

Icones:—Smith *Eng. Bot.* t. 127; *Svensk Bot.* t. 190; Beck in Reichenbach *Icon.* xxiv, t. 194.

Camb. Brit. Fl. ii. *Plate 139.* (*a*) Flowering shoot of the pistillate plant. (*b*) Lower leaves. (*c*) Pistillate flowers (enlarged). (*d*) Fruits (enlarged). (*e*) Flowering shoot of staminate plant. (*f*) Staminate flowers (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 2528; *Herb. Fl. Ingric.* iv, 534.

Perennial. *Root* long and tapering. *Stem* 3—8 dm. high, little branched, glabrous. *Ochreae* elongate. *Petioles* of the ground-leaves longer than the laminae. *Laminae* of the ground-leaves ovate-sagittate, rather thick; of the stem-leaves and inflorescence sessile. *Inflorescence* branched, branches ascending, whorls distant. *Flowers* dioecious or polygamous; May to August. *Perianth*—outer segments soon reflexed, inner ones enlarged in fruit. *Fruiting segments* ovate-obtuse, entire, larger than and enclosing the achene, reddish, each with a pale elongate tubercle. *Achenes* dark brown.

Damp roadsides, meadows and pastures, hedgebanks, natural grassland, woods, marshes; of calcifugous and nitrophilous tendencies. Common ? throughout the British Isles; ascending to 1040 m. in co. Kerry.

Europe, from Nova Zembla southwards; Asia Minor; Caucasus; Trans-Caucasia; Himalaya region; northern Asia; North and South America; Greenland. Ascends to 2130 m. in Switzerland.

Series iii. *ACETOSELLAE*

Acetosellae nobis; *Acetosella* Meisner in Martius *Fl. Brasil.* v, pt. i, 10 (1855) as a section; in DC. *Prodr.* xiv, 63 (1856) as a section; Rouy *Fl. France* xii, 81 (1910) as a section; Ascherson und Graebner *Syn.* iv, 782 (1912) as a section.

For characters, see page 130. Only British species:—*R. acetosella.*

3. RUMEX ACETOSELLA. Sheep's Sorrel. Plate 140

Oxalis tennifolia Gerard *Herb.* 320 (1597); *Acetosa minor lanceolata* Parkinson *Theatr. Bot.* 744 (1640); *Lapathum acetosum repens lanceolatum* Ray *Syn.* ed. 3, 143 (1724).

Rumex acetosella L. *Sp. Pl.* 338 (1753)!; Syme *Eng. Bot.* viii, 56 (1868); Rouy *Fl. France* xii, 81 (1910); Ascherson und Graebner *Syn.* iv, 782 (1912); *Acetosa acetosella* Miller *Gard. Dict.* ed. 8, no. 2 (1768).

Icones:—Curtis *Fl. Lond.* ii, t. 77; Smith *Eng. Bot.* t. 1674!; Beck in Reichenbach *Icon.* xxiv, t. 192.

Camb. Brit. Fl. ii. *Plate 140.* (*a*) Shoot with pistillate flowers. (*b*) Ground-leaves and rhizomes. (*c*) Staminate branches. (*d*) Staminate flower (enlarged). (*e*) Pistillate flowers (enlarged). (*f*) Ripening ovaries (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 2133 et 2133 bis; Welwitsch, 410; *Herb. Fl. Ingric.* iv, 535.

Perennial. *Rhizomes* shallow, horizontal, much branched, often very extensive. *Aërial stems* erect, 1—4 dm. high. *Ochreae* ultimately membranous, with a terminal lanceolate appendage, fimbriate. *Petioles* of the ground-leaves very long. *Laminae* of the ground-leaves hastate to lanceolate or even linear; when hastate, with lobes acute and sometimes bifid or multifid. *Inflorescence* leafless. *Pedicels* short. *Flowers* from May to July. *Perianth-segments* brownish-red, not increasing much in fruit, all becoming more or less closely appressed to the achene, with a slight thickening at the base of the midrib.

The British forms of *Rumex acetosella* require further study before it is possible to describe them satisfactorily. In addition to certain growth-forms with narrow leaves, which occur on very dry soils, Ostenfeld (in *New Phyt.* xi, 124 (1912)) indicates that we have two forms, one northern and one southern. Whether or not each of these forms has its narrow-leaved state we are not able to state.

(*a*) **R. acetosella** var. **gymnocarpus** Čelakowski in *Sitzungsb. Böhm. Gesellsch. Wissensch.* 402 (1892); *R. acetosella* Rouy *Fl. France* xii, 81 (1910) excl. race *angiocarpus* p. 82.

Perianth-segments shorter than the achene, appressed to it, but separated from it without difficulty by rubbing.

West Riding of Yorkshire, Lancashire, and doubtless elsewhere. Probably more northern in its distribution than var. *angiocarpus*.

Europe.

(*b*) **R. acetosella** var. **angiocarpus** Čelakowski in *ibid.* 402 (1892); *R. acetosella* race *angiocarpus* Rouy *Fl. France* xii, 82 (1910); Ascherson und Graebner *Syn.* iv, 787 (1912).

More glaucous than var. *gymnocarpus*, at least when young. *Perianth-segments* as long as the achene, closely appressed to it, and with difficulty separated from it by rubbing.

Cornwall, Suffolk, Norfolk, Cambridgeshire, Huntingdonshire, and doubtless elsewhere. Probably more southern in its distribution than the preceding variety.

Europe.

An allied Mediterranean species, *R. multifidis* L. *Sp. Pl.* ed. 2, 482 (1762) (= *R. acetoselloïdes* Balansa in *Bull. Soc. Bot. France*, sér. 2, i, 282 (1854)) sometimes occurs in this country as a casual.

Dry banks, roadsides, heaths, woods, natural grassland, moors; most abundant on dry light sandy soils, but not rare on some siliceous soils; local on limestone soils, and rare on Chalk; absent from the heavier clays and marls. In every county in the British Isles; ascending to 1040 m. in co. Kerry.

Scandinavia, Iceland, Faeröes, France, Germany, central Europe, Russia, southern Europe, Asia; northern and southern Africa; Atlantic islands; America; Greenland; Australia. Ascends to 2400 m. in Switzerland.

Section II. *LAPATHUM*

Lapathum [Tournefort *Inst.* 504 (1719) as a genus] Meisner in DC. *Prodr.* xiv, 42 (1856); Ascherson und Graebner *Syn.* iv, 699 (1912).

For characters, see page 130.

The British species belong to the subsection *Eu-Lapathum* Ascherson und Graebner *Syn.* iv, 702 (1912).

British series of *Lapathum*

Series i. †**Alpini** (see below). Plants about 4—5 dm. high, of fresh, moist ground. *Ground-leaves* very broad, often broader than long, deeply cordate at the base, very obtuse. *Flowers* monoclinous or polygamous. *Fruiting segments* subcordate, strongly reticulate, entire or subentire; tubercles absent or very small.

Series ii. **Hydrolapatha** (p. 134). Large plants (1—2 m. high), of aquatic or subaquatic habitats. *Ground-leaves* longer than broad. *Lower stem-leaves* larger than the ground-leaves. *Fruiting-segments* of the perianth triangular, margin entire or denticulate; each with a small, narrow, distinct tubercle.

Series iii. **Crispi** (p. 136). Usually tall and strict plants (1—2 m. high) of inland waste places or submaritime or maritime habitats. *Ground-leaves* very much longer than broad. *Fruiting segments* suborbicular-cordate, margin entire; usually 1—3 tubercles.

Series iv. **Obtusifolii** (p. 140). Large plants (about 1 m. high) of dry or rather moist waste places. *Ground-leaves* about half as broad as long or rather broader. *Fruiting segments* truncate at the base, margin more or less toothed; tubercles usually 3, variable in size.

Series v. **Pulchres** (p. 142). Plants about 3—5 dm. high, or decumbent, of very dry places. *Ground-leaves* often constricted a little below the middle. *Fruiting segments* strongly toothed, each with a tubercle.

Series vi. **Sanguinei** (p. 143). Plants about 4—6 dm. high, of more or less moist ground. *Ground-leaves* not constricted. *Fruiting segments* entire, tubercles 1—3.

Series vii. **Maritimi** (p. 147). Plants about 3—5 dm. high, of aquatic or subaquatic habitats. *Ground-leaves* narrow, at least 5 or 6 times as long as broad. *Fruiting-segments* with narrow, slender teeth, at least as broad as the achene, each with a tubercle.

Series i. †*Alpini*

†Alpini nobis.

For characters, see above. Only British species:—†*R. alpinus*.

4. †RUMEX ALPINUS. Monk's Rhubarb. Plate 141

Hippolapathum rotundifolium Gerard *Herb.* 313 (1597).

Rumex alpinus L. *Sp. Pl.* 334 (1753)!; Syme *Eng. Bot.* viii, 53 (1868); Rouy *Fl. France* xii, 72 (1910); Ascherson und Graebner *Syn.* iv, 736 (1912).

Icones:—Hooker in *Eng. Bot. Suppl.* t. 2694: this drawing is erroneously referred to *R. longifolius* by Meisner in DC. *Prodr.* xiv, 44 (1856), an error repeated by Rouy *Fl. France* xii, 72 (1910); Beck in Reichenbach *Icon.* xxiv, t. 158.

Camb. Brit. Fl. ii. *Plate 141.* (*a*) Flowering shoot. (*b*) Stem-leaf (on left) and ground-leaf (on right). (*c*) The three persistent perianth-segments of a single fruit. (*d*) Flowers (two enlarged). (*e*) Fruiting segment (enlarged). Switzerland (*a, b, d*) (E. W. H.) and Westmorland (*c, e*) (C. E. M.).

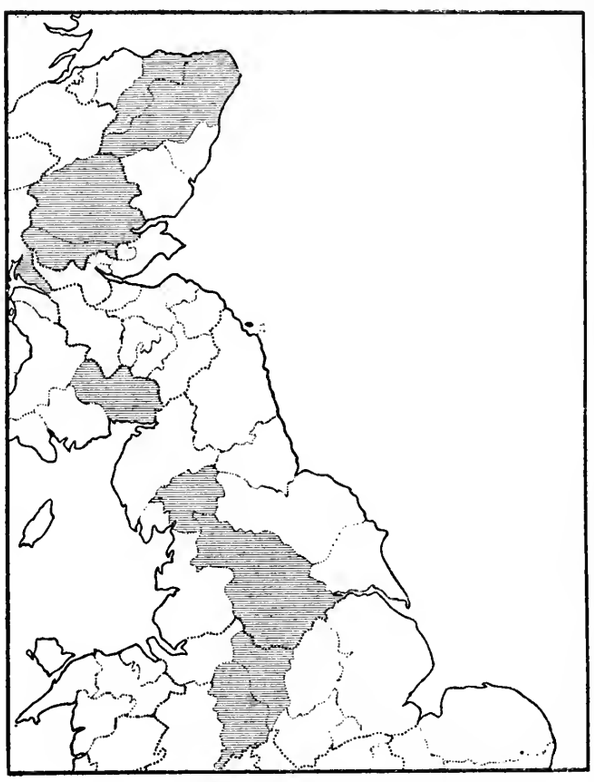
Exsiccata :—Reichenbach, 868; Tausch.

Perennial. *Rhizome* very stout, branches thick. *Stem* 3—8 dm. high, stout, branches short. *Petioles* of the ground-leaves long, stout. *Laminae* of the ground-leaves suborbicular-cordate. *Inflorescence* only a little leafy, branches suberect, whorls almost confluent. *Pedicels* much longer than the fruiting segments, jointed much below the middle. *Flowers* dioecious or polygamous; June and July, the earliest member of the section to flower. *Fruiting segments* suborbicular-cordate, entire or nearly so, strongly reticulate, 1 bearing a small or very small linear tubercle, about 5 mm. long and 4 broad.

As in the Alps, this is with us a nitrophilous species, occurring in fresh, wet places, near habitations, cow-sheds, and "lagers." The rhizome was formerly used as a simple and the leaves as a pot-herb; and consequently many British systematists have regarded the plant as a mere relic of cultivation in all its stations in this country. On the other hand, Hooker (*op. cit.*) thought the plant was indigenous; and its definitely northern distribution in hilly districts alone tends to confirm this view.

By stream-sides in hilly districts, usually near habitations, local and rather rare. Staffordshire, Derbyshire, West Riding of Yorkshire, Westmorland, Dumbartonshire, Fifeshire, Clackmannanshire, Perthshire, Aberdeenshire, Elginshire; not recorded for Wales or Ireland.

Mountainous districts in central and southern Europe; Asia Minor; Caucasus. Ascends to 2640 m. in Switzerland.



Map 23. Distribution of †*Rumex alpinus* in Great Britain

Series ii. *HYDROLAPATHA*

Hydrolapatha nobis.

For characters, see page 133. Only British species :—*R. hydrolapathum.*

5. RUMEX HYDROLAPATHUM. Great Water Dock. Plate 142

Hydrolapathum magnum Gerard *Herb.* 312 (1597); *Lapathum maximum aquaticum sive hydrolapathum* Ray *Syn.* ed. 3, 140 (1724).

Rumex hydrolapathum Hudson *Fl. Angl.* ed. 2, 154 (1778); Smith *Eng. Fl.* ii, 195 (1824)!; Syme *Eng. Bot.* viii, 51 (1868); Rouy *Fl. France* xii, 74 (1910); Ascherson und Graebner *Syn.* iv, 728 (1912); *R. britannicus* Hudson *Fl. Angl.* 135 (1762) non L. *Sp. Pl.*; *R. aquaticus* Miller *Gard. Dict.* ed. 8, no. 3 (1768); Smith *Fl. Brit.* 394 (1800); Fries *Fl. Suec.* 109 (1828)!; non L.; *R. maximus* Gmelin *Fl. Bad.* ii, 99 (1806) non Schreber.

Icones :—*Camb. Brit. Fl.* ii. *Plate 142.* (*a*) Flowering branches of var. *vulgaris.* (*b*) Leaves of var. *vulgaris.* (*c*) Basal leaf of var. *vulgaris.* (*d*) Fruiting segments (one enlarged) of var. *vulgaris.* Huntingdonshire (E. W. H.). (*e*) Fruiting segments (two enlarged) of var. *latifolius.*

A large, perennial, glaucous herb. *Rhizomes* thick, with numerous stout rootlets which are said to function as aërating organs. *Stem* about 1·5 or nearly 2·0 m. high, strict, robust, branched, branches ascending. *Petioles* of the ground-leaves up to about 3 dm. long. *Laminae* of the ground-leaves linear, about 5 dm. long and a fourth or a fifth as broad, acute at each end; of the lower stem-leaves larger, broader, truncate or asymmetrical at the base, margin more or less wavy especially towards the base, acute at the apex; of the upper stem-leaves lanceolate, acute at the apex; of the inflorescence-leaves, narrowly lanceolate, acute at each end. *Flowers* in late July and early August. *Stamens* as long as the perianth. *Anthers* linear, yellow. *Fruiting segments* triangular, acute or acuminate, entire or faintly denticulate towards the base, reticulated, each with a small, smooth, narrow tubercle. *Seeds* narrowed at each end, pale brown.

(*a*) **R. hydrolapathum** var. **vulgaris** nobis; *R. hydrolapathum* Trimen in *Journ. Bot.* xii, 35 (1874) excl. var. *latifolius*.

Icones:—Smith *Eng. Bot.* t. 2104, as *R. aquaticus*; *Fl. Dan.* t. 2348, as *R. hydrolapathum*; Reichenbach *Iconogr. Crit.* t. 370, fig. 554, as *R. hydrolapathum*; Beck in Reichenbach *Icon.* xxiv, t. 165 as *R. hydrolapathum*· *Camb. Brit. Fl.* ii. *Plate 142.* (*a—d*).

Exsiccata:—Billot, 3768, as *R. hydrolapathum*; Fries, vi, 52, as *R. aquaticus*; *Herb. Fl. Ingric.* viii, 532 as *R. hydrolapathum*.

Laminae narrower than in var. *latifolius*; of the ground-leaves, more or less cuneate at the base, not cordate; of the stem-leaves, broad at the base; of the inflorescence-leaves cuneate at the base. *Fruiting segments* broadly triangular, about 4—5 mm. broad, entire or subentire; tubercles broader than in var. *latifolius*.

This is the common British form of the species.

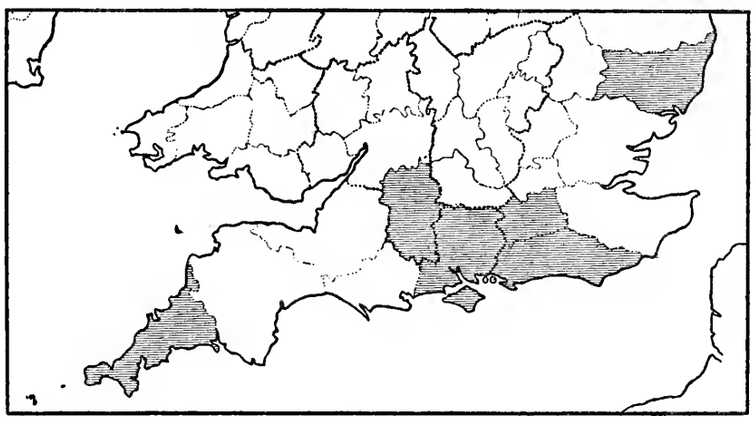
(*b*) **R. hydrolapathum** var. latifolius [Borrer MS., ex] Trimen in *Journ. Bot.* xii, 35 (1874)!; *R. maximus* Schreber in Schweigger et Koerte *Fl. Erlang.* i, 152 (1811) non Gmelin; *R. heterophyllus* Schultz *Prodr. Fl. Starg., Suppl.* 21 (1819); Rouy *Fl. France* xii, 74 (1910); *R. acutus* var. *latifolius* Wahlenberg *Fl. Suec.* 223 (1824); *R. aquaticus* var. *heterophyllus* G. F. W. Meyer *Chlor. Hanov.* 477 (1836); *R. aquaticus* × *hydrolapathum* Haussknecht in *Mitt. Geogr.* (*Thüring.*) *Jena* iii, 64 (1885); Murbeck in *Bot. Notiser* 10 (1899); Ascherson und Graebner *Syn.* iv, 740 (1912).

Icones:—*Sv. Bot.* t. 161, as *R. acutus*; *Fl. Dan.* t. 2347, as *R. maximus*; Trimen in *Journ. Bot.* xii, t. 140, as *R. maximus*; Beck in Reichenbach *Icon.* xxiv, t. 169, fig. 3—8, as *R. aqnaticus* × *hydrolapathum*.

Camb. Brit. Fl. ii. *Plate 142.* (*e*).

Exsiccata:—Fries, vi, 53, as *R. maximus*; Thielens et Devos, iii, 273, as *R. maximus*.

Differs from var. *vulgaris* chiefly in its broader laminae. *Laminae* of the ground-leaves ovate-acute to deltoid, broader especially towards the base, shorter, at the base cordate, truncate, or rounded, often oblique, more or less obtuse at the apex; of the stem-leaves, usually cordate at the base; of the inflorescence broadly lanceolate, acute at the apex. *Fruiting segments* triangular, subcordate at the base, up to 7 mm. long and 6 to 7 broad, margin more or less denticulate towards the base or subentire, each with an ovate-lanceolate acute tubercle. *Seed* elliptical acute, about 2·5 to 3 mm. long and 2 broad, chestnut-brown.



Map 24. Distribution of *R. hydrolapathum* var. *latifolius* (=*R. maximus*) in England

English specimens of this variety often have the laminae more triangular than in the continental ones, and the tubercles more prominent. Otherwise, English and continental specimens are identical; and there need be no doubt that the var. *latifolius* of Trimen is the plant known abroad as *R. maximus* or as *R. aquaticus* × *hydrolapathum*.

As to the status of the plant, there is much difference of opinion. Some botanists consider it a species, closely allied with but distinct from *R. hydrolapathum*; but, in our opinion, the differences between the two plants are too slight to justify this view. Many authorities regard it as a hybrid of *R. aquaticus* and *R. hydrolapathum*; but its occurrence in this country, where *R. aquaticus* is unknown[1], is sufficient evidence for the rejection of this hypothesis. It may well be that hybrids of *R. aquaticus* and *R. hydrolapathum* occur in localities where these species grow side by side: if so, it is necessary to distinguish them from *R. hydrolapathum* var. *latifolius*. Rouy suggests that if the plant really be a hybrid, *R. patientia* or *R. longifolius* is more likely to be one of its parents than *R. aquaticus*. In answer to this suggestion, it is only necessary to point out that *R. patientia* (like *R. aquaticus*) is not a British plant, and that *R. longifolius* is unknown in Great Britain south of Derbyshire whilst the disputed plant (*R. hydrolapathum* var. *latifolius* = *R. maximus*) is confined to localities in the extreme south of England.

Borders of rivers, ponds, and ditches; rare and local; Isle of Wight, Hampshire, Cornwall, Sussex, Surrey, Wiltshire, Suffolk.

Scandinavia, Denmark, Germany, Holland, Belgium, France, Spain, Italy, central and southern Russia. Trimen (*loc. cit.*) adds Cape Verde Islands, Azores, Formosa, and doubtfully from America.

[1] The statement by Ascherson and Graebner (*Syn.* iv, 735 (1912)) that *R. aquaticus* occurs in the British Islands is apparently based on a misapprehension.

Although there is no doubt that Linnaeus included *R. hydrolapathum* in his *R. aquaticus*, as his synonyms prove, and although Miller and Smith (*olim*) retained the latter name for the British plant, yet the diagnosis given by Linnaeus is not applicable to this species.

There was little justification for Hooker and Babington applying the name *R. aquaticus* to *R. longifolius* (= *R. domesticus*) (see below): the latter species is more closely related to *R. crispus* than either to *R. aquaticus* or to *R. hydrolapathum*.

R. hydrolapathum occurs on the borders of rivers, ponds, and ditches, and occasionally in reed-swamps; widespread, though rather local, in the lowlands of England, Wales and Ireland; rather rare in southern and eastern Scotland, reaching as far north as Elginshire; usually absent from hilly and mountainous districts.

Norway, Sweden, Denmark, Germany, France, central Europe (ascending to about 355 m.), Spain, Italy, northern Balkan peninsula, central and southern Russia.

Series iii. *Crispi*

Crispi nobis.

For characters, see page 133.

British species and chief hybrids of *Crispi*

6. **R. longifolius** (see below). The largest and stoutest member of this series. *Laminae* less markedly undulate than in *R. crispus* var. *typicus*. *Fruiting segments* large (5 × 6 mm.), with quite small tubercles.

R. crispus* × *longifolius (p. 137). *Laminae* less markedly undulate than in *R. crispus* var. *typicus*. *Fruiting segments* with tubercles larger than in *R. longifolius*.

R. longifolius* × *obtusifolius (p. 137). *Inflorescence* larger than in *R. longifolius*. *Fruiting segments* larger and broader than in *R. obtusifolius*, with at least 1 distinct tubercle.

7. **R. crispus** (p. 138). *Laminae* at least of the upper leaves markedly undulate. *Fruiting segments* suborbicular, about 4 × 5 mm., 1—3 tubercled.

8. ***R. elongatus** (p. 139). *Laminae* all flat, attenuate at the base. *Fruiting segments* elongate, 1-tubercled.

6. RUMEX LONGIFOLIUS. Plate 143

Rumex longifolius DC. *Fl. France Suppl.* v [on vi], 368 (1815); Rouy *Fl. France* xii, 71 (1910); *R. aquaticus* var. *crispatus* Wahlenberg *Fl. Lapp.* 91 (1812); *R. domesticus* Hartman *Fl. Scand.* 148 (1820) excl. var. β; Syme *Eng. Bot.* viii, 50 (1868); Murbeck in *Bot. Notiser* 13 (1899); Ascherson und Graebner *Syn.* iv, 725 (1912); *R. aquaticus* Hooker in *Eng. Bot. Suppl.* no. 2698 (1831) excl. syn. L., Reichenbach, et syn. *Sv. Bot.*; Babington *Man.* 255 (1843); non L.

Icones:—Hooker in *Eng. Bot. Suppl.* t. 2698, as *R. aquaticus*; *Fl. Dan.* t. 2349, as *R. domesticus*; t. 2350, as *R. domesticus* var.; Reichenbach *Iconogr. Crit.* t. 345, fig. 526 as *R. domesticus*; Beck in Reichenbach *Icon.* xxiv, t. 161, as *R. domesticus*.

Camb. Brit. Fl. ii. *Plate 143.* (*a*) Shoot with ripening fruits. (*b*) Lower leaf. (*c*) The three persistent perianth-segments of a single fruit (enlarged). North Riding of Yorkshire (C. E. S.).

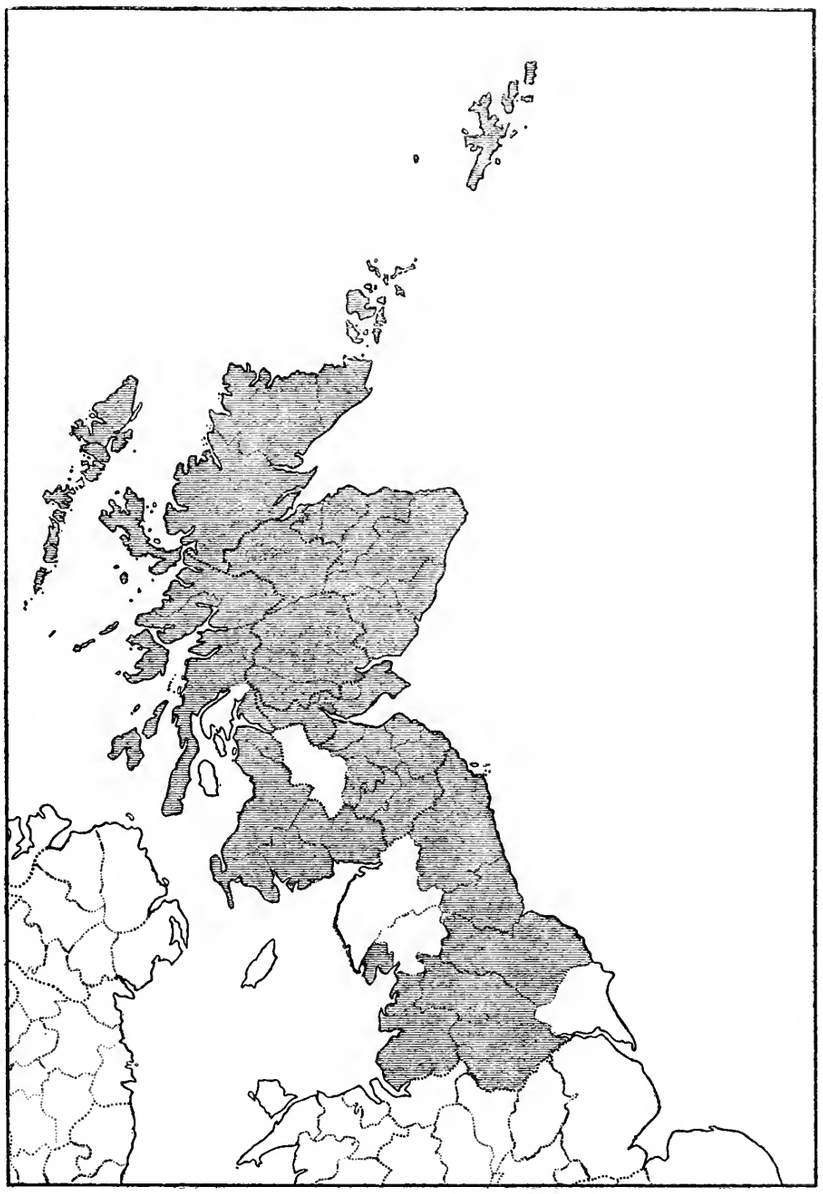
Exsiccata:—Fries, vii, 55, as *R. domesticus*; Herb. *Fl. Ingric.* vi, 530, as *R. domesticus*; viii, 531 b, as *R. domesticus* var. *elongata*; herb. Lindley in Herb. Univ. Cantab.

Perennial. *Rhizome* stout. *Aërial stem* tall (up to nearly 2 m.), robust, branched, branches ascending. *Ochreae* of stem-leaves large, lacerate. *Petioles* very long, margins prominent. *Laminae* of the ground-leaves large, rounded and scarcely cordate at the base, undulating but much less so than in *R. crispus* var. *typicus*, crenulate, subacute; of the stem-leaves, almost lanceolate, truncate at the base, subacute; of the inflorescence, oblong-lanceolate. *Inflorescence* leafy at the base only; branches suberect; whorls usually more or less crowded, many-flowered. *Pedicels* rather longer than the fruiting segments, jointed a little below the middle. *Flowers* in July and August. *Anthers* rather small, oblong. *Fruiting segments* subentire, about 5 mm. long and 6 broad, cordate at the base, not very strongly reticulate; tubercles quite small. *Achenes* about 3 mm. long, and 1·5 broad, ovate, brown.

Some botanists have erroneously regarded *R. longifolius* as a hybrid of *R. aquaticus* and *R. crispus*.

Alluvial meadows, stream-sides, ditch-banks, damp road-sides, waste-places and cultivated fields. From the West Riding of Yorkshire to Orkney and Shetland, rather common in northern Scotland; not recorded from Ireland, Wales, or southern England.

Scandinavia (Arctic and southern), Denmark, Faeröes, France, Germany, Pyrenees, Russia; Caucasus, central Asia; North America (northern and Arctic); Greenland.



Map 25. Distribution of *R. longifolius* in Great Britain

R. crispus* × *longifolius comb. nov.; *R. propinquus* J. E. Areschoug in *Bot. Notiser* 22 (1840); *R. crispus* × *domesticus* Murbeck in *Bot. Notiser* 20 (1899); Ascherson und Graebner *Syn.* iv, 727 (1912).

Exsiccata :—Herb. Marshall, 2183.

Differs from *R. longifolius* in its more contracted *inflorescence*, in its *whorls* containing more flowers, in its *fruiting segments* more broadly cordate, and in its larger *tubercles*. From *R. crispus* var. *typicus* it is distinguished by its less wavy laminae.

Local or overlooked; from Argyllshire and Kincardineshire to Zetland.

Norway, Sweden.

R. longifolius* × *obtusifolius comb. nov.; *R. conspersus* Areschoug *Sv. Vet. Akad. Öfvers.* 65 (1862)! ex Ascherson und Graebner *op. cit.*; Syme *Eng. Bot.* viii, 48 (1868) excl. syn. Willdenow; non Hartman; *R. domesticus* × *obtusifolius* Murbeck in *Bot. Notiser* 14 (1899); *R. obtusifolius* × *domesticus* Ascherson und Graebner *Syn.* iv, 744 (1912).

Icones :—Syme *Eng. Bot.* viii, t. 1217, as *R. conspersus*; Beck in Reichenbach *Icon.* xxiv, t. 159, as *R. confertus.*

Aërial stem about 1 m. high or rather more, stout. *Petioles* of the ground-leaves as long as the laminae. *Laminae* of the ground-leaves oblong-acute, subcordate to obtuse at the base, margin more or less undulate, acute to obtuse at the apex. *Inflorescence* large; branches suberect or ascending; with some stalked acute leaves especially towards the base, whorls rather close together. *Pedicels* about twice as long as the fruiting segments, articulated below the middle. *Fruiting segments* about 5 mm. long and 8 broad, subcordate, acute, larger, broader, and more cordate than in *R. obtusifolius*, dentate towards the base; one with a distinct short tubercle. *Achene* 3—5 mm. long and 2 broad, ovate, dark brown, often infertile.

Many forms of this putative hybrid occur, most of which approach in habit *R. obtusifolius* rather than *R. longifolius*. "Professor Areschoug named the Scottish plant '*conspersus*' on seeing specimens in my herbarium, so that its identity with the Swedish plant so named may be fully acquiesced in" (H. C. Watson, *Top. Bot.* ed. 2, 358 (1883)).

Local; south-eastern, eastern, and northern Scotland to Orkney and Zetland.

Norway, Sweden, Denmark, northern Russia.

7. RUMEX CRISPUS. Curled Dock. Plate 144

Lapathum folio acuto crispo Ray *Syn.* ed. 3, 141 (1724).

Rumex crispus L. *Sp. Pl.* 335 (1753)!; Syme *Eng. Bot.* viii, 49 (1868); Rouy *Fl. France* xii, 73 (1910); Ascherson und Graebner *Syn.* iv, 722 (1912).

Perennial. *Rhizome* more slender than in most of the allied species. *Stem* up to about 1 m. high, flexuous, leafy; branches suberect. *Petioles* about as long as the laminae. *Laminae* lanceolate, usually subcordate or truncate at the base, usually very undulate, acute; of the ground-leaves up to about 2 dm. long and 7—8 cm. broad. *Inflorescence* rather leafy below, elongate, narrow; whorls rather crowded above, distant below. *Pedicels* jointed much below the middle, about twice as long as the fruiting segments. *Flowers* from mid-June to September; the first of the common docks to flower. *Anthers* oblong. *Fruiting segments* suborbicular acute to ovate, more or less cordate at the base, denticulate towards the base, 1 or all tubercled, usually about 4 or 5 mm. long. *Achenes* about 2·5 mm. long, acute at both ends.

Icones :—*Camb. Brit. Fl.* ii. *Plate 144.* (*a*) Fruiting branch. (*b*) Stem-leaf. (*c*) Ground-leaf. (*d*) Flowers (enlarged). (*e*) The three persistent perianth-segments of a single fruit. (*a—e*) var. *typicus.* Huntingdonshire (E. W. H.). (*f*) Fruiting segments (2 enlarged) of var. *trigranulatus.*

(*a*) **R. crispus** var. **typicus** Beck *Fl. Nied.-Oesterr.* 320 (1890).

Icones :—Curtis *Fl. Lond.* i, t. 60, as *R. crispus*; Smith *Eng. Bot.* t. 1998, as *R. crispus*!; Reichenbach *Iconogr. Crit.* t. 576, fig. 783, as *R. crispus*; *Fl. Dan.* t. 1334, as *R. crispus*; Beck in Reichenbach *Icon.* t. 163, as *R. crispus.*

Camb. Brit. Fl. ii. *Plate 144.* (*a—e*).

Exsiccata :—*Herb. Fl. Ingric.* iv, 530, as *R. crispus.*

Laminae all very wavy. *Inflorescence* more or less lax. *Fruiting segments* either with only 1 tubercle, or with 3 one of which is usually much larger than the others.

This is the common plant of waste places and arable land.

(*b*) **R. crispus** var. **subcordatus** Warren in *Bot. Exch. Club Brit. Report for 1872—4*, 36 (1875)!.

Stem taller (1·5 m.) than in var. *typicus*, more elongate; branches not appressed. *Laminae* subcordate at the base, wavy. *Inflorescence* more elongate, lax. *Fruiting segments* with only 1 tubercle.

Areschoug stated that this variety was allied with but distinct from his *R. propinquus* (= *R. crispus* × *longifolius*). Syme (in *Bot. Exch. Club Brit. Rep. for 1872—4*, p. 36) remarked that its seeds do not give pure seedlings. Hence the plant may be a hybrid; but more critical experiments are necessary before it is possible to offer a final opinion.

Local; Cornwall, Sussex, Warwickshire, East Riding of Yorkshire, Roxburghshire, Fifeshire, Kinross-shire. Not recorded for any other country.

(*c*) **R. crispus** var. **trigranulatus** Syme in *Bot. Exch. Club Brit. Rep. for 1872—4*, 37 (1875)!.

Icones :—*Camb. Brit. Fl.* ii. *Plate 144.* (*f*).

Exsiccata :—Linn. herb., as *R. crispus.*

Stem rigid. *Laminae* rather thick, wavy. *Inflorescence* with short, numerous, appressed branches; whorls crowded. *Fruiting segments* rather smaller than in var. *typicus*, each with a prominent reddish-brown tubercle.

Loose sand-dunes, shingle-beaches, dune-marshes, margins of salt-marshes; rather common in most of the maritime counties of Great Britain, from Cornwall and Kent to Orkney; not recorded for Ireland.

Sweden, central Russia, and doubtless elsewhere.

(*d*) R. crispus var. planifolius Schur *Enum. Pl. Transsilv.* 580 (1866).

Stem nearly 2 m. high. *Laminae* of the ground-leaves almost or quite flat, not or scarcely undulate, about 2·25 dm. long and not more than a quarter as broad, more or less glaucous; of the stem-leaves, slightly undulate; of the inflorescence-leaves, undulate, few. *Inflorescence* more crowded than in var. *typicus*, but with the whorls more distant and fewer-flowered than in var. *trigranulatus*. *Flowers* a little earlier than in var. *typicus*. *Fruiting segments* usually trigranulate.

This is an interesting estuarine variety which the Rev. A. Ley brought to the notice of British botanists (sub nominibus *R. elongatus* et *R. crispus* var. *elongatus*; vide *Bot. Exch. Club Brit. Rep. for 1882*, p. 76; *ibid. for 1884*, p. 109; *ibid. for 1910*, p. 591). It is desirable that it should be grown under critical conditions in order to ascertain if it be a permanent variety or only a *forma* or state due to the special edaphic conditions of the habitat.

Muddy estuaries, rare; Hampshire, Surrey, Middlesex, Gloucestershire, Monmouthshire.

Waste places, road-sides, arable land, sand-dunes, shingle-banks, edges of salt-marshes; very common, except on strongly calcareous soils; recorded for every county in the British Isles; ascending to 620 m. in Northumberland.

Europe; Asia (excluding southern) to China and Japan; northern Africa (? indigenous); central and North America (naturalised); New Zealand (naturalised).

R. condylodes × *crispus* (p. 147); *R. crispus* × *glomeratus* (p. 144); *R. crispus* × *longifolius* (p. 137); *R. crispus* × *obtusifolius* (p. 141).

R. crispus* × *pulcher Haussknecht in *Nutt. Bot. Ver. Thür.* xi, 60 (1897); Trimen in *Journ. Bot.* xvii, 251 (1879) nomen; Ascherson und Graebner *Syn.* iv, 760 (1912); × *R. pseudo-pulcher* Haussknecht *loc. cit.*

Icones:—Beck in Reichenbach *Icon.* xxiv, t. 191, fig. 4—6.

A specimen, said to be of this parentage by Warren, is in Herb. Mus. Brit., from Broughton.

We have observed plants at Chippenham, Cambridgeshire, which are intermediate between *R. crispus* and *R. pulcher*, and growing with these species.

Rare and critical. Recorded also for central Europe, Montenegro, and Thessaly.

8. *RUMEX ELONGATUS

Rumex elongatus Gussone *Pl. Rar. Adriat.* 150 (1826); *R. crispus* var. *elongatus* [Cosson ex] Battandier in *Bull. Soc. France* xxviii, 271 (1881); Trimen in *Journ. Bot.* xi, 237 (1873).

Icones:—Gussone, *op. cit.*, t. 28.

Perennial. *Rhizome* fusiform, white. *Stem* 1·5—2·0 dm. high, lax, subsimple. *Petioles* of the ground-leaves about as long as the laminae. *Laminae* oblong lanceolate, attenuate at the base, flat, about 20—30 cm. long and 2·5 broad; of the stem-leaves, almost linear, flat; of the inflorescence, linear, flat. *Inflorescence* strict, leafy below; whorls distant, 5—8 flowered. *Pedicels* as long as the fruiting segments, slender. *Flowers* in June. *Fruiting segments* elongate, more or less subcordate at the base, entire, rather strongly reticulate, 1-tubercled. *Achenes* elongate.

It is unlikely that an eastern Mediterranean species such as this should be indigenous in England; and, as its stations are all in close proximity to shipping, and also to Kew Gardens, it is more probable that the plant was originally introduced (no doubt unintentionally). It is interesting that it should also be naturalised in North America.

Records for Hampshire and the mouth of the Severn refer to *R. crispus* var. *planifolius*.

Tidal mud-banks of the river Thames, Middlesex (between Putney Bridge and Hammersmith Bridge).

Sardinia, Italy, Sicily; northern Africa; Asia Minor; North America (naturalised).

[***R. elongatus* × *obtusifolius*** C. E. Britton in *Journ. Bot.* xlix, 99 (1911) nomen.

A plant, purporting to be of this parentage, is mentioned as above in the *Journal of Botany*. The specimens are admitted to have been "past flower and fruit." Apart from this dubious record, the putative hybrid is unknown. It has to be admitted that the occurrence of such a hybrid, in the station for which

it was recorded where both *R. crispus* and *R. elongatus* occur, is quite probable; and the hybrid should be again looked for, and, if found, properly described.]

Series iv. *Obtusifolii*

Obtusifolii nobis.

For characters, see page 133. Only British species:—*R. obtusifolius.*

Species and chief hybrid of *Obtusifolii*

9. **R. obtusifolius** (see below). *Laminae* of the ground-leaves broad, flat. *Fruiting segments* dentate, often coarsely and irregularly dentate; tubercules usually 3, variable in size.

R. crispus* × *obtusifolius (p. 141). *Laminae* less undulate than in *R. crispus* var. *typicus*, but more so than in *R. obtusifolius*, narrower than in R. *obtusifolius*. *Fruiting segments* about 5 or 6 mm. long, ovate, dentate; tubercles 3, 1 usually larger than the others.

9. RUMEX OBTUSIFOLIUS. Broad-leaved Dock. Plate 145

Lapathum sylvestris folio minus acutum Johnson in Gerard *Herb.* ed. 2, 388 (1636); *L. vulgare folio obtuso* Ray *Syn.* ed. 3, 141 (1724).

Rumex obtusifolius L. *Sp. Pl.* 335 (1753)!; Syme *Eng. Bot.* viii, 46 (1868); Rouy *Fl. France* xii, 77 (1910); Ascherson und Graebner *Syn.* iv, 709 (1912).

Icones:—*Camb. Brit. Fl.* ii. *Plate 145.* (*a*) Fruiting branches of var. *microcarpus.* (*b*) Ground-leaf of var. *microcarpus.* (*b'*) Portion of stem with cut branches, and stem-leaf of var. *microcarpus.* (*c*) Flowers (enlarged) of var. *microcarpus.* (*d*) The three fruiting segments (enlarged) of a single fruit of var. *microcarpus.* (*e, f, g*) Fruiting segments (enlarged), from three different plants, of var. *macrocarpus.* Huntingdonshire (E. W. H.).

Perennial. *Rhizome* thick, blackish outside, yellowish inside. *Stem* about 1 m. high, erect, stout, with lines of short hairs, branched; branches suberect. *Ochreae* lacerate. *Petioles* of the ground-leaves about three-quarters as long as the laminae. *Laminae* of the ground-leaves large, obtuse or truncate or cordate at the base, margin crenulate, broadly oblong and obtuse at the apex or subtriangular-acute, slightly hairy on the larger veins underneath, up to about 3 dm. long and nearly 2 broad; of the inflorescence linear, attenuate at both ends. *Inflorescence* long, leafy at the base, branched; branches ascending; whorls more or less distant, many-flowered. *Pedicels* long, jointed below the middle. *Flowers* from late June to September. *Anthers* oblong, yellow. *Fruiting segments* triangular to ovate-oblong, margin more or less dentate; teeth very variable in size and shape, spreading, often irregular; tubercles usually 3, variable in size, often 1 ovoid and larger than the other 2, smaller ones often mere thickenings at the base of the midrib. *Achenes* ovate-acute, light yellowish brown, 2·5—3·0 mm. long and 1·5 broad.

(*a*) **R. obtusifolius** var. **macrocarpus** Dierbach *Syst. Uebers.* 82 (1826); Crepin *Fl. Belg.* ed. 2, 248 (1866); *R. obtusifolius* Wallroth *Sched. Crit.* 166 (1822) in sensu stricto; *R. obtusifolius* var. *agrestis* Fries *Fl. Suec.* ed. 2, 99 (1828); Rouy *Fl. France* xii, 77 (1910); *R. divaricatus* Fries *Fl. Suec. Mant.* iii, 25 (1842)!; *R. wallrothi* Nyman *Syll. Fl. Eur.* 327 (1855); *R. friesi* Grenier et Godron *Fl. France* iii, 36 (1855—6); *R. obtusifolius* var. *friesi* Döll *Fl. Bad.* 598 (1859); Trimen in *Journ. Bot.* xi, 131 (1873); *R. obtusifolius* race *agrestis* Ascherson und Graebner *Syn.* iv, 710 (1912).

Icones:—Curtis *Fl. Lond.* i, t. 61, as *R. obtusifolius*; Smith *Eng. Bot.* t. 1999, as *R. obtusifolius*; Reichenbach *Iconogr. Crit.* fig. 550, t. 366, as *R. obtusifolius*; Beck in Reichenbach *Icon.* xxiv, t. 181.

Camb. Brit. Fl. ii. *Plate 145.* (*e—g*).

Exsiccata:—Fries, vii, 57, as *R. divaricatus*; *Herb. Fl. Ingric.* iv, 529, as *R. obtusifolius.*

Stem stouter, ridges more hairy than in var. *microcarpus.* *Laminae* more oblong and obtuse. *Inflorescence* with branches more ascending, strongly toothed.

(*β*) Subvar. **purpureus** comb. nov.; *R. purpureus* Poirret in Lamarck *Encycl., Bot.* v, 63 (1804); *R. obtusifolius* var. *discolor* Wallroth *Sched. Crit.* 168 (1822); *R. obtusifolius* var. *purpurascens* Wahlenberg *Fl. Suec.* i, 222 (1824—6); *R. obtusifolius* var. *purpureus* Petermann *Fl. Lips.* 266 (1838).

Exsiccata:—One of the specimens of *R. obtusifolius* in Linn. herb. belongs to this form.

Veins of a strong reddish-purple colour.

This subvariety is not infrequently mistaken for *R. sanguineus.*

(*b*) **R. obtusifolius** var. microcarpus Dierbach *Syst. Uebers.* 82 (1826); Döll *Rhein. Fl.* 304 (1843); *R. acutus* L. partim excl. syn.; *Lapathum silvestre* Lamarck *Fl. France* iii, 4 (1778); *Rumex sylvestris* Wallroth *Sched. Crit.* 161 (1822); *R. obtusifolius* var. *silvestris* Fries *Fl. Suec.* 98 (1828); Trimen in *Journ. Bot.* xi, 131 (1873)!; Rouy *Fl. France* xii, 77 (1910); *R. obtusifolius* race *silvestris* Ascherson und Graebner *Syn.* iv, 712 (1912).

Icones:—*Fl. Dan.* t. 1335, as *R. obtusifolius*; Trimen in *Journ. Bot.* xi, t. 131, as *R. sylvestris*; Beck in Reichenbach *Icon.* xxiv, t. 180, as *R. obtusifolius* var. *sylvestris*.

Camb. Brit. Fl. ii. *Plate 145.* (*a—d*).

Exsiccata:—Fries, v, 54, as *R. obtusifolius*; x, 56, as *R. obtusifolius*; Reichenbach, 18, as *R. sylvestris*.

Stem less stout and less hairy than in var. *microcarpus*. *Laminae* usually more acute. *Inflorescence* with branches spreading at wider angles. *Fruiting segments* smaller (3—4 mm. long), less reticulated, much less toothed or even subentire. *Achenes* rather smaller (about 2 mm. long).

Trimen (*loc. cit.*) carefully studied the two varieties of this species, and decided that they were not sharply marked off from each other. Cf. also Warren in *Bot. Exch. Club Brit. Rep. for 1872—4*, p. 35.

Not often recorded as a British plant; Middlesex, Hertfordshire, Cambridgeshire, Huntingdonshire, Stirlingshire, Clackmannanshire.

Apparently common in the north-west of Europe; rare or little noticed elsewhere, as in France (Rouy *Fl. France* xii, p. 77).

Damp waste places, road-sides, arable land. Very common, and recorded for every county in the British Islands; ascending to over 500 m. in Perthshire.

Europe; Asia, from Syria to northern Beluchistan, Afghanistan, northern Persia, and Siberia; northern Africa; North and South America (naturalised). Ascends to 2000 m. in central Europe.

R. condylodes × *obtusifolius* (p. 147).

R. crispus* × *obtusifolius G. F. W. Meyer *Fl. Hanov.* 469 (1828); Uechtritz in Fiek *Fl. Schles.* 380 (1881); Haussknecht in *Mitt. Geogr. Ges.* (*Thüring.*) *Jena* iii, 75 (1885); Murbeck in *Bot. Notiser* 23 (1899); Ascherson und Graebner *Syn.* iv, 742 (1912); *R. acutus* L. *Sp. Pl.* 335 (1753)?, excl. syn., non L. herb.; Rouy *Fl. France* xii, 73 (1910); *R. cristatus* Wallroth *Sched. Crit.* 163 (1822) non DC.; Fries *Fl. Suec.* ed. 2, 100 (1828); *R. pratensis* Mertens und Koch *Deutschl. Fl.* ii, 609 (1826); Borrer in *Eng. Bot. Suppl.* no. 2757 (1832)!; Syme *Eng. Bot.* viii, 47 (1868).

Icones:—Borrer in *Eng. Bot. Suppl.* t. 2757 Beck in Reichenbach *Icon.* xxiv, t. 175.

Exsiccata:—Fries, ix, 58 et 58* as *R. acutus*.

Numerous forms occur, connecting the two species. *Stem* 1 m. or rather more in height; branches ascending. *Laminae* of the ground-leaves broadly oblong to oblong-acute, subcordate or truncate at the base, more or less undulate. *Pedicel* jointed much below the middle, about twice as long as the fruiting segments. *Flowers* from mid-June to October. *Fruiting segments* about 5 or 6 mm. long, ovate, subcordate, more or less dentate with acuminate teeth, strongly reticulate, usually all tubercled, tubercle usually larger than the other two. *Achene* 2·5 mm. long, acute, sometimes sterile.

Common; Cornwall and Kent to Orkney; doubtless as common in Ireland, but recorded only from counties Kerry, Westmeath, Mayo, and Down.

Norway; Sweden; Denmark; France; Germany; Spain; Italy; Balkan peninsula; Russia; Caucasus; North America; and doubtless wherever *R. crispus* and *R. obtusifolius* occur together.

[*R. elongatus* × *obtusifolius* (p. 139);] *R. glomeratus* × *obtusifolius* (p. 144); *R. limosus* × *obtusifolius* (p. 148); *R. longifolius* × *obtusifolius* (p. 137).

R. obtusifolius* × *pulcher Borbas in *Magyar. Bot. Lapok.* iii, 49 (1904); Trimen in *Journ. Bot.* xvii, 251 (1879) nomen; Ascherson und Graebner *Syn.* iv, 759 (1912); *R. oguliênsis* Borbas *loc. cit.*

Laminae broader and larger than in *R. pulcher*. *Inflorescence* with branches more divaricate than in *R. obtusifolius*. *Fruiting segments* with 1 well-developed tubercle, reticulate as in *R. pulcher*.

Very rare; Cornwall (specimen in Herb. Mus. Brit. by Rev. A. Ley: see also *Journ. Bot.* 346 (1875); *Bot. Exch. Club Brit. Report for 1877*, p. 18); Cambridgeshire.

Croatia (Borbas, *loc. cit.*).

Series v. *PULCHRES*

Pulchres nobis.

For characters, see page 133. Only British species:—*R. pulcher.*

10. RUMEX PULCHER. Fiddle Dock. Plate 146

Lapathum pulchrum bononiense sinuatum Ray *Syn.* ed. 3, 142 (1724).

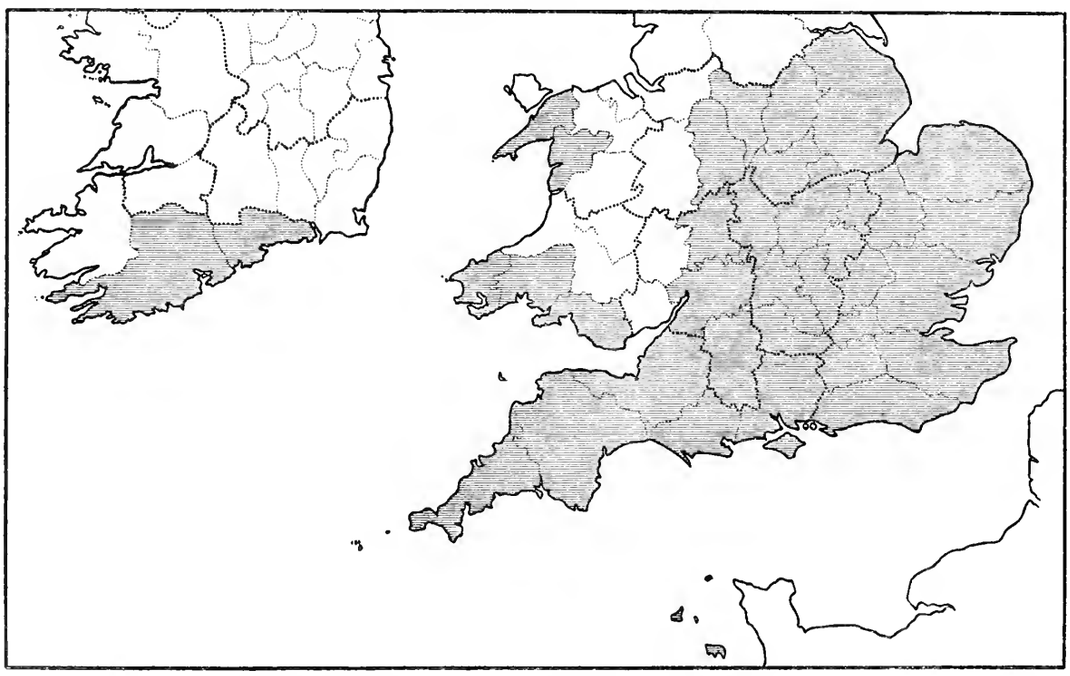
Rumex pulcher L. *Sp. Pl.* 336 (1753)!; Syme *Eng. Bot.* viii, 44 (1868); Rouy *Fl. France* xii, 77 (1910); Ascherson und Graebner *Syn.* iv, 705 (1912).

Icones:—Smith *Eng. Bot.* t. 1576!; Reichenbach *Iconogr. Crit.* t. 486, fig. 679; Beck in Reichenbach *Icon.* xxiv, t. 183, fig. 1—6.

Camb. Brit. Fl. ii. *Plate 146.* (*a*) Flowering branches. (*b*) Lower part of stem, with stem-leaf. (*c*) Ground-leaf. (*d*) Flowers (enlarged). (*e*) The three persistent perianth-segments (enlarged) of a single fruit. Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 3196; Reichenbach, 1737; Schultz (*Fl. Istr. Exs.*) 117.

Perennial. *Root* long, tapering. *Stem* suberect or procumbent, straggling, zigzag, rather slender, branched; branches divaricate, distant. *Petioles* long. *Laminae* of the ground-leaves, cordate at the base, some or all constricted a little below the middle and thus fiddle-shaped, margin crenulate and



Map 26. Distribution of *Rumex pulcher* in the British Isles

rather wavy, subacute; of the inflorescence, lanceolate. *Inflorescences* rather leafy, branches more or less divaricate; whorls distant, rather few-flowered. *Flowers* from June to August. *Pedicels* short, jointed below the middle. *Fruiting segments* oblong-ovate or ovate-acuminate, margins strongly toothed, teeth shorter than the breadth of the segment; tubercles 3, narrow, 1 much larger than the others. *Achenes* broadly ovate.

The British plants belong to the var. *typicus* Beck *op. cit.* p. 39 (1904) = var. *normalis* Rouy *op. cit.* p. 78 (1910).

Dry waste places, road-sides, rarely in dry pastures, especially near villages; in lowland districts, ascending to nearly 100 m. in Somerset. Channel Islands, Cornwall and Kent to Carnarvonshire and Lincolnshire; local in Wales; rare in Ireland (co. Cork and co. Waterford).

Mid-western, central, and southern Europe, southern Russia; Caucasus; Asia Minor; Syria; northern Africa; Canary Islands; Madeira; South Africa; North and South America (not indigenous). Ascends to 700 m. in Switzerland and to 800 m. in Montenegro.

R. condylodes × *pulcher* (p. 147); *R. crispus* × *pulcher* (p. 139); *R. glomeratus* × *pulcher* (p. 144); *R. obtusifolius* × *pulcher* (p. 141).

R. pulcher* × *rupestris nobis; Trimen in *Journ. Bot.* xvii, 251 (1879) nomen.

A specimen by Briggs (in Herb. Mus. Brit.) differs from *R. pulcher* in its strongly trigranulate fruiting segments, and from *R. rupestris* in its narrower laminae, its more divaricating branches of the inflorescence, and in its dentate fruiting segments.

Cornwall and Devonshire. See also *Bot. Exch. Club Brit. Rep. for 1872—4*, 34 (1875); *ibid.* 31 (1878); *ibid.* 55 (1881).

Series vi. *SANGUINEI*

Sanguinei nobis.

For characters, see page 133.

BRITISH SPECIES OF *Sanguinei*

11. **R. glomeratus** (see below). *Inflorescence* more or less leafy almost to the top, branches ascending or spreading. *Fruiting segments* with 3 tubercles.

12. **R. rupestris** (p. 145). *Inflorescence* leafy towards the base, leaves rather large, branches suberect. *Fruiting segments* with 3 prominent tubercles.

13. ***R. sanguineus** (p. 145). Whole plant with very conspicuous dark crimson veins even when young. *Inflorescence* not leafy. *Fruiting segments* with 3 tubercles.

14. **R. condylodes** (p. 146). *Inflorescence* not leafy. *Fruiting segments* with only 1 tubercle.

11. RUMEX GLOMERATUS. Plate 147

Lapathum acutum Gerard *Herb.* 311 (1597); Ray *Syn.* ed. 3, 142 (1724); *L. petiolis latescentibus foliis longe lanceolatis floribus verticillatis verrucosis* Haller *Hist.* 271 (1768).

Rumex glomeratus Schreber *Spicil. Fl. Lips.* Index [p. 155] no. 300 (1771); *R. acutus* L. *Sp. Pl.* 335 (1753) partim [syns. only, excl. diagnosis]; Miller *Gard. Dict.* ed. 8, no. 4 (1768) excl. diagnosis; Smith *Fl. Brit.* 391 (1800)!; *R. nemolapathum* Linn. fil. *Suppl. Pl.* 212 (1781); *R. conglomeratus* Murray *Prodr. Stirp. Gött.* 52 (1790); Syme *Eng. Bot.* viii, 40 (1868); Murbeck in *Bot. Notiser* 27 (1899); Rouy *Fl. France* xii, 76 (1910); Ascherson und Graebner *Syn.* iv, 715 (1912).

Icones:—Smith *Eng. Bot.* t. 724, as *R. acutus*; Reichenbach *Iconogr. Crit.* t. 347, fig. 552, as *R. glomeratus*; *Fl. Dan.* t. 2228; Beck in Reichenbach *Icon.* xxiv, t. 166.

Exsiccata:—Billot, 3766, as *R. conglomeratus*; Fries, ix, 57, as *R. conglomeratus*; Reichenbach, 1378, as *R. nemolapathum.*

Two sheets named *Rumex acutus* are in the Linnaean herbarium: the specimens belong to this species, and were supplied by Loefling (no. 277) from Spain ("= *L. acutum* Miller").

Perennial. *Stem* 4—8 dm. high, often more or less zigzag, branched from the base, branches slender. *Petioles* of the ground-leaves about one-third the length of the laminae. *Laminae* of the ground-leaves about 6 dm. long, lanceolate-acute, obliquely subcordate or rounded at the base, rather undulate, subentire; of the stem-leaves, linear-lanceolate, acute; of the inflorescence, almost sessile, linear, more crenulate. *Inflorescence* lax, leafy almost to the top, branched, branches ascending or wide-spreading, whorls distant. *Flowers* July and August. *Anthers* pale cream-coloured before dehiscence, pollen nearly white. *Fruiting segments* linear-oblong, margin entire or with only a few denticulations near the base, nearly 3 mm. long, each with a conspicuous oval tubercle. *Achenes* broadly ovate, reddish brown, and only about half the size of those of *R. condylodes.*

The synonyms cited by Linnaeus (*Sp. Pl.* 335 (1753)), and also the specimen in his herbarium, show that he included this species in his *Rumex acutus*; but, as his diagnosis refers to some other plant, we pass over his name in favour of Schreber's *R. glomeratus.* We deem it wise to adopt the rule not to accept a Linnaean name for a plant whenever the diagnosis which follows that name is quite inapplicable to that plant. The case of *R. glomeratus* is paralleled by those of *Rumex aquaticus* and *Chenopodium serotinum.*

The plant named *R. conglomeratus* var. *subsimplex* by Trimen (in *Journ. Bot.* xv, 134 (1877)) is simply a small state. If names be retained for states such as this, almost every species would require to be divided into innumerable *formae.*

(*β*) subvar. **divaricatus** comb. nov.; *R. divaricatus* Thuiller *Fl. Paris* éd. 2, 182 (1799) non L.; *R. conglomeratus* var. *pycnocarpus* Wallroth *Sched. Crit.* 157 (1822); *R. conglomeratus* var. *divaricatus* Bluff et Fingerhuth

Fl. Germ. 482 (1825); Rouy *Fl. France* xii, 76 (1910); *R. conglomeratus* var. *pusillus* Beck in Reichenbach *Icon.* xxiv, 25 (1904); Ascherson und Graebner *Syn.* iv, 717 (1912).

Icones :—Reichenbach *Iconogr. Crit.* t. 347, fig. 551, as *R. nemolapathum.*

Camb. Brit. Fl. ii. *Plate 147.* (*a*) Flowering shoot. (*b*) Portion of stem, with leaf. (*c*) Ground-leaf. (*d*) Flowers (enlarged). (*e*) The three persistent perianth-segments of a single fruit (enlarged). Huntingdonshire (E. W. H.).

Inflorescence with divaricate branches.

Cambridgeshire, Huntingdonshire, and doubtless elsewhere.

Banks of rivers, ponds, ditches, canals, local in marshes. Common in most parts of the lowland tracts of England, Wales, southern Scotland, and Ireland; local in western and northern Scotland, northwards to Caithness-shire; local or rare in hilly districts and on acidic peat.

Iceland (? indigenous), southern Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe, central and southern Russia, southern Europe; Asia Minor, northern Africa, South Africa; North America (adventitious). Ascends to 800 m. in central Europe.

R. condylodes × *glomeratus* (p. 146).

R. crispus* × *glomeratus comb. nov.; *R. conglomeratus* × *crispus* Haussknecht in *Mitt. Geogr. Ges.* (*Thüring.*) *Jena* iii, 68 (1885); Murbeck in *Bot. Notiser* 28 (1899); Ascherson und Graebner *Syn.* iv, 751 (1912); × *R. schulzii* Haussknecht *loc. cit.*

Icones :—Beck in Reichenbach *Icon.* xxiv, t. 172, fig. 1—3.

Rare or overlooked; Surrey and Berkshire. Sweden; France; central Europe; northern Africa.

R. glomeratus* × *maritimus comb. nov.; *R. conglomeratus* × *maritimus* Čelakowski *Prodr. Fl. Böhm.* 158 (1871); × *R. knafi* Čelakowski *loc. cit.*; Ascherson und Graebner *Syn.* iv, 757 (1912).

Icones :—Trimen in *Journ. Bot.* xii, t. 146, as *R. maritimus* forma *warreni*!; Beck in Reichenbach *Icon.* xxiv, t. 188, fig. 9, as × *R. knafi*; fig. 10, as × *R. warreni.*

Laminae of the ground-leaves as in *R. obtusifolius* but smaller; of the inflorescence, long, acute. *Inflorescence* leafy in the lower half. *Fruiting segments* elongate, dentate at least at the base, with 3 tubercles.

Very rare; Sussex, growing singly with its alleged parents in a nearly dried-up pond.

France; central Europe.

R. glomeratus* × *obtusifolius comb. nov.; *R. conglomeratus* × *obtusifolius* Rühmer in *Jahrb. Bot. Gart. Berlin* i, 253 (1881); Haussknecht in *Mitt. Geogr. Gesellsch.* (*Thüring.*) *Jena* iii, 72 (1885); Murbeck in *Bot. Notiser* 29 (1899); Ascherson und Graebner *Syn.* iv, 720 (1912); × *R. abortivus* Rühmer *loc. cit.*

Icones :—Beck in Reichenbach *Icon.* xxiv, t. 173, fig. 1—3.

Laminae closely resembling those of *R. obtusifolius*, but smaller. *Inflorescence* rather leafy. *Fruiting segments* smaller than in *R. obtusifolius*, oblong, entire or subentire, trigranulate.

Surrey, Berkshire (Druce, *Fl. Berksh.*, p. 432).

Denmark, Germany, central Europe, Greece.

R. glomeratus* × *pulcher comb. nov.; *R. conglomeratus* × *pulcher* Haussknecht in *Mitt. Geogr. Gesellsch.* (*Thüring.*) *Jena* iii, 73 (1885); Ascherson und Graebner *Syn.* iv, 760 (1912); × *R. mureti* Haussknecht *loc. cit.*; Rouy *Fl. France* xii, 89 (1910).

Icones :—Beck in Reichenbach *Icon.* xxiv, t. 191, fig. 1—3.

Stem 4—8 dm. high, much branched. *Laminae* of the ground-leaves, oblong, more or less cordate, subpanduriform; of the stem-leaves, narrowly oblong; of the inflorescence, very variable. *Inflorescence* more or less leafy, especially below, branched, branches variable, whorls distant. *Flowers* in June and July. *Fruiting segments* smaller than in *R. pulcher*, subentire or dentate towards the base, strongly reticulated as in *R. pulcher*; tubercles 3, prominent, equal or unequal. *Achenes* frequently sterile.

Many forms of this putative hybrid occur, some of which approach *R. pulcher* in the divaricate branches of the inflorescence, whilst others have the branches less spreading or even ascending as in some forms of *R. conglomeratus.*

Cornwall, Devonshire, Somerset (herb. Marshall, 3215), Sussex, Monmouthshire (herb. Marshall, 2747).

France, central Europe, Greece; northern Africa (Murbeck).

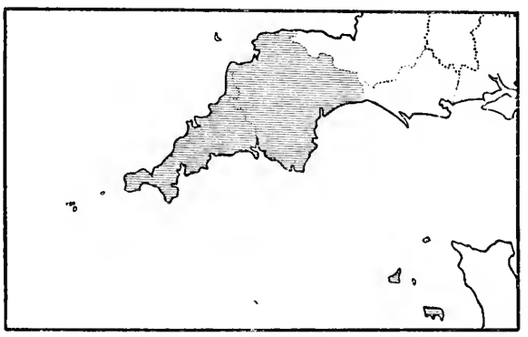
12. RUMEX RUPESTRIS. Plate 148

Rumex rupestris Le Gall *Fl. Morbihan* 501 (1852); Boreau in *Fl. Centr. France* ii, 552 (1857); Trimen in *Journ. Bot.* xiv, 1 (1876)!; Rouy *Fl. France* xii, 76 (1910).

Icones :—Trimen in *Journ. Bot.* xiv, t. 173.

Camb. Brit. Fl. ii. *Plate 148.* (*a*) Flowering shoot. (*b*) Ground-leaf. (*c*) Fruiting segments. (*d*) Fruiting segments from another plant (two enlarged). Cornwall (C. C. V.).

Perennial. *Stem* about 4—7 dm. high, branched above; branches short, suberect. *Petioles* of the lower leaves about 4—10 cm. long, usually much shorter than the laminae. *Laminae* of the lower leaves narrowly oblong or oblong-lanceolate, about 2·0—2·5 dm. long and 3—4 cm. broad, margins crenulate-undulate, narrowed at each end; of the stem-leaves lanceolate; of the inflorescence, larger than in *R. glomeratus*. *Inflorescence* branched, branches suberect, leafy in the lower half, whorls rather distant. *Pedicels* a little longer than the fruiting segments, jointed below the middle. *Flowers* in July and August. *Fruiting segments* larger than in *R. glomeratus*, about 4 mm. long, narrowly ovate-oblong, obtuse; tubercles 3, broad, conspicuous, reddish-brown, larger than in *R. glomeratus*. *Achenes* about 2 mm. long and 1·0—1·5 broad.



Map 27. Distribution of *Rumex rupestris* in England

Sea-shores in clefts of rocks, at the foot of cliffs, and on shingle. Local and rather rare; Channel Isles, Devonshire, Cornwall. Specimens from Sussex which we have seen named *R. rupestris* are probably *R. condylodes* × *crispus*.

France—Normandy, Brittany, Vendée; Spain—Galicia; ? Portugal.

R. pulcher × *rupestris* (p. 143).

13. *RUMEX SANGUINEUS. Bloodwort. Plate 149

Lapathum sativum sanguineum Johnson in Gerard *Herb.* ed. 2, 390 (1636); *L. sanguineum* Parkinson *Theatr. Bot.* 1226 (1640); *L. folio acuto rubente* Ray *Syn.* ed. 3, 142 (1724).

Rumex sanguineus L. *Sp. Pl.* 334 (1753)!; Hudson *Fl. Angl.* 133 (1762); *R. sanguineus* var. *purpureus* Stokes in *Bot. Mat. Med.* ii, 302 (1812); *R. sanguineus* var. *genuinus* Syme *Eng. Bot.* viii, 42 (1868); Ascherson und Graebner *Syn.* iv, 719 (1912).

Icones :—*Camb. Brit. Fl.* ii. *Plate 149.* (*a*) Flowering shoot. (*b*) Ground-leaf. (*c*) Persistent perianth-segments (enlarged). (*d*) Flowers (enlarged). Jersey (E. W. H.).

Perennial. *Stem* about 5 dm. high. *Ochreae* appressed. *Petioles* of the ground-leaves about a third to half as long as the laminae. *Laminae* oblong, subcordate at the base, margin more coarsely and irregularly crenate than in *R. condylodes*, rather more obtuse at the apex, shorter than in *R. condylodes*, primary veins more numerous; of the inflorescence, larger than in *R. condylodes*; all with broad, dark-crimson veins even when very young. *Pedicel* jointed near the base. *Flowers* in July, about a week later than *R. condylodes*. *Fruiting segments* oblong, entire, somewhat reticulate, one with a tubercle. *Achenes* small, ovate, brown.

This is an obscure and little-known plant. The "*Rumex sanguineus*" of the majority of botanists is simply an autumnal state of *R. condylodes* with more or less well-marked crimson-coloured veins. The leaves of *R. sanguineus* have broad, dark-crimson veins from the moment they appear above the ground in February; and these continue as a well-marked character until the aërial shoot perishes in late autumn. The two species are closely allied, as Bieberstein (*Fl. Taur.-Cauc.* i, p. 288) states when founding the latter species; but they are no nearer to each other than many other plants which are commonly kept as species, such as *Salix phylicifolia* and *S. nigricans*, *Quercus robur* and *Q. sessiliflora*, *Betula alba* and *B. pubescens*.

The origin of *R. sanguineus* is unknown to us; and it is possible that the plant is of garden origin. It has long been cultivated in Europe, though now it is, at least in the British Islands, very rare.

Waste places, roadsides, orchards; Channel Isles, Gloucestershire, Shropshire, East Riding of Yorkshire; Ireland—co. Galway. Doubtless elsewhere, but book-records of this plant are very dubious owing to confusion with the red-veined forms of other species.

Linnaeus (*loc. cit.*) gives its home as in Virginia, and adds that the plant has migrated thence into England. Europe (but perhaps not indigenous).

14. RUMEX CONDYLODES. Wood Dock. Plate 150

Lapathum viride Dillenius in Ray *Syn.* ed. 3, 141 (1724).

Rumex condylodes Bieberstein *Fl. Taur.-Cauc.* i, 288 (1808); *R. sanguineus* var. *viridis* Sibthorp[1] *Fl. Oxon.* 118 (1794); Smith[1] *Fl. Brit.* 390 (1800)!; Koch *Syn.* 613 (1837); Syme *Eng. Bot.* viii, 41 (1868); Rouy *Fl. France* xii, 75 (1910); Ascherson und Graebner *Syn.* iv, 719 (1912); *R. nemorosus* [Schrader ex] Willdenow *Enum. Hort. Berol.* 397 (1809); *Lapathum viride* Gray *Nat. Arr.* ii, 274 (1821).

Icones:—*Fl. Dan.* t. 2249, as *R. nemolapathum*; Beck in Reichenbach *Icon.* xxiv, t. 167, as *R. sanguineus*. *Camb. Brit. Fl.* ii. *Plate 150.* (*a*) Flowering shoot. (*b*) Lower part of stem, with leaf. (*c*) Ground-leaf. (*d*) Flowers (enlarged). (*e*) The three persistent perianth-segments of a single fruit. Huntingdon (E. W. H.).

Previous figures by British botanists purporting to be of this species have been singularly unfortunate, for neither the plate in Curtis' *Fl. Lond.* nor the one in the *Eng. Bot.* can be regarded as correct.

Exsiccata:—Billot, 3767, as *R. sanguineus* var. *viridis*; Fries, i, 53, as *R. nemolapathum*; Ehrhart herb. as *R. nemolapathum.*

Perennial. *Stem* up to about 1 m. high, branched, branches suberect. *Petioles* of the ground-leaves nearly as long as the laminae. *Laminae* of the ground-leaves ovate-lanceolate, rounded to subcordate at the base, crenulate, acute; of the inflorescence subsessile. *Inflorescence* lax, leafless except at or near the base, more or less branched, branches suberect; whorls separate, few-flowered. *Pedicels* equalling or longer than the fruiting-segments, jointed almost at the base. *Flowers* appearing in late June, 2—4 weeks earlier than in *R. glomeratus*. *Anthers* sulphur-yellow before dehiscence. *Fruiting segments* oblong, rounded at the base, entire, more obtuse than in *R. sanguineus*, about 3—4 mm. long; one with a narrowly ovate tubercle; the others either destitute of tubercles or with rather indistinct tubercles. *Achenes* ovate-elliptical, brown, shining.

(*β*) forma **sanguinalis** comb. nov.; *R. sanguineus* auct. pl., non L.

Veins turning to a bright rusty red or scarlet colour in autumn.

This state is often confused with *R. sanguineus*.

Damp woods, shady hedge-bottoms, sides of ditches, damp shady waste places. Very common; from the Channel Isles, Cornwall and Kent to Argyllshire, Elginshire, and Orkney. Apparently rare in the west and north of Scotland; in every county in Ireland; ascending to about 350 m. in Perthshire.

Southern Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe, central and southern Russia, southern Europe; Caucasus; Asia Minor; central Asia; northern Africa; North and South America (not indigenous). Ascends to 1000 m. in south-eastern Europe.

R. condylodes* × *glomeratus comb. nov.; *R. conglomeratus* × *sanguineus* Haussknecht in *Mitt. Geogr. Gesellsch. (Thüring.) Jena* iii, 73 (1885); Ascherson und Graebner *Syn.* iv, 720 (1912); × *R. ruhmeri* Haussknecht *loc. cit.*

Icones:—Curtis *Fl. Lond.* i, t. 62, as *R. acutus*; Beck in Reichenbach *Icon.* xxiv, t. 171, as *R. conglomeratus* × *sanguineus.*

Trimen (*Journ. Bot.* xiv, 310 (1876)) refers t. 1533 of the *Eng. Bot.* (as *R. sanguineus*) to this hybrid.

Stem erect, branches usually ascending. *Laminae* narrow as in *R. glomeratus*. *Inflorescence* rather leafy but not nearly so much so as in *R. glomeratus*, whorls usually few-flowered. *Fruiting segments* entire, with 3 oblong-oval tubercles of different sizes. *Achenes* frequently not ripening.

In habit, the forms of *R. glomeratus* × *condylodes* frequently simulate *R. rupestris*; their fruits are smaller than in this species.

Perhaps the "trigranulate *nemorosus*," distributed by the late Rev. A. Ley (*vide*, e.g., *Bot. Exch Club Brit. Rep. for 1872—4*, p. 30) should be placed here.

As *R. glomeratus* and *R. condylodes* are closely allied and often grow in close propinquity, we should have expected putative hybrids between them to be abundant. This, however, does not appear to be the case; or, if it is, then the hybrids are difficult to distinguish. *R. condylodes* comes into flower a fortnight to a month earlier than *R. glomeratus*; but autumnal states of the former are not infrequently in flower at the same times as *R. glomeratus.*

Damp places, growing with the supposed parents; Sussex, Surrey, Herefordshire, Cambridgeshire, Staffordshire. Germany.

[1] This plant is frequently cited as "*Rumex viridis* Sibthorp" or "*Rumex viridis* Smith"; but botanists who cite it thus cannot have consulted the work of Sibthorp or of Smith.

R. condylodes* × *crispus comb. nov.; *R. crispus* × *sanguineus* Haussknecht in *Mitt. Geogr. Ges. Thür. Jena* iii, 76 (1885); × *R. sagórski* Haussknecht *loc. cit.*; *R. sanguineus* × *crispus* Ascherson und Graebner *Syn.* iv, 753 (1912).

Icones :—Beck in Reichenbach t. 172, fig. 4—7, as *R. crispus* × *sanguineus.*

Exsiccata :—? Fries, ix, 57, as *R. conglomeratus.*

Laminae of the ground-leaves undulate, but less so than in *R. crispus* var. *typicus*, very acute as in *R. condylodes*; of the inflorescence, flat. *Inflorescence* leafy only at the base. *Fruiting segments* with 1—3 rather large tubercles.

Isle of Wight, Hampshire, Sussex, Surrey (herb. Marshall, 2840), Carnarvonshire, and doubtless elsewhere.

Sweden, Denmark, France, central Europe.

R. condylodes* × *obtusifolius comb. nov.; *R. obtusifolius* × *sanguineus* Haussknecht in *Mitt. Geogr. Ges.* (*Thüring.*) *Jena* iii, 78 (1885); Murbeck in *Bot. Notiser* 32 (1899); Ascherson und Graebner *Syn.* iv, 721 (1912); × *R. duffti* Rouy *Fl. France* xii, 89 (1910); × *R. duffti* Haussknecht.

Icones :—Beck in Reichenbach *Icon.* xxiv, t. 173, fig. 4—6, as *R. obtusifolius* × *sanguineus.*

Stem up to 1 m. high, branches usually ascending. *Laminae* of the ground-leaves narrower than in *R. obtusifolius*, elliptical to oblong, subcordate to truncate at the base, margin more or less crenulate, acute; of the inflorescence, linear-lanceolate, acute, shortly petioled. *Inflorescence* branched, lax, leafy at the base, whorls rather distant and slender. *Flowers* in July and August. *Fruiting segments* elongate, dentate at least below; tubercles 1—3, one larger than the others.

Somerset, Worcestershire, Derbyshire, Perthshire, and doubtless elsewhere.

Sweden, Denmark, Germany, central Europe.

R. condylodes* × *pulcher comb. nov.; *R. nemorosus* × *pulcher* Briggs in *Bot. Exch. Club Brit. Rep. for 1872—4*, 34 (1875); Trimen in *Journ. Bot.* xvii, 251 (1879) nomen.

Laminae of the stem-leaves oblong. *Inflorescence* with branches ascending or spreading or divaricate, with minute leaves at the base of the whorls of the lower branches. *Fruiting segments* about as large as those of *R. conglomeratus*, some entire, others with 1—2 teeth towards the base, strongly reticulated, tubercled; tubercles of unequal sizes.

A poor specimen by Warren, from Sussex, purporting to be of this parentage, is preserved in Herb. Mus. Brit. (cf. *Bot. Exch. Club Brit. Rep. for 1872—4*, p. 34).

Sussex. Not recorded outside England.

Series vii. *MARITIMI*

Maritimi nobis.

For characters, see page 133.

British species of *Maritimi*

15. **Rumex limosus** (see below). *Inflorescence* with whorls more or less separate. *Fruiting segments* about as long as the segment is broad, slender.

16. **Rumex maritimus** (p. 149). *Inflorescence* with whorls confluent. *Fruiting segments* about twice as long as the breadth of the segment, very slender.

15. RUMEX LIMOSUS. Marsh Dock. Plate 151

Hydrolapathum minus Gerard *Herb.* 312 (1597); Johnson in Gerard *Herb.* ed. 2, 389 (1636); *Lapathum aureum* Dillenius in Ray *Syn.* ed. 3, 142 (1724).

Rumex limosus Thuiller *Fl. Paris* ed. 2, 182 (1799); Rouy *Fl. France* xii, 79 (1910); *R. palustris* Smith *Fl. Brit.* 394 (1800)!; Syme *Eng. Bot.* viii, 43 (1868) excl. syn. *R. steini*; *R. maritimus* var. *viridis* Meyer *Chlor. Hanov.* 480 (1836); *R. conglomeratus* × *maritimus* Haussknecht in *Mitt. Geogr. Gesellsch.* (*Thüring.*) *Jena* iii, 69 (1885); Ascherson und Graebner *Syn.* iv, 757 (1912).

Biennial. *Stem* erect, 6—8 dm. high, leafy, rather zigzag, becoming tawny yellow, branched, branches ascending. *Petioles* mostly much shorter than the laminae. *Laminae* of the ground-leaves

linear-lanceolate, margins somewhat crenulate, acute to acuminate; of the inflorescence, long and lanceolate to linear. *Inflorescence* with many, long, narrow leaves; whorls many-flowered, more or less interrupted especially in the lower half and often quite to the top. *Pedicels* jointed below the middle, thickened towards the top. *Flowers* larger than in *R. maritimus*; appearing in early July. *Fruiting segments* narrowly ovate, toothed below; teeth narrow, about as long as the segment is broad; each segment with a large, oval or oblong-oval, reddish tubercle; becoming tawny yellow in August. *Achenes* broadly ovate, acute, dark brown, larger than in *R. maritimus*.

Some botanists regard *R. limosus* as a hybrid of *R. glomeratus* and *R. maritimus* (see Gillot et Parmentier in *Bull. Soc. Bot. France*, xliv, 325—339 (1897); Beck in *Fl. N.-Oest.* 319 (1890); Ascherson und Graebner *Syn.* iv, 756 (1912)). On the other hand, Nilsson (in *Bot. Notiser* 224 et seq., 1887) and Rouy (*Fl. France* xii, 79—80, 1910) oppose this view. Our own sympathies are with the latter authorities, partly on the ground that *R. limosus* often occurs in situations where one or both of its alleged parents are absent, and partly because, in all disputed cases, we prefer to reject theories of hybridism which are not supported by actual experiment.

(*a*) **R. limosus** var. **palustris** Rouy *Fl. France* xii, 79 (1910); *R. palustris* Smith *Fl. Brit.* 394 (1800)!, in sensu stricto; Babington.

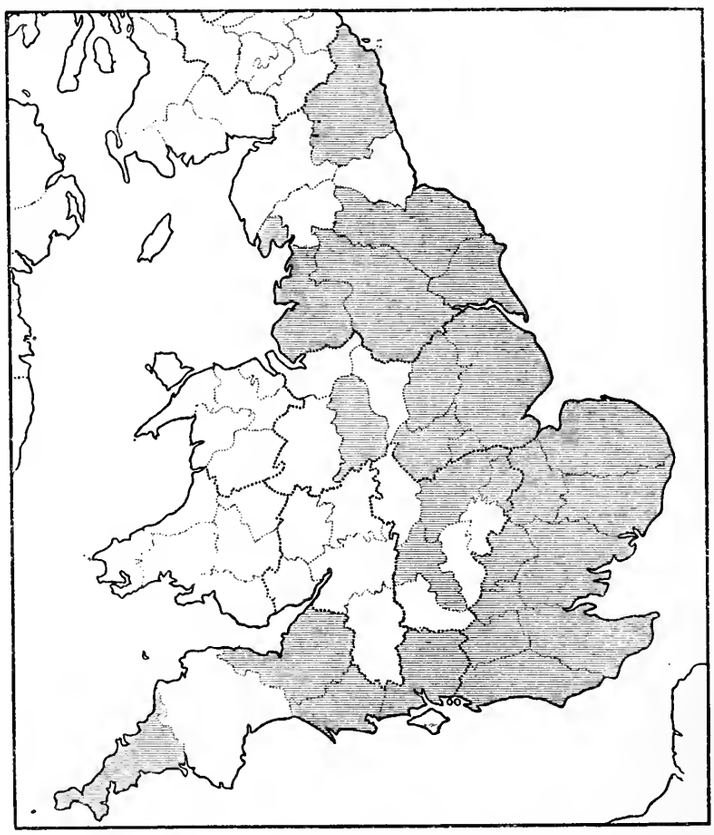
Icones:—Curtis *Fl. Lond.* i, t. 63, as *R. maritimus*; *Sv. Bot.* t. 706, as *R. maritimus*; Syme *Eng. Bot.* t. 1213, as *R. palustris*; Beck in Reichenbach *Icon.* t. 185, as *R. limosus*.

The figure in Smith's *Eng. Bot.* (t. 1932) named *R. palustris* is some other plant, probably some hybrid: Syme (*op. cit.*) says it is *R. pratensis* (= *R. crispus* × *obtusifolius*) but that the enlargements are correct for *R. palustris*.

Camb. Brit. Fl. ii. *Plate 151.* (*a*) Flowering shoot. (*b*) Lower leaf. (*c*) Flowers (enlarged). (*d*) Persistent perianth-segments (enlarged). Huntingdon (E. W. H.).

Exsiccata:—Fries, ii, 52, as *R. palustris*.

(*b*) **R. limosus** var. **thuilleri** Rouy *Fl. France* xii, 79 (1910); *R. limosus* Thuiller *loc. cit.* in sensu stricto; *R. palustris* × *maritimus* Nilsson in *Bot. Notiser* 234 (1887); *R. limosus* × *maritimus* Murbeck in *Bot. Notiser* 34 (1889).



Map 28. Distribution of *Rumex limosus* in England

Exsiccata:—Billot, 1760 et 1760 bis, as *R. palustris*; Wirtgen, xv, 839, as *R. palustris*.

Branches more slender. *Inflorescence* with whorls less separate especially towards the top, and with more flowers.

This variety is in some ways intermediate between *R. palustris* Smith (*in sensu stricto*) and *R. maritimus* L.; but whether it is a hybrid of *R. maritimus* and *R. palustris* Smith, or a bridging variety, we are unable definitely to state.

River-banks, marshes, fens, margins of ponds; in lowland districts only; chiefly in eastern England. Cornwall (rare), Dorset, and Kent to Lancashire and Yorkshire, Northumberland; not recorded for Scotland, Wales, or Ireland.

Sweden, Denmark, Germany, Holland, Belgium, France, central Europe, Russia, southern Europe; Asia.

R. limosus* × *obtusifolius Murbeck in *Bot. Notiser* 35 (1899); *R. obtusifolius* × *palustris* Čelakowski *Prodr. Fl. Böhm.* 158 (1867); Nilsson in *Bot. Notiser* 231 (1887); *R. conglomeratus* × *maritimus* × *obtusifolius* Beck in Reichenbach *Icon.* xxiv, 45 (1904); Ascherson und Graebner *Syn.* iv, 761 (1912).

Icones:—Beck *op. cit.* t. 189, fig. 1—3, as *R. limosus* × *obtusifolius*.

Stem taller than in *R. limosus*. *Laminae* broader. *Fruiting segments* larger, rather regularly toothed, teeth stouter.

Cambridgeshire.

Hungary.

16. RUMEX MARITIMUS. Golden Dock. Plate 152

Lapathum folio acuto flore aureo Johnson *Merc. Bot.* ii, 24 (1641); Ray *Syn.* ed. 3, 142 (1724).

Rumex maritimus L. *Sp. Pl.* 335 (1753)!; Miller *Gard. Dict.* ed. 8, no. 10 (1768) incl. *R. aureus*; Stokes in Withering, *Bot. Arr.* ed. 2, i, 371 (1787); Syme *Eng. Bot.* viii, 42 (1868); Rouy *Fl. France* xii, 78 (1910); Ascherson und Graebner *Syn.* iv, 703 (1912); *R. aureus* Miller *Gard. Dict.* ed. 8, no. 8 (1768) incl. *R. maritimus*; Relhan *Fl. Cantab.* 147 (1785).

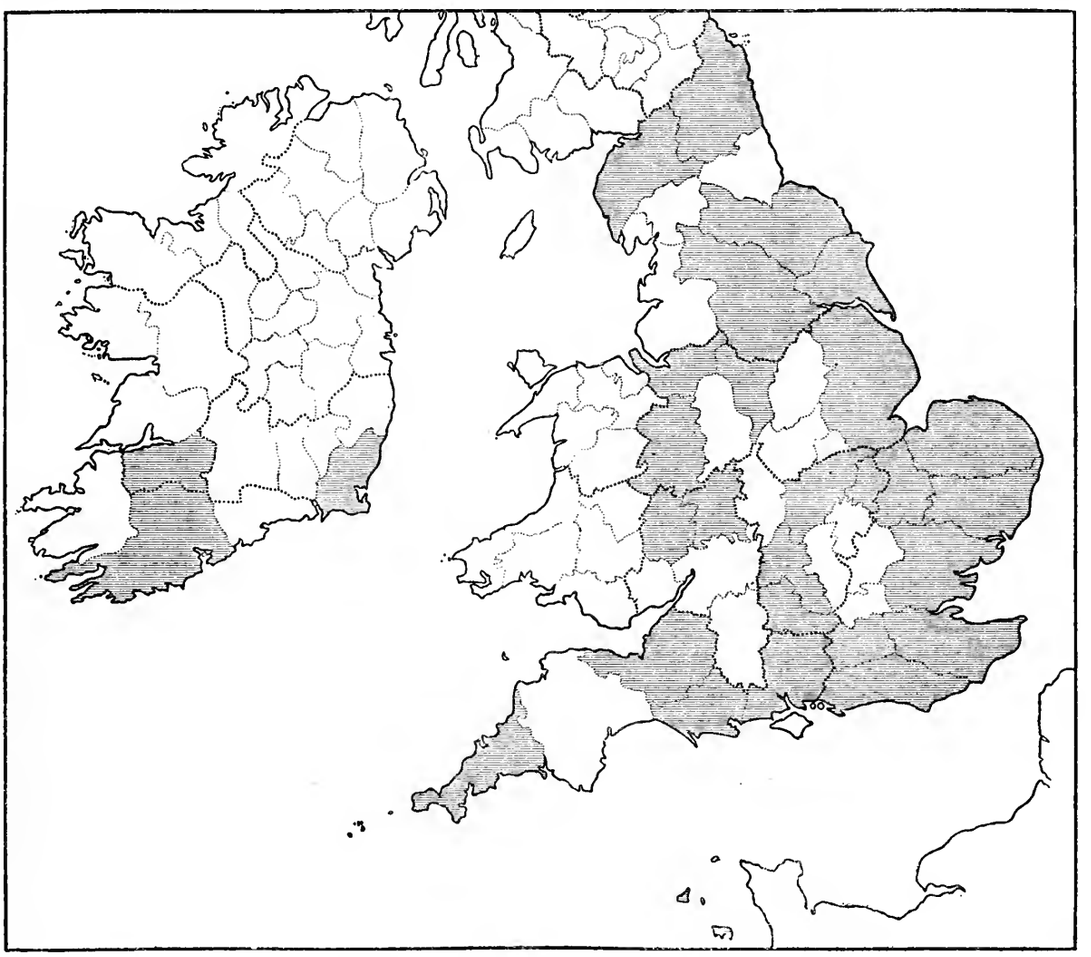
Icones:—Smith *Eng. Bot.* t. 725; *Fl. Dan.* t. 1208; Beck in Reichenbach *Icon.* xxiv, t. 186.

Camb. Brit. Fl. ii. *Plate 152.* (*a*) Flowering shoot. (*b*) Lower leaf. (*c*) Persistent perianth-segments (two enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 1948; Fries, i, 54; v. Heurck et Martinis, iv, 184; Schultz, vi, 554; Thielens et Devos, i, 30; Wirtgen, viii, 399; *Herb. Fl. Ingric.* x, 524.

Biennial. *Stems* erect, about 5—7 dm. high, rather slender, rather zigzag, leafy, branched, ultimately of a golden-brown colour. *Petioles* much shorter than the laminae. *Laminae* ultimately of a golden-brown colour; of the ground-leaves lanceolate, obtuse at the base, more or less wavy; of the inflorescence, linear. *Inflorescence* with whorls usually confluent. *Flowers* appearing in late July or early August about 2 weeks later than *R. limosus*. *Fruiting segments* ovate-triangular, margin with very slender teeth, teeth about twice as long as the segment is broad, each segment with a narrow linear tubercle. *Achenes* very small, ovate-triangular, acute, yellowish brown.

The trivial name *maritimus* of this species is misleading: in this country the plant usually occurs in non-maritime habitats.



Map 29. Distribution of *Rumex maritimus* in the British Isles

Marshes, fens, river-banks; local; chiefly in eastern England, and at low levels only. From the Channel Isles, Cornwall (rare), Dorset, and Kent to Cheshire, Cumberland, and Northumberland; said to be adventitious in some of its northerly stations and in Wales (Radnorshire); Ireland (co. Cork, co. Limerick, co. Wexford).

Scandinavia, Denmark, Germany, France, Holland, Belgium, central Europe, southern Europe, Russia, Caucasus; central Asia; North and South America. Ascends to 330 m. in Bayeux (Sendtner).

R. glomeratus × *maritimus* (cf. p. 144).

Subclass 3. *CENTROSPERMAE*

Centrospermae Engler *Führer Bot. Gart. Breslau* 36 (1886) as an order; in Engler und Prantl *Pflanzenfam. Nachtr.* 346 (1897) including group "c," as an order; *Syll.* ed. 2, 110 (1898) including group "c," as an order; *Curvembryosae* Lindley *Nat. Syst.* ed. 2, 206 (1836) partim.

Although the range of floral structure in the *Centrospermae* is very great, we believe the group to be a very natural one. The different orders probably represent diverging lines of development from a primitive apocarpous stock. Apocarpous fruits still occur in some exotic forms of the *Phytolaccaceae*; and *Mesembryanthemum*, which is naturalised in this country, represents the extreme limits of specialisation in this order. The remaining orders are closely allied; and specialised forms occur in the tribe *Diantheae*. These orders too are related to the *Primulales*; and in future systems of classification, it may be that the *Centrospermae* and the *Primulales* will be placed much closer together than at present.

In a general way, it may be said that the earlier and probably more primitive members of the *Centrospermae* are characterised by alternate leaves, by a monochlamydeous and sepaloid perianth, by a single whorl of antisepalous stamens, by free carpels or a unilocular indehiscent one-seeded fruit with basal placentation, and by anemophilous pollination, whilst the later and probably more specialised members of the group possess opposite leaves, a heterochlamydeous perianth, an obdiplostemonous androecium, a unilocular dehiscent many-seeded and rarely subseptate fruit with free-central or central placentation, and by entomophilous pollination.

For characters, see page 2.

Orders of *Centrospermae*

Order 1. ***Phytolaccales** (see below). *Leaves* alternate or opposite. *Flowers* bracteate, bracts often coloured and simulating a calyx, the parts sometimes spirally arranged. *Perianth* monochlamydeous, sepaloid. *Stamens* 3—∞, outer ones sometimes barren and petaloid. *Carpels* 1—∞, almost apocarpous or (usually) syncarpous. *Fruit* an achene, nut, drupe, or capsule. *Placentation* basal, axile, or parietal.

Order 2. **Chenopodiales** (p. 152). *Leaves* usually alternate, rarely opposite. *Flowers* ebracteate or bracteate. *Perianth* monochlamydeous, sepaloid, persistent, with 1—5 usually 4—5 segments, rarely absent. *Stamens* usually equal in number to the perianth-segments, rarely fewer, usually antisepalous. *Fruit* usually an achene, rarely a primitive 1-seeded pyxidium. *Placentation* basal.

Order 3. **Portulaccales** (see Vol. III). *Leaves* alternate or opposite, stipulate or not. *Flowers* ebracteate or bibracteate. *Perianth* dichlamydeous. *Calyx* consisting of 2 opposite sepals (sometimes regarded as bracteoles). *Corolla* with 4—5 petals, polypetalous or gamopetalous. *Stamens* 4—5 and antipetalous, or twice this number.

Order 4. **Dianthales** (see Vol. III). *Leaves* usually entire, usually opposite and decussate, stipulate or not. *Flowers* usually actinomorphic and entomophilous. *Perianth* monochlamydeous or (usually) heterochlamydeous. *Stamens* usually 10, in 2 whorls, more rarely 3—5, outer whorl often antisepalous. *Ovary* with 1—5 carpels, unilocular or sometimes with more or less definite traces of septa. *Placentation* basal, free-central, or central. *Fruit* an achene or (usually) a capsule.

Order 1. *PHYTOLACCALES

Phytolaccales nobis; *Phytolaccineae* Engler *Pflanzenfam. Nachtr.* 347 (1897).

For characters, see above. Only family represented in this country:—**Aïzoaceae*.

Family 1. *AÏZOACEAE

Aïzoaceae A. Braun in Ascherson *Fl. Prov. Brandenb.* i, 60 (1864); Pax in Engler und Prantl *Pflanzenfam.* iii, pt. 1b, 33 (1889); *Ficoïdeae* Jussieu *Gen. Pl.* 315 (1789) partim; Bentham and Hooker *Gen. Pl.* i, 851 (1867); *Ficoideae* or *Mesembryaceae* Lindley *Nat. Syst.* ed. 2, 56 (1836) including *Tetragoniaceae* p. 209.

Shrubs or herbs. *Leaves* simple, usually opposite, succulent. *Stipules* absent or scarious. *Inflorescence* cymose or solitary and terminal. *Perianth* monochlamydeous, sepaloid, with 4—8, usually 5, segments; segments united or apparently free, the median one posterior, equal or unequal. *Androecium* often consisting of stamens and petaloid staminodes. *Stamens* 5—∞. *Ovary* superior to

subinferior, with 2—∞ carpels, syncarpous. *Style* absent. *Stigmas* as many as the carpels. *Fruit* usually a capsule, with thick and succulent walls, with 1—∞ loculi, opening at the apex. *Seeds* few or ∞. *Placentation* basal, central, axile, or parietal. *Embryo* lying on the outside of the endosperm, curved or even spiral. *Endosperm* mealy.

About 18 genera and 420 species; chiefly in South Africa, but also in the Mediterranean region, tropical Africa, tropical Asia, California, South America, and Australia.

Only genus represented in the British flora:—**Mesembryanthemum.*

Genus 1. *Mesembryanthemum

Mesembryanthemum [Dillenius *Hort. Eltham.* 225 (1732)] L. *Sp. Pl.* 480 (1753) et *Gen. Pl.* ed. 5, 215 (1754); Pax in Engler und Prantl *Pflanzenfam.* iii, pt. 1b, 45 (1889); Harvey and Sonder *Fl. Capens.* ii, 387 (1861—2).

Succulent undershrubs or herbs. *Leaves* usually opposite, succulent. *Inflorescence* cymose or solitary and terminal. *Perianth* monochlamydeous, more or less adherent to the ovary; segments 2—8, usually 5, unequal. *Staminodes* numerous, petaloid, ligulate, united at the base, in 1—∞ whorls. *Stamens* numerous, united at the base, in many whorls. *Ovary* 4—20, subinferior or inferior. *Placentation* parietal. *Fruit* a capsule, opening at the summit, and only in moist air. *Seeds* numerous.

About 350 species, nearly all South African, but a few others in South America, Australia, and California, southern Europe and northern Africa.

1. *MESEMBRYANTHEMUM EDULE. Hottentot's Fig. Plate 153

M. falcatum majus flore amplo luteo Dillenius *Hort. Eltham.* 283, t. 212, fig. 212 (1732) [= var. *edule*].

Mesembryanthemum edule L. [*Syst. Nat.* 1060 (1759)] *Sp. Pl.* ed. 2, 695 (1762); Haworth *Observ. Misc.* 392 (1794); Harvey and Sonder *Fl. Capensis* ii, 412 (1861—2) emend.; [*M. acinaciforme* var. *flavum* L. *Sp. Pl.* 485 (1753)] *M. equilaterum* Haworth *Observ. Mesembr.* 390 (1794); *M. virescens* Haworth *Syn. Pl. Suec.* 236 (1802); *M. aequilaterale* Haworth *Misc. Nat.* 77 (1803); Bentham and Mueller *Fl. Austral.* 324 (1866); Reiche *Fl. Chili* ii, 367 (1898).

Icones:—*Camb. Brit. Fl.* ii. *Plate 153.* (*a*) Flowering shoot. (*b*) Flower. (*c*) Cross-section of leaf. (*d*) Cross-section of fruit. (*e*) Vertical section of fruit. (*f*) Cross-section of portion of fruit (enlarged). (*g*) Upper surface of fruit, with stigmas. (*h*) Staminodes and stamens. (*i*) Stamens (enlarged). Cornwall (C. C. V.).

Perennial. *Stem* robust, decumbent, 2-ridged, compressed. *Leaves* acinaciform, subconnate, thick and succulent, triangular in outline, outer ridge more or less serratulate, up to about 10·0 cm. long and 1·25 broad and deep but often rather smaller. *Bracteoles* (or uppermost pair of leaves) leaf-like, not cup-like, rather longer than the combined length of the pedicel and ovary. *Pedicels* very stout. *Flowers* about 4—7 cm. in diameter; May to September. *Perianth* comparatively inconspicuous, green, with 5 unequal segments, the largest segment up to about 3—4 cm. long. *Staminodes* reddish-purple or sulphur-yellow in colour. *Stamens* of the same colour. *Anthers* versatile. *Ovary* with about 6—10 carpels and as many loculi and stigmas. *Capsule* large, edible.

The forms which are naturalised in this country may be placed under three varieties:—(*a*) **M. edule* var. *flavum* nobis (= *M. edule* L. *l.c.*, in sensu stricto)—*staminodes* large, yellow; *carpels* about 10. (*b*) **M. edule* var. *virescens* nobis (= *M. virescens* Haworth, *l.c.*, in sensu stricto)—*staminodes* large, purple; *carpels* about 8. (*c*) **M. edule* var. *equilaterum* (= *M. equilaterum* Haworth, *l.c.*; *M. aequilaterale* Haworth, *l.c.*; in sensu stricto)—*staminodes* smaller, purple; *carpels* about 6.

The allied *M. acinaciforme* (L. *Sp. Pl.* ed. 2, 695 (1762)) has shorter and cup-like bracts which are about half as long as the pedicel and ovary combined, staminodes of a deep purple, and usually more numerous (12—13) stigmas. See Dillenius *Hort. Eltham.* 282, t. 211, fig. 270 (1732), as *M. acinaciforme flore amplissimo purpureo*; and Curtis *Bot. Mag.* t. 5539, as *M. acinaciforme*; and cf. *Bot. Reg.* t. 1732, as *M. rubrocinctum.* *M. acinaciforme* is naturalised in the Mediterranean region; but we have no evidence that it is so in England or the Channel Isles.

Cultivated in gardens, and now naturalised near the sea on cliffs, rocks, old walls, and hedgebanks in the Channel Isles, Cornwall (including the Scilly Isles), and in the Isle of Wight. "Nowhere naturalised in Ireland, though it grows well in wild places" (R. Ll. Praeger *in litt.*).

Mediterranean region (naturalised); South Africa, South America, Australia, Tasmania, California (perhaps not indigenous).

Order 2. CHENOPODIALES

Chenopodiales Lindley *Nat. Syst.* ed. 2, 207 (1836); *Chenopodiïneae* Engler *Führer Bot. Gart. Breslau* 36 (1886); in Engler und Prantl *Pflanzenfam. Nachtr.* 347 (1897); *Syll.* ed. 2, 110 (1898).

For characters, see page 150.

BRITISH FAMILIES OF *Chenopodiales*

Family 1. ***Amarantaceae** (see below). *Flowers* bracteate, crowded in a dense inflorescence. *Perianth* more or less scarious.

Family 2. **Chenopodiaceae** (p. 153). *Flowers* bracteate or ebracteate, usually arranged in a lax inflorescence. *Perianth* herbaceous or even succulent.

Family 1. *AMARANTACEAE

Amarantaceae Jussieu in *Ann. Mus. Paris* ii, 131 (1803); Schinz in Engler und Prantl *Pflanzenfam.* iii, pt. 1a, 91 (1893); *Amarantineae* Rouy *Fl. France* xii, 20 (1910) as a sub-family.

Herbs, rarely succulent. *Leaves* large, alternate, flat, pinnately nerved, petioled. *Inflorescence* more or less crowded. *Flowers* with a bract and 2 bracteoles. *Perianth* membranous, green or purple, more or less persistent, more or less enveloping the fruit. *Fruit* an achene or a 1-seeded pyxidium dehiscing irregularly or transversely.

This family is closely allied to the *Chenopodiaceae*; and indeed some botanists, e.g., Rouy (*Fl. France* xii) unite them. The chief character which distinguishes the *Amarantaceae* from the *Chenopodiaceae* is the membranous nature of the perianth.

About 54 genera and 520 species, warm temperate and tropical zones.

The genus *Amarantus* belongs to the sub-family *Amarantoïdeae* Shinz *op. cit.*, p. 97.

Genus 1. *Amarantus

Amarantus [Tournefort *Inst.* 234, t. 118 (1719)] L. *Sp. Pl.* 989 (1753) et *Gen. Pl.* ed. 5, 427 (1754); Shinz in Engler und Prantl *Pflanzenfam.* iii, pt. 1a, 102 (1893); Rouy *Fl. France* xii, 20 (1910).

Herbs with alternate leaves, not mealy. *Flowers* monoecious or polygamous, July to September. *Perianth* usually with 5 segments, often 3, segments slightly united at the base. *Stamens* usually equal in number to the perianth-segments; when less than 5, 1 or more subulate staminodes may occur. *Ovary* unilocular, uniovulate. *Style* short or absent. *Stigmas* 2—3, long, subulate. *Fruit* an achene or a 1-seeded pyxidium. *Seeds* compressed, vertical.

45 species; chiefly in tropical or subtropical regions.

SPECIES OF *Amarantus*

1. ***A. retroflexus** (see below). *Inflorescence* crowded. *Perianth* 5-partite. *Stamens* 5.

2. ***A. blitum** (p. 153). *Inflorescences* axillary, distant when young. *Perianth* 2—3, usually 3-partite. *Stamens* 2—3, usually 3.

1. *AMARANTUS RETROFLEXUS. Plate 154

Amarantus retroflexus L. *Sp. Pl.* 991 (1753); Rouy *Fl. France* xii, 21 (1910).

Icones:—Reichenbach *Iconogr. Crit.* t. 475, fig. 668.

Camb. Brit. Fl. ii. *Plate 154.* Flowering shoot. Jersey (E. W. H.).

Exsiccata:—Billot, 631; Thielens et Devos, iv, 382.

Annual, more or less roughly hairy. *Petioles* long. *Laminae* ovate to rhomboid-ovate, more or less undulate. *Inflorescence* green, crowded. *Bracts* and *bracteoles* rigid, setose, longer than the perianth-segments. *Flowers* July to September. *Perianth* 5-partite, segments ovate-lanceolate to oblong. *Stamens* 5.

Locally common in the Channel Isles and (more rarely) in the south of England, as a weed of cultivated land, and in waste places; Hampshire, Dorset, Devonshire, Cornwall, Somerset, Sussex, Kent, Middlesex, and doubtless elsewhere; adventitious in the north of England.

Tropical and subtropical America; adventitious in the western, central, and southern states of U.S.A., in Europe (from Denmark southwards), in northern Africa, and in Asia.

2. *AMARANTUS BLITUM

Amarantus blitum L. *Sp. Pl.* 990 (1753); Hudson *Fl. Angl.* 356 (1762); Smith *Fl. Brit.* 1018 (1800); Syme *Eng. Bot.* vii, 184 (1867); *A. sylvestris* Desfontaine *Tabl. l'Ecole Bot.* 44 (1804) nomen; Grenier et Godron *Fl. Fr.* iii, 4 (1855); Rouy *Fl. France* xii, 22 (1910); *A. minor* Gray *Nat. Arr.* ii, 289 (1821); *A. blitum* var. *sylvestris* Moquin in DC. *Prodr.* xiii, pt. ii, 263 (1849).

Icones :—Smith *Eng. Bot.* t. 2212; Reichenbach *Iconogr. Crit.* t. 474, fig. 667.

Exsiccata :—Billot, 2131; Todaro.

Annual. *Stem* usually erect, about 2—5 dm. high, glabrous, branched. *Petioles* long. *Laminae* ovate-lanceolate to narrowly rhomboidal, attenuate at each end. *Inflorescences* greenish, agglomerated, axillary, subsessile. *Bracteoles* lanceolate. *Flowers* sessile, polygamous; July to September. *Perianth* greenish, segments 3. *Stigmas* 3, sessile, linear. *Fruit* elliptical to suborbicular, dehiscing transversely, 1-seeded. *Seed* lenticular, dark red to nearly black; September and October.

Rather rare and local; a weed of arable land from the Channel Isles, Cornwall, Hampshire and Kent, northwards to Middlesex, Huntingdonshire, and Cambridgeshire.

Western and central Europe, adventitious in its more northerly stations of southern Europe; northern Africa; south-western Asia; Australia (adventitious); N. America (adventitious).

Family 2. CHENOPODIACEAE

Chenopodiaceae Du Mortier *Anal. Fam. Plantes* 15 et 17 (1829); Lessing in *Linnaea* ix, 197 (1834); Lindley *Nat. Syst.* ed. 2, 208 (1836); Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. 1 a, 36 (1893); *Salsolaceae* Moquin in DC. *Prodr.* xiii, pt. ii, 41 (1849).

Shrubs, undershrubs, or herbs, frequently more or less succulent, and with curious hairs which are often vesicular and which give rise to the so-called "mealy" appearance of the shoot. *Leaves* usually alternate (opposite in *Salicornia*), simple, exstipulate. *Flowers* bracteate or ebracteate, actinomorphic, small, usually monoclinous. *Inflorescence* usually compound, the whole being racemose but with the branches usually cymose. *Pollination* anemophilous. *Perianth* monochlamydeous and sepaloid (often absent in pistillate flowers in *Atriplex*), persistent, usually 5-partite, with 1—5, usually 4—5 segments; segments more or less united below. *Stamens* 1—5, usually 4—5, not more numerous than the perianth-segments, usually hypogynous, rarely on a disc. *Anthers* introrse. *Ovary* consisting of 2—5, usually 2 carpels, usually superior, rarely (in *Beta*) subinferior, with 1 loculus, and 1 basal ovule. *Stigmas* usually 2, rarely brush-like. *Fruit* usually an achene, rarely (as in *Beta*) a pyxidium, usually surrounded by the persistent perianth. *Seeds* vertical or horizontal. *Embryo* peripheral. *Endosperm* usually present (absent in most species of *Salicornia*).

The highly specialised characters of *Salicornia* render the definition of the family *Chenopodiaceae* unusually difficult.

About 75 genera and 500 species, characteristic of arid regions in all the great continents, and spreading into the moister parts of the temperate zones.

British tribes of *Chenopodiaceae*

Tribe 1. **Chenopodiëae** (p. 154). *Leaves* alternate, usually broad and flat. *Flowers* ebracteate, usually monoclinous, sometimes some monoclinous and some pistillate. *Perianth* present in both staminate and pistillate flowers. *Achene* more or less enveloped by the persistent perianth. *Embryo* peripheral, horse-shoe shaped. *Endosperm* present.

Tribe 2. **Beteae** (p. 166). Characters of *Chenopodiëae*, but *perianth segments* more succulent, *stigma* stouter and shorter, and *fruit* a pyxidium, subinferior, with thicker walls.

Tribe 3. **Atripliceae** (p. 168). *Leaves* as in *Chenopodiëae*. *Flowers* usually diclinous. *Perianth* of staminate flowers present and ebracteate as in *Chenopodiëae* and *Beteae*, but usually absent in the pistillate flowers which are 2-bracteate, rarely present along with 2 bracts in the pistillate flowers (cf. section *Dichospermum* of *Atriplex*). *Embryo* peripheral, horse-shoe shaped. *Endosperm* present.

Tribe 4. **Suaedeae** (p. 182). *Leaves* small, succulent, alternate. *Bracteoles* small. *Stigmas* papillate all round. *Embryo* rolled in a flat spiral. *Integument of seed* double.

Tribe 5. **Salsoleae** (p. 184). *Leaves* as in *Suaedeae*, but often more or less prickly-acuminate. *Bracteoles* larger than in *Suaedeae*. *Stigmas* papillate only on the inner surface. *Embryo* rolled in a helicoid spiral. *Integument* of seed single, membranous.

Tribe 6. **Salicornieae** (p. 186). *Leaves* small, entire, succulent, alternate or (as in the British forms) opposite and decussate. *Bracts* succulent, like the leaves. *Flowers* monoclinous. *Perianth* small, succulent, usually more or less embedded in the leaves. *Stamens* 1—2. *Endosperm* present or (as in the British forms) absent.

Tribe 1. *CHENOPODIËAE*

Chenopodieae C. A. Meyer in Ledebour *Fl. Alt.* 371 (1829) partim; Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. 1a, 52 et 58 (1893); *Eu-Chenopodieae* Bentham and Hooker *Gen. Pl.* iii, 44 (1880) partim.

For characters, see page 153. Only British genus:—*Chenopodium*.

Genus 1. Chenopodium

Chenopodium [Tournefort *Inst.* 506, t. 288 (1719) including *Blitum* p. 507] L. *Sp. Pl.* 218 (1753) et *Gen. Pl.* ed. 5, 103 (1754) including *Blitum*; Bentham and Hooker *Gen. Pl.* iii, 51 (1880); Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. 1a, 60 (1893).

Shrubs, undershrubs, or herbs, more or less mealy. *Stem* grooved, erect, or decumbent. *Leaves* alternate. *Petioles* usually present. *Laminae* with entire or toothed or lobed margins. *Bracteoles* absent. *Inflorescence* more or less branched, branches cymose. *Flowers* usually monoclinous, rarely polygamous. *Perianth* with 3—5, usually 4—5 segments, joined at the base, often slightly membranous at the margin. *Stamens* 2—5, usually 4—5, springing from the receptacle. *Filaments* subulate. *Pericarp* thin and membranous. *Stigmas* 2—5, usually 2. *Seed* bifacial, lenticular, mostly horizontal, often vertical on the terminal cymes, rarely all vertical. *Endosperm* starchy.

About 60 species; chiefly in the temperate zones.

Sections of *Chenopodium*

Section I. †**Agathophyton** (see below). Perennial. *Perianth* with 5 segments. *Stamens* 5. *Stigmas* 2—5, long. *Seeds* vertical, except the terminal ones of the cymes which are horizontal, large.

Section II. **Chenopodiastrum** (p. 155). Annual. *Perianth* with 5 segments. *Stamens* 5. *Stigmas* short. *Seeds* horizontal.

Section III. **Pseudoblitum** (p. 163). Annual. *Perianth* of terminal flowers with 5, of lateral ones with 3—4 segments. *Stamens* as many as the perianth-segments. *Stigmas* short. *Seeds* either all vertical, or those of the terminal flowers horizontal and the others vertical; very small.

Section IV. ***Monocarpus** (p. 166). Allied to *Pseudoblitum*, but with *fruiting perianth* succulent and bacciform.

Section I. †*AGATHOPHYTON*

Agathophyton Ascherson *Fl. Brandenb.* 573 (1864); Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. 1a, 61 (1897); *Anserina* Du Mortier *Fl. Belg.* 21 (1827) as a genus.

For characters, see above. Only British species:—†*C. bonus-henricus*.

1. †CHENOPODIUM BONUS-HENRICUS. Good King Henry. Plate 155

Bonus henricus Gerard *Herball* 259 (1597); *Lapathum unctuosum sive bonus henricus* Parkinson *Theatr. Bot.* 1225 (1640); *Blitum perenne bonus henricus dictum* Ray *Syn.* ed. 3, 156 (1724).

Chenopodium bonus-henricus L. *Sp. Pl.* 218 (1753)!; Smith *Fl. Brit.* 272 (1800)!; Syme *Eng. Bot.* viii, 24 (1868); Rouy *Fl. France* xii, 50 (1910); *C. esculentum* Salisbury *Prodr.* 151 (1796); *C. spinacifolium* Stokes *Bot. Mat. Med.* ii, 14 (1812).

Icones:—Curtis *Fl. Lond.* i, t. 53; Smith *Eng. Bot.* t. 1033; *Fl. Dan.* t. 579; Beck in Reichenbach *Icon.* xxiv, t. 257.

Camb. Brit. Fl. ii. *Plate 155.* (*a*) Flowering shoot. (*b*) Ground-leaf. (*c*) Flower (enlarged). (*d*) Persistent perianth enclosing the nearly ripe achene (enlarged). (*e*) Pistil (enlarged). (*f*) Seeds (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Billot, 2904 et 2904 bis.

Perennial, scarcely mealy. *Rhizome* stout. *Stem* rather stout, erect, grooved, about a third to half a metre high, branched below. *Petioles* of the ground-leaves as long as or rather longer than the laminae. *Laminae* broadly hastate, basal lobes descending, large. *Inflorescence* leafless except at the base. *Flowers* polygamous, mostly monoclinous, a few pistillate; late May and June. *Perianth* with 5 segments, green, margin membranous. *Stamens* 5. *Filaments* subulate. *Stigmas* usually 2—3, rarely 4 or 5. *Seeds* large, about 1·5 mm. by 1·7, reddish to nearly black, minutely punctate; August.

By British field-botanists, this species is often considered to be a mere relic of cultivation. It was formerly cultivated rather commonly, and indeed still is in Lincolnshire, where it is known as "marcury" (i.e., mercury), as a kind of spinach; and it is also used as a simple. However, the plant seems to be too widely distributed in England and the neighbouring countries on the mainland of Europe for this explanation to be considered quite satisfactory. Even in the Alps, it is a nitrophilous species, frequenting the "lägers" or places where the cattle lie, and growing with other nitrophilous species, such as *Urtica dioïca*, *Rumex alpinus*, and *Aconitum napellus*. No doubt its nitrophilous tendencies are partly responsible for its normal occurrence near habitations and cow-sheds. British botanists have never realised the significance of these nitrophilous species, though Swiss botanists, in particular, are quite familiar with them.

Road-sides, especially near villages and habitations and cow-sheds; chiefly lowland but ascending to 360 m. in Derbyshire, northwards to Caithness-shire; throughout England, Wales (except Cardiganshire), and southern and eastern Scotland (northwards to Perthshire); local in western and northern Scotland and in Ireland.

Central and southern Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe (rising to 2700 m. in the Tyrol), Russia, southern Europe; western Asia; North America.

Section II. *CHENOPODIASTRUM*

Chenopodiastrum Moquin in DC. *Prodr.* xiii, pt. 2, 61 (1849); Volkens *op. cit.* p. 61; Rouy *Fl. France* xii, 42 (1910).

For characters, see page 154.

Series of *Chenopodiastrum*

Series i. **Polysperma** (see below). *Laminae* entire or subentire. *Seeds* rugose.

Series ii. **Alba** (p. 157). *Laminae* entire or toothed. *Seeds* smooth.

Series iii. **Urbica** (p. 159). *Laminae* usually more or less toothed or lobed, larger than in *Polysperma*. *Seeds* rugose.

Series i. *Polysperma*

Polysperma nobis; sectio 1*, Moquin in DC. *Prodr.* xiii, pt. ii, 61 (1849).

For characters, see above.

British species of *Polysperma*

2. **C. polyspermum** (see below). *Shoot* scarcely mealy. *Achene* enclosed by the persistent perianth.

3. **C. vulvaria** (p. 157). *Shoot* mealy, foetid. *Achene* projecting from the persistent perianth.

2. CHENOPODIUM POLYSPERMUM. All-seed. Plate 156

Atriplex sylvestre sive polyspermum Gerard *Herb.* 237 (1597); *Chenopodium betae-folia* Ray *Syn.* ed. 3, 157 (1724).

Chenopodium polyspermum L. *Sp. Pl.* 220 (1753)!; Smith *Fl. Brit.* 278 (1800)! including *C. acutifolium*; Syme *Eng. Bot.* viii, 10 (1868); Rouy *Fl. France* xii, 47 (1910).

Icones:—*Fl. Dan.* t. 1153.

Camb. Brit. Fl. ii. *Plate 156.* (*a*) Flowering shoot of var. *acutifolium.* (*b*) Persistent perianths and achenes (enlarged) of var. *obtusifolium.* Jersey (E. W. H.). (*c*) Flowering shoot of var. *obtusifolium.* (*d*) Persistent perianths and achenes (enlarged) of var. *obtusifolium.* Huntingdonshire (E. W. H.).

Annual, rather mealy. *Stem* erect or decumbent, often much branched, lower branches then wide-spreading, 4-angled. *Petioles* rather short, often about a third as long as the laminae or rather shorter. *Laminae* elliptical to elliptical-acute, thin. *Inflorescences* axillary and terminal, about

as long as the leaves, with ascending or wide-spreading branches; branches short, either sub-simple or compound. *Achenes* not wholly enclosed by the persistent perianths. *Seeds* black, slightly rugose, about 0·7 mm. in diameter.

(*a*) **C. polyspermum** var. **acutifolium** Gaudin *Fl. Helv.* ii, 259 (1828); Ascherson *Fl. Brandenb.* 568 (1864); Syme *Eng. Bot.* viii, 11 (1868). *C. acutifolium* Smith *Eng. Bot.* no. 1481 (1805)!; *C. polyspermum* var. *spicato-racemosum* Koch *Syn.* 607 (1837); *C. polyspermum* var. *spicatum* Moquin *Chenop. Monogr. Enum.* 22 (1840); Rouy *Fl. France* xii, 47 (1910); *C. polyspermum* var. *erectum* Sonder *Fl. Hamb.* 142 (1851).

Icones:—Curtis *Fl. Lond.* i, 52 as *C. polyspermum*; Smith *Eng. Bot.* t. 1481, as *C. acutifolium*; Beck in Reichenbach *Icon.* xxiv, t. 236, fig. 2, as *C. polyspermum* var. *spicatum*.

Camb. Brit. Fl. ii. *Plate 156.* (*a*, *b*).

Exsiccata:—Billot, 1318, as *C. polyspermum*; Gandoger, 356, as *C. acutifolium*; Todaro, 1324, as *C. polyspermum*; *Herb. Fl. Ingric.* iv, 511 (partim), as *C. polyspermum*.

Usually erect. *Laminae* of the upper leaves broadly lanceolate, usually acute. *Inflorescence* with spicoid branches, branches much shorter than in var. *obtusifolium*.

From the Channel Isles, Cornwall, and Kent northwards to Berwickshire; rare in Wales and northern England; rare or not distinguished in Ireland—counties Cork and Dublin.

(*b*) **C. polyspermum** var. **obtusifolium** Gaudin *Fl. Helv.* ii, 258 (1828); *C. polyspermum* Smith *loc. cit.*, in sensu stricto!; *C. polyspermum* var. *cymosum* Chevallier *Fl. Paris* éd. 2, ii, 385 (1836); Rouy *Fl. France* xii, 47 (1910); Ascherson und Graebner *Syn.* v, 27 (1913); *C. polyspermum* var. *cymoso-racemosum* Koch *Syn.* 607 (1837); *C. polyspermum* var. *prostratum* Sonder *Fl. Hamb.* 142 (1851); *C. polyspermum* var. *genuinum* Syme *Eng. Bot.* viii, 11 (1868).

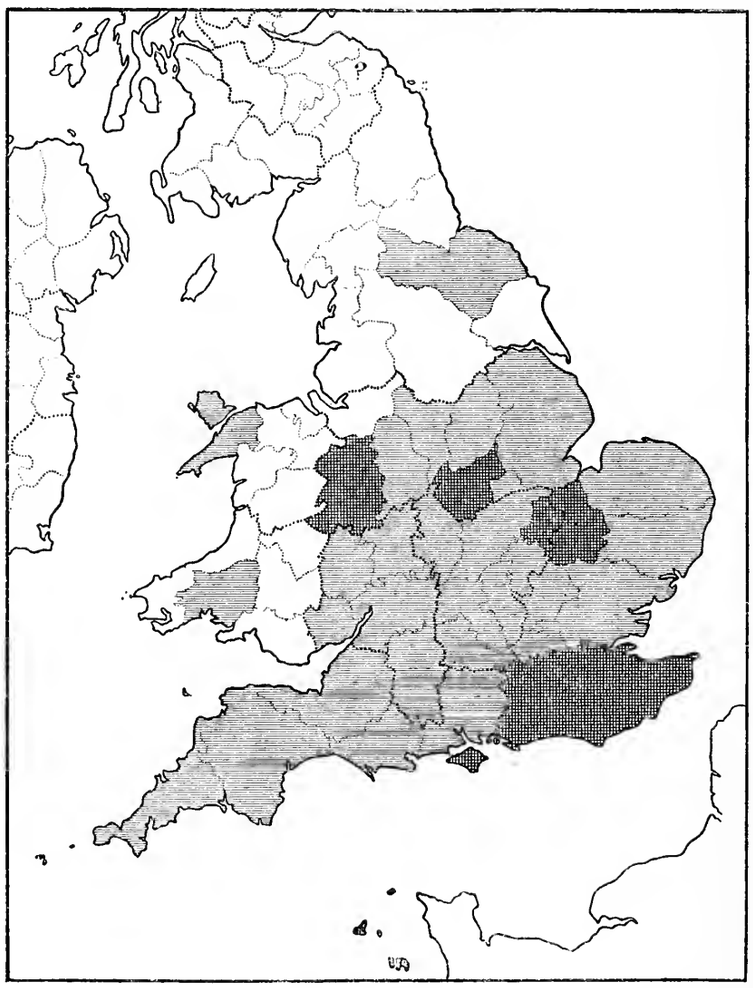
Icones:—Smith *Fl. Lond.* t. 1480, as *C. polyspermum*; Beck in Reichenbach *Icon.* xxiv, t. 236, fig. 1, as *C. polyspermum* var. *cymosum*.

Camb. Brit. Fl. ii. *Plate 156.* (*c*, *d*).

Exsiccata:—Linn. herb.; Smith herb.; as *C. polyspermum*; *Herb. Fl. Ingric.* iv, 511 (partim), as *C. polyspermum*.

Usually prostrate or decumbent. *Laminae* all or mostly obtuse, usually of a darker green, and rather thicker. *Inflorescence* with branches having more slender, longer, and more divaricate stalks.

Northwards to Shropshire and Leicestershire; less frequent than var. *acutifolium* but in the same kind of localities.



Map 30. Distribution of *Chenopodium polyspermum* in the British Isles. The var. *acutifolium* occurs in all the counties which are shaded, and the var. *obtusifolium* in those which are shaded more darkly

Range more extended than that of var. *acutifolium*, occurring in Asia Minor, central Asia, and North America (adventitious).

Damp, rich, cultivated ground, road-sides, waste places, and farmyards; in southern and eastern England chiefly, and confined to the lowlands; from the Channel Isles, Cornwall, and Kent northwards to Cheshire and Lincolnshire, and the North Riding of Yorkshire and Berwickshire. Adventitious in most of its more northerly stations. Ireland—co. Cork and co. Dublin—perhaps not indigenous.

Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe, Russia, southern Europe; Asia; North America (adventitious).

3. CHENOPODIUM VULVARIA. Stinking Goosefoot. Plate 157

Atriplex olida Gerard *Herb.* 258 (1597); Ray *Cat. Cantab.* 17 (1660); *Blitum foetidum vulvaria dictum* Ray *Syn.* ed. 3, 156 (1724).

Chenopodium vulvaria L. *Sp. Pl.* 220 (1753)!; Syme *Eng. Bot.* viii, 12 (1868); Rouy *Fl. France* xii, 46 (1910); *C. olidum* Curtis *Fl. Lond.* ii, no. 68[1]; Smith *Fl. Brit.* 277 (1800)!.

Icones:—Curtis *Fl. Lond.* ii, t. 68, as *C. olidum*; Smith *Eng. Bot.* t. 1034, as *C. olidum*; *Fl. Dan.* t. 1152; Beck in Reichenbach *Icon.* xxiv, t. 237.

Camb. Brit. Fl. ii. *Plate 157.* (*a*) Flowering shoots. (*b*) Flower (enlarged). (*c*) Seeds (enlarged). Lower shoot from Cambridgeshire (C. E. M.); other parts from Huntingdonshire (E. W. H.).

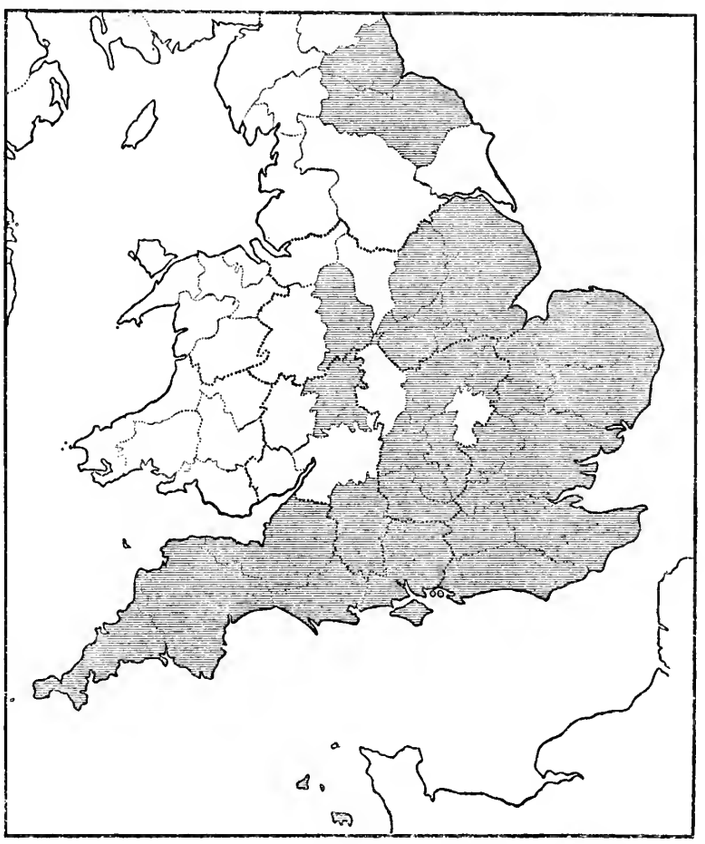
Exsiccata:—Billot, 2354; Todaro, 526.

Annual, very mealy, and with the nauseous odour of stale salt fish. *Root* small. *Stem* decumbent, branched; branches opposite, wide-spreading. *Petioles* usually about two-thirds as long as the laminae. *Laminae* ovate or subrhomboid, acute or subacute, up to about 2·5 cm. long. *Inflorescences*—terminal ones short, axillary ones longer and more numerous, usually subtended by a full-sized leaf. *Achenes* enclosed by the persistent perianths. *Seeds* black, punctate, nearly 1·0 mm. in diameter.

It is interesting that this plant still exists at Cambridge in the same station for which it was recorded by John Ray (*loc. cit.*) in 1660.

Rare on landward edges of salt-marshes and on shingle beaches; in its inland stations, it occurs in waste places and at the bottom of old walls; only lowland, and chiefly in southern and eastern England; from the Channel Isles, Cornwall, and Kent, northwards to Durham; adventitious northwards to Fifeshire.

Southern Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe (ascending to 1675 m. in the Alps), Russia, southern Europe; northern Africa; south-western Asia; North America (adventitious).



Map 31. Distribution of *Chenopodium vulvaria* in England

Series ii. *ALBA*

Alba nobis.

For characters, see page 155. Only British species:—*C. album.*

4. CHENOPODIUM ALBUM. Goosefoot. Plates 158, 159

Blitum atriplex sylvestris dictum Ray *Syn.* ed. 3, 154 (1724); *C. foliis integris racemosum* Dillenius in Ray *Syn.* ed. 3, 155 (1724) [=var. *integerrimum*]; *C. folio sinuato candicante* Martyn *Meth. Cantab.* 17 (1727) [=var. *spicatum*].

Chenopodium album L. *Sp. Pl.* 219 (1753)!, including *C. viride*!; Smith *Fl. Brit.* 275 (1800)!; *Eng. Fl.* ii, 13 (1824); excl. var. *β*; Syme *Eng. Bot.* viii, 13 (1868); Rouy *Fl. France* xii, 44 (1910); *C. candicans* Lamarck *Fl. France* iii, 248 (1778) excl. var. *β*; *C. leiospermum* DC. *Fl. France* iii, 390 (1805).

[1] The dates of publication of the parts of Curtis' *Fl. Lond.* are uncertain. See W. A. Clarke in *Journ. Bot.* xxxvii, 390 *et seq.* (1899) and other references there cited.

Icones :—Beck in Reichenbach *Icon.* xxiv, t. 240, as *C. album* var. *typicum*; t. 241, as *C. album* var. *striatum*; t. 242, as *C. album* var. *viride.*

Annual; more or less mealy. *Stem* erect, grooved, more or less branched. *Petioles* about as long as the laminae. *Laminae* of the lower leaves subrhomboidal to sublanceolate, margin usually more or less toothed. *Inflorescence* more or less branched; branches suberect to divaricate. *Perianth* more or less mealy. *Seeds* all horizontal, not rugose, shining, about 2 mm. in diameter.

As is well known, this is a very variable species; and we do not claim that the following forms exhaust those which can be found in this country. We think there is much to be said for the position virtually adopted by Linnaeus (*loc. cit.*) that there are here really two species. On this supposition, the numerous forms which have been described by botanists might be regarded as consisting chiefly of hybrids and hybrid-segregates; and we should welcome experiments with a view of testing this hypothesis. Syme (*Eng. Bot.* viii, p. 15) states that one of the varieties of *C. album* invariably comes true from seed; but the contrary has also been affirmed. The apparently contradictory results are each capable of being satisfactorily explained, if the above hypothesis be correct.

(*a*) **C. album** var. **spicatum** Koch *Syn.* 606 (1837); *C. album* L. *loc. cit.*, in sensu stricto; *C. album* var. *incanum* Moquin *Chenopod. Monogr. Enum.* 29 (1840); *C. album* var. *commune* Moquin in DC. *Prodr.* xiii, pt. ii, 71 (1849) incl. var. *candicans*; Grenier et Godron *Fl. France* iii, 19 (1855); Rouy *Fl. France* xii, 44 (1910); *C. album* var. *candicans* Moquin *loc. cit.*, incl. var. *commune*; Syme *Eng. Bot.* viii, 13 (1868).

Icones :—Curtis *Fl. Lond.* i, 50, as *C. album*; Smith *Eng. Bot.* t. 1723, as *C. album.*

Exsiccata :—Linn. herb. as *C. album*; *Herb. Fl. Ingric.* iv, 513 b, as *C. album* var. *vegetius.*

Shoot very mealy. *Branches* erect or suberect. *Laminae* subrhomboidal, more or less coarsely toothed. *Inflorescences* and partial inflorescences crowded.

This is perhaps the commonest form of the species.

(*β*) var. **spicatum** forma **incanum** comb. nov.; *C. album* var. *incanum* Moquin *Chenopod. Monogr.* 29 (1840); *album* var. *candicans* Moquin in DC. *Prodr.* xiii, pt. ii, 71 (1849) in sensu stricto; *C. album* var. *commune* subvar. *candicans* Rouy *Fl. France* xii, 44 (1910).

Exsiccata :—*Herb. Fl. Ingric.* iv, 513, as *C. album.*

A small and perhaps a half-starved form of *C. album* var. *spicatum.* *Laminae* usually entire towards the base and toothed towards the apex. *Inflorescence* with shorter branches.

Occurs sometimes with var. *spicatum*, but oftener on drier soils or at higher altitudes.

(*b*) **C. album** var. **virescens** Wahlenberg *Fl. Suec.* i, 158 (1826); Moquin in DC. *Prodr.* xiii, pt. ii, 71 (1849); *C. paganum* Reichenbach *Fl. Germ. Excurs.* 579 (1830); *C. glomerulosum* Reichenbach *loc. cit.*; *C. album* var. *viridescens* St-Amans *Fl. Agenaise* 105 (1821); Moquin *Chenopod. Monogr. Enum.* 29 (1840); *C. album* var. *glomerulosum* Hartman *Fl. Scand.* 199 (1849); *C. album* var. *subglabrum* Sonder *Fl. Hamburg* 143 (1851); *C. album* var. *paganum* Syme *Eng. Bot.* viii, 14 (1868).

Icones :—Syme *Eng. Bot.* viii, t. 1190, as *C. album* var. *paganum.*

Camb. Brit. Fl. ii. *Plate 158.* (*a*) Flowering shoot. (*b*) Lower part of stem, with leaves. (*c*) Lower leaves. (*d*) Achenes (enlarged). Huntingdonshire. (E. W. H.).

Taller and more luxuriant than var. *spicatum*, less mealy, greener. *Laminae* broader, more coarsely and irregularly toothed. *Inflorescence* laxer, more branched, more leafy; branches usually divaricate, longer than the subtending leaves. *Seeds* rather larger.

Very common in damp, rich, waste places in eastern England and doubtless elsewhere, but reliable records of this and of many other varieties of species are scanty.

Europe.

(*c*) **C. album** var. **integerrimum** Gray *Nat. Arr.* ii, 285 (1821); *C. viride* L. *Sp. Pl.* 219 (1753)! partim; *Fl. Angl.* (1754); *C. album* var. *viride* Syme *Eng. Bot.* viii, 14 (1868) non auct. pl.; *C. lanccolatum* [Mühlenberg ex] Willdenow *Enum. Hort. Berol.* i, 291 (1809); *C. album* var. *lanceolatum* Cosson et Germain *Fl. Paris* 451 (1845); Ascherson *Fl. Brandenb.* 570 (1864).

Icones :—Syme *Eng. Bot.* viii, t. 1189.

Camb. Brit. Fl. ii. *Plate 159.* (*a*) Flowering shoot. (*b*) Lower leaves. (*c*) Seeds (one enlarged). Jersey (E. W. H.).

Exsiccata :—Linn. herb., as *C. viride*; v. Heurck et Martinis iv, 183, as *C. leiospermum*; Todaro, 1025, as *C. album* var. *viride*; Wirtgen ix, 521 (partim), as *C. album* var. *glomerulosum*; *Herb. Fl. Ingric.* iv, 513 d, as *C. album* var. *sylvaticum.*

Nearer var. *virescens* than var. *spicatum* in size, colour, and inflorescence. *Laminae* of the lower leaves broadly lanceolate, entire or subentire; of the upper leaves lanceolate, entire. *Seeds* rather smaller (1·0—1·2 mm. in diameter) than in var. *virescens.*

Distribution as in var. *virescens*.

Europe; North America (naturalised).

(*d*) ***C. album** var. **leptophyllum**[1] Moquin in DC. *Prodr.* xiii, pt. ii, 71 (1849).

Stem 2—7 dm. high. *Petioles* short. *Laminae* linear to narrowly oblong-lanceolate, entire, about 1·5—2·5 cm. long. *Perianth-segments* strongly keeled. *Seeds* rather smaller than in the preceding varieties.

Waste places, local; Sussex, Hertfordshire, and northwards to Aberdeenshire.

Europe (not indigenous); North America.

C. album var. ***integerrimum*** × var. ***spicatum*** comb. nov.; *C. album* var. *viride* Swartz *Svensk Bot.* no. 411 (1809); Wahlenberg *Fl. Suec.* 158 (1826).

Icones:—*Svensk Bot.* t. 411, as *C. album* var. *viride*; *Fl. Dan.* t. 1150, as *C. viride*.

Laminae of the lower leaves triangular to rhomboidal, margin more or less dentate; of the upper leaves lanceolate, entire to subentire.

Plants which we refer to this hybrid are not uncommon. Owing, however, to the close affinity of the putative parents, and to the small size and inconspicuous nature of the flowers, the plants appear merely as intermediate leaf-varieties.

Cambridgeshire, and doubtless elsewhere.

C. album is very abundant in waste places, cultivated land, and road-sides throughout the British Isles, more especially in lowland localities.

Faeröes, Iceland, Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe (ascending to 2300 m. in Switzerland), Russia, southern Europe; northern Africa; Asia; America; Australia.

Series iii. *URBICA*

Urbica nobis. For characters see page 155.

British species of *Urbica*

5. ***C. opulifolium** (see below). *Laminae* of the lower leaves not hastate, nearly as broad as long, apex obtuse.

6. **C. ficifolium** (p. 160). *Laminae* of the lower leaves hastate, basal lobes prominent, central lobe oblong, apex obtuse.

7. **C. murale** (p. 161). *Laminae* of the lower leaves often nearly as broad as long, not hastate, very coarsely and irregularly toothed, teeth acute, apex acute or obtuse.

8. **C. urbicum** (p. 161). *Laminae* of the lower leaves subtriangular, not hastate, usually more or less toothed, apex acute.

9. **C. hybridum** (p. 162). *Laminae* of the lower leaves cordate, not hastate, marginal teeth few and large, apex acuminate.

5. *CHENOPODIUM OPULIFOLIUM. Plate 160

Blitum folio subrotundo Dillenius in Ray *Syn.* ed. 3, 155 (1724).

Chenopodium opulifolium [Schrader ex] Koch et Ziz *Cat. Pl. Palat.* 6 (1814); DC. *Fl. France* v [on vi], 372 (1815); Rouy *Fl. France* xii, 43 (1910); *C. viride* L. *Sp. Pl.* 219 (1753) pro minima parte (id est, syn. Vaillanti); *C. serotinum* L. *Cent. Pl.* ii, 12 (1756); *Syst. Nat.* ed. 10, 948 (1759) excl. syn. Raii; *C. album* var. *rotundifolium* Gray *Nat. Arr.* ii, 284 (1821); *C. album* var. *opulifolium* G. F. W. Meyer *Chlor. Hanov.* 465 (1836).

Icones:—Beck in Reichenbach *Icon.* xxiv, t. 239.

Camb. Brit. Fl. ii. *Plate 160.* (*a*) Flowering shoot. (*b*) Lower leaves. (*c*) Seed (enlarged). Herefordshire (S. H. B.).

Exsiccata:—Billot, 2526; Fries, xiv, 62; Reichenbach, 659; Todaro, 1027 (a small-leaved form); Welwitsch, 86; Wirtgen, vi, 251; vii, 296.

[1] The citation *C. leptophyllum* Nuttall ex Moquin *loc. cit.*, frequently seen in systematic works, is inadmissible, as the name is only cited by Moquin in synonymy.

Annual, mealy, with the odour of *C. vulvaria* when young, but fainter. *Stem* erect or decumbent, 3—8 dm. high, angular, branched. *Petioles* about two-thirds as long as the laminae. *Laminae*—lower ones rhomboidal, broadly cuneate and subentire below, coarsely and irregularly dentate above, usually obtuse at the apex; upper ones lanceolate and entire, glaucous-looking underneath. *Inflorescences* usually much branched at maturity, lower branches shorter than the leaves, usually divaricate, with the partial inflorescences interrupted. *Persistent perianth* enveloping the fruit. *Seeds* rugose, more or less shining.

Mr G. C. Druce (*Dill. Herb.* 58 (1907)) refers specimens in the herbarium of Dillenius, named *Blitum folio subrotundo* to *C. album*; but the description in Ray *Syn.* ed. 3, p. 155 appears to be more applicable to *C. opulifolium.*

Specimens doubtfully referred to *C. album* × *opulifolium* (see *Brit. Bot. Exch. Club Report for 1906*, p. 240) and collected in Lancashire are indistinguishable from *C. opulifolium.*

Adventitious, from Cornwall and Kent northwards to Somerset, Buckinghamshire, Worcestershire, Huntingdonshire, and Lancashire.

Germany, Belgium, France, central Europe, Russia, southern Europe; northern Africa; Abyssinia; Asia Minor and central Asia.

6. CHENOPODIUM FICIFOLIUM. Fig-leaved Goosefoot. Plate 161

Blitum ficus folio Dillenius in Ray *Syn.* ed. 3, 155 (1724).

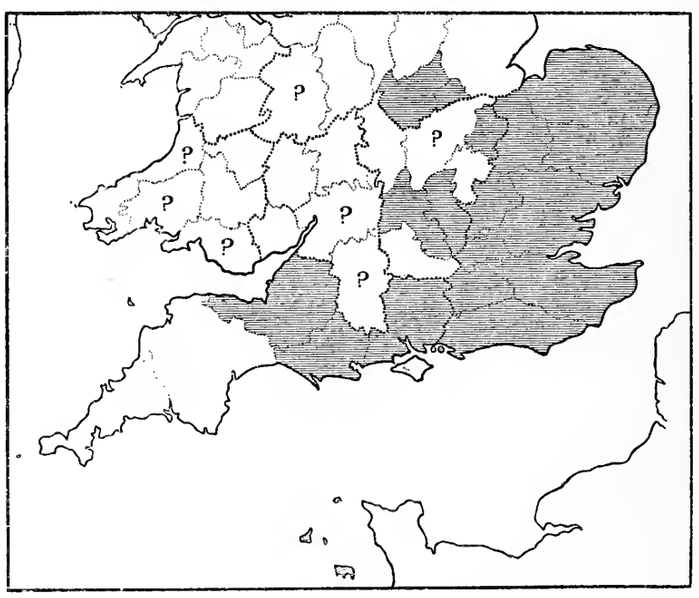
Chenopodium ficifolium Smith *Fl. Brit.* 276 (1800)!; Moquin in DC. *Prodr.* xiii, pt. ii, 65 (1845); Syme *Eng. Bot.* viii, 15 (1868); Rouy *Fl. France* xii, 46 (1910); *C. serotinum* L. *Cent. Pl.* ii, 12 (1756) pro minima parte (id est, syn. Raii) non herb.; Hudson *Fl. Angl.* 91 (1762) partim (excl. diagn.); Suter *Fl. Helv.* i, 177, et ii, 428 (1822); Moquin *Chenopod. Monogr. Enum.* 26 (1840) non in DC. *Prodr.*; *C. viride* Curtis *Fl. Lond.* i, no. 51, non auct. al.; *C. album* var. *ficifolium* G. F. W. Meyer *Chlor. Hanov.* 465 (1836).

Icones:—Curtis *Fl. Lond.* i, t. 51, as *C. viride*; Smith *Eng. Bot.* t. 1724; Syme *Eng. Bot.* viii, t. 1191; *Fl. Dan.* t. 2768; Beck in Reichenbach *Icon.* xxiv, t. 238.

Camb. Brit. Fl. ii. *Plate 161.* (*a*) Flowering shoot. (*b*) Lower leaves. (*c*) Flowers (enlarged). (*d*) Seeds. (*e*) Seed (enlarged). Cambridgeshire (A. F.).

Exsiccata:—Wirtgen, xi, 625.

Annual, mealy. *Stem* erect or decumbent, more or less branched, from 3—9 dm. high. *Petioles* about two-thirds as long as the laminae, rather slender. *Laminae*—lower ones 3-lobed; lateral lobes narrowly oblong and cuneate below; central lobe oblong, very coarsely dentate or subentire, obtuse at the apex, often purplish at the base, up to about 7 cm. long. *Inflorescences*—axillary ones longer than the leaves, ascending, lax, more or less branched; lower ones subtended by a nearly full-sized leaf, leafy towards the base; upper ones subtended by a lanceolate leaf; apical ones leafless. *Perianth* with segments with a narrow membranous margin. *Seeds* rugose, about 0·8—1·0 mm. in diameter, black.



Map 32. *C. ficifolium* occurs in the counties which are shaded, and is adventitious in the counties marked with a "?"

We cannot follow some recent British authorities in naming this plant *C. serotinum* L. The Linnaean diagnosis does not allow of this. In our opinion, the only part of *C. serotinum* L. which includes the present plant is Ray's synonym; and this we think was included in error. Hudson simply adds other synonyms to that of Ray's whilst retaining the Linnaean diagnosis which surely refers to some other species. The specimen in the Linnaean herbarium is not *C. ficifolium*: it is a young plant, scarcely determinable with certainty, obtained from the garden at Upsala from seeds sent by Sauvage or Gouan.

Waste ground on damp, rich soil, and on manure heaps; from Dorset and Kent northwards to Somerset, Leicestershire, and Norfolk; Wales—Carmarthenshire and Cardiganshire—perhaps adventitious only; adventitious in Ireland and in the north of England.

Denmark, Germany, Holland, Belgium, France, central Europe, Russia, southern Europe; northern Africa; Asia.

7. CHENOPODIUM MURALE. Plate 162

Atriplex procumbens folio sinuato lucido crasso Ray *Hist.* i, 198 (1686).

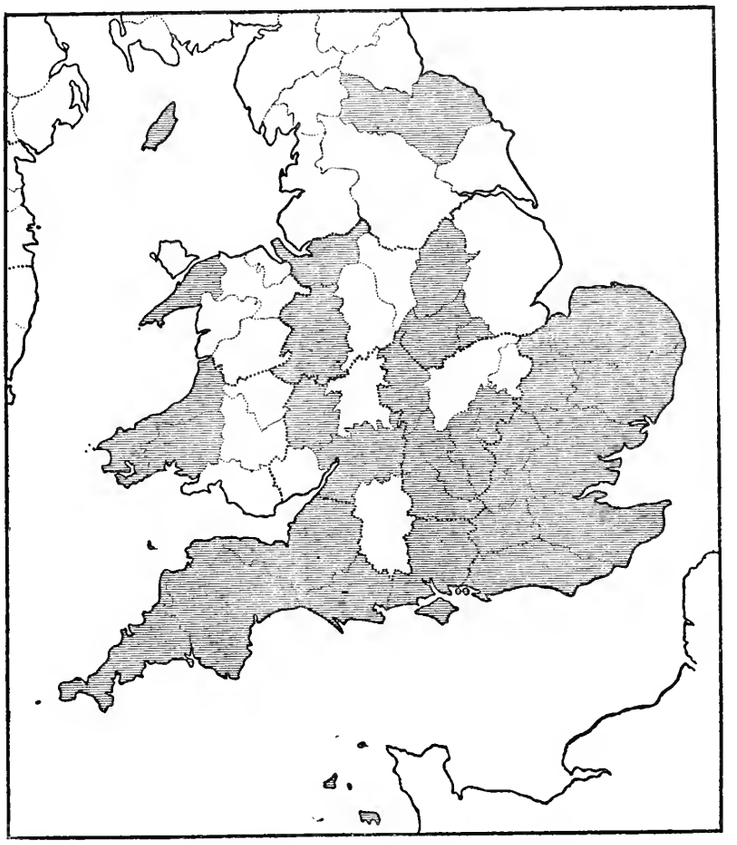
Chenopodium murale L. *Sp. Pl.* 219 (1753)!; Smith *Fl. Brit.* 274 (1800)!; *Eng. Fl.* ii, 11 (1824); Syme *Eng. Bot.* viii, 16 (1868); Rouy *Fl. France* xii, 43 (1910).

Icones :—Curtis *Fl. Lond.* ii, t. 66; Smith *Eng. Bot.* t. 1722; *Fl. Dan.* t. 2048; Beck in Reichenbach *Icon.* xxiv, t. 245, fig. 1—5, as *C. murale.*

Camb. Brit. Fl. ii. *Plate 162.* (*a*) Flowering shoot. (*b*) Lower leaf. (*c*) Flower (enlarged). (*d*) Seed (enlarged). Jersey (E. W. H.).

Exsiccata :—Billot, 3764; Fries, xv, 59; Thielens et Devos, iv, 331; Todaro, 1026.

Slightly mealy; ? foetid. *Stem* 3—7 dm. high, much branched from the base; branches more or less decumbent. *Petioles* about half as long as the laminae. *Laminae* usually broadly triangular or rhomboid, coarsely and irregularly and acutely toothed, teeth more or less incurved, apex acute or subobtuse. *Inflorescences* short, rather crowded, very leafy, lateral ones usually spreading. *Flowers* in August and September. *Achenes* almost completely enveloped by the persistent perianth. *Seeds* black, finely rugose, about 1·0 mm. by 1·2 or 1·2 by 1·4 in size.



Map 33. Distribution of *Chenopodium murale* in England and Wales

(*β*) subvar. **microphyllum** Cosson et Germain *Fl. Paris* 453 (1845); *C. murale* var. *microphyllum* Gürke *Pl. Europ.* ii, 132 (1897); Rouy *Fl. France* xii, 43 (1910).

Exsiccata :—Herb. Marshall, no. 1081.

Smaller in all its parts.

Kent, and perhaps elsewhere.

France, Greece, and doubtless elsewhere.

Locally abundant as a weed of cultivated ground and waste places, on light soils chiefly; rare on sand-dunes. Local, but widely distributed in the lowlands of England and Wales; adventitious in southern and eastern Scotland, and in Ireland (near Cork, Dublin and Belfast).

Southern Sweden, Denmark, Germany, Holland, Belgium, France, central Europe, southern Europe; northern Africa; south-western and southern Asia; America (not indigenous); Australia (not indigenous).

8. CHENOPODIUM URBICUM. Plates 163, 164

C. erectum foliis triangularis dentatis spicis e foliorum alis plurimus longis erectis tenuibus Dillenius in Ray *Syn.* ed. 3, 155 (1724).

Chenopodium urbicum L. *Sp. Pl.* 218 (1753)!; Smith *Fl. Brit.* 273 (1800); *Eng. Fl.* ii, 10 (1824); Syme *Eng. Bot.* viii, 18 (1868); Rouy *Fl. France* xii, 42 (1910).

Icones :—*Fl. Dan.* t. 1148, as *Blitum urbicum*; Beck in Reichenbach *Icon.* xxiv, t. 246.

Annual, slightly mealy. *Stem* erect, 3—7 dm. high, grooved. *Petioles* rather long. *Laminae* of the lower leaves triangular, more or less truncate at the base, margin usually more or less

toothed, teeth regular or very irregular and hooked, acute to subobtuse. *Inflorescence* much branched; branches erect or suberect, elongate, tapering, lower ones shorter than the subtending leaves. *Achenes* not quite completely enveloped by the persistent perianths. *Seeds* about 1·0—1·5 mm. in diameter, black, rugose, dull.

(*a*) **C. urbicum** var. **deltoïdeum** Neilreich *Fl. Nied.-Oesterr.* i, 279 (1859); *C. melanospermum* Wallroth *Sched. Crit.* 112 (1822); *C. intermedium* var. *melanospermum* Schur *Pl. Transs.* 572 (1866); *C. urbicum* var. *genuinum* Syme *Eng. Bot.* viii, 19 (1868); *C. urbicum* Rouy *Fl. France* xii, 42 (1910) excl. race *microspermum*.

Icones :—*Svensk Bot.* t. 459, as *C. urbicum*; Beck in Reichenbach *Icon.* xxiv, t. 246, as *C. urbicum*.

Camb. Brit. Fl. ii. *Plate 163.* (*a*) Flowering shoot. (*b*) Persistent perianths (enlarged), enclosing the achenes. (*c*) Seeds (three enlarged). Hort. (E. M. H.).

Exsiccata :—Reichenbach, 660, as *C. urbicum*; Todaro, 1323, as *C. urbicum*; Welwitsch (*Iter Lusit.*), 93, as *C. urbicum*; 215 (*Fl. Lusit.*) as *C. urbicum*.

Less mealy than in var. *intermedium*. *Laminae* smaller, truncate at the base, margin subentire to slightly dentate, teeth spreading and subobtuse.

(*b*) **C. urbicum** var. **intermedium** Koch *Syn.* 605 (1837); Babington *Man.* 250 (1843); Syme *Eng. Bot.* viii, 19 (1868); *C. intermedium* Mertens und Koch *Deutschl. Fl.* ii, 297 (1826); *C. urbicum* var. *grandidentatum* Dietrich *Fl. Boruss.* no. 849 *β* (1843); *C. urbicum* race *microspermum* Rouy *Fl. France* xii, 43 (1910).

Icones :—Smith *Eng. Bot.* t. 717, as *C. urbicum*; Beck in Reichenbach *Icon.* xxiv, t. 247, as *C. urbicum* var. *intermedium*.

Camb. Brit. Fl. ii. *Plate 164.* (*a*) Flowering shoot. (*b*) Lower leaves. (*c*) Portion of stem (enlarged). Cambridge Botanic Garden (R. I. L.). (*d*) Persistent perianth (enlarged), enclosing the achene. (*e*) Seeds (two enlarged). Cornwall (C. C. V.) and Cambridge Botanic Garden (R. I. L.).

Exsiccata :—Reichenbach, 1740 et 1740 bis, as *C. rhombifolium*.

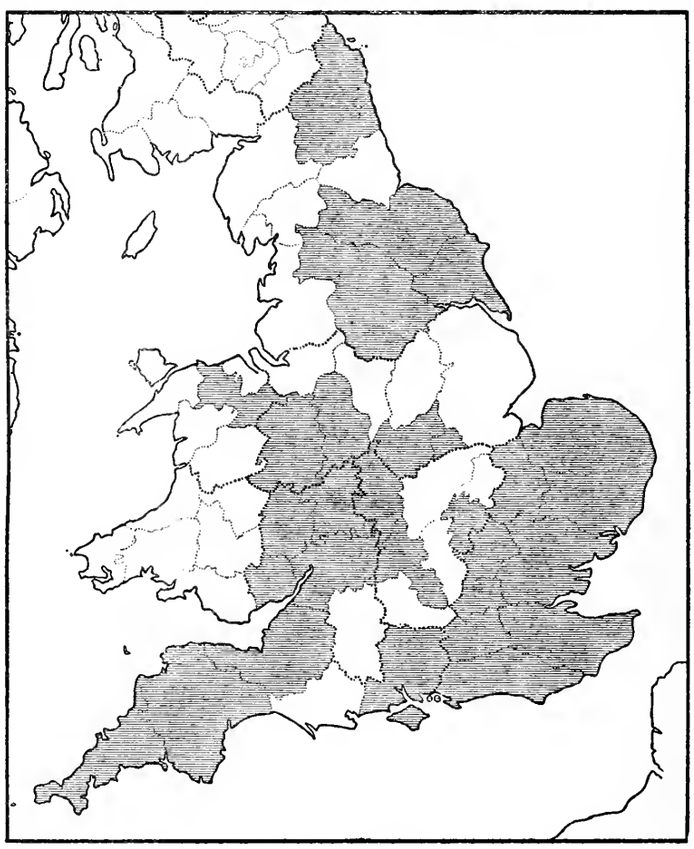
More mealy than in var. *deltoïdeum*. *Laminae* larger, less truncate at the base, margin much more strongly toothed, teeth very irregular and hooked. *Seeds* rather smaller (about 1·1—1·4 mm. in diameter). This variety is liable to be confused with *C. rubrum* var. *blitoïdes*.

Commoner in this country than var. *deltoïdeum*.

Western and central Europe, Balkan peninsula; Caucasus, central Asia; North America (adventitious).

Ditch-banks; damp, rich, waste places; manure-heaps; in lowland localities only. From Cornwall and Kent northwards to Lancashire and Yorkshire; adventitious in many of its more northerly stations; Wales—?Denbighshire; Scotland—adventitious; Ireland—adventitious near Dublin.

Southern Scandinavia, Denmark, Germany, France, central Europe, Russia, southern Europe; south-western and central Asia.



Map 34. Distribution of *Chenopodium urbicum* in Great Britain

9. CHENOPODIUM HYBRIDUM. Plate 165

Chenopodium stramonii folio Dillenius in Ray *Syn.* ed. 3, 154 (1724).

Chenopodium hybridum L. *Sp. Pl.* 219 (1753)!; Smith *Fl. Brit.* 275 (1800)!; *Eng. Fl.* ii, 12 (1824); Syme *Eng. Bot.* viii, 17 (1868); *C. angulosum* Lamarck *Fl. France* iii, 249 (1778); Rouy *Fl. France* xii, 42 (1910).

Icones :—Curtis *Fl. Lond.* ii, 67; Smith *Eng. Bot.* t. 1919; *Fl. Dan.* t. 2049; Beck in Reichenbach *Icon.* xxiv, t. 243, as *C. hybridum* f. *cymigerum*; t. 244, as *C. hybridum* f. *spicatum*.

Camb. Brit. Fl. ii. *Plate 165.* (*a*) Flowering shoot. (*b*) Lower part of stem. (*c*) Lower leaf. (*d*) Flower (enlarged). (*e*) Seeds. (*f*) Seeds (enlarged). Hort., from seed brought from Jersey (E. W. H.).

Exsiccata :—Billot, 3192.

Annual; scarcely mealy; odour disagreeable. *Stem* erect, up to 1 m. high, grooved, more or less branched, slender above. *Petioles* half to two-thirds as long as the leaves. *Laminae* large, thin, cordate-ovate, with a few very large teeth, acuminate; upper ones narrower, becoming subentire. *Inflorescence* lax; lower branches peduncled, wide-spreading, subtended by a small leaf, shorter than the leaves, upper ones leafless. *Perianth-segments* broadly keeled. *Achenes* only partially enclosed by the persistent perianth. *Seeds* large (for this series of species), about 1·4—1·6 mm. in diameter, black, coarsely rugose.

Although named *C. hybridum*, there is no reason to suppose this plant is a hybrid.

Rich, damp, waste places, manure heaps, cultivated land; from Dorset and Kent to Shropshire and Norfolk; adventitious in Carnarvonshire, Lancashire, near Edinburgh, and near Belfast.

Map 35. Distribution of *Chenopodium hybridum*

Southern Scandinavia, Denmark, Germany, France, central Europe (to 1400 m.), Russia, southern Europe; northern Africa; Asia Minor and central Asia; North America.

Section III. *PSEUDOBLITUM*

Pseudoblitum Bentham and Hooker *Gen. Pl.* iii, 52 (1880); Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. 1 a, 61 (1893).

For characters, see page 154.

British species of *Pseudoblitum*

10. **C. rubrum** (see below). *Laminae* narrower than in *C. botryodes*, margin very variable—strongly dentate to subentire, green underneath. *Inflorescence* leafy.

11. **C. botryodes** (p. 165). *Laminae* deltoid, broader than in *C. rubrum*, margin subentire, green underneath. *Inflorescence* leafless above, branches usually longer than the subtending leaves.

12. **C. glaucum** (p. 165). *Laminae* oblong, margin sinuate, very glaucous-looking underneath. *Inflorescence* leafy.

10. CHENOPODIUM RUBRUM. Plates 166, 167, 168

Blitum pes anserinus dictum est auctiore folio Ray *Syn.* ed. 3, 154 (1724).

Chenopodium rubrum L. *Sp. Pl.* 218 (1753)!; Smith *Fl. Brit.* 274 (1800); *Eng. Fl.* ii, 11 (1824); Rouy *Fl. France* xii, 48 (1910) excl. var. *crassifolium*; *C. rubrum* subsp. *eu-rubrum* Syme *Eng. Bot.* viii, 22 (1868).

Annual, scarcely mealy, usually with much anthocyanin. *Stem* erect, decumbent, or prostrate, up to 7 dm. high but often much smaller, grooved, usually branched. *Petioles* rather long. *Laminae* extremely variable in shape and size, subrhomboid to spathulate, margin usually coarsely toothed, teeth often rather obtuse, apex usually acute to acuminate. *Inflorescences* often dense, leafy to the apex, often much branched and then with the lower branches about two-thirds as long as the subtending leaves. *Flowers* very small; July to September. *Perianth* with 3—5 segments, often 5 in the terminal flowers and 4 in the others. *Filaments* slender, a little longer than the perianth. *Achenes* very small. *Seeds* reddish, shining, small, nearly all vertical, terminal ones often horizontal, horizontal ones rather larger than the vertical ones which are about 0·6—0·7 mm. in diameter; August to October.

(*a*) **C. rubrum** var. **blitoïdes** Wallroth *Sched. Crit.* 507 (1822); Rouy *Fl. France* xii, 49 (1910); *C. blitoïdes* Lejeune *Fl. Spa* 126 (1811)?; *Blitum rubrum* var. *acuminatum* Koch *Syn.* ed. 2, 699 (1844).

Icones :—Beck in Reichenbach *Icon.* xxiv, t. 256, as *C. rubrum* var. *acuminatum.*

Camb. Brit. Fl. ii. *Plate 166.* (*a*) Flowering shoot. (*b*) Seeds (enlarged). Huntingdonshire (E. W. H.).

Exsiccata :—Linn. herb., as *C. rubrum*; Reichenbach, 330, as *C. rubrum*; Woloszczak (*Fl. Polon. Exsicc.*), 870, as *Blitum polymorphum* var. *rubrum.*

Stem tall, up to 7 dm. high, strongly grooved. *Petioles* about half as long as the laminae or rather more. *Laminae* rather narrowly deltoid, margin with large irregular teeth, the second or third tooth from the base much larger than the others, apex markedly acuminate. *Inflorescence* rather less dense than in var. *vulgare.*

Rich, waste places and manure-heaps; Somerset, Sussex, Kent, Surrey, Middlesex, Cambridgeshire, Gloucestershire, Huntingdonshire, Lincolnshire, Derbyshire, Cheshire.

Germany, Belgium, France, central Europe, Russia.

(*b*) **C. rubrum** var. **vulgare** Wallroth *Sched. Crit.* 507 (1822) incl. var. *foliosum*; Rouy *Fl. France* xii, 49 (1910); *C. rubrum* subsp. *eu-rubrum* var. *genuinum* Syme *Eng. Bot.* viii, 22 (1868).

Icones :—Curtis *Fl. Lond.* ii, 65 as *C. rubrum*; Smith *Eng. Bot.* t. 1721, as *C. rubrum*; *Fl. Dan.* 1149, as *C. rubrum*; Beck in Reichenbach *Icon.* xxiv, t. 255, fig. 1, as *C. rubrum.*

Exsiccata :—Billot, 169, as *Blitum rubrum*; *Herb. Fl. Ingric.* iv, 518, as *Blitum polymorphum.*

Stem erect, branched, up to half a metre high. *Laminae* subrhomboid, toothed, teeth subregular, second tooth from the bottom rather larger than the others, apex acute, about two-thirds as broad as long.

(*c*) **C. rubrum** var. **glomeratum** Wallroth *Sched. Crit.* 507 (1822); Rouy *Fl. France* xii, 49 (1910).

Stem erect. *Leaves* much smaller than in the preceding varieties. *Laminae* attenuate at the base, entire or subentire. *Perianth* not succulent. *Partial inflorescences* axillary, small, more or less crowded.

Kent (herb. Marshall, 1075).

(*d*) **C. rubrum** var. **spathulatum** Rouy *Fl. France* xii, 49 (1910); *Blitum rubrum* var. *spathulatum* Cosson, Germain, et Weddell *Introd. Fl. Paris* 108 (1842) excl. syn. Lejeune; *B. polymorphum* var. *spathulatum* Cosson et Germain *Fl. Env. Paris* 454 (1845).

Icones :—*Camb. Brit. Fl.* ii. *Plate 167.* Flowering shoot. Cambridgeshire (A. F.).

Stem erect, up to about a third of a metre high, slender and rather flexuous. *Laminae* small, rather thick, attenuate at the base, entire or subentire. *Inflorescences* very leafy.

Mr A. Fryer, who supplied the specimen figured in Plate 167, regarded the plant as an erect form of var. *pseudo-botryoïdes*, and stated that this was the view of H. C. Watson.

Damp, rich, waste place, at Chatteris, Cambridgeshire.

(*e*) **C. rubrum** var. **pseudo-botryoïdes** [Watson in *Lond. Cat. Brit. Plants* ed. 6, 18 (1867)! nomen] Babington *Manual* ed. 7, 294 (1884); *C. rubrum* subsp. *eu-rubrum* var. *pseudo-botryoïdes* Syme *Eng. Bot.* viii, 22 (1868); *Blitum rubrum* var. *nanum* Jacobsen in *Bot. Tidsskr.* 96 (1879) nomen; *C. rubrum* var. *diffusum* [Boenninghausen ex] Beckhaus *Fl. Westf.* 756 (1893); *C. rubrum* forma *pseudo-botryoïdes* Druce *Fl. Berks.* 420 (1897)!; *C. rubrum* var. *humile* [Moquin in DC. *Prodr.* xiii, pt. ii, 84 (1849) partim, non *C. humile* Hooker] Rouy *Fl. France* xii, 49 (1910).

Icones :—Syme *Eng. Bot.* t. 1197, as *C.* [subsp.] *eu-rubrum* var. *pseudo-botryoides.* This is of an unusually brilliant red colour.

Camb. Brit. Fl. ii. *Plate 168.* (*a*) Whole plant. (*b*) Seeds (four enlarged). Somerset (E. S. M.).

Stem procumbent or prostrate, branched from the base. *Laminae* more or less spathulate, smaller than in the preceding varieties, more succulent. *Inflorescences* shorter, more or less subcapitulate. *Seeds* rather smaller.

Borders of salt-marshes and of inland ponds in lowland localities; Cornwall, Devonshire, Somerset, Sussex, Kent, Surrey, Middlesex, Hertfordshire, Norfolk, Northumberland, Carmarthenshire; ? Fifeshire; co. Wexford.

Scandinavia, Denmark, Germany, Belgium, France, central Europe, Russia, southern Europe; Asia; North America.

C. rubrum occurs in damp, rich soil in cultivated ground and on manure-heaps chiefly, but also (chiefly as var. *spathulatum*) on the landward edges of salt-marshes, and on the banks of ponds; in lowland situations, northwards to Northumberland and the Scottish lowlands; rare in Wales, Scotland and Ireland (counties Kerry and Wexford to Galway and Antrim); adventitious in many of its stations.

Western, central (1200 m.), and southern Europe; Asia Minor, central Asia; North America.

11. CHENOPODIUM BOTRYODES. Plate 169

Chenopodium botryodes Smith *Eng. Bot.* no. 2247 (1811); *Eng. Fl.* ii, 11 (1828); *C. crassifolium* Hornemann *Hort. Reg. Hafn.* 254 (1815); Roehmer et Schultes *Syst. Veg.* vi, 262 (1820); *Blitum crassifolium* Reichenbach *Fl. Germ. Excurs.* 582 (1830); *C. rubrum* var. *crassifolium* G. F. W. Meyer *Chlor. Hanov.* 464 (1836); *C. rubrum* var. *paucidentatum* Koch *Syn.* ed. 2, 699 (1844); *Blitum polymorphum* var. *crassifolium* Moquin *Chenopod. Monogr. Enum.* 45 (1840); *C. rubrum* var. *salinum* Godron *Fl. Lorraine* ii, 243 (1845); *C. rubrum* var. *crassifolium* Moquin in DC. *Prodr.* xiii, pt. ii, 84 (1849); Rouy *Fl. France* xii, 49 (1910); *C. rubrum* var. *botryodes* Hooker and Arnott *Brit. Fl.* 346 (1850); Sonder *Fl. Hamb.* 145 (1851); *C. rubrum* subsp. *botryodes* Syme *Eng. Bot.* viii, 21 (1868).

Icones :—Smith *Eng. Bot.* t. 2247; *Fl. Dan.* t. 2894, fig. 1—2, as *Blitum botryodes.*

Camb. Brit. Fl. ii. *Plate 169.* (*a*) Flowering shoot. (*b*) Lower leaf. (*c*) Seeds. (*d*) Seeds (enlarged). Kent (J. G.).

Exsiccata :—Billot, 169 bis, as *Blitum rubrum* var. *crassifolium*; herb. Marshall, 1188, 2516, 2589.

In Smith's herbarium, there are two plants named *C. botryodes*: of these, one is a not very typical example of the species, and the other a specimen of *C. rubrum* var. *spathulatum.* In the same herbarium a very typical specimen of *C. botryodes* is named *C. rubrum*?.

Map 36. Distribution of *Chenopodium botryodes* in England

Annual, allied to *C. rubrum*, but a smaller plant than *C. rubrum* var. *blitoïdes* and *C. rubrum* var. *vulgare.* *Stem* ascending or prostrate, somewhat angular, branched often from the base, lower branches divaricate. *Petioles* often about as long as the laminae. *Laminae* subrhomboidal to triangular, rather succulent, subentire or with a few small and usually distant teeth, nearly as broad as long, more or less obtuse. *Inflorescences* usually not or only a little leafy towards the apices. *Flowers* small; August and September. *Perianth* with 5 rather succulent segments. *Filaments* slender, a little longer than the perianth. *Seeds* dark red to black, rather larger and more elongate than in *C. rubrum*, about 0·75—0·85 mm. by 0·6—0·7.

Indigenous, chiefly by the sea, by the sides of brackish ditches, and on the landward margins of salt-marshes and reached only by the very highest tides. Channel Isles (Guernsey), Hampshire, Sussex, Kent, Essex, Suffolk, Norfolk.

Scandinavia, Denmark, Germany, France, central Europe, southern Europe; North America.

12. CHENOPODIUM GLAUCUM. Plate 170

C. angustifolium laciniatum minus Dillenius in Ray *Syn.* ed. 3, 155 (1724).

Chenopodium glaucum L. *Sp. Pl.* 220 (1753)!; Smith *Fl. Brit.* 277 (1800)!; *Eng. Fl.* ii, 14 (1824); Syme *Eng. Bot.* viii, 23 (1868); Rouy *Fl. France* xii, 48 (1910).

Icones :—Smith *Eng. Bot.* t. 1454; *Fl. Dan.* t. 1151; Beck in Reichenbach *Icon.* xxiv, t. 248.

Camb. Brit. Fl. ii. *Plate 170.* (*a*) Flowering shoots. (*b*) Young shoot. (*c*) Lower leaves. (*d*) Seeds (enlarged). Sussex (T. H.).

Exsiccata :—Billot, 2355; Reichenbach, 866; *Herb. Fl. Ingric.*, iv, 514 (a small-leaved form).

Annual. *Stem* about 5—50 cm. long; erect, decumbent, or prostrate; usually branched, branches spreading. *Petioles* rather stout, of the lower leaves less than half as long as the laminae. *Laminae* oblong, margin sinuous, obtuse, often about 3 cm. long and 1 broad, thick, rather glaucous and sometimes purplish above, very glaucous-looking underneath owing to the presence of numerous, hard, "mealy" hairs. *Inflorescences* with branches shorter than the subtending leaves, not or little branched, rather leafy at the base, terminal and lateral. *Flowers* small; August and September. *Perianth* with 3—5 segments. *Filaments* short. *Achenes* enveloped by the persistent perianth; September and October.

(β) forma **microphyllum** comb. nov.; *C. glaucum* var. *microphyllum* Moquin *Chenopod. Monogr. Enum.* 31 (1840); Rouy *Fl. France* xii, 48 (1910).

Exsiccata:—Herb. Marshall, as *C. glaucum.*

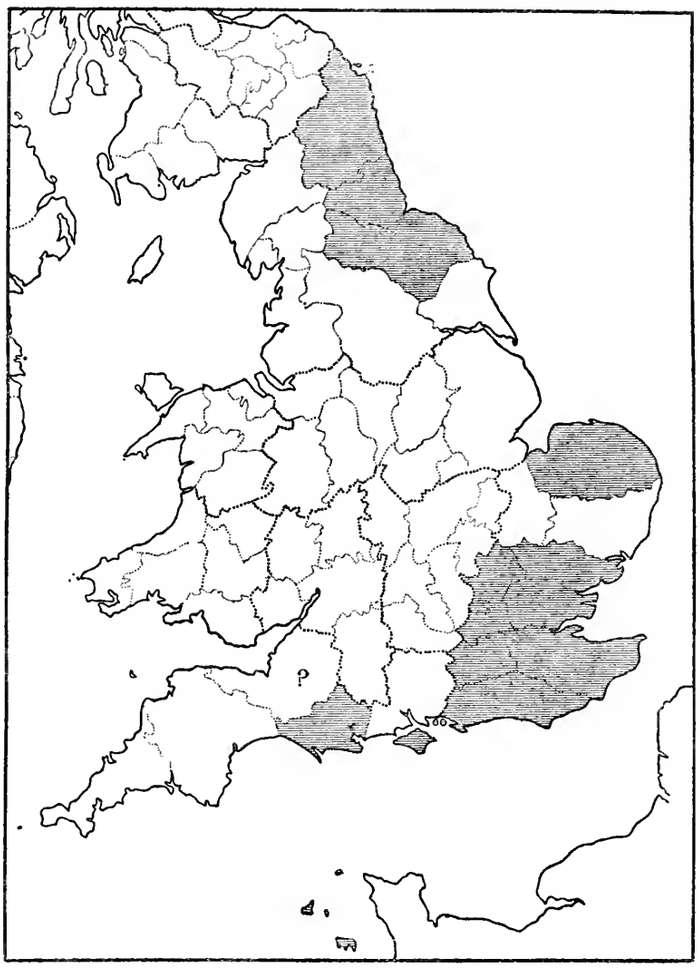
Smaller, usually more prostrate, its branches more divaricate.

A form of margins of ponds, and damp heathy places, which are dry in summer. Surrey.

France, Germany, and doubtless elsewhere.

Usually on damp, rich, waste ground, near farm-yards and manure-heaps; rarely on sandy and shingly sea-shores. Local, in southern and eastern England, from the Channel Isles, Dorset, and Sussex northwards to Northumberland. Adventitious in Wales (Glamorganshire) and Scotland (Fifeshire).

Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe, Russia, southern Europe; Asia; Greenland; America (? adventitious).



Map 37. Distribution of *Chenopodium glaucum* in England

Section IV. **MONOCARPUS*

Monocarpus Ascherson *Fl. Brandenb.* 572 (1864); *Blitum* L. *Gen. Pl.* ed. 5, 6 (1754) as a genus; Bentham and Hooker *Gen. Pl.* iii, 52 (1880); Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 61 (1893).

For characters, see page 154. Only British species:—**C. capitatum.*

13. *CHENOPODIUM CAPITATUM

***Chenopodium capitatum** Ascherson *Fl. Brandenb.* 572 (1864); Rouy *Fl. France* xii, 50 (1910); *Blitum capitatum* L. *Sp. Pl.* 4 (1753).

Annual, scarcely mealy. *Stem* erect, not leafy towards the summit. *Petioles* long. *Laminae* subhastate, shallowly sinuate-dentate to entire, very acute, rather thick. *Inflorescences* agglomerated, lower ones with a subtending leaf, upper ones leafless. *Flowers* July and August. *Seeds* with a carinal border, acute; August and September.

Rare, and not indigenous. Carnarvonshire; Ireland—co. Fermanagh: "in fields at Farnaght for over a century past" (Praeger *Tourist's Fl. West Ireland,* p. 180 (1909)).

Origin unknown, but naturalised in central and southern Scandinavia, Germany, Denmark, Holland, Belgium, France, central Europe (ascending to 1715 m. in Switzerland), rare in southern Europe.

Tribe 2. *BETEAE*

Beteae Moquin in DC. *Prodr.* xiii, pt. ii, 43 et 49 (1849) emend.; Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 52 et 54 (1893).

For characters, see page 153. Only British genus:—*Beta.*

Genus 2. Beta

Beta [Tournefort *Inst.* 501, t. 686 (1719)] L. *Sp. Pl.* 222 (1753) et *Gen. Pl.* ed. 5, 103 (1754); Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 56 (1893).

Differs from *Chenopodium* in the following characters:—*Perianth* becoming thicker, especially towards the base as the fruit ripens, and becoming adherent to the fruit. *Ovary* subinferior. *Fruit* a 1-seeded pyxidium.

Species about 9; Europe and Asia. Only British genus:—*Beta.*

1. BETA MARITIMA. Sea Beet. Plate 171

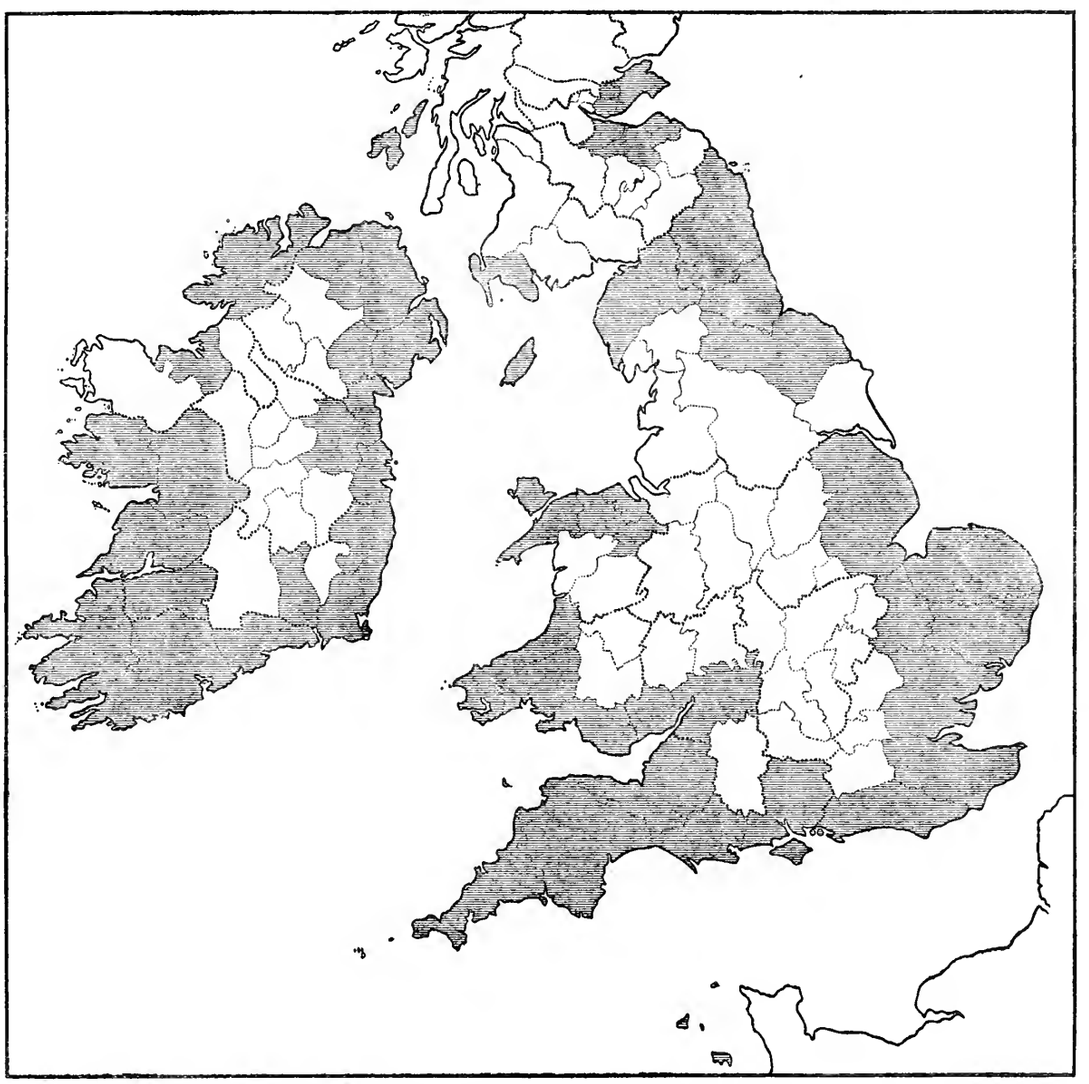
Beta sylvestris maritima Parkinson *Theatr. Bot.* 750 (1640); Ray *Syn.* ed. 3, 157 (1724).

Beta maritima L. *Sp. Pl.* ed. 2, 322 (1762); Syme *Eng. Bot.* viii, 8 (1868); Rouy *Fl. France* xii, 39 (1910). [*B. vulgaris* var. *perennis* L. Sp. *Pl.* 222 (1753); *B. vulgaris* L. *Fl. Angl.* 13 (1754); Hudson *Fl. Angl.* 93 (1762)].

Icones:—Smith *Eng. Bot.* t. 285; *Fl. Dan.* t. 1571; Beck in Reichenbach *Icon.* xxiv, t. 233, as *B. vulgaris* var. *perennis*.

Camb. Brit. Fl. ii. *Plate 171.* (*a*) Flowering shoots. (*b*) Leaves. (*c*) Flower (enlarged). (*d*) Flower (enlarged) in longitudinal section. (*e*) Lower part of stem, in transverse section. Norfolk (E. W. H.).

Exsiccata:—Billot, 3191; Fries, xiii, 68; Reichenbach, 2452.



Map 38. *Beta maritima* occurs on the coasts of those counties which are shaded

Perennial; glabrous. *Root* usually stout, not creeping. *Stem* eventually decumbent, 3—12 dm., much branched, ends of the branches ascending, stout at the base which is perennial. *Petioles* stout, longer than the laminae. *Laminae*—lower ones ovate or subrhomboidal, margin somewhat undulating, very shortly acuminate at the apex, large, rather succulent; upper ones subsessile, narrower; lower ones up to about 15 cm. long and about half as broad. *Inflorescences* from about 8 to 60 cm. long, slender; the partial inflorescences sessile, subtended by a small narrow leaf, consisting of only 2—3 flowers, distant. *Flowers* sessile; July to September. *Perianth* about 4 mm. in diameter; segments 5, incurved, broad at the top, edges narrowly membranous. *Stamens* 5. *Filaments* subulate, about as long as the perianth. *Stigmas* 2—3. *Seeds* horizontal and ? 2—3 in the fruit; August to October.

In the first edition of the *Species Plantarum*, p. 222 (1753), Linnaeus placed this plant as a variety (var. *maritima*) of his *Beta vulgaris*. In the second edition of the same work, p. 322 (1762), he elevated the plant to a species under the name of *B. maritima*. The rule adopted in all such cases in the present work is to take the second edition of the *Species Plantarum* as the starting point of nomenclature. Accordingly, we adopt the name *B. maritima* for the species, and pass over any earlier names, such as *B. vulgaris* Hudson *Fl. Angl.* 93 (1762). This has been the practice of nearly all botanists since the binominal system was founded; and to follow the rule, in the cases in question, of retaining the binominal used in the first edition of the *Species Plantarum* would therefore result in undesirable confusion. There are not many species involved; and although the rule we adopt is perhaps a slight departure from the letter of the international rules of nomenclature, it is obviously in keeping with their general aim which is the conservation of names established in literature. Cf. *Salicornia herbacea* and *Mesembryanthemum edule*.

The cultivated beets (*B. vulgaris* L. *Sp. Pl.* ed. 2, 322 (1762) non ed. 1) are very closely allied to this, and may best be distinguished from it by their annual or biennial habit and by their flowers more frequently in groups of 3 and 4 instead of 2 and 3.

There is some doubt as to whether the present species has given rise to the cultivated beets or whether the latter have not sprung from some annual or biennial wild form of southern Europe.

Edges of salt-marshes, muddy, sandy, and shingly foreshores just within reach of the highest tides, and on spray-washed sea-cliffs and sea-walls. From the Channel Isles, Cornwall, and Kent to Wigtownshire, the southern Hebrides, and Fifeshire; Ireland generally.

Denmark, Holland, Belgium, France, central and southern Russia, southern Europe; northern Africa; Asia Minor to the East Indies.

Tribe 3. *ATRIPLICEAE*

Atripliceae C. A. Meyer in Ledebour *Fl. Alt.* i, 371 (1829) emend.; Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 52 et 62 (1893).

For characters, see page 153. Only British genus:—*Atriplex*.

Genus 3. **Atriplex**

By C. E. MOSS and A. J. WILMOTT, F.L.S.

Atriplex [Tournefort *Inst.* 505, t. 286 (1719)] L. *Sp. Pl.* 1052 (1753) et *Gen. Pl.* ed. 5, 472 (1754); Bentham and Hooker *Gen. Pl.* iii, 53 (1880); Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 63 et 64 (1893).

Shrubs, undershrubs, or herbs; often "mealy" (cf. page 153). *Leaves* usually alternate, sometimes opposite below and alternate above. *Inflorescence* usually with long compound spikes with leaf-like bracts at the base of the partial cymose inflorescences; spikes usually more or less interrupted. *Flowers* imperfect. *Staminate flowers* with a perianth. *Perianth* with 3—5, usually 5 segments. *Pistillate* flowers with no perianth (except in some of the flowers of the members of the section *Dichospermum*), and with 2 opposite bracteoles. *Ovary* of the pistillate flowers functional, a rudimentary one sometimes occurring in the staminate flowers. *Stigmas* 2. *Fruiting bracteoles* of the pistillate flowers persistent, more or less coherent along the lower part of their margins; either smooth, or tuberculate (i.e., with large protuberances, usually 2, near the base of the outer surface, and sometimes with smaller accessory ones, thus forming 2 groups side by side), or muricate (i.e., with numerous small conical protuberances). *Seed* compressed, discoid, and either vertical or (as in the members of the section *Dichospermum*) some vertical and others horizontal, either large (2·5—3·0 mm. in diameter) or small (1·2—1·5 mm. in diameter). *Pericarp* thin.

Atriplex is related to *Chenopodium* (and therefore to *Beta*) through the section *Dichospermum*.

The arrangement of species here adopted represents, as far as a linear arrangement allows, the gradual transition from the simple, and probably primitive, forms to the more complex ones. The genus is strongly developed along several lines in Australia; and the British forms give an inadequate idea of the genus.

About 100 species; cosmopolitan, chiefly subtropical, warm temperate, and temperate.

Subgenera of *Atriplex*

Subgenus 1. **Eu-Atriplex** (p. 169). *Laminae* linear to triangular, often more or less hastate or lobed at the base. *Bracteoles* eventually triangular to ovate, rhomboidal, or suborbicular, truncate or cuneate at the base, lateral lobes (when present) smaller than the median one. *Radicle* of seed horizontal.

Subgenus 2. **Obione** (p. 180). *Laminae* elliptical or nearly so. *Bracteoles* eventually obdeltoid, 3-lobed, lateral lobes often larger than the median one, united nearly to the apex. *Radicle* of seed vertical.

Subgenus 1. *EU-ATRIPLEX*

Eu-Atriplex C. A. Meyer in Ledebour *Fl. Alt.* iv, 305 (1833) as a tribe, including sect. *Schizotheca*; Meisner *Pl. Vac. Gen.* i, 319 (1836—43); Volkens in Engler und Prantl, *Pflanzenfam.* iii, pt. i a, 65 (1893); *Atriplex* Gaertner *De Fruct.* i, 361, t. 75, fig. 8 (1788) as a genus.

For characters, see page 168.

Sections of *Eu-Atriplex*

Section I. ***Dichospermum** (see below). Annual herbs. *Flowers* dimorphic:—(1) about a quarter of them without bracteoles but with a *perianth* of 4—5 *segments* and with horizontal *seeds*; (2) and the remainder with no *perianth* and with vertical seeds. *Bracteoles*, when present, eventually large (5—10 mm. in diameter), free almost to the base, ovate to suborbicular.

Section II. ***Paniculatae** (p. 170). Shrubs or undershrubs, very mealy. *Inflorescence* spicate, leafless, dense or interrupted. *Flowers* dioecious or hemi-dioecious. *Bracteoles* feebly united below, coriaceous.

Section III. **Teutliopsis** (p. 170). Annuals. *Stems* green with whitish or reddish stripes. *Bracteoles* united only in the lower portion, except in *A. glabriuscula* where they are united half-way up, remaining herbaceous or becoming slightly hardened in *A. glabriuscula*.

Section IV. **Obionopsis** (p. 179). Annuals. *Stems* whitish or pale brown, occasionally with red patches. *Bracteoles* united up to the middle, hardened in the lower half.

Section I. **DICHOSPERMUM*

***Dichospermum** Du Mortier *Fl. Belg.* 21 (1827); Westerlund in *Linnaea* vi, new ser. 138 (1876); Volkens in Engler und Prantl, *Pflanzenfam.* iii, pt. i a, 65 (1893).

For characters, see above. Only British species:—**A. hortensis*.

1. *ATRIPLEX HORTENSIS. Garden Orach

A. sativa alba Gerard *Herball* 256 (1597) including *A. sativa purpurea*.

Atriplex hortensis L. *Sp. Pl.* 1053 (1753); Bentham *Handb. Brit. Fl.* 442 (1858); Ascherson und Graebner *Fl. Nordostd. Flachl.* 284 (1898); Rouy *Fl. France* xii, 27 (1910).

Icones:—Beck in Reichenbach *Icon.* xxiv, 260.

Exsiccata:—Ahlberg; *Herb. Fl. Ingric.* ix, 521.

Annual, slightly mealy. *Stem* erect, 3—15 dm. high, stout, branched, green with yellowish or reddish ridges. *Petioles* about 2—3 cm. long. *Laminae* of the lower leaves large (up to 20 cm. long and 12 broad), subtriangular or ovate, more or less subcordate at the base, entire or with shallow dentitions, apex obtuse, dull above, only slightly mealy below. *Inflorescence* of terminal and axillary compound spikes. *Partial inflorescences* few-flowered, remote (usually about 5 mm. apart). *Flowers* in August. *Fruiting bracts* large (about 10 mm. long and 9 broad), broadly ovate to suborbicular, entire. *Seeds* either large (up to 4 mm. in diameter) and laterally compressed, or smaller (about 2 mm. in diameter) and dorsally compressed; September.

A. hortensis is a very variable plant, especially as regards colour and the shape of the leaves. Of the colour-forms of the plant, Miller (*Gard. Dict.* ed. 8 (1768)) states that one "is of a deep green [=forma *typica* Beck *loc. cit.*], another of a dark purple [=forma *ruberrima* Beck *loc. cit.*], and a third" has "green leaves and purple borders" [=forma *rubra* Beck *loc. cit.*]. Miller continues:—during the "forty years [in] which I have cultivated these sorts, I have never observed them to vary." We are not aware that any morphological characters are definitely correlated with the development of anthocyanin. Colour-forms such as the preceding occur in a very large number of species; and systematic botanists are inconsistent in giving names to some of them and not to others.

British examples of this species have sometimes been erroneously named *Atriplex nitens* (=*A. sagittata* Borkh. *Rhein. Mag.* 477 (1793)): this is a plant of central Europe, extending to Tibet, and occurring adventitiously in western Europe. Specimens in herb. H. C. Watson (in Herb. Kew.) prove that Bromfield's record of *A. nitens* (vide *Phytol.* ii, 330 (1845) and *Fl. Vect.* 426 (1856)) really refers to *A. hortensis*.

Cultivated in southern England where it sometimes occurs as a garden escape, as a weed, and also adventitiously, as in Jersey, the Isle of Wight, Surrey, Middlesex, Essex, Cambridgeshire, Worcestershire, and Denbighshire. Bromfield (*Fl. Vect.* p. 426 (1856)) said that, in 1845, it occurred "on the shore between Ryde and Binstead at intervals, for more than a quarter of a mile" (=4 decametres).

Cultivated in central and southern Europe where it occurs adventitiously: supposed to be indigenous in central Asia; but plants from central Asia we have seen named *A. hortensis* are nearer *A. nitens*. It is possible that the plant has originated in cultivation, as Beck (*Icon.* xxiv, 128 (1908)) suggests.

Section II. **PANICULATAE*

Paniculatae Bentham *Fl. Austral.* v, 166 (1870).

For characters, see page 169. Only British species:—**A. halimus*.

2. *ATRIPLEX HALIMUS. Great Shrubby Orach. **Plate 172**

Halimus Clusius *Hist.* i, 53 (1601).

Atriplex halimus L *Sp. Pl.* 1052 (1753); Willk. et Lange *Prodr. Fl. Hisp.* i, 267 (1861); Rouy *Fl. France* xii, 36 (1910).

Icones:—Beck in Reichenbach *Icon.* xxiv, t. 270 (1908).

Camb. Brit. Fl. ii. *Plate 172.* (*a*) Flowering shoot. (*b*) Barren portion of shoot. (*c*) Staminate flowers. Jersey (E. W. H.).

Exsiccata:—Billot, 2903, 2903 bis; Bourgeau (*Pl. Canar.*), 957; (*Pl. d'Esp.*), 1455; Orphanides, 274; Porta et Rigo (*It. Ital. secund.*), 349; Schultz et Winter, ii, 139; Todaro, 415; Welwitsch (*It. Lusit.*), 225.

Shrub, very mealy. *Stem* weak, scrambling, up to 2 m. high, much branched. *Leaves* alternate. *Petioles* short (1—2 mm.). *Laminae* ovate-rhomboidal, cuneate below, entire or rarely subdentate towards the base, usually obtuse, evergreen. *Inflorescence* with wide-spreading branches. *Partial inflorescences* many-flowered, mostly not quite contiguous. *Flowers* hemi-dioecious; August to October. *Fruiting bracts* reniform to suborbicular, broader than long, entire or slightly denticulate, slightly apiculate, only slightly joined below.

Planted to form fences near the sea, on dry loose sandy soil and on sea-cliffs in the Channel Isles and along the southern shores of England; occasionally escaping, as in the Channel Isles, on to sandy waste places where it is now naturalised.

France, Spain, and the Mediterranean region; Asia, eastwards to Tibet; northern, tropical, and southern Africa; Chili.

Section III. *TEUTLIOPSIS*

Teutliopsis Du Mortier *Fl. Belg.* 20 (1827) emend.; Westerlund *Sv. Atripl.* 39 (1861) as a subsection; Ascherson *Fl. Brandenb.* 576 (1864); Volkens in Engler und Prantl, *Pflanzenfam.* iii, pt. i a, 65 (1893); Beck in Reichenbach *Icon.* xxiv, 129 (1908).

For characters, see page 169.

Series of *Teutliopsis*

Series i. **Littorales** (see below). *Laminae* linear to narrowly elliptical. *Bracteoles* strongly muricate at maturity and usually inflated.

Series ii. **Patulae** (p. 173). *Laminae* linear to ovate, frequently with a prominent lobe on each side, attenuate at the base. *Bracteoles* at maturity cuneate at the base, smooth or a little muricate towards the base.

Series iii. **Hastatae** (p. 175). *Laminae* of the lower leaves triangular, lobed, truncate or rarely subcuneate at the base. *Bracteoles* at maturity ovate to triangular, cuneate or truncate or subcordate at the base. *Seeds* either small (1 mm. in diameter), when the inflorescence is more compound than in the series *Patulae*, or large (2 mm. in diameter).

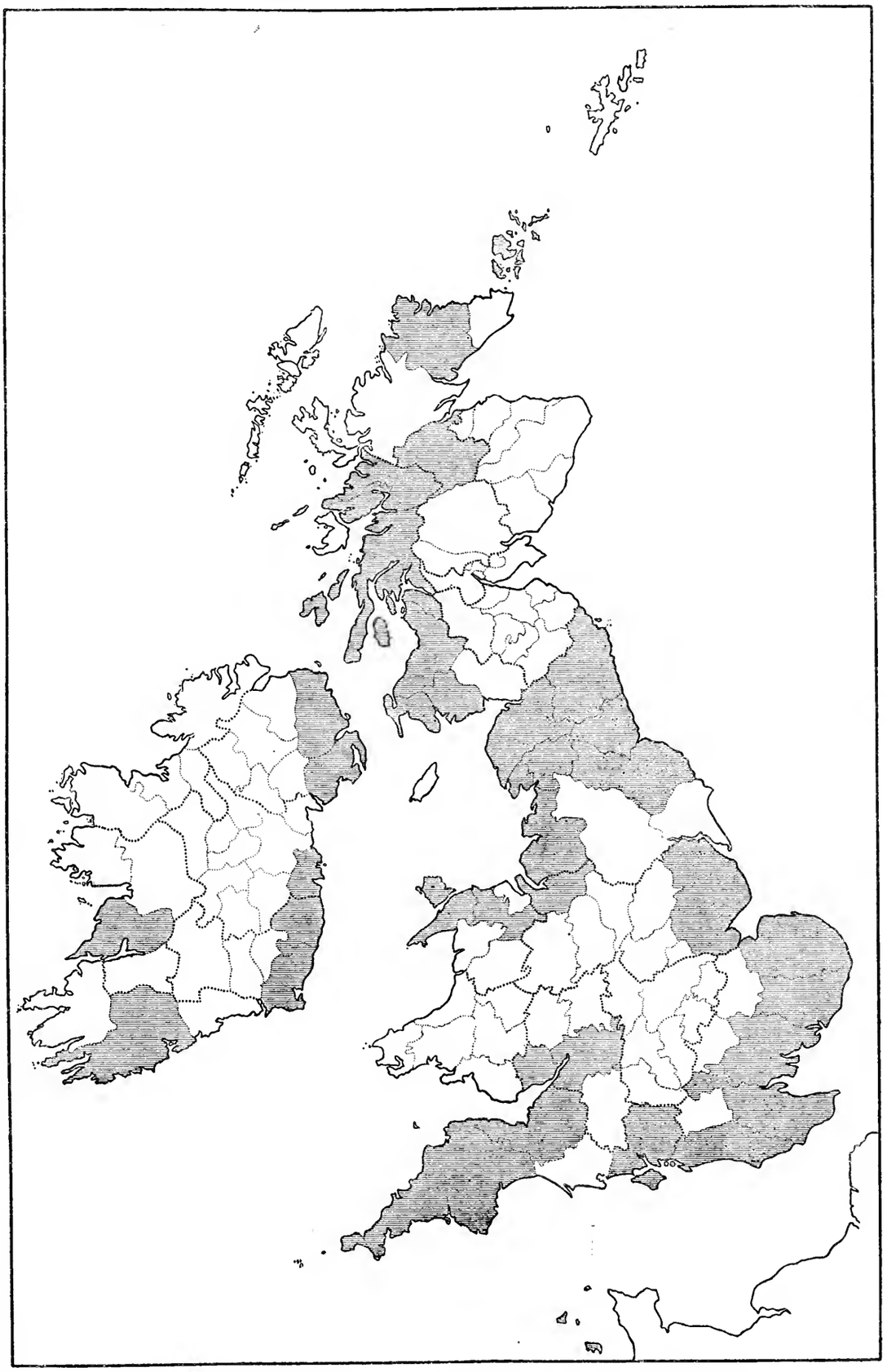
Series i. *LITTORALES*

Littorales Moss and Wilmott in *Camb. Brit. Fl.* ii, 170; *Exomideae* Westerlund *Sv. Atripl.* 59 (1861); in *Linnaea* xl, 171 (1876).

For characters, see above. Only British species:—*A. littoralis*.

3. ATRIPLEX LITTORALIS. Plates 173, 174

A. maritima altera oxyridis aut scopariae folio sive minima L'Obel *Stirp. Illustr.* 85 (1655) [= var. *genuina*]; *A. maritima angustifolia secunda* L'Obel *op. cit.* p. 86 [= var. *serrata*]; *A. angustifolia maritima dentata* Ray *Hist.*



Map 39. *Atriplex littoralis* occurs on the shores of the counties which are shaded

Pl. i, 193 (1686) [= var. *serrata*]; *Syn.* ed. 3, 152 (1724); *A. angustissimo et longissimo folio* Hermann *Hort. Lugd. Bat.* 79 (1687) [= var. *genuina* forma]; Ray *loc. cit.*; *A. maritima scopariae folio* Dale in Ray *Syn.* ed. 3, 153 (1724) [= var. *genuina*]; *A. maritima angustifolia obtusiore folio* Dillenius in Ray *loc. cit.* [= var. *genuina* forma].

Atriplex littoralis L. *Sp. Pl.* 1054 (1753); Syme *Eng. Bot.* viii, 26 (1868); Ascherson und Graebner *Fl. Nordost. Flachl.* 285 (1898); *A. patula* race *littoralis* Rouy *Fl. France* xii, 35 (1910); *A. erecta* Hudson *Fl. Angl.* 376 (1762) including *A. littoralis*, non Smith, nec Babington, nec omnium al. auctorum.

Icones:—*Fl. Dan.* t. 1287; Sturm *Deutsch. Fl.* 79, 12, as *A. littoralis*; 80, 1, as *A. marina.*

Exsiccata:—Billot, 2353, as *A. littoralis*; Fries, v, 58; v, 59[1] [=var. *serrata*]; herb. E. S. Marshall, 786 [=var. *genuina*]; Reichenbach, 352; 1473, as *A. marina*; Schultz et Winter, ii, 140; Wirtgen, ii, 88; xv, 838.

Annual, more or less mealy. *Root* deep. *Stem* up to a metre high, usually rather stout, much branched, the lower branches erect from a decumbent base, the upper branches divaricate to suberect, up to 20 (usually 5—10) mm. in diameter at the base, green with pale reddish stripes. *Petioles* short or absent. *Laminae* linear to linear-oblong, entire or coarsely serrate or dentate, lower ones broader and attenuate at the base into a short petiole, upper ones sessile, often about 10—15 times as long as broad. *Inflorescence* of long (up to 2 dm.) spikes; spikes virgate, interrupted and rather leafy below. *Pollen* yellow. *Bracteoles* eventually triangular-ovate, often as broad as long, either muricate all over or with a smooth terminal lobe of varying length. *Seeds* about 1—2 mm. in diameter.

Specimens vary greatly in size; and various modifications occasionally occur. Some of these have the main stem prostrate, and the branches erect. Others have a simple, erect stem. The following varieties are usually described in floras; but the varietal characters may be found in any combination.

(*a*) **A. littoralis** var. **genuina** Syme *Eng. Bot.* viii, 27 (1868).

Icones:—Syme *Eng. Bot.* t. 1200.

Camb. Brit. Fl. ii. *Plate 173.* (*a*) Shoot with ripening fruits. (*b*) Lower part of shoot. (*c*) Mature bracteoles (enlarged). Isle of Wight (E. W. H.).

Laminae thick, mealy, entire. *Bracteoles* eventually with short, smooth, terminal lobes with divergent tips.

This is the common form of the coasts of Great Britain, as of Europe generally.

(*b*) **A. littoralis** var. **serrata** Gray *Nat. Arr.* ii, 282 (1821); *A. serrata* Hudson *Fl. Angl.* 377 (1762); *A. marina* L. *Mant.* ii, 300 (1771); *A. littoralis* var. *marina* Wahlenberg *Fl. Suec.* ii, 661 (1826); Syme *Eng. Bot.* viii, 27 (1868); Ascherson und Graebner *Fl. Nordostd. Flachl.* 285 (1898); *A. patula* race *littoralis* var. *dentata* Rouy *Fl. France* xii, 35 (1910).

Icones:—Smith *Eng. Bot.* t. 708 as *A. littoralis.*

Camb. Brit. Fl. ii. *Plate 174.* (*a*) Flowering shoot. (*b*) Leaves from lower part of shoot. (*c*) Fruiting bracts (enlarged) enclosing the fruit. Hampshire (E. W. H.).

Usually a larger and more branched plant than var. *genuina*, often about 6—7 dm. high. *Laminae* lanceolate to linear, rather more succulent, margin denticulate, serrate, or dentate. *Bracteoles* eventually muricate all over, tips appressed.

Detharding (*Consp. Megalop.* 24 (1828)) states that this variety is the stouter plant of the two, that in places where the remains of *Algae* have accumulated it grows to a length of 3 or 4 "feet" whilst var. *genuina* under the same circumstances remains normal, and that its bracts increase in size as they mature whilst those of var. *genuina* do not.

On the other hand, Syme (*op. cit.* p. 28) states that the two varieties do not come true when grown from seed. There is, however, no evidence to show that Syme obtained his seeds by self-pollinating the plants from which he collected them; and it is highly improbable that this necessary precaution was taken. Consequently, Syme's observation is almost valueless, as the plants he obtained from his seeds may have been hybrids.

Judging from what we ourselves have observed in nature, there is no doubt that plants may be found which conform to the descriptions of the two varieties, and there is no doubt that plants occur which combine the characters of the two. We believe that some, at all events, of the latter plants are hybrids of the two varieties.

Isle of Wight and Hampshire to Northumberland.

Scandinavia, Denmark, Germany, France, central Europe, Russia.

A. littoralis is indigenous on the coasts of the British Isles, on the landward margins of salt marshes, on sea-walls, and in waste places near the sea; from the Channel Islands, Cornwall, and Kent northwards to Orkney; local in Scotland; Ireland—counties Cork, Clare, Wexford, Wicklow, Dublin, Down, and Antrim.

Scandinavia, Denmark, Germany, Holland, Belgium, France, Austria-Hungary, southern Europe; western and central Asia.

[1] Many Danish specimens, and also many Scandinavian ones, differ from var. *genuina* Syme in being more slender and in having pale green and thin laminae: an example of the Danish form is depicted in *Fl. Dan.* t. 1287, and is perhaps a distinct variety.

Series ii. *PATULAE*

Patulae Westerlund in *Sv. Atripl.* 53 (1861); in *Linnaea* xl, 164 (1876).

For characters, see page 170. Only British species:—*A. patula.*

4. ATRIPLEX PATULA. Orach. Plates 175, 176

Atriplex sylvestris angustifolia Johnson in Gerard *Herball.* ed. 2, 326 (1636); Ray *Syn.* ed. 3, 151 (1724).

Atriplex patula L. *Sp. Pl.* 1053 (1753); Babington *Manual* 252 (1843) including *A. angustifolia* et *A. erecta*; Syme *Eng. Bot.* ed. 3, viii, 29 (1868); Ascherson und Graebner *Fl. Nordostd. Flachl.* 285 (1898); Rouy *Fl. France* xii, 34 (1910) excluding race *littoralis* p. 35; *A. angustifolia* Smith *Fl. Brit.* 1092 (1804)!; *Eng. Fl.* iv, 258 (1828): *Schizotheca patula* Čelakowsky *Prodr. Fl. Böhm.* 149 (1867).

Exsiccata:—Billot, 3190, 3190 bis, 3190 ter; Fries, viii, 53; Woloszczak (*Fl. Polon. Exsicc.*), 722, as *Schizotheca patula*; *Herb. Fl. Ingric.* 522.

Annual more or less mealy. *Stem* erect or decumbent or prostrate, much branched either at the base or throughout its whole length, from 10—60 cm. high or rather more, green with paler green or pinkish stripes. *Leaves* usually alternate, sometimes all or the lower ones opposite. *Petioles* variable in length, from 1—10 mm. *Laminae* of the lower leaves ovate-lanceolate or linear-lanceolate, attenuate at the base, entire or denticulate, with or without the 2 basal lobes, lobes sometimes large and prominent. *Flowers* from August to October. *Bracteoles* eventually rhomboid, usually small (about 2—3 mm. long and 2 broad), sometimes much enlarged (about 10 mm. long and 5 broad) when growing in rich soil, cuneate at the base, margin denticulate or entire, lateral lobes sometimes absent, rarely suborbicular, apex sometimes more or less acuminate, outer surface smooth or muricate, usually very mealy; September and October. *Seeds* usually small (about 1 mm. in diameter).

This is one of the most variable plants of the British flora; but there appears to be very little correlation of the different characters. The following variations are the best known to us, and are probably the most common in the British Isles. However, intermediate forms are numerous; and, although not here described, they are certain to be encountered by every student of the genus.

An allied species (*A. oblongifolia* Waldstein et Kitaibel *Pl. Rar. Hung.* iii, 278, t. 221 (1812); Mertens und Koch *Deutschl. Fl.* ii, 316 (1826); *A. tartarica* auct. non Linn.) sometimes occurs adventitiously. It has more glaucous leaves than *A. patula*, and ovate (not rhombic), entire bracteoles.

(*a*) **A. patula** var. **angustissima** Grenier et Godron *Fl. France* iii, 13 (1855); Beckhaus *Fl. Westf.* 759 (1893); *A. angustifolia* var. *angustissima* Wallroth *Sched. Crit.* 116 (1822); *Schizotheca patula* var. *angustissima* Čelakowsky *Prodr. Fl. Böhm.* 149 (1867); *A. agrestis* Schur *Enum. Pl. Transsylv.* 575 (1866).

Exsiccata:—Schur, 9298; herb. Marshall, 2181, partim.

Stem stiff, erect (2—4 dm.) or prostrate and forming circular patches; branches divaricate. *Petioles* almost absent. *Laminae* linear-lanceolate, entire, usually very mealy. *Bracteoles* eventually rhombic or circular, entire, muricate, usually small (1—2 mm. long and broad) or occasionally rather large (3 mm. long and broad).

Several forms of this plant occur. Of the British forms, the commonest is prostrate, and makes circular patches: the *laminae* are mealy, and about 3·0 cm. long and 0·3 broad: the *bracteoles* at maturity are small, smooth, and rather mealy. A second is less prostrate: its *inflorescence* is more branched; and its *bracteoles* muricate at maturity, as in a specimen—perhaps an authentic one—of var. *microcarpa* Koch in Herb. Kew.: this form is widespread. A third, possibly var. *angustissima* Wallroth *in sensu stricto*, is erect, with divaricate branches: its *laminae* are about 1—2 cm. long and 1—2 mm. broad; and its *bracteoles* at maturity are very mealy: this occurs at Whitstable, Kent, and perhaps elsewhere. Until, however, these forms have been more fully studied, it seems undesirable to create new names to embrace them.

(*b*) **A. patula** var. **linearis** Moss and Wilmott in *Camb. Brit. Fl.* ii, 173; *A. angustifolia* subsp. *leiocarpa* var. *linearis* Gaudin *Fl. Helv.* vi, 320 (1830); *Schizotheca patula* var. *macrotheca* Beck *Fl. Nied.-Öst.* 335 (1890).

Icones:—*Camb. Brit. Fl.* ii. *Plate 175.* (*a*) Upper portion of shoot. (*b*) Leaves. (*c*) Fruiting bracteoles (enlarged). Huntingdonshire (E. W. H.).

Exsiccata:—Gandoger (*Fl. Gall. Exsicc.*) 919, as *A. angustifolia.*

Stem long and straggling. *Laminae* linear-lanceolate, entire (forma *integrifolia* Beck *loc. cit.*) or with large, entire, forwardly-curved lobes (forma *hastifolia* Beck *loc. cit.*), about 5—6 cm. long and 1 broad. *Inflorescence* with long, nearly simple, ascending branches; partial inflorescences usually distant. *Bracteoles* eventually rhombic, often somewhat denticulate about the middle, smooth,

apex either elongated or not, about 2—3 mm. long and 2 broad. *Seeds* small, about 1 mm. in diameter.

Arable land and waste places; Kent, Surrey, and doubtless elsewhere.

(*c*) **A. patula** var. **erecta** Lange *Haandb. Dansk. Fl.* 558 (1851); Beckhaus *Fl. Westf.* 758 (1893); Syme *Eng. Bot.* viii, 29 (1868); *A. erecta* Babington *Manual* 252 (1843) et auct. pl., sed non Hudsoni nec Smithi.

Stem erect or decumbent. *Branches* numerous; basal ones divaricate, opposite, decumbent or ascending; upper ones ascending. *Petioles* of the lower leaves distinct, about 5—15 mm. long. *Laminae* of the lower leaves ovate, shortly cuneate at the base, with small basal lobes, denticulate; upper ones smaller, lanceolate. *Inflorescence* often much branched; spikes with the partial inflorescences more close together than in var. *lineare*. *Bracteoles* eventually rhombic, apex produced or not, smooth or more or less muricate, about 3—5 mm. long and 2—4 broad. *Seeds* 1—2 mm. in diameter.

The binominal *Atriplex erecta* was originally bestowed by Hudson on the *A. angustifolia laciniata* Ray *Hist. Plant.* i, 192 (1686); *Syn.* ed. 3, 152 (1724). Ray states that the plant he describes was found "on the entrance into Battersea Field [near London] from Nine Elms," by "Mr Martyn." No specimen from this locality can now be traced; but, from Ray's description, we are persuaded that he refers to a form of *A. littoralis* var. *serrata*. Hence *A. erecta* Hudson is placed as a synonym of this variety (see page 172).

Smith (*Fl. Brit.*) took up the name *A. erecta*, and supplied a figure (*Eng. Bot.* t. 2223) and maintained the name in his *Eng. Fl.* iv, 260, where he refers to a specimen "in Mr Rose's herbarium, probably from Mr Hudson, or at least named by him." A specimen by Rose is in Smith's herbarium; and it agrees so closely with the figure in *Eng. Bot.* that there can be little or no doubt that it is the specimen alluded to by Smith. We ourselves do not believe that it is the plant of Ray; and hence it cannot be that of Hudson.

Babington's *A. erecta* is neither Ray's, Hudson's, nor Smith's plant, though these authorities are erroneously cited by Babington. Babington based his description on specimens from the Channel Isles, and added that "this plant is frequent in England, and is considered by Mr Edw. Forster as the true *erecta* of Hudson." It is clear to us that Forster was labouring under some misapprehension. Babington's specimens are a form of *A. patula*, and not the "distinctissima species, fructu parvo, maxime muricato copiosissimo, facile recognescendo" of Smith (*Fl. Brit.* p. 1094). Anyone familiar with the writings of Sir J. E. Smith will know that he does not pile up superlatives in this way when describing a well-known plant. Babington describes his plant as "plus minusve muricatis fructum," which is very different from Smith's "fructu parvo maxime muricato copiosissimo."

Syme (*Eng. Bot.* ed. 3) realised that the *A. erecta* auct. pl. was not the *A. erecta* of Smith. He named the former *A. patula* var. *serrata*, and states that the latter is "very rare," and that he had seen it growing "only at Twickenham." However, it may be doubted if he really saw Smith's plant, for the leaf which he adds to the original figure is a leaf of his var. *serrata*. Specimens gathered by him at Twickenham are in Herb. Mus. Brit., and are certainly not Smith's plant. They are a mixed lot, and some may be var. *erecta* forma *crassa*, and others hybrids of *A. patula* and *A. hastata* var. *microtheca*.

The *A. erecta* of recent authorities is the *A. erecta* of Babington, and not the *A. erecta* of Hudson or Smith.

(*a*) var. **erecta** forma **crassa** Moss and Wilmott in *Camb. Brit. Fl.* ii, 174; *A. angustifolia* var. *crassa* Mertens und Koch *Deutschl. Fl.* 315 (1826).

Plant larger, and very much branched. *Stem* thick, up to about 1 m. high. *Petioles* of the lower leaves about 1·0—1·5 cm. long. *Laminae* larger, thicker, about 7 cm. long and 4 broad. *Bracteoles* larger, about 4 mm. long and 3 broad, rather succulent, smooth or with 2 tubercles.

This state of var. *erecta* is rather common on rich garden soil and in waste places.

Common and widely distributed in the lowlands of England, especially in arable land.

(*β*) var. **erecta** forma **serrata** Moss and Wilmott in *Camb. Brit. Fl.* ii, 174; *A. patula* var. *serrata* Syme *Eng. Bot.* ed. 3, viii, 29 (1868).

Plant smaller. *Stem* erect, stiff, about 4—6 dm. high; basal branches stiff, suberect, decumbent; upper branches usually few, ascending. *Petioles* of the lower leaves about 5—10 mm. long. *Laminae* smaller, thin, about 4·0—5·0 cm. long and 1·5 broad. *Bracteoles* eventually rhombic, varying from smooth to very muricate, about 2—3 mm. long.

This is a common form in arable land, and occurs from Hampshire northwards to eastern Inverness-shire.

(*γ*) var. **erecta** forma **umbrosa** Moss and Wilmott in *Camb. Brit. Fl.* ii, 174.

Stem weak and slender, straggling; branches divaricate, weak. *Leaves* as in forma *serrata* but thinner. *Inflorescence* very lax; partial inflorescences few-flowered. *Bracteoles* eventually larger and more leaf-like, thin, about 4—5 mm. long and 3—4 broad.

Common in hedgerows and similar shady places. An analogous state of var. *linearis* also occurs.

(*d*) **A. patula** var. **bracteata** Westerlund *Sveriges Atripl.* 57 (1861)!.

Icones:—*Camb. Brit. Fl.* ii. *Plate 176.* (*a*) Upper portion of shoot. (*b*) Fruiting bracteoles. Huntingdonshire (E. W. H.).

Exsiccata :—Herb. Marshall, 785; 2180.

Plant succulent. *Laminae* ovate-triangular or ovate or lanceolate, nearly always entire, apex usually obtuse, up to about 6 cm. long and 1—2 broad. *Bracteoles* large, ovate, cuneate at the base, some enlarged and leaf-like, up to about 10 mm. long and 5 broad.

Small states occur, which are more or less prostrate, and which have all the bracteoles enlarged (10—15 mm. long and 5—6 broad), as in Westerlund's plant.

A. patula occurs in cultivated ground and waste places throughout the British Isles, ascending to 275 m. in Derbyshire.

Faeröes, Iceland, Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe, Russia, southern Europe; northern Africa; western Asia; North America (naturalised). Recorded also for southern Africa and Australia, but specimens from these countries differ from British plants.

Series iii. *HASTATAE*

Hastatae Westerlund in *Sv. Atripl.* 39 (1861); in *Linnaea* xl, 150 (1876).

For characters, see page 170.

British species of *Hastatae*

5. **A. hastata** (see below). *Branches* ascending or decumbent. *Stems* erect or decumbent. *Inflorescence* leafless. *Bracteoles* at maturity either ovate and truncate to subcordate at the base or rhombic and small (2—3 mm. in length). *Seeds* usually small (about 1—2 mm. in diameter).

6. **A. glabriuscula** (page 177). *Branches* prostrate. *Inflorescence* very leafy. *Bracteoles* at maturity rhombic, large (4—5 mm. in length), rounded at the base. *Seeds* larger, usually about 3—4 mm. in diameter.

5. ATRIPLEX HASTATA. Plates 177, 178, 179, 180

A. sylvestris vulgaris Johnson in Gerard *Herball* ed. 2, 326 (1633) including *A. sylvestris altera*; *A. sylvestris annua folio hastato seu deltoïde* Morison *Bles.* 237 (1669); *A. sylvestris annuo folio deltoïde sinuato et mucronato hastae cuspidis simili* Morison *Hist.* ii, 607 (1680); *A. sylvestris folio hastato seu deltoïde* Ray *Syn.* ed. 1, 36 (1690); ed. 3, 151 (1724).

Atriplex hastata L. *Sp. Pl.* 1053 (1753); *Fl. Suec.* ed. 2, 364 (1755); Syme *Eng. Bot.* viii, 31 (1868); Ascherson und Graebner *Fl. Nordostd. Flachl.* 285 (1898); Rouy *Fl. France* xii, 33 (1910); *A. patula* Smith *Fl. Brit.* 1091 (1804) non L.; *Eng. Fl.* iv, 257 (1828).

Exsiccata :—Billot, 2732; 3189, as *A. hastata* var. *oppositifolia*; Reichenbach 1379, as *A. patula* [= var. *microtheca*]; 2564, as *A. microsperma*; Todaro (*Fl. Sic. Exs.*) 906, as *A. triangularis.*

Erect or decumbent, more or less mealy. *Stem* up to about 1 m. high, much branched near the base, green with narrow stripes which are of a paler green or pink colour. *Leaves* opposite below, alternate above. *Petioles* short, about 1 cm. long or rather more. *Laminae* of the lower leaves triangular, usually longer than broad, margin entire or coarsely and irregularly dentate to laciniate, more or less succulent; of the upper leaves lanceolate, entire. *Partial inflorescences* widely separated below. *Flowers*—a few developing earlier than the rest and becoming larger than they; August and September. *Bracteoles* ovate with a subcuneate, truncate, or subcordate base, margin subentire, denticulate or very deeply laciniate, smooth, muricate, or bituberculate, often with prominent veins. *Seeds* 1—2 mm. in diameter.

(*a*) **A. hastata** var. **genuina** Godron in Grenier et Godron *Fl. France* iii, 12 (1855) excl. syn. Babington; Ascherson und Graebner *Fl. Nordostd. Flachl.* 285 (1898); Rouy *Fl. France* xii, 33 (1910); *A. patula* Smith *Fl. Brit.* 1091 (1804) excluding varieties; Babington *Manual* 252 (1843); *A. hastata* subsp. *smithi* Syme *Eng. Bot.* viii, 32 (1868).

Icones :—Curtis *Fl. Lond.* ii, 66, as *A. hastata*; Smith *Eng. Bot.* t. 936, as *A. patula.*

Camb. Brit. Fl. ii. *Plate 177.* (*a*) Flowering shoot. (*b*) Lower part of shoot. (*c*) One of the lower leaves. (*d*) Fruiting bracteoles. Huntingdonshire (E. W. H.). *Plate 178.* (*a*) Fruiting branch. (*b*) Fruiting bracteoles. Huntingdonshire (E. W. H.).

Stem erect; branches ascending. *Petioles* about 1 cm. long. *Laminae* of the lower leaves ovate-triangular, base truncate or occasionally somewhat cuneate, lobes short, prominent, horizontal, margin dentate to entire; of the upper leaves lanceolate, entire; usually dark green, often somewhat

succulent. *Inflorescence* with axillary and terminal spikes; spikes about 10 cm. long, simple, partial inflorescences discrete. *Fruiting bracteoles* rhomboid-ovate, elongate, up to about 5 mm. long and 3 broad, denticulate to entire, tuberculate, usually dark green and somewhat succulent. *Seeds* about 2 mm. in diameter.

Westerlund (*Sver. Atripl.* 44 (1861)) states that the bracteoles may become "an inch" long.

A. hastata var. *genuina* is common in cultivated and waste ground. Hampshire, Surrey, Huntingdonshire, and doubtless elsewhere.

(*β*) var. **genuina** forma **salina** Moss and Wilmott in Moss *Camb. Brit. Fl.* ii, 176; *A. triangularis* Willdenow *Sp. Pl.* iv, 963 (1806); *A. prostrata* Babington *Man.* 252 (1843) partim non Boucher; *A. hastata* var. *triangularis* Moquin in DC. *Prodr.* xiii, pt. ii, 95 (1849) partim; Rouy *Fl. France* xii, 33 (1910); *A. hastata* var. *parvifolia* Moquin *loc. cit.* partim; *A. hastata* var. *depressa* Hartmann *Skand. Fl.* ed. 5, 197 (1849); *A. deltoïdea* var. *triangularis* Babington *Man.* ed. 3, 270 (1851); *A. hastata* subsp. *deltoïdea* var. *triangularis* Syme *Eng. Bot.* viii, 31 (1868); *A. prostrata* var. *parvifolia* Hartmann *Skand. Fl.* ed. 11, 349 (1879); *A. hastata* var. *microtheca* forma *salina* Beck in Reichenbach *Icon.* xxiv, 131 (1908); *A. hastata* var. *salina* auct. pl., partim.

Whole plant smaller, very mealy. *Stem* prostrate or decumbent. *Laminae* of the lower leaves triangular, small (2—3 cm. long), almost or quite entire, glaucous-looking owing to the abundance of the mealy hairs, rather succulent. *Inflorescence* subsimple, rather leafy at the base. *Fruiting bracteoles* often as in var. *deltoïdea*, but sometimes rather more succulent and occasionally bituberculate.

This grades into the common form of var. *deltoïdea* through a series of intermediates: some of these states may be due to habitat-conditions; and others appear to be the results of hybridisation and factorial segregation.

Sea-shores, shingle-banks, and the seaward edge of sand-dunes. Somerset, Sussex, Kent, Essex, Norfolk, Yorkshire, and doubtless elsewhere.

(*b*) **A. hastata** var. **deltoïdea** Moquin in DC. *Prodr.* xiii, 2, 94 (1849); Rouy *Fl. France* xii, 33 (1910); *A. deltoïdea* Babington *Prim. Fl. Sarn.* 82 (1839) et alibi partim; *A. hastata* var. *macrotheca* forma *deltoïdea* Beck in Reichenbach *Icon. Fl. Germ.* 130 (1908).

Icones:—Babington in *Eng. Bot. Suppl.* t. 2860, as *A. deltoïdea.*

Camb. Brit. Fl. ii. *Plate 179.* (*a*) Fruiting branches. (*b*) Lower part of shoot. (*c*) Leaf from lower part of shoot. (*d*) Fruiting bracteoles (enlarged). Huntingdonshire (E. W. H.). *Plate 180.* (*a*) Upper portion of shoot. (*b*) Fruiting bracteoles (enlarged). (E. W. H.).

Stem erect, much branched. *Petioles* 1·0—1·5 mm. long. *Laminae* of the lower leaves triangular, lobes short and triangular, margin denticulate to entire, usually rather thin, about 4—5 cm. long and 3—4 broad; of the upper leaves lanceolate, lobed or not. *Inflorescence* with compound terminal spikes; partial inflorescences more or less discrete. *Fruiting bracteoles* triangular, cuneate at the base, margin often with 1 or 2 denticulations at the lateral angle, smooth, thin, flat, some of them only slightly exceeding the achene, others larger (3—4 mm. long and 2—3 broad). *Seeds* mostly small (1·0—1·5 mm. in diameter).

The fruiting bracteoles of this variety are very different from those of var. *genuina*; but the range of variation is very great. Several forms are recognisable; but we have not yet been able to investigate them sufficiently to determine their status. (1) The common form has dark green leaves, a more compound inflorescence, and stouter spikes. (2) Another form is common in the ditches of eastern England (e.g., eastern Huntingdonshire, Cambridgeshire, and Suffolk): this has pale green leaves, often a rather simple inflorescence, and very slender and rather long spikes (Plate 179). (3) Under the influence of saline conditions, the plants become reduced in size and decumbent in habit. We have considered whether or not these saline forms are referable to *A. prostrata* ([Boucher ex] DC. *Fl. France* iii, 387 (1805)); but so much hybridisation appears to be proceeding among the sea-shore forms that it is difficult to arrive at a decision.

(*c*) **A. hastata** var. **microtheca** Rafn *Dann. Fl.* 239 (1800); *A. microsperma* [Waldstein et Kitaibel ex] Willdenow *Sp. Pl.* iv, 964 (1806); Waldstein et Kitaibel *Pl. Rar. Hung.* iii, 278, t. 250 (1812) non t. 221; Host *Fl. Austr.* i, 320 (1827); Babington *Man.* 253 (1843); *Monogr. Brit. Atripl.* in *Trans. Bot. Edinb.* i, 11 (1844); *A. ruderalis* Wallroth *Sched. Crit.* 115 (1822); *A. latifolia* var. *microcarpa* Meyer *Chlor. Hanov.* 468 (1836); Koch *Syn.* ed. 2, 702 (1844); *A. patula* var. *microsperma* Moquin *Chen. Enum.* 54 (1840) including var. *oppositifolia* partim; *A. hastata* var. *microsperma* Moquin in DC. *Prodr.* xiii, pt. ii, 95 (1849); Rouy *Fl. France* xii, 34 (1910).

Stem erect; *branches* stiff and rigid, lower ones ascending from a short decumbent base, upper ones ascending. *Leaves* mostly opposite. *Laminae* of the lower leaves triangular, denticulate or subdenticulate, rather rigid; of the upper leaves hastate or lanceolate. *Inflorescence* of numerous rather short, densely arranged spikes; partial inflorescences dense, almost or quite confluent. *Fruiting bracteoles* ovate, entire, usually small, about 3 mm. long and 3 broad, rarely larger and

then slightly denticulate, usually smooth, rarely muricate, yellow when mature, fitting closely to the seed and convex. *Seeds* small, about 1 mm. in diameter.

Surrey, and doubtless elsewhere.

(*d*) **A. hastata** var. **oppositifolia** Moquin in DC. *Prodr.* xiii, pt. ii, 95 (1849); *A. oppositifolia* DC. *Fl. France* v, 371 (1805); *A. sacki* Rostkovius et Schmidt *Fl. Sed.* 401, t. 1 (1824); *A. hastata* var. *oppositifolia* Moquin *Monogr. Chen. Enum.* 54 (1840) partim; *A. hastata* var. *microtheca* forma *oppositifolia* Beck in Reichenbach *Icon.* xxiv, 131 (1908) including forma *sacki.*

Exsiccata:—Herb. Marshall, 310; 2181 (partim), as *A. patula* var. *angustifolia.*

Stem usually erect, rarely prostrate; lower branches long, suberect from a slightly decumbent base, often nearly as long as the main stem. *Laminae* small, 1·5—2·0 cm. long, margin very variable, more mealy than in var. *macrotheca*, subcoriaceous, usually yellowish green. *Inflorescence* with shorter branches, terminal spike much longer than the lateral ones. *Fruiting bracteoles* small, about 2 mm. long and 1·5 broad, rhomboid-ovate, surface and margin very variable.

Sandy foreshores; Dorset, Somerset, Kent, Middlesex, Norfolk, Wigtownshire, Elginshire, and doubtless elsewhere.

A. glabriuscula × *hastata* var. *oppositifolia* (p. 178).

[(*e*) **A. hastata** var. **calotheca** Rafn *Dan. Fl.* ii, 240 (1796)!; *A. hastata* [L. *Sp. Pl.* (1753) partim] Willdenow *Sp. Pl.* iv, 963 (1806); Wahlenberg *Fl. Suec.* 659 (1826); Fries *Fl. Succ.* 287 (1828)!; *A. calotheca* Fries *Fl. Suec. Mant.* iii, 164 (1842)!; Ascherson und Graebner *Fl. Nordost. Flachl.* 286 (1898).

Icones:—*Svensk Bot.* t. 627, as *A. hastata*; *Fl. Dan.* t. 1638; Reichenbach *Iconogr. Crit.* t. 16, fig. 33, as *A. hastata*; Beck in Reichenbach *Icon.* xxiv, t. 262, as *A. calotheca.*

Exsiccata:—Linn. herb., as *A. hastata*; Fries, i, 56, as *A. hastata*; viii, 55, as *A. calotheca*; *Herb. Fl. Ingric.* iv, 523 b, as *A. calotheca* var.

Differs from var. *genuina* in having the *laminae* and *bracteoles* very deeply laciniate, the laciniations of the bracteoles being as long as the breadth of the undivided part. *Bracteoles* usually rather large (up to 1 cm. in diameter, including the laciniations), membranous, markedly reticulate, smooth.

This variety has been reported from, and might be expected to occur on sea-shores in northern localities. See *Bot. Exch. Club Brit. Rep. for 1897*, p. 563; *Ann. Scott. Nat. Hist.* 33 and 119 (1899). However, we have seen no British specimens which we can refer to var. *calotheca*; and we cannot, at present, regard the plant as British.

Southern Scandinavia, Denmark, Germany, northern Russia.]

A. hastata is local but widespread throughout the British Isles; commoner on the coast (in waste places, on sea-walls, near salt-marshes, and on maritime clayey cliffs) and on the banks of alluvial ditches than inland where it is either a plant of rich damp waste places or merely adventitious; from the Channel Isles, Cornwall, and Kent northwards to Zetland. In Ireland, it is fairly generally distributed, being "apparently commoner on the coast than inland" (Praeger *op. cit.*, p. 269). No doubt the plant is adventitious only in its upland stations.

Faeröes, Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe, Russia, southern Europe; Asia; North America (? indigenous). The var. *calotheca* occurs in Scandinavia, Finland, Denmark, and Germany.

6. ATRIPLEX GLABRIUSCULA. Plates 181, 182, 183, 184

A. maritima nostras Ray *Cat. Angl.* 35 (1670); *A. maritima perennis folio deltoïde triangulari minus incano* Morison *Hist. Oxon.* ii, 607 (1680); Dillenius in Ray *Syn.* ed. 3, 152 (1724); *A. maritima ad foliorum basin auriculata procumbens et ne vix sinuata* Plukenet *Almagestum* 61 (1696)[1] excl. syn.

Atriplex glabriuscula Edmonston *Fl. Shetland* 39 (1845); *A. patula* var. *β* Smith *Fl. Brit.* 1092 (1804); *A. rosea* Babington *Fl. Sarn.* 84 (1839); *Manual* 253 (1843); non Linn.; *A. babingtoni* Woods *Tourist's Fl.* 316 (1850); Babington *Manual* ed. 3, 270 (1851); Syme *Eng. Bot.* viii, 33 (1868); Hartmann *Skand. Fl.* ed. 11, 348 (1879); Ascherson und Graebner *Fl. Nordostd. Flachl.* 286 (1898); Rouy *Fl. France* xii, 32 (1910).

Icones:—*Camb. Brit. Fl.* ii. *Plate 181.* (*a*) Upper portion of shoot. (*b*) Fruiting bracteoles (enlarged). Isle of Wight (E. W. H.). This form is intermediate between var. *babingtoni* and var. *virescens.*

Annual, mealy. *Stem* prostrate, much branched, branches forming circular patches up to 50 cm. or even rather more in diameter, stout, with many opposite branches arising on the

[1] *Fide* Druce and Vines *The Dillenian Herbaria* 56 (1907). However, it appears to us probable that entire-leaved, prostrate, sea-shore varieties of *A. hastata* were intended by most of the synonyms.

stem just above the ground; branches long and subsimple. *Lower leaves* opposite. *Petioles* short (5—10 mm.). *Laminae* triangular, usually with short basal lobes, more or less dentate, mostly small (about 1·5—2·0 cm. long and 1·0—1·5 broad), mealy on both sides, rather succulent. *Inflorescence* usually not much branched, leafy nearly to the tip, sometimes with spreading branches. *Fruiting bracteoles* rhomboidal to suborbicular, large (6—10 mm. long), usually inflated, united in the lower half, usually with 2 groups of large tubercles on the back, less often smooth. *Seeds* large (2 mm. in diameter).

In addition to the two following varieties, other forms occur; but they are much confused by forms which we consider to be hybrids with forms of *A. patula* and *A. hastata*. The characters of the inflorescence and of the bracteoles are here taken to be distinctive of the species *A. glabriuscula*.

(*a*) **A. glabriuscula** var. **babingtoni** Moss and Willmott *Camb. Brit. Fl.* ii, 178; *A. babingtoni* Woods *Tourist's Fl.* 316 (1850) in sensu stricto; *A. hastata* var. *babingtoni* Hartmann *Skand. Fl.* ed. 7, 182 (1858).

Icones:—Babington in *Eng. Bot. Suppl.* t. 2880 (1844) as *A. rosea*; *Fl. Dan.* t. 2712, as *A. babingtoni*.

Camb. Brit. Fl. ii. *Plate 182.* (*a*) Shoot with ripening fruit. (*b*) Fruiting bracteoles (enlarged), enclosing ripe fruits. (*c*) Seeds (enlarged). Isle of Wight (E. W. H.).

Exsiccata:—Dörfler, 3225, as *A. babingtoni*; Fries, xiv, 60, as "*A. hastatae* et *crassifolia affinis*"; herb. Beeby[1], 881, as *A. babingtoni*; herb. Marshall, 1363, as *A. babingtoni* var. *virescens*; 1364, 1898, 2488, 2489, 2590, 3132, as *A. babingtoni*.

Branches more numerous than in var. *virescens*, rather distant, subsimple, usually rather yellowish green or reddish brown. *Laminae* of the lower leaves deltoid to triangular, often very denticulate; of the upper leaves narrowly elliptical, often denticulate and with basal lobes. *Fruiting bracteoles* rhomboid, about as broad as long (4—5 mm.), much swollen, with 2 tubercles or 2 groups of tubercles, rarely smooth, somewhat hardened and yellowish when quite mature. *Seeds* large (2—3 mm. in diameter).

Sussex, Somerset, Kent, Buteshire, Forfarshire, Inverness-shire, Zetland, and doubtless elsewhere.

Faeröes, Iceland, Scandinavia, Denmark, Germany, France, central Europe.

(*b*) **A. glabriuscula** var. **virescens** Moss and Wilmott *Camb. Brit. Fl.* ii, 178; *A. glabriuscula* Edmonston *Fl. Shetland* 39 (1845) in sensu stricto; *A. babingtoni* var. *virescens* Lange *Haandb. Danske Fl.* 712 (1864)!; Hartmann *Skand. Fl.* ed. 11, 348 (1879).

Icones:—*Fl. Dan.* t. 2713, as *A. babingtoni* var. *virescens*.

Camb. Brit. Fl. ii. *Plate 183.* (*a*, *b*) Shoots with ripening fruits. (*c*) Fruiting bracteoles (enlarged), enclosing ripe seeds. (*d*) Seed (enlarged). Jersey (E. W. H.). *Plate 184.* (*a*) Flowering shoot. (*b*) Fruiting bracteole (enlarged). Dorset (C. E. S.).

Exsiccata:—Herb. Beeby, 868, 869, 878, as *A. babingtoni* var. *virescens* ("teste Lange"); herb. Marshall, 2447, as *A. babingtoni*; 244, 311 (partim, as *A. patula*), 782, 1921, 1925, 1926.

Branches long and nearly simple, often larger, coarser, greener, and more succulent than var. *babingtoni* (Plate 183), but small forms occur (Plate 184). *Laminae* of the lower leaves ovate-triangular, truncate or subcuneate at the base, lobed, nearly entire; of the upper leaves elliptical, entire, 1·0—2·5 cm. long. *Fruiting bracteoles* broadly ovate-triangular, base campanulate, usually very denticulate, smooth or tuberculate, large (about 5—12 mm. long and 5—10 broad), with prominent veins, dark green, not much swollen. *Seed* large (3—4 mm.).

Channel Isles, Devonshire, Kent, Lincolnshire, East Riding of Yorkshire, Ross-shire, eastern Inverness-shire, Sutherlandshire,

Faeröes, Scandinavia, Denmark, Germany (Baltic shores), France.

A. glabriuscula occurs on sandy and gravelly foreshores at the limits of high spring tides, on shingle-banks, on sea-walls, and rarely on the drier parts of salt-marshes. It occurs in every British maritime county except Carmarthenshire, Denbighshire, the Isle of Man, Dumfriesshire, Stirlingshire, and Caithness-shire.

Coasts of north-western Europe.

A. glabriuscula* × *hastata var. ***oppositifolia*** Moss and Wilmott in *Camb. Brit. Fl.* ii, 178.

Plants which we consider to have had the origin here suggested have the characters of the putative parents very much mingled. (1) Some are erect plants, with a much branched inflorescence, and with some large bracteoles containing seeds and some sterile small and undeveloped ones. (2) Possibly also many of the "non-typical" prostrate plants are

[1] W. H. Beeby (1849—1910). His herbarium is in the South London Botanical Institute.

referable to this parentage; but it has to be confessed that there are no cultural data to support the hypothesis. Some of these non-typical plants resemble *A. hastata* in many points, but have a leafy inflorescence.

Probably common wherever the two putative parents grow together, e.g., Sussex.

Section IV. *OBIONOPSIS*

Obionopsis Lange *Haandb. Dansk. Fl.* 634 (1856—9); Westerlund in *Linnaea*, xl, 140 (1876); *Scherocalyma* Ascherson *Fl. Brandenb.* 578 (1864); Ascherson und Graebner *Fl. Nordostd. Flachl.* 286 (1898).

For characters, see page 169. Only British species :—*A. sabulosa.*

7. ATRIPLEX SABULOSA. Plates 185, 186

A. marina Gerard *Herb.* 257 (1597); *A. maritima* Ray *Hist. Pl.* i, 193 (1686); *Syn.* ed. 3, 152 (1724) excl. syn. J. Bauhin; *A. maritima nostras procerior folio angulosis adnodum sinuatis* Ray *loc. cit.*; *A. caule annuo foliis deltoïdes-lanceolatis obtuse dentatis subtus farinaceis* L. *Hort. Cliff.* 469 (1737)! excl. syn.

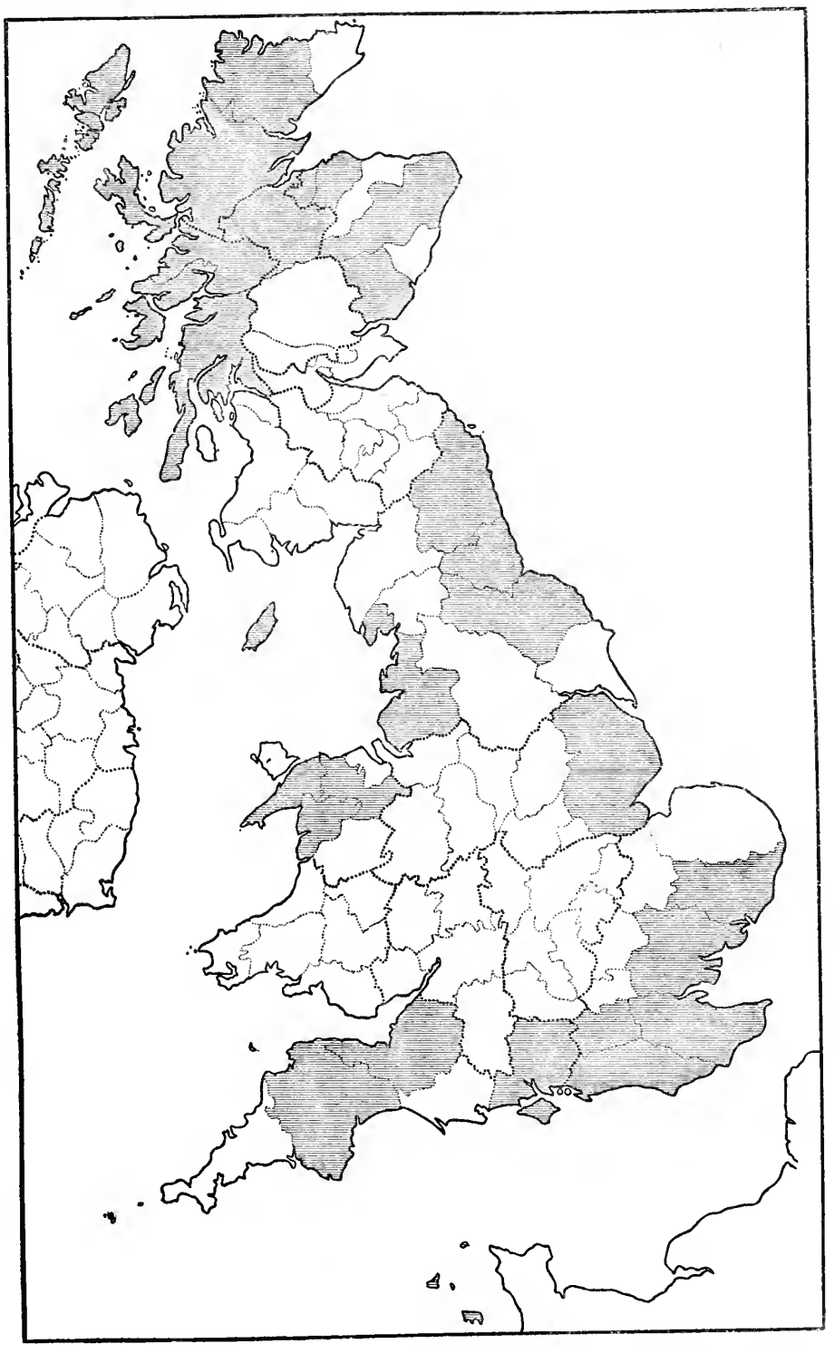
Atriplex sabulosa Rouy *Bull. Soc. Bot. Fr.* xxvii, p. xx (1890); *A. laciniata* L. *Sp. Pl.* 1053 (1753) excl. syn. omn. exc. *Hort. Cliff.*, pro minima parte, nomen confusum; *Sp. Pl.* ed. 2, 1494 (1763)! quoad descr. et spec.; *A. maritima*[1] L. *Fl. Angl.* 25 (1754); *A. farinosa* Du Mortier *Fl. Belg.* 20 (1827) non Forskål; *A. arenaria* Woods in *Phytologist* iii, 593 (1849); *Tourist's Fl.* 317 (1850); Babington *Manual* ed. 3, 271 (1851); Syme *Eng. Bot.* viii, 34 (1868); non R. Br. nec Nuttall; *A. crassifolia* Grenier et Godron iii, 10 (1855) partim, non C. A. Meyer; *A. rosea* var. *arenaria* Westerlund *Sver. Atr.* 32 (1861); in *Linnaea* 142, t. 1, fig. 2 (1875) excl. syn. plur.[2]; *A. maritima* Hallier *Bot. Zeit. Beitr.* 10 (1863) non Crantz nec Pallas; *A. tornabeni* var. *sabulosa* Rouy *Fl. France* xii, 30 (1910).

Icones :—Smith *Eng. Bot.* t. 165, as *A. laciniata*; *Fl. Dan.* t. 1284, as *A. marina.*

Camb. Brit. Fl. ii. *Plate 185.* (*a*) Fertile shoot. (*b*) Portion of underside of lamina (enlarged). (*c*) Fruiting bracts, enclosing ripe seeds. Jersey (E. W. H.). *Plate 186.* (*a*) Fertile shoot. (*b*) Fruiting bracteoles (enlarged). Isle of Wight (E. W. H.).

Exsiccata :—Dickson (*Hort. Sic. Brit.*) iv, 15, as *A. laciniata.*

The specimen of "*A. laciniata*" in the Linnaean herbarium was added between the publication of the two editions of the *Species Plantarum.* It was collected by Kähler; and it is almost certain that the description of *A. laciniata* in the second edition of this work was made from this specimen, which belongs to the allied *A. tornabeni.*



Map 40. *Atriplex sabulosa* occurs on the coasts of the counties which are shaded

[1] We suggest that this name is the result of a *lapsus calami*, as *A. maritima* is the Raian name which is referred to.

[2] The varieties of *A. rosea*, *A. tartarica*, and *A. laciniata* have been greatly confused in nomenclature. Westerlund's synonyms must be partially excluded as the British form of the species is not definitely known to reach Spain or the Mediterranean region.

Annual, very mealy, white to silvery. *Stem* rather stout, decumbent, much branched; branches up to 2 dm. long, ascending; pale yellowish to reddish, with reddish flakes. *Petioles* short (2—5 mm.). *Laminae* broadly rhomboid-ovate, more or less cuneate at the base, margin sinuate-dentate with sinuses shallow and entire to subentire, lobes absent or rudimentary, obtuse at the apex, rather thick, silvery, very mealy on both surfaces, usually about 2 cm. long and 1·5 broad. *Inflorescences* axillary, much shorter than the leaves, about 3—5 mm. long. *Flowers* mostly staminate, about 2—6 in each cluster; August and September. *Fruiting bracteoles* rhomboidal, usually broader than long, about 7 mm. long and 8 broad, sharply contracted or subcordate at the base, lateral angles truncate, smooth or tuberculate, silvery, mealy. *Seeds* brown, dull; radicle prominent; September and October.

Sandy and shingly foreshores, and margins of salt-marshes, at the limit of the high spring-tides. From the Channel Isles, Cornwall, and Kent to Zetland. Not recorded for Ireland.

A. sabulosa occurs in Sweden (not indigenous), Denmark, Germany (shores of the Baltic Sea), Belgium, northern shores of France.

Subgenus 2. *OBIONE*

Obione [Gaertner *De Fruct.* ii, 198, t. 126, fig. 5 (1791) as a genus] C. A. Meyer in *Fl. Altaica* iv, 315 (1833) as a section, including sect. *Halimus*; Syme *Eng. Bot.* viii, 36 (1868); Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 66 (1893); *Halimus* Wallroth *Sched. Crit.* 117 (1822) as a genus; Reichenbach *Fl. Germ. Excurs.* 576 (1830) as a genus.

For characters, see page 168.

British species of *Obione*

8. **A. portulacoïdes** (see below). Undershrub or dwarf undershrub. *Lower leaves* opposite, gradually narrowed at the base into a rather long petiole, somewhat narrowed towards the apex. *Fruiting bracteoles* sessile or nearly so, middle lobe conspicuous, not much exceeded in length by the lateral lobes.

9. **A. pedunculata** (p. 182). Annual herb. *Leaves* alternate, abruptly contracted at the base into a short petiole. *Fruiting bracteoles* on long pedicels, middle lobe small, much exceeded by the lateral lobes.

8. ATRIPLEX PORTULACOÏDES. Sea Purslane. Plate 187

Halimus vulgaris seu portulaca marina Johnson in Gerard *Herb.* ed. 2, 523 (1636); *A. maritima fruticosa halimus et portulaca marina dicta angustifolia* Ray *Syn.* ed. 3, 153 (1724).

Atriplex portulacoïdes L. *Sp. Pl.* 1053 (1753); Syme *Eng. Bot.* viii, 36 (1868); *Halimus portulacoïdes* Du Mortier *Fl. Belg.* 20 (1827) nomen; Nees in *Flora* xviii, 359 (1835); *Obione portulacoïdes* Moquin *Monogr. Chenop.* 75 (1840); Rouy *Fl. France* xii, 37 (1910).

Icones:—Smith *Eng. Bot.* t. 261; *Fl. Dan.* t. 1889; Beck in Reichenbach *Icon.* xxiv, 271, as *Obione portulacoïdes.*

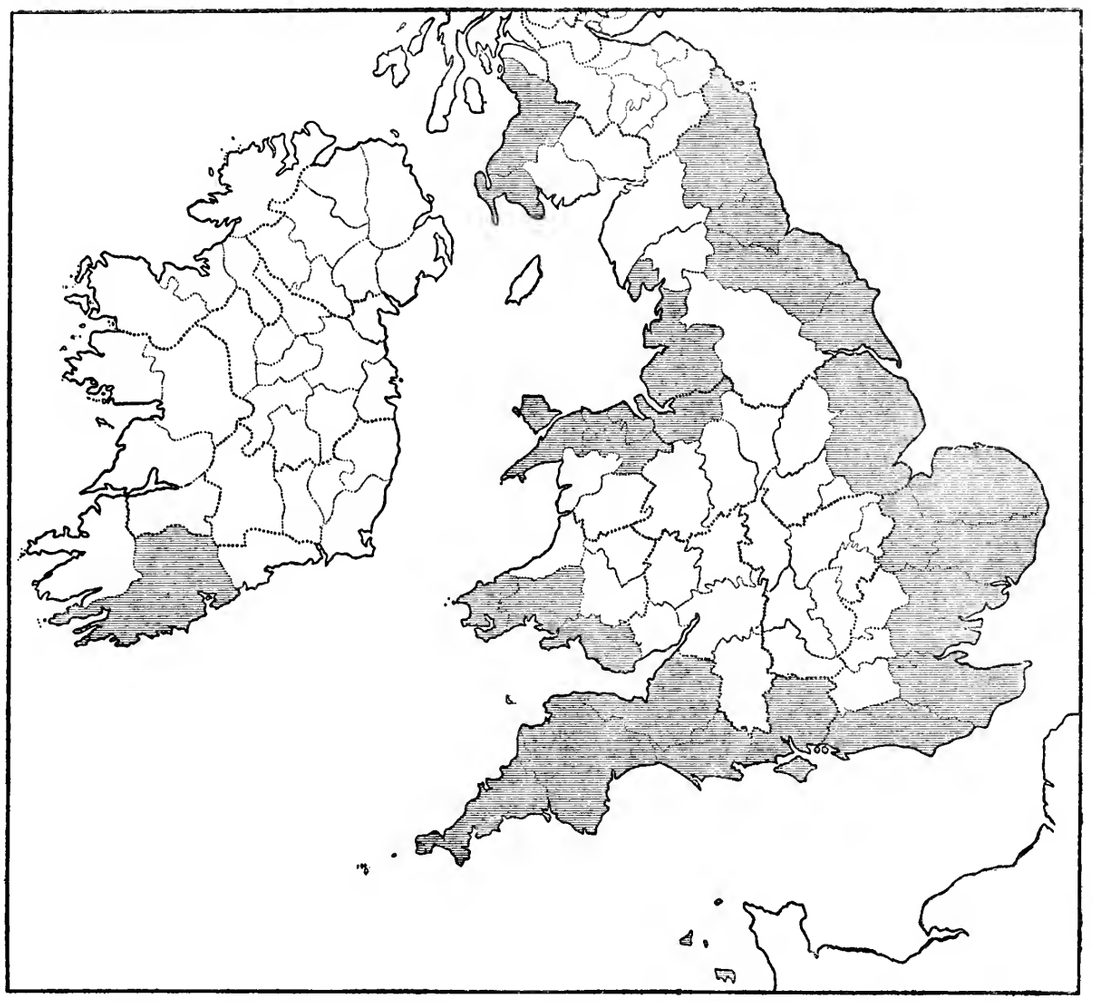
Camb. Brit. Fl. ii. *Plate 187.* (*a*) Flowering shoot. (*b*) Staminate flowers (enlarged). Devonshire (E. M. H.).

Exsiccata:—Billot, 1058, et 1058 bis, as *Obione portulacoïdes*; Bourgeau (*Pl. d'Esp.*), 1454; Fries, xiv, 61, as *Halimus portulacoïdes*; v. Heurck, ii, 86, as *Halimus portulacoïdes*; Schultz, 2579, as *Obione portulacoïdes*; Thielens et Devos, iii, 271, as *Halimus portulacoïdes*; Todaro, 515; Wirtgen, 397, as *Halimus portulacoïdes.*

The specimens by Todaro belong to the small narrow-leaved form (*Halimus australis* Nees in *Flora* xviii, 359 (1835)).

Undershrub, up to 6 dm. high, or dwarf undershrub, very mealy. *Rhizome* short, creeping, much branched. *Stem* decumbent, much branched; branches ascending, terete below, angular above. *Leaves* opposite below, opposite or alternate above. *Petioles* short, about 5—10 mm. long. *Laminae* of the lower leaves elliptical, attenuate below, entire, lobes absent, apex rounded or apiculate; of the upper ones linear; mealy above, strongly so underneath. *Inflorescence* of terminal and axillary compound spikes; partial inflorescences interrupted below, a leaf at the base of each. *Flowers* either perfect, or with functional stamens and a rudimentary ovary, or with functional

ovaries and no stamens; July to September. *Fruiting bracteoles* sessile or nearly so, obdeltoid or 3-lobed with the middle lobe prominent, united two-thirds of the way up from the base, either much tubercled or only slightly so or smooth, about 3—5 mm. long and 4—6 broad. *Seeds* small (up to about 2·5 mm. in diameter), rugose, compressed, dull chestnut-brown; September and October.



Map 41. *Atriplex portulacoïdes* occurs on the coasts of the counties which are shaded

(*a*) **A. portulacoïdes** var. **latifolia** Gussone *Fl. Sic. Syn.* ii, 588 (1843); Lojacono Pojero *Fl. Sic.* ii, part 2, 279 (1907); *Halimus portulacoïdes* Nees *loc. cit.*, in sensu stricto.

Laminae oblong-lanceolate, broad, those of the main branches usually about 3 times as long as broad. *Bracteoles* at maturity up to 5 mm. long and 4 wide, smooth or tuberculate.

This is the common British plant. (The Mediterranean form has narrower leaves: it is the (*b*) var. *angustifolia* Gussone *op. cit.*) A specimen in herb. C. E. Salmon, from Rye, Sussex, has unusually broad leaves, only twice as long as broad, and strongly tuberculate bracteoles.

(*β*) forma **parvifolia** comb. nov.; *O. portulacoïdes* var. *parvifolia* Rouy *Fl. France* xii, 37 (1910).

Dwarf undershrub, rising only about 5—6 cm. above the ground; smaller in all its parts than the other varieties.

Blakeney, Norfolk, just within reach of the highest tides. Pointed out to us by Professor F. W. Oliver.

France (Rouy *loc. cit.*).

Locally abundant on muddy and sandy salt-marshes, rarely on shingly salt-marshes, which are washed by ordinary high tides, and on sea-walls; often social—especially when fringing pools and denudation channels on salt-marshes. From the Channel Isles, Cornwall, and Kent northwards to Ayrshire and Northumberland. Ireland—co. Cork.

Denmark, Germany, Russia, Holland, Belgium, France, southern Europe; northern Africa; Asia Minor; Cape Colony; North America (not indigenous).

9. ATRIPLEX PEDUNCULATA. Plate 188

A. marina semine lato nondum descripta Johnson *Merc. Bot.* ii, 16 (1641); *A. marina semine lato* Ray *Syn.* ed. 3, 153 (1754); *A. maritima nostras ocimi minoris folio* Ray *loc. cit.*

Atriplex pedunculata L. *Fl. Angl.* 25 (1754); *Cent. Pl.* i, 34 (1755); Hudson *Fl. Angl.* 378 (1762); L. *Sp. Pl.* ed. 2, 1675 (1763); Syme *Eng. Bot.* viii, 37 (1868); *Diotis atriplicoïdes* Bieberstein *Fl. Taur.-Cauc.* ii, 397 (1808); *Halimus pedunculatus* Wallroth *Sched. Crit.* 117 (1822); *Obione pedunculata* Moquin *Chenop. Enum. Monogr.* 75 (1840); Ascherson und Graebner *Fl. Nordost. Flachl.* 283 (1898); Rouy *Fl. France* xii, 38 (1910).

Icones :—Smith *Eng. Bot.* t. 232; *Fl. Dan.* t. 304.

Camb. Brit. Fl. ii. *Plate 188.* (*a*) Fertile shoots. (*b*) Staminate flowers (enlarged). (*c*) Fruiting bracteoles (enlarged), enclosing ripe fruits. Kent (E. M. H.).

Exsiccata :—Billot, 2525, as *Obione pedunculata*; Fries, i, 57, as *Halymus pedunculatus*; Reichenbach, 483, as *Halimus pedunculatus*; Wirtgen, viii, 398, as *Halimus pedunculatus.*

Annual; very mealy and silvery-glaucous. *Stem* erect, from about 3—30 cm. high, usually 5—20, slender, rather zigzag, angular, subsimple or branched, branches spreading or decumbent. *Leaves* alternate. *Petioles* short. *Laminae* ovate-lanceolate to obovate-lanceolate, entire, apex rounded and often with rather blunt apiculus, rather succulent, about 1·2—3·7 cm. long. *Partial inflorescences* lax, interrupted, axillary. *Flowers* in August and September. *Pistillate flowers* subsessile, pedicel elongating greatly as the fruit ripens. *Fruiting bracteoles* obdeltoid, compressed, united almost up to the top, 3-lobed, the central lobe very small, the lateral lobes spreading. *Mature pedicel* up to about 12—13 mm. long. *Seeds* small, nearly 2 mm. in diameter, compressed, dull, light brown.

Map 42. *Atriplex pedunculata* has occurred on the coasts of the counties which are shaded

The *A. maritima nostras ocimi minoris folio* Ray *loc. cit.* was probably a dwarf-form of this species: it was named *A. pedunculata* var. *humilis* by Gray in his *Nat. Arr.* ii, 282 (1821).

An extremely large form, with laminae 2—5 cm. long and very thick, was collected among rubbish on a salt-marsh in Kent in 1902 by Mr H. Groves.

Very rare; on salt-marshes, in the wetter portions of the association of *Glyceria maritima.* Kent, Suffolk, Norfolk, Cambridgeshire and Lincolnshire: only found recently, we believe, in Kent: an Irish record from western Galway is perhaps due to some error. Rarely adventitious on foreign ballast, as in Durham and Carnarvonshire.

Western Europe, from southern Sweden to Normandy, Baltic coasts—Germany and northwards to Ösel in Russia, central Germany, south-eastern Europe; Asia Minor, Caucasus, central Asia.

Tribe 4. *SUAEDEAE*

Suaedeae Moquin in DC. *Prodr.* xiii, pt. ii, 152 (1849); Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 53 et 78 (1893); Rouy *Fl. France* xii, 62 (1910); *Suaedineae* Moquin in *Ann. Sc. Nat.* sér. 2, iv, 215 (1835).

For characters, see page 153. Only British genus :—*Suaeda.*

Genus 1. Suaeda

Suaeda [Forskål *Fl. Aegypt. Arab.* lxxx et 69 (1775) t. 18 (1776) nomen] Du Mortier *Fl. Belg.* 22 (1827) nomen; Moquin in *Ann. Sc. Nat.* sér. 2, iv, 215 et 216 (1835); in DC. *Prodr.* xiii, pt. ii, 155 (1849) incl. *Chenopodina* p. 159; Bentham and Hooker *Gen. Pl.* iii, 66 (1880); Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 78 et 80 (1893); Rouy *Fl. France* xii, 62 (1910); nomen conservandum. [*Lerchia* Haller *Comm. Hort. Gott.* (1743); *Dondia* Adanson *Fam. Pl.* ii, 261 (1763).]

Small shrubs, undershrubs, or herbs. *Leaves* small, alternate, sessile, more or less glaucous, terete to plano-convex, succulent. *Bracteoles* 2—3, small, persistent. *Flowers* monoclinous or diclinous, axillary. *Perianth* small, more or less succulent, persistent, greenish; segments 5, not keeled. *Stamens* 5. *Style* very short or absent. *Stigmas* 3—5, short. *Achenes* with a thin membranous pericarp. *Seeds* horizontal, oblique, or vertical. *Integument* double, testa thick. *Embryo* in a flat spiral. *Radicle* inferior. *Endosperm* present or not.

About 40 species; cosmopolitan, chiefly in saline situations.

BRITISH SPECIES OF *Suaeda*

1. **S. fruticosa** (see below). Perennial. *Leaves* evergreen, short (5—6 mm.), subcylindrical. *Stigmas* 3. *Seeds* vertical.

2. **S. maritima** (see below). Annual. *Leaves* plano-convex, usually about twice to three times as long as those of *S. fruticosa*. *Stigmas* 2. *Seeds* horizontal.

1. SUAEDA FRUTICOSA. Plate 189

Blitum fruticosum maritimum vermicularis frutex dictum Ray *Syn.* ed. 3, 156 (1724) excl. syn.

Suaeda fruticosa Forskål *Fl. Aegypt. Arab.* 70 (1775); Moquin *Chenop. Monogr. Enum.* 122 (1840); in DC. *Prodr.* xiii, pt. ii, 156 (1849); Syme *Eng. Bot.* viii, 2 (1868); *Chenopodium fruticosum* L. *Sp. Pl.* 221 (1753); *Salsola fruticosa* L. *Sp. Pl.* ed. 2, 324 (1763); Smith *Eng. Bot.* no. 635 (1799); *Fl. Brit.* 280 (1800); *Eng. Fl.* ii, 18 (1828).

Icones:—Smith *Eng. Bot.* t. 635, as *Salsola fruticosa*.

Camb. Brit. Fl. ii. *Plate 189.* (*a*) Terminal flowering branches. (*b*) Lateral barren branches. (*c*) Lower part of an old stem. (*d*) Flowers (two enlarged). (*e*) Achene, surrounded by persistent calyx. Norfolk (E. W. H.).

Exsiccata:—Billot, 3194; Welwitsch (*Iter. Lusit.*), 130, as *Chenopodium fruticosum*.

Small shrub. *Root* penetrating deeply into the soil. *Stem* erect, up to about 1 m. high or rather more, stout. *Branches* numerous, suberect or ascending, very leafy, glabrous, subterranean ones often numerous and rooting freely. *Leaves* almost terete, obtuse, crowded especially towards the ends of the branches, evergreen 5—6 mm. long and 1 mm. broad. *Flowers* in small cymes of 1—3 flowers; mid-July to September. *Stigmas* 3. *Seeds* ovoid, vertical, shining; September and October.

Map 43. *Suaeda fruticosa* occurs in the counties which are shaded, and has been recorded for the counties marked with a "?"

It would scarcely be thought that such an unequivocal species as *Suaeda fruticosa* would have provided difficulties for British geographical botanists: such, however, is actually the case. We can only suppose that the erroneous records have been made by those who were quite unfamiliar with the plant, and who have mistaken stout forms of *S. maritima* for the perennial species. We have seen the plant in Dorset and Norfolk, in both of which counties it is locally abundant. There are records of it for Hampshire and Sussex; but neither Mr A. Bennett nor ourselves have seen specimens from these counties. It was recorded for Lincolnshire, by the Rev. J. Dodsworth, in 1836: "as he knew [*S. maritima*]..., he can hardly have been mistaken" (Rev. E. A. Woodruffe Peacock in *The Naturalist*, 184 (1896)). Of the remaining records, some refer to stations where the plant has occurred as an alien near docks, and others are errors.

Shingle-banks, margins of shingle-banks and salt-marshes, and sea-walls. Dorset, Essex, Suffolk, Norfolk, and Lincolnshire (extinct); Wales—Glamorganshire (? indigenous). Records for other counties are either errors for *S. maritima*, or are doubtful, or only refer to the adventitious occurrence of the plant, as in the vicinity of docks.

France (rare in the north, more abundant in the west and south), southern Europe; northern Africa; south-western Asia and the East Indies.

2. SUAEDA MARITIMA. Sea Blite. Plates 190, 191

Kali minus Johnson in Gerard *Herb.* ed. 2, 535 (1636); *K. minus album* Parkinson *Theatr. Bot.* 279 (1640); *Blitum kali minus album dictum* Ray *Syn.* ed. 3, 156 (1724).

Suaeda maritima [Du Mortier *Fl. Belg.* 22 (1827) nomen] Moquin in *Ann. Sc. Nat.* xxiii, 308 (1831) incl. *S. macrocarpa*; Babington *Manual* ed. 3, 266 (1851); Syme *Eng. Bot.* viii, 3 (1868); Rouy *Fl. France* xii, 63 (1910); *Chenopodium maritimum* L. *Sp. Pl.* 221 (1753); Smith *Eng. Bot.* no. 633 (1799); *Eng. Fl.* ii, 16 (1824); *Suaeda chenopodioïdes* Pallas *Ill. Plant.* 56 (1803); *Schoberia maritima* C. A. Meyer in Ledebour *Fl. Altaica* i, 400 (1829); *Chenopodina maritima* Moquin in DC. *Prodr.* xiii, pt. ii, 161 (1849).

Annual. *Stem* erect, decumbent, or prostrate, up to about half a metre in length. *Leaves* plano-convex, subacute to acuminate, up to about 1·5 cm. long and 1—4 mm. broad. *Flowers*

in small cymes of 1—3 flowers; mid-July to September. *Stigmas* 2. *Seeds* compressed, shining, finely punctate; August and September.

(*a*) **S. maritima** var. **macrocarpa** Moquin *Chenopod. Monogr. Enum.* 128 (1840); *Chenopodium macrocarpum* Desvaux *Journ. Bot.* i, 48 (1813); *Schoberia macrocarpa* C. A. Meyer in Ledebour *Fl. Altaica* i, 402 (1829); *Suaeda macrocarpa* Moquin in *Ann. Nat. Sc.* sér. i, xxiii, 309 (1831); *Chenopodina maritima* var. *macrocarpa* Moquin in DC. *Prodr.* xiii, pt. ii, 161 (1849).

Icones:—Smith *Eng. Bot.* t. 633, as *Chenopodium maritimum*; *Fl. Dan.* t. 489, as *Chenopodium maritimum*. *Camb. Brit. Fl.* ii. *Plate 190.* (*a*) Whole plant (the prostrate form). (*b*) Persistent perianths, enclosing fruit. (*c*) The same (enlarged). Cornwall (C. C. V.).

Exsiccata:—Billot, 1057, 1057 bis, as *Chenopodina maritima*; Bourgeau (*Pl. d'Esp.*), 1466, as *Chenopodina maritima*; Durieu (*Pl. Sel. Hisp. Lusit.*), 238, as *Chenopodina maritima*; Fries, iv, 78, as *Schoberia maritima*; v. Heurck et Martinis, v, 231; Reichenbach, 871, as *Schoberia maritima*; Schultz, xii, 1132; Thielens et Devos, i, 97; Welwitsch (*Iter. Lusit.*), 73, as *Chenopodium maritimum*; Wirtgen, iii, 398, et viii, 394, as *Schoberia maritima*.

Annual. Erect, decumbent, or prostrate. *Stem*, when erect, usually less tall than in var. *flexilis*. *Branches* more divaricate. *Laminae* shorter (about 1 cm. long), less markedly acute. *Flowers* appearing in mid-July, about 2—4 weeks earlier than in var. *flexilis*. *Achenes* larger (about 2 mm. in diameter), ripening earlier; August and September.

Both this and var. *flexilis* vary in being either erect or prostrate; and consequently we do not regard Syme's var. *ascendens* (*Eng. Bot.* ed. 3, viii, 3 (1868)) and his var. *procumbens* (*loc. cit.*) as of any importance. Apparently Syme himself was almost of the same opinion, for, of his two varieties, he states that "it is scarcely possible to draw any line of demarcation between them" (*op. cit.* p. 4).

Cornwall, Dorset, Hampshire, Isle of Wight, Kent, Essex, Norfolk, and doubtless elsewhere.

Belgium, France, Russia, Spain, and doubtless elsewhere.

(*b*) **S. maritima** var. **flexilis** Rouy *Fl. France* xii, 63 (1910).

Icones:—*Camb. Brit. Fl.* ii. *Plate 191.* (*a*) Shoot of a typical plant. Isle of Wight (C. E. M.). (*b*) Flowering shoot of a plant grown in an inland garden. (*c*) Flowers (enlarged). (*d*) Fruit (enlarged). Hort., origin Sussex (E. W. H.).

Stem usually erect, occasionally prostrate, not branched at the base; branches short, ascending. *Leaves* longer and more tapering than in var. *macrocarpa*. *Flowers* appearing later; August and September. *Seeds* smaller, about 1·1—1·4 mm. in diameter, ripening later.

Dorset, Isle of Wight, Hampshire, Sussex, Essex, Norfolk, and doubtless elsewhere. Perhaps more southern in its range than var. *macrocarpa*.

Belgium, France, southern Europe, and doubtless elsewhere.

S. maritima occurs in salt-marshes, usually on the higher portions, throughout the British Isles.

Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe, Russia, southern Europe; northern Africa; Asia; America; Australia. Probably the American and Australian forms are specifically distinct from the European ones.

Tribe 5. *SALSOLEAE*

Salsoleae C. A. Meyer in Ledebour *Fl. Altaica* i, 370 (1829); Moquin in *Ann. Sc. Nat.* sér. 2, iv, 209 (1835); in DC. *Prodr.* xiii, pt. ii, 169 (1849); Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 53 et 81 (1893); Rouy *Fl. France* xii, 64 (1910).

For characters, see page 153. Only British genus:—*Salsola*.

Genus 1. **Salsola**

By C. E. SALMON, F.L.S.

Salsola L. *Sp. Pl.* 222 (1753) et *Gen. Pl.* ed. 5, 104 (1754); Gaertner *Fruct.* i, 359 (1788); Volkens in Engler und Prantl *Pflanzenfam.* iii, pt. i a, 81 et 82 (1893). [*Kali* Tournefort *Inst.* 147, t. 128 (1719) partim.]

Small shrubs, undershrubs, or herbs. *Leaves* small, alternate or opposite, sessile, more or less glaucous, often rigid and spinescent. *Bracteoles* 2. *Flowers* monoclinous. *Perianth* small, more or less succulent, persistent, with 4—5, usually 5, segments; segments with a transverse scarious dorsal appendage or "wing"; wing developing after pollination and enlarging more or less in fruit. *Stamens* 3—5, usually 5. *Filaments* sometimes inflated or even joined towards the base. *Style* rather long. *Stigmas* 2—3, usually 2, compressed or subulate. *Achenes* with

either a succulent or membranous pericarp, enclosed in the winged and enlarged perianth. *Seeds* horizontal. *Integument* single. *Embryo* green, cochleate. *Endosperm* absent.

About 40 species; Europe; temperate Asia; northern and southern Africa; chiefly in saline situations.

British species of *Salsola*

1. **S. kali** (see below). Usually much stouter than *S. tragus*. *Spines* of the leaves usually stronger. *Wings* of the fruiting perianth pronounced. *Achene* larger, about 2·5 mm. long and 3·5 broad.

2. ***S. tragus** (page 186). *Stem* slender. *Leaves* slender, about 2—5 cm. long, scarcely succulent. *Wings* usually absent, if present shorter than in *S. kali*. *Achene* smaller, about 2 mm. long and broad.

1. SALSOLA KALI. Prickly Saltwort. Plates 192, 193, 194

Kali Lyte *New Herball* 127 (1586); *Tragos matthioli seu potius tragus improbus matthioli* Gerard *Herb.* 959 (1597); *Tragos sive tragum matthioli* Parkinson *Theatr. Bot.* 1034 (1640); *Kali spinosum cochleatum* Ray *Syn.* ed. 3, 159 (1724).

Salsola kali L. *Sp. Pl.* 222 (1753)!; Miller *Gard. Dict.* ed. 8, no. 1 (1768)!; Smith *Eng. Bot.* no. 634 (1799); *Fl. Brit.* 280 (1800); *Eng. Fl.* ii, 18 (1824); Syme *Eng. Bot.* viii, 4 (1868); Rouy *Fl. France* xii, 65 (1910) excl. race *gmelini*.

Icones:—*Svensk Bot.* t. 471, as *S. kali*.

Camb. Brit. Fl. ii. *Plate 192.* (*a*) Flowering shoot of var. *hirsuta*. Norfolk (C. E. M.). (*b*) Flowering shoot of var. *glabra*. (*c*) Portion of stem of var. *glabra*. (*d*) Ripening ovary (enlarged). Sussex (T. H.).

Annual. *Root* strong, penetrating the soil to a considerable depth. *Stem* erect, decumbent or prostrate, up to about 6 dm. high, though usually about half this height, with pale green or reddish stripes, usually much branched from the base. *Branches* spreading or ascending. *Leaves* sessile, succulent, subterete, subulate, often rather recurved, about 1—4 cm. long, attenuate at the apex into a little spine. *Bracteoles* 2, in the axils of the leaves, leaflike. *Flowers* 1—3 in the axil of a leaf or leafy bract; opening in July. *Perianth* with 4—5, usually 5 segments; segments lanceolate, membranous during the flowering period, becoming more or less cartilaginous in fruit and markedly thickened about the middle, the thickening forming sometimes a mere ridge and at other times forming horizontally spreading wings of variable size. *Stamens* 3—5, usually 5. *Anthers* pale yellow. *Style* rather longer than the stigmas. *Stigmas* 2—3. *Achene* turbinate, about 2·5 mm. long and 3·5 broad, covered with the persistent perianth.

The short-leaved forms have been named var. *brevifolia* (Du Mortier *Fl. Belg.* 23 (1827) nomen), and the longer-leaved forms var. *longifolia* (Du Mortier *loc. cit.* nomen = var. *tenuifolia* Reichenbach *Fl. Excurs. Germ.* 583 (1832) non aliorum). Plants with stouter leaves have been named var. *crassifolia* (Reichenbach *loc. cit.* = var. *latifolia* Schur *Pl. Transsilv.* 568 (1866)). Plants with rudimentary wings have been named var. *marginata* by Čelakowsky (*Fl. Böhm.* 155 (1867)).

(*a*) **S. kali** var. **hirsuta** Hornemann *Oec. Plant.* ed. 3, i, 293 (1821); *S. decumbens* Lamarck *Fl. France* iii, 241 (1778); *S. kali* var. *hirta* Tenore *Syll. Fl. Neap.* 124 (1831); Rouy *Fl. France* xii, 65 (1910); *S. kali* var. *vulgaris* Koch *Syn.* ed. 2, 693 (1844); *S. kali* var. *typica* Beck *Fl. Nied.-Öst.* 340 (1890).

Icones:—*Fl. Dan.* t. 818 (left-hand plant), as *S. kali*; Smith *Eng. Bot.* t. 634, as *S. kali*; Pallas *Ill.* t. 28, fig. 2, as *S. kali*; *Fl. Lond.* ed. 2, t. 158; Beck in Reichenbach *Icon.* xxiv, t. 292.

Camb. Brit. Fl. ii. *Plate 193.* (*a*) Upper portion of plant. (*b*) Portion of stem (enlarged). (*c*) Infructescence (enlarged). Sussex (T. H.).

Exsiccata:—Billot, 841, as *S. kali*; Dickson, xii, 14, as *S. kali*; Hansen, 868; Magnier, 35, as *S. kali*; Schultz, x, 904, as *S. kali*. The specimens by Billot and Schultz belong to the slender-leaved form.

Stem prostrate or ascending, asperous. *Leaves* asperous. *Wings of the mature perianth* dilated or rarely rudimentary.

This is the common British plant.

Scandinavia, Denmark, Germany, Holland, France, Italy, and doubtless elsewhere.

(*b*) **S. kali** var. **glabra** Detharding *Consp. Pl. Megalop.* 25 (1828); Tenore *Syll. Fl. Neap.* 124 (1831) excl. syn. L.; *S. spinosa* Lamarck *Fl. France* iii, 240 (1778) excl. syn. L.; *S. tragus* DC. *Fl. France* iii, 396 (1815) non Linn.; *S. kali* var. *tragus* Moquin in DC. *Prodr.* xiii, pt. ii, 187 (1849) excl. syn. L.; Rouy *Fl. France* xii, 65 (1910) excl. syn. L.; *S. kali* var. *calvescens* Grenier et Godron *Fl. France* iii, 31 (1855).

Icones :—*Fl. Dan.* t. 818 (right-hand drawing), as *S. kali*; Cusin *Fl. France* xix, t. 54, as *S. kali* var. *calvescens*.

Camb. Brit. Fl. ii. *Plate 194.* Branches with ripening fruits. Jersey (E. W. H.).

Exsiccata :—Billot, 3195, as *S. tragus*; Dörfler, 4687, as *S. kali* var. *calvescens*; Hansen, 867; Magnier, 3350, as *S. kali* var. *calvescens*; Reichenbach, 662 (some specimens are intermediate in certain respects between the two varieties), as *S. tragus*; Reverchon, 166, as *S. kali*; Todaro, 1088, as *S. controversa*; *Herb. Fl. Ingric.* viii, 526, as *S. kali*; *Pl. Finland*, 192, as *S. kali* var. *calvescens*; *Soc. Dauph.* 1826, as *S. kali* var. *calvescens*.

Stem usually erect, almost or quite glabrous. *Leaves* glabrous or almost so. *Wings of the persistent perianth* usually less dilated than in var. *hirsuta*, sometimes more or less rudimentary.

The form with the rudimentary wings has been named var. *brevimarginata* by Koch (*Syn.* ed. 2, 693 (1844)). Rouy (*loc. cit.*) states that both large and small wings sometimes occur on the same stem; and I have observed the same phenomenon myself. Further observations are required before it is possible to state whether or not such plants are hybrids, and whether or not the characters of large and small wings behave in any Mendelian manner.

Channel Isles, the Isle of Wight, Sussex, and perhaps elsewhere.

France, Russia, Italy (including Sardinia and Sicily), and doubtless elsewhere.

Salsola kali occurs on sandy foreshores in every county in Great Britain except Monmouthshire, and in all those of Ireland except Limerick and Leitrim.

Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe, Russia, southern Europe; northern Africa; Asia; North America (coast from Cape Breton Island to Florida).

2. *SALSOLA TRAGUS

Salsola tragus L. *Cent. Pl.* ii, 13 (1756)!; *Sp. Pl.* ed. 2, 322 (1762); Miller *Gard. Dict.* ed. 8, no. 2 (1768); Britten and Brown *Ill. Fl. N. U. S.* i, 586 (1896) excl. syn. Moquin; *S. scariosa* Stokes *Bot. Mat. Med.* ii, 31 (1812); *S. kali* var. *apula* Tenore *Syll. Fl. Neap.* 125 (1831); *S. kali* var. *tenuifolia* Meyer *Chlor. Hanov.* 470 (1836); Moquin in DC. *Prodr.* xiii, pt. ii, 187 (1849); non Bieberstein; Hallier et Brand in Koch *Syn.* ed. 3, iii, 2226 (1902—7); *S. kali* race *gmelini* Rouy *Fl. France* xii, 65 (1910).

Icones :—Pallas *Ill.* t. 28, fig. 3, as *S. kali*; Cusin *Fl. France* xix, t. 55; Beck in Reichenbach *Icon.* t. 293, figs. 3—6. All these figures are of the glabrous form.

Exsiccata :—Reichenbach, 485 (the asperous form), as *S. kali*; Rehmann, 150 (the glabrous form), as *S. kali*; Schultz, 2778 (the glabrous form); Sintenis, 181 b (the asperous form), as *S. kali*; *Soc. Dauph.* 1827 (the asperous form).

Annual. *Stem* slender, tall (up to about 7 dm.), erect or rarely more or less decumbent, much branched; branches asperous or glabrous. *Leaves* slender, elongate (about 2—5 cm. long and 1—2 mm. broad), subfiliform, not or scarcely succulent, asperous or glabrous. *Wings* almost always absent, when present shorter than in *S. kali*. *Achene* smaller, about 2 mm. long and broad.

Not indigenous; Southwick, Sussex; Ware brickfield, Hertfordshire; near the docks, Hull; waste ground, St Anne's-on-the-sea, Lancashire. The asperous form occurred at Southwick and St Anne's, the glabrous form in the other localities.

Western Europe—Germany, Holland, Belgium, and France, but perhaps not indigenous. Indigenous in central, southern, and eastern Europe, in northern Africa, in south-western Asia; North America (now a troublesome weed in cultivated land and waste places, but not indigenous). The asperous form seems to be the commoner on the continent of Europe.

Tribe 6. *SALICORNIËAE*

Salicornieae Du Mortier *Fl. Belg.* 23 (1827); C. A. Meyer in Ledebour *Fl. Altaica* i, 371 (1829); Moquin *Chen. Enum. Monogr.* 108 (1840); in DC. *Prodr.* xiii, pt. ii, 144 (1849); Rouy *Fl. France* xii, 57 (1910) as a subfamily.

For characters, see page 154. Only British genus :—*Salicornia*.

Genus 1. **Salicornia**

By C. E. MOSS and E. J. SALISBURY, D.Sc., F.L.S.

Salicornia [Tournefort *Inst.* t. 485 (1719)] L. *Sp. Pl.* 3 (1753) et *Gen. Pl.* ed. 5, 4 (1754); Grenier et Godron *Fl. France* iii, 27 (1855); Duval-Jouve in *Bull. Soc. Bot. France* xv, 170 (1868); Moss in *Journ. Bot.* xlix, 177 (1911).

Undershrubs or annual herbs, inhabiting inland and maritime salt-marshes. *Stem* usually much branched. *Leaves* succulent, opposite and decussate; the opposite pairs fused along their margins and thus forming "segments"; segments surrounding the stem, usually free at the tip, very smooth and translucent, glabrous. *Inflorescences* in terminal spikes; spikes usually compound, with a sterile segment at the base; the partial inflorescences consisting of cymes of usually 3 flowers, rarely of more in some foreign species, and of 1 in *S. disarticulata*. *Perianth* 4-partite or 3-partite, segments ill-defined, sunk in the leaves (=bracts) of the spike. *Bracteoles* absent. *Stamens* 1—2; if 2, appearing in succession. *Radicle* incumbent. *Endosperm* absent in the British forms. *Testa* either thick and tuberculate, or (in the British forms) thin and covered with fine hairs which are more or less curved or coiled at the tip.

In this work, we omit, as a rule, references to the internal structure of plants. In *Salicornia*, however, the occurrence and distribution of stereids (or lignified strengthening cells) and of spirally marked water-containing cells in the mesophyll of the leaf are of unusual interest in relation to the determination of species. Accordingly we supply the following details from the work of Dr Ethel de Fraine (in *Journ. Linn. Soc.* xli, pp. 330—334 (1913)) with regard to the British species and their allies. In *S. glauca* Delile (a Mediterranean species), stereids alone occur, and these are of comparatively large size. In *S. fruticosa* L. (a widespread species occurring in France but not in the British Isles), both stereids and spiral cells occur, the latter being limited to the palisade leaf-tissue. Both stereids and spiral cells occur in *S. perennis* var. *radicans* (Smith) Moss and Salisbury, *S. perennis* var. *lignosa* (Woods) Moss, *S. gracillima* (Townsend) Moss, and *S. disarticulata* Moss: in these species the stereids occur in the reproductive shoots alone, whilst in *S. fruticosa* L. they occur in both the vegetative shoots and the reproductive shoots. In the following species, stereids are absent:—*S. dolichostachya* Moss, *S. herbacea* L., *S. ramosissima* Woods, *S. pusilla* Woods, *S. prostrata* var. *smithiana* (Moss) Moss and Salisbury, *S. prostrata* var. *pallasi* Moss and Salisbury, *S. prostrata* var. *appressa* (Du Mortier) Moss and Salisbury, and *S. oliveri* Moss: of these species, spiral cells also are absent in *S. dolichostachya* Moss and *S. oliveri* Moss, whilst in the others, spiral cells occur chiefly in the reproductive shoots. The occurrence of stereids in *S. gracillima* and *S. disarticulata* was quite unexpected; and the fact of their occurrence in *S. gracillima* makes it impossible to associate the plant with *S. pusilla*, as was done by Townsend (*Fl. Hampshire*, ed. 2, 640 (1904)).

The British species belong to the subgenus *Eu-Salicornia* (Grenier et Godron *Fl. France* iii, 27 (1855); Moss in *Journ. Bot.* xlix, 178 (1911)) which may be distinguished from the subgenus *Arthrocnemum* (Grenier et Godron *op. cit.*; Moss *op. cit.*) by the much thinner seed-coat, by the hairs of the seed-coat, and usually by the absence of endosperm. The non-British species *S. fruticosa* (L. *Sp. Pl.* ed. 2, 5 (1762)) connects the two subgenera, and was placed in *Arthrocnemum* by Moquin. Moquin also placed the British perennial species in the same genus: this is curious, for the latter species (*S. perennis*) possesses none of the characters of Moquin's genus *Arthrocnemum*.

So far as our experience goes, herbarium specimens of *Salicornia* are more unsatisfactory than in any other British genus. Not only do these plants dry badly, but they are frequently gathered before they are in flower. In fact, it is surprising what a large number of botanists there are who have never observed the flowers of *Salicornia*. As regards the British Isles, none of the species comes into flower before mid-August in average years; and several of them do not begin to flower until the end of August or the beginning of September. The seeds take about 5 to 8 weeks to ripen.

About 25 species; cosmopolitan in saline districts.

British sections of *Salicornia*

Section I. **Pseudo-Arthrocnemum** (see p. 188). Perennial undershrubs. *Stem* much branched, erect or decumbent. *Branches*—some remaining barren—and others terminated by a flowering spike. *Flowers* protogynous. *Spikes* stout, cylindrical, blunt, up to about 3—4 mm. broad. *Cymes* 3-flowered, the central flower broad-based, the lateral flowers separated by the median one. *Perianth* with 4 segments. *Stamens* 2. *Stigmas* bifid. *Testa* subtuberculate or covered with numerous nearly straight or slightly curved hairs, hairs not coiled at the tip.

Section II. **Salicorniëlla** (p. 189). Annual herbs. *Stem* erect, decumbent, or prostrate. *Branches* often numerous, all terminated by a flowering spike. *Flowers* protandrous. *Spikes* more slender than in *Pseudo-Arthrocnemum*. *Cymes* usually 3-flowered, 1-flowered in *S. disarticulata*, the median flower cuneate at the base, the lateral flowers usually contiguous and placed below the median one. *Stamens* usually 1. *Stigmas* tufted. *Testa* thin, covered with slender hairs which are circinately coiled at the tip.

Section I. *PSEUDO-ARTHROCNEMUM*

Pseudo-Arthrocnemum Moss and Salisbury in *Camb. Brit. Fl.* ii, 187; *Perennes* Duval-Jouve in *Bull. Soc. Bot. France* xv, 170 (1868); Moss in *Journ. Bot.* xlix, 178 (1911).

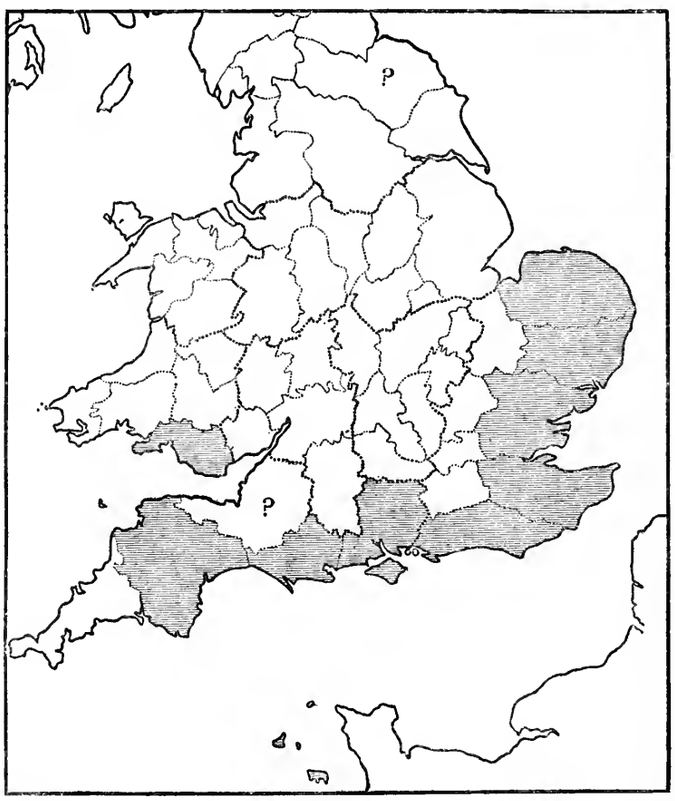
For characters, see p. 187. Only British species:—*S. perennis.*

1. SALICORNIA PERENNIS. Perennial Glasswort. Plates 195, 196

Kali geniculatum majus sive alia nova species kali perennis Ray *Hist. Plant.* ii, 1857 (1688); *K. geniculatum perenne fruticosus procumbens* Ray *Syn.* ed. 2, 67 (1696); *ibid.* ed. 3, 136 (1724).

Salicornia perennis Miller *Gard. Dict.* ed. 8, no. 2 (1768)!; Moss in *Journ. Bot.* xlix, 179 (1911) including *S. lignosa*; *S. fruticosa* Withering *Bot. Arr.* ed. 2, 3 (1787); Smith *Fl. Brit.* 3 (1800); non L.; *S. radicans* Smith *Eng. Bot.* no. 1691 (1807) incl. *S. fruticosa* no. 2467; Syme *Eng. Bot.* viii, 7 (1868); Rouy *Fl. France* xii, 60 (1910); *S. fruticosa* auct. angl., olim.

Dwarf shrub, often a social or subsocial plant growing in matted tussocks up to about a metre or rather more in diameter. *Stem* ascending or decumbent. *Segments* usually dark green especially when growing in mud, usually fading to a brown or rarely (particularly when growing in sand or shingle) to a red colour, basal ones keeled, very concave at the top. *Terminal spikes* cylindrical, short, blunt, with about 8 flowering segments, about 3—5 mm. long and 3—4 broad. *Cymes* 3-flowered. *Flowers* nearly equal in size, the central one slightly larger than the lateral ones; August and September. *Seeds* nearly globular, covered with curved hairs which are rather stouter but not coiled as in *Salicorniella*; October.



Map 44. *Salicornia perennis* occurs on the coasts of the counties which are shaded

The seeds of this species are often in this country killed by early frosts, which do not injure the seeds of the herbaceous species. Doubtless this susceptibility is one of the chief reasons why *S. perennis* has a more southerly distribution than *S. herbacea*.

Bentham (*Handb. Brit. Fl.* 436 (1858) and 385 (1866)) reduced all the British forms of *Salicornia*, including even *S. perennis*, to a single species, and did not even recognise any variety. Bentham named this group "*Salicornia herbacea* Linn.", although Linnaeus himself never included any perennial form in his *S. herbacea*. There can be no doubt that Bentham had not studied the British glassworts; and his attempt therefore to include *S. perennis* in his "*S. herbacea* Linn." is remarkable. Bentham (*loc. cit.*) states that "when luxuriant, after the first flowering, branches [of '*S. herbacea* Linn.'] shoot out from every joint or node as well as from the spike itself; the lower ones become hard, and often procumbent, and rooting at the nodes, and the whole plant will extend to a foot or more; and in favourable seasons a few plants will outlive the winter, so as to have the appearance of under-shrubs, but probably do not last beyond the second year." It would be difficult to find a statement more crowded with errors than this, or one more bold in an attempt to fob unskilful conjectures as established truths. It is well known that Bentham went to great lengths to support his opinions of the ultra-synthetic nature of species; but the above extract may, we hope, be taken as the limit to which he was prepared to go in this regard.

S. fruticosa has several times been recorded as British. The early botanists, such as Withering (*loc. cit.*), doubtless usually meant *S. perennis* by their records of *S. fruticosa*, the latter species being unknown to them. The *S. fruticosa* of Smith (*Eng. Bot.* no. 2467) appears to have been merely a state of *S. perennis*. Mr A. G. More (see *Journ. Bot.* ix, 170 (1871)) thought that *S. perennis* var. *lignosa* might be *S. fruticosa*; but in this he was certainly mistaken. *S. fruticosa* is a not uncommon species in the Mediterranean region, and certainly reaches as far north as the estuary of the river Loire. Corbiére (*Nouv. Fl. de Normandie* 495 (1893)) and Rouy (*Fl. France* xii, 60 (1910)) record *S. fruticosa* for northern France where we ourselves have only been able to find *S. perennis*. *S. fruticosa* may easily be separated from *S. perennis* by its erect stem, and by its ripe seeds which are covered with small conical protuberances. The latter are shorter than the hairs of the seeds of *S. perennis*, and only very slightly curved.

(*a*) **S. perennis** var. **radicans** Moss and Salisbury in *Camb. Brit. Fl.* ii, 188; *S. perennis* Miller *loc. cit.*; Moss *loc. cit.*; *S. radicans* Smith *loc. cit.* including *S. fruticosa* loc. cit.; Syme *loc. cit.*; in sensu stricto;

Arthrocnemum fruticosum var. *radicans* Moquin *Chen. Monogr. Enum.* 112 (1840); *S. fruticosa* var. *radicans* Grenier et Godron *Fl. France* iii, 28 (1855); *S. sarmentosa* Duval-Jouve in *Bull. Soc. Bot. France* xv, 174 (1868)!.

Icones:—Smith *Eng. Bot.* t. 1691, as *S. radicans*; t. 2467, as *S. fruticosa* (this appears to be a small portion of a barren plant of var. *radicans*, drawn from a dried specimen: it is one of the few figures of the *English Botany* not cited by Smith in his *English Flora*); Syme *Eng. Bot.* ed. 3, t. 1183, as *S. radicans*.

Camb. Brit. Fl. ii. *Plate 195.* (*a*) Barren shoot. (*b*) Flowering shoot. (*c*) Flowering spikes (enlarged). Isle of Wight (E. W. H.).

Shoot leaving the ground by numerous stems, and spreading centrifugally. *Branches* with numerous rootlets towards the base. *Hairs of the seed* rather longer than in var. *lignosa*.

Records for Somerset (as *S. fruticosa*, in Turner and Dillwyn *Bot. Guide* 748 (1805)) and the North Riding of Yorkshire (as *S. radicans*, Mudd in Baker *North Yorkshire* 275 (1863)) require confirmation.

Sandy and gravelly salt-marshes, preferring the landward margins seldom washed by the tides; on wet muddy salt-marshes frequently tide-washed, where the plant rarely produces flowers. Southern and eastern England, from Devonshire to Norfolk; Wales—Glamorganshire.

France, Spain, Algeria.

(*b*) **S. perennis** var. **lignosa** Moss in *New Phytologist* xi, 409 (1912); *S. lignosa* Woods *Bot. Gazette* iii, 31 (1851)!; Moss in *Journ. Bot.* xlix, 179 (1911).

Icones:—*Camb. Brit. Fl.* ii. *Plate 196.* (*a*) Shoot with flowering branches. (*b*) Flowering spike (enlarged). Isle of Wight (E. W. H.). (*c*) Lower portion of plant, with roots, main stem, and lower parts of branches. (*d*) Seeds (much enlarged). Hampshire (C. E. M.).

Differs from var. *radicans* chiefly in habit. *Shoot* leaving the ground by 1, rarely 2 or 3 main stems, and growth mainly unilateral. *Branches* without adventitious roots. *Seeds* with rather shorter hairs than in var. *radicans*.

Mr Joseph Woods (1776—1864), who appears to have been the first British botanist to study closely the forms of *Salicornia*, read his account at the Linnean Society on January 21st, 1851, and published it in three different journals in the same year (1851). The first of these publications was in the *Botanical Gazette*, pp. 29—33 (March, 1851), the second in the *Proc. Linn. Soc.* ii, 109—113 (April 15th, 1851; but dated 1855), and the third in *The Phytol.* iv, 208—211 (July or later, 1851). The account in the *Proc. Linn. Soc.* was apparently revised by Mr Kippist, at that time librarian of the Linnean Society, who adds some useful notes on the seeds of Woods' plates. We are indebted to Dr B. Daydon Jackson, Gen. Sec. Linn. Soc., for help in ascertaining the order of the appearance of these three accounts.

Local; gravelly foreshores and salt-marshes, just within reach of the highest tides; rarely on sea-walls within reach of the spray; from Dorset to Essex and Norfolk.

France (the Bouche d'Erquy, Brittany); Algeria (near Oran).

S. perennis occurs on salt-marshes, rarely on gravelly foreshores and on sea-walls, usually in places not washed by ordinary tides, Gloucestershire, and from Devonshire to Norfolk.

France (including southern France), Spain, Algeria.

Section II. *SALICORNIËLLA*

Salicorniëlla Moss and Salisbury in *Camb. Brit. Fl.* ii, 189; *Annuae* Duval-Jouve in *Bull. Soc. Bot. France* xv, 170 (1868); Moss in *Journ. Bot.* xlix, 180 (1911).

As regards floral structure, *S. dolichostachya* connects the sections *Pseudo-Arthrocnemum* and *Salicorniëlla*, whilst as regards anatomical structure the bridging species of these sections are *S. gracillima* and *S. disarticulata*. It is curious that *S. disarticulata*, the most reduced member of the genus if judged by its uniflorous cymes and small flowering spikes should retain traces of the members of the section *Pseudo-Arthrocnemum* in the stereids of its reproductive shoots. It is this combination of derived and primitive characters in many plants that renders it impossible to indicate affinities by any linear arrangement.

For characters, see page 187.

Series of *Salicorniëlla*

Series i. **Dolichostachyae** (p. 190). *Terminal spikes* usually very long, up to 12—16 cm., with about 30—40 flowering segments, often curved and branched. *Cymes* 3-flowered. *Central flower* separating or almost separating the lateral ones. *Stamens* 1 to each flower.

Series ii. **Herbaceae** (p. 190). *Terminal spikes* shorter (usually very much shorter) than in *Dolichostachyae*, up to about 5·0 cm. long, flowering segments fewer (not more than about 16, and often only 2—4), straight, unbranched. *Cymes* 3-flowered. *Central flower* usually not separating the lateral ones. *Stamens* 1—2 to each flower.

Series iii. **Disarticulatae** (p. 195). *Terminal spikes* very short, up to about 2—6 mm. long, with about 3—4 flowering segments, straight, unbranched; segments freely disarticulating before the seeds are ripe. *Cymes* uniflorous, the lateral flowers being totally suppressed. *Stamens* 1 to each flower.

Series i. *DOLICHOSTACHYAE*

Dolichostachyae Moss and Salisbury in *Camb. Brit. Fl.* ii, 190.

For characters, see page 189. Only species:—*S. dolichostachya.*

2. SALICORNIA DOLICHOSTACHYA. Glasswort. Plates 197; 198

Salicornia dolichostachya Moss in *New Phytologist* xi, 409 (1912).

Icones:—*Camb. Brit. Fl.* ii. *Plate 197.* (*a*) Portion of a plant. (*b*) Upper part of a flowering spike (enlarged). Isle of Wight (E. W. H.). The illustration represents only a portion of the whole plant.

Annual. *Stem* erect or decumbent, about 5—30 cm. high, often very much branched, the branches usually tumbling over each other in a most disorderly manner. *Segments* usually green or greenish yellow, soft, variable in length, usually long (up to about 4—5 cm. long and 5 mm. wide). *Spikes* very long (8—16 cm.), much longer as a rule than in any other of our species, tapering, blunt, frequently branched and curved, often with 1—2 shorter spikes arising at the base of the sterile segment, with about 15—30 segments, segments about 4—5 mm. long, sterile segments about 5—8 mm. long. *Cymes* 3-flowered, central flower two-thirds as high as the segment or a little higher, cuneate at the base; lateral flowers separated or almost separated from each other by the central one, about half as high as the central one and of about the same area. *Flowers* appearing in mid-August, earlier than in the other herbaceous species. *Seeds* about 1·7 mm. long, covered with numerous long hairs.

Professor F. W. Oliver informs us that this species is collected for pickling in preference to other herbaceous species on the salt-marshes at Blakeney, Norfolk, the villagers deliberately passing over *S. herbacea*, for example, and gathering only *S. dolichostachya.* In other localities, where *S. dolichostachya* does not grow, *S. herbacea* is similarly collected. We have never seen *S. perennis*, *S. gracillima*, or *S. disarticulata* collected for pickling. It is interesting to add that *S. dolichostachya* and *S. herbacea* possess no stereids, thus differing from *S. perennis*, *S. gracillima*, and *S. disarticulata.*

This species is very abundant and often very large on the gravelly foreshore on the west of Hayling Island, Hampshire. The form of the Norfolk coast is much smaller.

Gravelly foreshores and portions of salt-marshes subject to much wave-action. Devonshire, Hampshire, Isle of Wight, Sussex, Kent, Essex, Norfolk; Ireland—co. Dublin and western Galway; not recorded for Wales or Scotland.

Scandinavia?, Denmark.

S. dolichostachya* × *herbacea Moss in *New Phytologist* xi, 410 (1912).

Icones:—*Fl. Dan.* t. 1621, as *S. europaea* var. *patula*; Pallas *Ill. Plant.* t. 2, fig. 1, as *S. acetaria.*

Camb. Brit. Fl. ii. *Plate 198.* (*a*) Whole plant. (*b*) Portion of fruiting spike (enlarged). Isle of Wight (E. W. H.).

Intermediate plants between the putative parents. *Stem* erect or decumbent, 5—20 cm. high, often much branched but less so than in vigorous specimens of *S. dolichostachya.* *Spikes* long (about 3—6 cm.), erect or somewhat curved, not often branched, with about 8—20 segments. *Lateral flowers* joined or not; late August and September.

When *S. dolichostachya* and *S. herbacea* grow together, intermediate plants occur. These, however, are, in our experience, absent where only one of these species occurs. We therefore infer that the intermediates are hybrids.

Salt-marsh on the north of Hayling Island, Hampshire (September, 1912).

Southern Scandinavia?, Denmark.

Series ii. *HERBACEAE*

Herbaceae Moss and Salisbury in *Camb. Brit. Fl.* ii, 190.

For characters, see page 189.

BRITISH SPECIES OF *Herbaceae*

3. **S. herbacea** (p. 191). *Stem* usually erect, variable in size, up to about 2—3 dm. high. *Terminal flowering spikes* slightly tapering, obtuse, usually rather long (up to about 22 mm.), with about 8—16 flowering segments. *Flowers* nearly equal in size. *Stamens* 1—2, usually 1.

4. **S. ramosissima** (p. 192). *Stem* erect, very variable in size, up to about 2 dm. high. *Terminal flowering spikes* markedly tapering, acute, shorter than in most forms of *S. herbacea* (up to about 12—16 mm. long), with about 4—6 flowering segments. *Lateral flowers* much smaller than the central one. *Stamens* 2.

5. **S. pusilla** (p. 193). *Stem* erect, up to about 1·0 to 1·5 dm. high, branches curved-ascending. *Terminal spikes* short, up to about 5—12 mm. long, with about 2—4 flowering segments. *Lateral flowers* smaller than the central one. *Stamens* 1.

6. **S. gracillima** (p. 193). *Stem* erect, up to about 1·0—1·5, rarely 2·0 dm. high; branches regular, all or all except the lowest ones short (up to about 2·0—2·5 cm. long), subequal, parallel. *Terminal spikes* short (up to about 8—12 mm. long), stout, with 2—4 flowering segments. *Lateral flowers* smaller than the central one. *Stamens* 1.

7. **S. prostrata** (p. 194). *Stem* prostrate or ascending, usually much branched, the two lowest branches usually bent backwards and nearly as long as the main stem. *Terminal spikes* short, about 1—2 cm. long. *Lateral flowers* smaller, usually much smaller than the central one. *Stamens* 1.

3. SALICORNIA HERBACEA. Common Glasswort. Plate 199

Salicornia Ray *Synops.* ed. 3, 136 (1724).

Salicornia herbacea L. *Sp. Pl.* ed. 2, 5 (1762); Woods in *Bot. Gazette* 29 (1851)!; Syme *Eng. Bot.* viii, 6 (1868); Rouy *Fl. France* xii, 58 (1910) excl. race *prostrata*; *S. fruticosa* Miller *Gard. Dict.* ed. 8, no. 1 (1768) non L.; *S. annua* Smith *Eng. Bot.* no. 415 (1797)! incl. *S. procumbens* no. 2475 (1813)!; *S. stricta* Du Mortier in *Bull. Soc. Bot. Belg.* vii, 334 (1868)!; *S. emerici* Duval-Jouve in *Bull. Soc. Bot. France* xv, 176 (1868)! incl. *S. patula*, p. 175, partim; *S. europaea* Rendle and Britten in *Journ. Bot.* xlv, 104 (1907); Robinson and Fernald in Gray's *New Man.* 369 (1908); Moss in *Journ. Bot.* xlix, 180 (1911).

[*S. europaea* var. *herbacea* L. *Sp. Pl.* 3 (1753); *S. europaea* Hudson *Fl. Angl.* 1 (1762) partim.]

Icones:—*Camb. Brit. Fl.* ii. *Plate 199.* (*a*) Whole plant. (*b*) Portion of fruiting spike (enlarged). (*c*) Seeds (enlarged). Devonshire (E. W. H.).

Annual. *Stem* usually erect, sometimes more or less decumbent, branched. *Branches* usually numerous, arising at wide angles but often more or less sharply ascending towards the tips, up to about 3 dm. high, often spongy at the base (due to the production of aërenchyma). *Segments* very concave at the top, usually bright green, basal ones fading usually to yellow, rarely to scarlet, basal ones keeled. *Spikes* slightly tapering when in flower, obtuse, terminal ones with about 8—16 flowering segments, segments about 4—5 mm. long and 3 broad, sterile basal segment about 3—7 mm. long. *Flowers* nearly equal in size, lateral ones contiguous, apex of the central one reaching about two-thirds of the way up the segment; late August and September, a little earlier than *S. ramosissima*. *Stamens* 1, rarely a second one present which may be either perfect or rudimentary. *Seeds* ripe in October and early November.

Linnaeus, in the first edition of his *Species Plantarum*, names this species *S. europaea* var. *herbacea*, and has a second variety *S. europaea* var. *fruticosa*. In the second edition of this work, the two varieties are raised to species under the names respectively of *S. herbacea* and *S. fruticosa*. As we have previously explained, we adopt the second edition of the *Species Plantarum* as the starting point of nomenclature in all cases of this nature. Cf. *Beta maritima*, p. 167.

Some authors continue to state that certain forms of *S. herbacea* occur which are biennial. This view finds expression in the trivial name *S. biennis* cited in synonymy by Smith (*Fl. Brit.* 2 (1800)) as a manuscript name of Afzelius; and this name is taken up by Rouy (*Fl. France* xii, 59 (1910)) in his *S. herbacea* race *biennis*. We doubt the existence of any biennial member of the genus, at least so far as western Europe is concerned.

(*a*) forma **stricta** Moss and Salisbury in *Camb. Brit. Fl.* ii, 191; *S. herbacea* var. *stricta* G. F. W. Meyer in *Hanov. Mag.* 178 (1829); *S. stricta* Du Mortier *loc. cit.*!, in sensu stricto; *S. emerici* Duval-Jouve *loc. cit.*, in sensu stricto; *S. herbacea* race *biennis* Rouy *Fl. France* xii, 59 (1910)?; *S. europaea* forma *stricta* Moss in *Journ. Bot.* xlix, 180 (1911).

Stem erect; *branches* ascending, often subfastigiate. *Segments* usually green, fading to yellow, rarely to red. *Spikes* rather long (up to about 22 mm.).

This, so far as the British Islands are concerned, is the southern form of the species, though it occurs as far north at least as Lancashire and Lincolnshire. It is abundant in northern and western France. It also occurs in Belgium.

(β) forma **patula** Moss and Salisbury in *Camb. Brit. Fl.* ii, 192; *S. annua* Smith *loc. cit.*, including *S. procumbens*, in sensu stricto!; *S. patula* Duval-Jouve *loc. cit.*, partim!; *S. herbacea* var. *procumbens* Syme *Eng. Bot.* viii, 6 (1868); *S. herbacea* race *annua* Rouy *Fl. France* xii, 58 (1910); *S. europaea* forma *patula* Moss in *Journ. Bot.* xlix, 180 (1911).

Icones:—Smith *Eng. Bot.* t. 415, as *S. annua* (repeated in ed. 3 as *S. herbacea* var. *acetaria*); t. 2475, as *S. procumbens*, repeated in ed. 3 as *S. herbacea* var. *procumbens*).

Stem shorter than in the commoner samples of forma *stricta*, often more or less decumbent; branches fewer, shorter, and more divaricate. *Spikes* shorter.

This appears to be the commonest form of the species in northern Europe generally.

S. herbacea occurs in salt-marshes, especially muddy salt-marshes which are frequently inundated by the tides. From the Channel Isles, Cornwall, and Kent northwards to Zetland; in all the maritime counties of Ireland, except Leitrim.

Scandinavia, Denmark, Germany, Holland, Belgium, France, central Europe, Russia, southern Europe; northern and southern Africa; Asia; America. Probably the "*S. herbacea*" of all tropical or subtropical localities belongs to a distinct species.

S. dolichostachya × *herbacea* (see page 190).

S. herbacea* × *pusilla Moss and Salisbury in *Camb. Brit. Fl.* ii, 192; *S. intermedia* Woods in *Bot. Gazette* iii, 30 (1851) partim.

Stem erect, usually much shorter than in *S. herbacea*. *Segments* shorter and becoming more turgid than in *S. herbacea*. *Spikes* intermediate between the putative parents, much shorter than in *S. herbacea*.

Woods (*loc. cit.*) states that his *S. intermedia* includes three plants, all of which are erect. The first, he states, resembles *S. pusilla*, but has longer and redder spikes: this we refer to *S. herbacea* × *pusilla*. The second approaches *S. herbacea* in its yellow-green colour and long cylindrical spikes: this is perhaps *S. dolichostachya* × *herbacea*. The third approaches *S. ramosissima* in its bushy habit: this we refer to *S. herbacea* × *ramosissima*. It is, of course, impossible to use the name *S. intermedia* for a medley of hybrids or other intermediate forms; and, if the name be used at all, it should, we think, be restricted to the first of these forms.

Hampshire (northern shores of Hayling Island, and south-west of Lymington). Not known elsewhere.

S. herbacea* × *ramosissima Moss and Salisbury in *Camb. Brit. Fl.* ii, 192; *S. intermedia* Woods *loc. cit.* part.

Intermediate between the putative parents, and growing with them. *Spikes* shorter and more acute than in *S. herbacea*, longer and more obtuse than in *S. ramosissima*.

Hampshire, Norfolk, Lincolnshire, and doubtless elsewhere.

Denmark, France.

4. SALICORNIA RAMOSISSIMA. Plate 200

Salicornia ramosissima Woods in *Bot. Gazette* iii, 29 (1851)!; Moss in *Journ. Bot.* xlix, 181 (1911); *S. patula* Duval-Jouve in *Bull. Soc. Bot. France* xv, 175 (1868)! partim.

Icones:—*Fl. Dan.* t. 303, as *S. herbacea* var. *europaea*.

Camb. Brit. Fl. ii. *Plate 200.* (*a*) Whole plant, in the fruiting state. (*b*) Seeds (enlarged). Lincolnshire (C. E. M.).

Exsiccata:—Smith herb.; herb. E. S. Marshall, 2597.

Annual. *Stem* erect, up to about 18—20 cm. high, very much branched in the luxuriant forms, but all stages to branchless specimens occur, branches ascending. *Segments* apple-green, entirely green except the membranous upper margin which is dingy red or crimson: in the green forms, the lower segments fade to yellow; segments about 10, rarely up to 20 mm. long, basal ones sharply keeled. *Spikes* tapering and markedly acute when in flower; terminal ones about ? 12—16 mm. long, with about 4—6 flowering segments, segments about 2—3 mm. long and of the same width, becoming blunt in fruit, sterile segment at base about 3—5 mm. long. *Flowers*—central one nearly twice as large as the lateral ones, reaching about two-thirds of the way up the segment; appearing at the end of August. *Stamens* 2, appearing successively. *Seeds* with crozier-shaped hairs; late October.

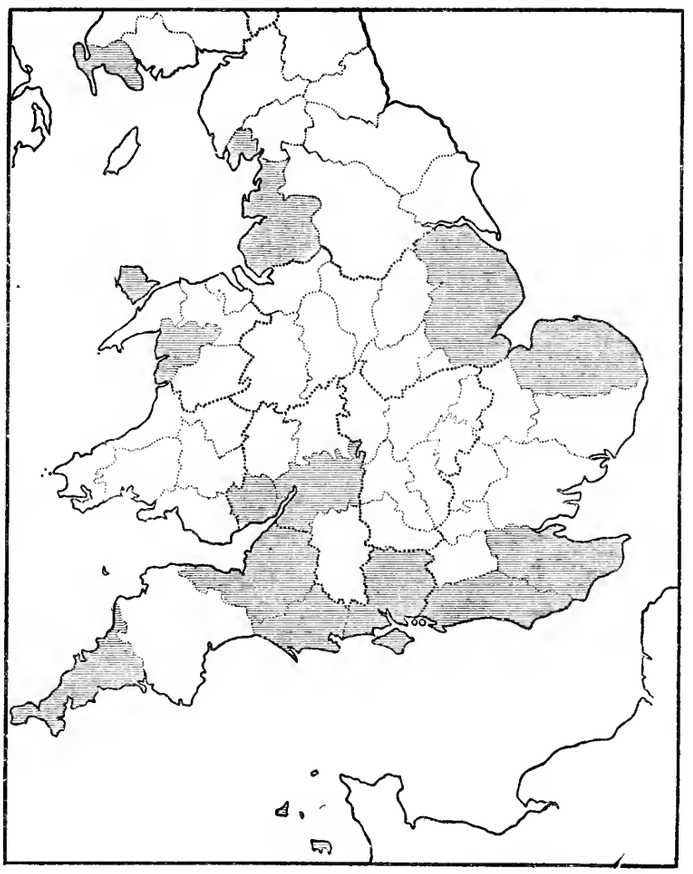
It is curious that there is a specimen of this in the Smithian herbarium, under the name of *S. ramosissima*, dated 1814. There is no mention of it in Smith's *English Flora* (vol. i, 1824).

Branchless or almost branchless, dwarfed forms are very abundant under certain conditions; and thus the trivial name *ramosissima* is not very apt. On the Bouche d'Erquy, Brittany, Professor F. W. Oliver and his party found that a red branchless or almost branchless form occurred uniformly on the rather higher and drier parts of the salt-marsh. These forms occur in precisely the same situations year after year. In some seasons, these forms are so highly coloured as to have called forth the name "Crimson Plains" for the habitats in question. Similar dwarfed forms occur coloured dingy red and apple-green. The characters of the flowers of the dwarfed forms remain constant; and there need therefore be little difficulty in identifying them. These dwarf forms are perfectly constant in their characters from year to year in their special habitats; and, in some genera, they would long ago have been given varietal or even specific names by systematic botanists with ultra-analytical tendencies. Dwarf forms, such as are here mentioned, occur at the mouth of the Thames, on the shores of the Wash, and are doubtless widespread.

Salt-marshes, especially sandy salt-marshes, and chiefly on their landward margins. Channel Isles, Dorset, Cornwall, the estuary of the Severn; eastwards from Dorset to Kent; shores of the Wash; Lancashire; Wales—Merionethshire and Anglesey; Scotland—Wigtownshire.

Southern Scandinavia, Denmark, Germany (Schleswig-Holstein), France (including southern France), central Europe (Moravia), Spain.

S. herbacea × *ramosissima* (page 192).



Map 45. *Salicornia ramosissima* occurs on the coasts of the counties which are shaded

5. SALICORNIA PUSILLA. Plate 201

Salicornia pusilla Woods in *Bot. Gaz.* iii, 30 (1851); Moss in *Journ. Bot.* xlix, 182 (1911).

Icones:—*Camb. Brit. Fl.* ii. *Plate 201.* Whole plants. Hampshire (C. E. M.).

Annual. *Stem* usually erect, up to about 12—16 cm.; branches curved-ascending, graceful. *Segments* usually grey-green, rarely red in colour, fading to yellowish green or dingy red, 4—8 mm. long, often subglobular. *Spikes* short, with about 2—4 flowering segments, about 5—12 mm. long, fruiting segments inflated and almost globular; sterile segment at the base about 2—4 mm. long and slightly keeled. *Flowers*—lateral one about one-half as large as the central one, central one reaching about two-thirds of the way up the segment; tips of perianths often more darkly coloured than the rest of the plant; late August and September. *Stamens* 1. *Seeds* with comparatively long hairs, only slightly coiled; October.

Some of the records of this plant refer to *S. gracillima*, and others even to *S. disarticulata*.

Rare and critical; gravelly foreshores and on the landward edges of salt-marshes. Dorset, Hampshire, Isle of Wight, Sussex, and Norfolk. Not known out of England.

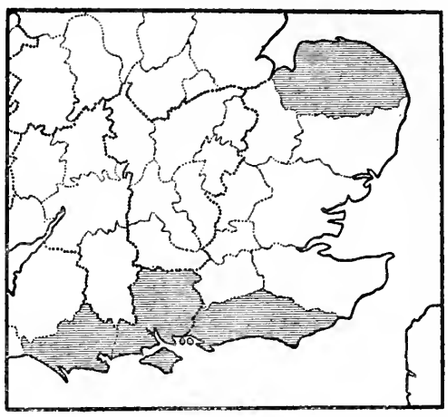
S. herbacea × *pusilla* (p. 192).

6. SALICORNIA GRACILLIMA. Plate 202

Salicornia gracillima Moss in *Journ. Bot.* xlix, 182 (1911); *S. pusilla* var. *gracillima* Townsend *Fl. Hampshire* ed. 2, 640 (1904)!.

Icones:—*Camb. Brit. Fl.* ii. *Plate 202.* (*a*) Whole plants. (*b*) Flowering spike (enlarged). (*c*) Seeds (enlarged). Hampshire (C. E. M.).

Annual. *Stem* erect, usually about 10—15, rarely up to about 20 cm. high; branches regular, basal ones rarely twice or thrice as long as the upper ones; all or all except the basal ones short (up to about 2·0—2·5 cm. long), ascending, parallel, subequal in size, usually reddish or red. *Spikes* obtuse; terminal ones short, up to about 6—10 mm. long, stout with 2—4 flowering segments, segments about 3 mm. long, sterile segment at base 2·5—3·0 mm. long. *Flowers*—lateral ones about half as big as the central one, central one reaching to less than one-third from the top of the segment; late August and September. *Stamens* 1 to each flower. *Seeds* with crozier-shaped hairs; October.



Map 46. *Salicornia gracillima* occurs on the coasts of the counties which are shaded

Anatomically *S. gracillima* and *S. disarticulata* may be distinguished from all the other herbaceous species by the occurrence of strengthening stereids in the reproductive segments.

So far as the characters and distribution of *S. gracillima* are concerned, the view that the plant is a hybrid of *S. disarticulata* and *S. ramosissima* or *S. pusilla* is a tenable one; but no experiments have ever been made in hybridising forms of *Salicornia*.

Locally abundant on the drier parts of salt-marshes; Dorset, Hampshire, the Isle of Wight, Sussex, Norfolk, and doubtless elsewhere. Not definitely known outside England.

S. disarticulata × *gracillima* (p. 196).

7. SALICORNIA PROSTRATA. Plates 203, 204, 205

Salicornia prostrata Pallas *Ill. Plant.* 8 (1803); Moss in *Journ. Bot.* xlix, 184 (1911) including *S. smithiana* p. 183, et *S. appressa* p. 184.

Annual. *Stem* usually prostrate, more rarely ascending from a procumbent base, usually much branched; the two lowest branches usually bent backwards, forming an angle greater than a right-angle with the main stem which is scarcely longer than the two lowest branches. *Segments* green, dingy red, or bright red. *Terminal spikes* short, up to about 20 mm. long but often shorter, acute or obtuse. *Flowers* variable in size, lateral ones smaller and often much smaller than the central one; mid-August to September. *Stamens* 1 to each flower.

We retain the prostrate British forms of the series *Herbaceae* as a separate species, though not without some misgivings. We suspect that the forms in question may ultimately prove to have originated from the erect species. For example, var. *appressa* is very closely allied to *S. ramosissima*, and forms of var. *smithiana* to *S. dolichostachya*, *S. herbacea* forma *patula*, and *S. pusilla*. More observations and if possible cultural experiments are necessary before this matter can be definitely settled. It is, however, no easy matter to grow species of *Salicornia*, especially the herbaceous ones, under cultural conditions. So far, our own efforts in this direction have met with little success. To grow these plants with success, it appears first to be necessary to obtain a successful colony of the filamentous *Algae* which are abundant on salt-marshes and which indeed appear to be ecologically the most important plants of any salt-marsh. The seeds of the flowering-plants of the salt-marsh are caught in the filaments of the *Algae*: the filaments keep the ground and the seedlings moist, and serve as a mulch to protect the young growing plants. In culture the erect forms tend to topple over; and thus the natural habit of the plants is obscured.

An allied plant is *S. oliveri*[1] (Moss in *Journ. Bot.* xlix, 183 (1911)). It is simply branched: the branches spread at wide angles: all the flowering spikes are large (about 8—15 mm. long), cylindrical, obtuse, and with about 7—10 flowering segments: the flowers are nearly equal in size. It occurs in northern Brittany on mobile sand which is frequently tide-washed, and should be looked for in southern England.

(*a*) **S. prostrata** var. **smithiana** Moss and Salisbury in *Camb. Brit. Fl.* ii, 194; *S. smithiana* Moss in *Journ. Bot.* xlix, 183 (1911).

Icones:—*Camb. Brit. Fl.* ii. *Plate 203.* (*a*) Whole plant in the fruiting state. (*b*) A terminal and two lateral spikes (enlarged). (*c*) Seeds (enlarged). Lincolnshire (C. E. M.). *Plate 204.* (*a*) Whole plant in the fruiting state. (*b*) A terminal and two lateral spikes (enlarged). Somerset (E. S. M.).

Exsiccata:—Herb. Marshall, 3549. This is the plant illustrated in Plate 203.

Stem prostrate, procumbent, or ascending from a procumbent base, very variable in length. *Branches* few or many, when much branched the two lowest branches are long and make an angle bigger than a right angle with the main stem, as in var. *appressa*. *Spikes* very slightly tapering, blunt, about 10—20 mm. long, sterile basal segment about 3—6 mm. long. *Flowers*—mid-August to September; central flower about two-thirds as high as the segment and about twice as large as the lateral ones. *Stamens* 1 to each flower.

[1] After its discoverer, Professor F. W. Oliver.

It has, in this country, been customary in recent years to treat var. *smithiana* and var. *appressa* as species. It is true that extreme stages occur which are very distinct-looking in habit, in spikes, and in flowers; but many examples occur which it is difficult to refer to either form. Whether or not these intermediates are hybrids is a difficult matter to determine.

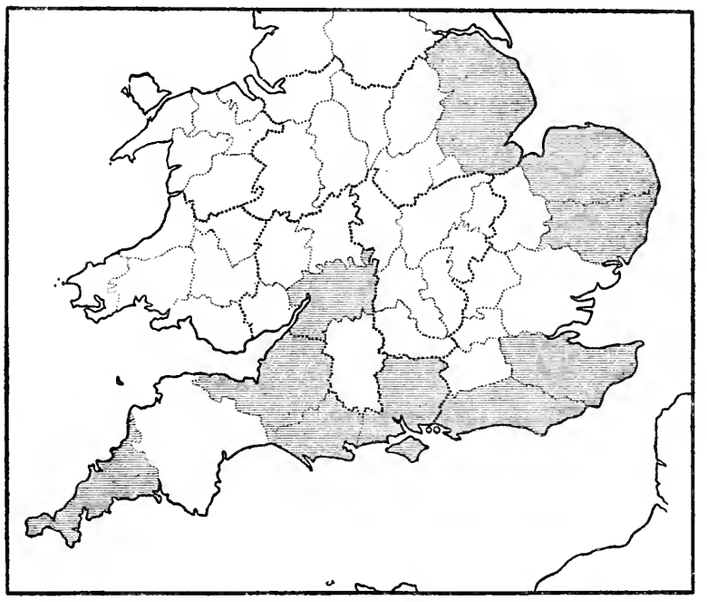
Higher and drier parts of salt-marshes, usually on mud; Gloucestershire, Somerset, Cornwall, Dorset, Hampshire, Isle of Wight, Sussex, Kent, Suffolk, Norfolk, Lincolnshire.

Belgium, France.

[(*b*) **S. prostrata** var. **pallasi** var. nov.; *S. prostrata* Pallas *loc. cit.*, in sensu stricto.

Icones:—Pallas *Ill. Plant.* t. 3, as *S. prostrata.*

Stem prostrate. *Branches* spreading at wide angles; the two lowest ones about as long as the main stem, and thus giving the shoot a more or less triangular outline. *Segments* green, frequently turning to a dingy red in autumn. *Terminal spikes* about 6—12 mm. long, blunt. *Flowers*—lateral ones about two-thirds as big as the central one; late August.



Map 47. *Salicornia prostrata* occurs on the coasts of the counties which are shaded

This variety should be searched for in southern England: it occurs in northern Brittany as well as in Russia.]

(*c*) **S. prostrata** var. **appressa** Moss and Salisbury in *Camb. Brit. Fl.* ii, 195; *S. appressa* Du Mortier in *Bull. Soc. Bot. Belg.* vii, 334 (1868)!; Moss in *Journ. Bot.* xlix, 184 (1911).

Icones:—*Camb. Brit. Fl.* ii. *Plate 205.* (*a*) Whole plant in the fruiting state. (*b*) Terminal spike (enlarged). (*c*) Seeds (enlarged). Hampshire (C. E. M.). The wide angles made by the branches and the main stem are due to flaccidity: in the growing state, the angles are much narrower.

Habit of var. *pallasi*, but branches (except the two lowest ones) ascending at a much narrower angle, and the whole shoot frequently crimson or dingy red. *Terminal spikes* very acute, small, up to about 12 mm. long, with 3—4 flowering segments. *Flowers*—central one much larger than the lateral ones, frequently reaching almost to the top of the segment; mid-August to early September. *Stamens* 1 to each flower.

We have gathered juvenile forms of this variety which produced flowers and seeds, and which consisted only of the cotyledons, a basal sterile segment, and a single flowering segment.

Higher parts of salt-marshes, especially on partially reclaimed saltings, and in hollows on derelict pastures close to the sea. Southern and eastern shores of England; Somerset, Cornwall, Dorset, Hampshire, Isle of Wight, Sussex, Kent, Norfolk, and Lincolnshire.

North-west Germany, Belgium, France.

S. prostrata occurs on drying-up salt-marshes, and frequently in salt-pans behind sea-walls, in southern and eastern England, from Gloucestershire to Lincolnshire.

Europe and perhaps elsewhere.

Series iii. *DISARTICULATAE*

Disarticulatae Moss and Salisbury in *Camb. Brit. Fl.* ii, 195.

For characters, see page 190. Only species:—*S. disarticulata.*

8. SALICORNIA DISARTICULATA. Plate 206

Salicornia disarticulata Moss in *Journ. Bot.* xlix, 183 (1911).

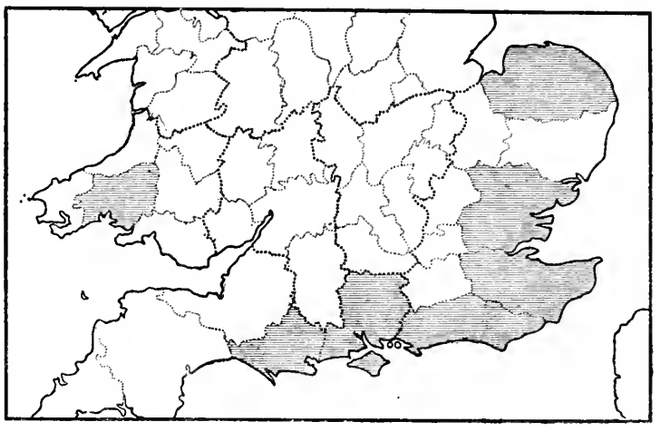
Icones:—*Journ. Bot.* xlix, t. 514. This illustration is the one used in the present work (Plate 206).

Camb. Brit. Fl. ii. *Plate 206.* (*a*) Whole plant in the fruiting state. (*b*, *c*) Fruiting spikes (enlarged). (*d*) Seeds (enlarged). Isle of Wight (E. W. H.).

Exsiccata:—Herb. E. S. Marshall, 2510, 2596.

Annual. *Stem* usually erect, rarely prostrate, up to about 20—25 cm. high, rigid. *Branches* numerous, arising at acute angles. *Segments* yellowish green, fading to a brownish yellow, about 5—8 mm. long. *Spikes* very short, terminal ones up to about 6 mm. long and about 2—4 fertile segments, lateral ones up to about 3 mm. long and usually with 1—2 fertile segments; sterile basal segment about 1—2 mm. long, tapering at the base; spikes disarticulating as a whole shortly before the seeds are ripe. *Flowers* solitary, the lateral ones being totally suppressed, reaching about two-thirds of the way up the segment; September. *Stamens* 1. *Seeds* ripe in late October and early November.

The uniflorous character is remarkably constant. Many thousands of flowers have been examined, and only in 1 or 2 cases has a cyme been observed with a second abortive lateral flower.



Map 48. *Salicornia disarticulata* occurs on the coasts of the counties which are shaded

Drier parts of salt-marshes; Carmarthen, Dorset, Isle of Wight, Hampshire, Sussex, Kent, Essex, Norfolk.

Northern France (several salt-marshes between St Malo and Erquy).

S. disarticulata × ***gracillima*** Moss and Salisbury in *Camb. Brit. Fl.* ii, 196.

Habit of *S. disarticulata*. *Segments* small but usually larger than in *S. disarticulata*. *Spikes* small but larger than in *S. disarticulata*. *Cymes* with 1—3 flowers.

Intermediates between *S. disarticulata* and other species of the genus are either very rare or, perhaps (if the uniflorous character disappears in hybrids), difficult to distinguish. However, there are specimens in the private herbarium of the Rev. E. F. Linton which approach *S. disarticulata* in habit, in the small size of the segments, and which have triflorous cymes and larger spikes than in *S. disarticulata*; and similar plants were included in a gathering of *S. disarticulata*, which Mr C. E. Britton sent to the British Botanical Exchange Club in 1912. Mr Linton's plants were collected in Dorset, Mr Britton's in Essex. We refer them to the putative hybrid *S. disarticulata* × *gracillima*.

Very rare. Dorset and Essex. Not known elsewhere.

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Many of the pre-Linnaean synonyms are abbreviated.

The main references to plant-groups (genera, species, etc.) are in thick type.

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