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# Botanical Society of the British Isles

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This issue is dedicated to the memory of

J. EDWARD LOUSLEY

1907-1976

(Portrait Plate 1, facing p. 312)

sometime President of the Society and for

40 years a member of its Council.

*Watsonia*, **11**: 282–286 (1977).

# J. Edward Lousley (1907-1976)

J. G. DONY

*9, Stanton Road, Luton, Beds. LU4 OBH*

J. Edward Lousley, who was born at Clapham on 18th September, 1907 and died at Streatham Common on 6th January, 1976, was the most noteworthy British field botanist of his time. His paternal ancestors had been Berkshire farmers bearing the Christian names of either Jethro or Job, the latter being J. Edward's first name but rarely used by him. His great-great-grandfather, Job Lousley (1790–1855), was a competent naturalist, the value of whose work was later assessed by J. Edward (*Berkshire arch. J.*, **65**: 57–65 (1969)).

Jethro Lousley (1882–1963), J. Edward's father, had no love for farming and came to London at a comparatively early age to enter the service of the South London Metropolitan Gas Company, becoming eventually an Area Supervisor. His work entailed living in various places in South London until 1925, when the small family (there was only the one son) went finally to 7, Penistone Road, an address that was to become widely known to botanists both in Britain and abroad for almost half a century. Jethro's life was given to serving good causes, and in 1946 he was awarded the MBE in recognition of his long service as Chairman of the Streatham National Savings Committee. He was a member of Wandsworth Borough Council for about seven years and, after his retirement in 1947, he lived at Bexhill-on-Sea, sitting on its Borough Council for the last twelve years of his life. He was, it may be noted, a most skilled gardener. J. Edward's mother, who died in 1945, came from Huguenot stock.

Lousley's interest in natural history came at the early age of 12 or 13, when he was attending the Strand School, an L.C.C.-maintained grammar school at Brixton that had a very high reputation. He was one of a small party of boys from the school who were invited by W. R. Sherrin, then the curator of the South London Botanical Institute, to use its facilities as much as they liked. He was here to meet other similarly-minded youths, including D. G. Catcheside and E. C. Wallace. Sherrin's main interest was in bryophytes, but he chose boys associated with the Institute to ride with him in pairs on bicycles to study natural history as a whole in his favourite haunts in Surrey. There grew with Lousley a love for the Surrey countryside which was to remain with him throughout his life.

In 1922 his parents moved to Norbury, which was outside the L.C.C. area, and as a result his formal education was completed at Selhurst Grammar School, where he became secretary of the Natural History and Scientific Society and also of the Philatelic Society. The instinct in him to collect was strong indeed. He collected stamps, mainly those that came his way, for many years but we must be grateful that the desire to build up a herbarium soon gained the upper hand. He reached the sixth form, leaving the school in April 1924 to join Barclays Bank.

For ten years he worked in South London branches of the bank before being transferred to the City to serve first in the Stock Exchange and City Branches and finally in the Trustee Department of the Head Office of the bank. He was the Departmental Manager at the time of his retirement. Progress in the service of the bank entailed studying, mainly at evening classes, to gain the necessary examination qualifications, but his interest in field botany remained. He sought a wider approach with membership of the British Empire Naturalists' Association (B.E.N.A.), becoming a member of its Council when he was only 19 years of age. Some of his earliest papers were published in *Country-side*, the journal of B.E.N.A.

He continued to be loyal to the South London Botanical Institute. In 1926 Sherrin persuaded him to join the Watson Botanical Exchange Club and in the following year he joined the Botanical Society and Exchange Club of the British Isles, known in those days more often as the Botanical Exchange Club. The membership of both clubs enabled him to meet or correspond with the botanical giants of an age that was rapidly passing. He soon gained a reputation for having an intimate knowledge of the British flora which, at a time when members of the Watson Exchange

Club used their initials only rather than their names, caused a minor crisis. J. E. Little, a venerable and competent botanist, found his determinations credited to the young enthusiast Lousley—much to his annoyance as he claimed the initials were *his* as he had them first! (c.f. *Rep. Watson botl Exch. Club*, **3**: 414 (1928)).

Lousley's great knowledge of the flora was gained from a careful study of all the available literature, by an examination of specimens determined by the experts (finding here the true value of membership of the exchange clubs) and finally by excursions, usually in the company of others, to various parts of the British Isles. Some of those who joined him on these expeditions have recalled how carefully he planned them, knowing precisely what he wished to see and where, working out how long could be spent here and there to catch the connections that would take them back to base. He would even go to the length of training to face the strenuous climbs he knew would be ahead. For one brief period he drove a car, but otherwise he had to face the trials of public transport or be dependent upon friends, of whom he had many.

At a comparatively early age he realized the need for specialization, and for him it was to be the study of the genus *Rumex*, his work on which soon gained him an international reputation. He was also interested in the problems of island floras and, before the outbreak of the Second World War, was contemplating an early publication of a Flora of the Isles of Scilly.

The Watson Exchange Club, in which Lousley had been most active, came to an end in 1934 largely because its sole purpose, the exchange of specimens, had by then become less popular and much misunderstood. He now became more active in the Botanical Exchange Club, which, following the death in 1932 of G. C. Druce, who had long been its sole custodian, was in the process of adopting a rather loosely defined constitution. In 1936 he was elected to its Council, to remain on it either as an elected member or an officer until his death a few months short of 40 years later.

In the period between leaving school in 1924 and the Second World War he had travelled to every part of the British Isles, gaining an intimate knowledge of its flora. His herbarium, begun modestly, had grown and was eventually to be the largest in the British Isles owned by a private individual. The specimens were fortunately mounted on small sheets, as no ordinary dwelling house could have housed the complete collection. He began the compilation of an index with cross references to all that was known of the plants that comprised the British flora. Of Druce it had been said that he had seen all British wild vascular plants, and Lousley had without any doubt seen more than any of his contemporaries. Above all he knew them intimately. His work bore the mark of an expert, with the result that many who did not know him personally assumed, as I indeed once did, that he was a professional botanist.

In 1940 he married Dorothy Winifred Thorpe, who survives him; they had one child, Margaret, who is now the wife of Dr John Gleghorn of Lancaster University. Mrs Lousley was to ease considerably the burden of the increasing work he undertook. His correspondence was becoming voluminous, not the least of his trials being that for many years the morning post arrived long after he had left home for the City. Mrs Lousley sensed priorities, dealing herself with many routine items, thus enabling her husband to deal more adequately with what remained.

The war was to be in every respect a turning point in Lousley's life. In April 1941 Francis Druce (not related to G. C. Druce), the treasurer and acting secretary of the Botanical Exchange Club, was killed in an air raid. Simultaneously all the records of membership and the accounts of the club were also destroyed. Lousley was near at hand with the willingness to become treasurer and face the formidable task of reconstituting the club. This entailed writing to all whose names had appeared in recent reports, only to find that a number had no knowledge that they were members and others, for reasons known only to G. C. Druce himself, had been made honorary members. Some had been long since dead and many, having moved, could not be traced. He found ultimately that only 342 members could be considered to be 'good on the books'.

The war-time conditions curtailed his travelling, making it for the time being impossible for him to visit the Isles of Scilly. The bombing of the City, where he had been working for six years, brought introduced plants to the bombed sites which attracted his attention. He was eventually to list nearly 300 species which had occurred in these changed circumstances of war in 'the square mile of the City'. Nearer to his home he found an entirely new plant, an indirect result of the bombing, which he appropriately named the London Ragwort (*Senecio* × *londinensis*).

The return to peace brought still more changes in Lousley's activities. The discovery of

introduced plants on the bombed sites coincided with that of an increasing number of species introduced with wool. He turned his attention to the alien flora, soon becoming the unchallenged authority on introduced plants. For some time he contemplated writing a full account of the alien flora of Britain but, much to the regret of all who knew him, this was not achieved. Broadcasting came his way, and from 1946 until about 1966 he was to be heard frequently in nature and similar programmes of the B.B.C. He appeared also, but less regularly, on television. In 1950 he was invited to contribute one of the early volumes in the Collins New Naturalist series, *Wild flowers of chalk and limestone* (1950). This proved a most popular work and the one for which he became most widely known. It was based on a close study of Box Hill in his beloved Surrey with an expanded treatment to include the whole of the British Isles which only he, with his unique knowledge, could have achieved.

The post-war years were to see great changes for the Botanical Exchange Club. The days of exchange were numbered, the *Journal of Botany* had ceased publication in 1945, and the Club had the opportunity, given a sound leadership, of assuming a changed character to become a much more effective body. Following the death of Francis Druce, the acting secretaryship was held for the war years by A. J. Wilmott, who was to be the moving spirit in the four years immediately following the war. Wilmott, Deputy Keeper of Botany at the British Museum (Natural History), was a brilliant botanist but with a forceful personality. During the period of his influence a new constitution was adopted in 1947, when the name of the Club was changed to The Botanical Society of the British Isles; a new journal, *Watsonia*, was launched and the first conference held. Wilmott himself edited the first Conference Report. His death in 1950 precipitated a crisis which was solved by Lousley agreeing to become the secretary, relinquishing the treasurership he had held for nine years. This action was made possible by E. L. Swann, already assistant treasurer, who was willing to take over the whole of the treasurership. The change for Lousley meant putting aside work which he could selfishly have considered to be more important.

He was to be secretary for six years, which were to be ones of great change and expansion for the Society. When he retired from office the membership had grown from 342 to 1,084. He thought that it was essential for one person to know all the affairs of the Society, and in the 15 years that he was treasurer or secretary he had attended every meeting of the Council and its committees—at times there were as many as seven—except one when illness had prevented him from being present. It was in this period that valuable co-operative work with D. H. Kent began, firstly with Kent's assistant secretaryship and his editorship of the Society's *Proceedings*, and secondly in their joint authorship of the Handlist of Plants of the London Area, which appeared as supplements to the *London Naturalist* between 1951 and 1957.

Valuable work for the Society arose from his zeal for nature conservation. After the formation of the Nature Conservancy in 1947 he was instrumental in securing joint meetings with representatives of the Society when, as our spokesman, he was, with his wide knowledge of the country as a whole, better able to present our case than anyone else could have done. He made many reports for the Nature Conservancy and was a member of its Committee for England from 1966 to 1973, an appointment which gave no cause for surprise. He was especially active in the fight to save Upper Teesdale and played an important part in 'The Countryside in 1970' conferences in 1963 and 1965. When the Council for Nature was formed in 1959 he was its first honorary secretary, an office he was forced to relinquish five years later because its meetings had increased in number and were held at times when it became difficult for him to attend.

He played an important part in the launching of the B.S.B.I. Maps Scheme as chairman of the Maps Committee from its formation in 1950. He edited *The study of the distribution of British plants*, the report of the 1950 Conference, which heralded the Maps Scheme and culminated in the publication of the *Atlas of the British flora* in 1962. Three more Conference Reports were to be edited by him. When he was relieved of executive office, his advice, which could be given from his extensive knowledge of the Society's affairs, remained available as a result of his service as President from 1961 to 1965 and as Vice-President from 1956 to 1960 and from 1969 to 1973. In the intervening periods he was an ordinary elected member of the Council. He continued his membership of the Publications Committee, and of the Maps Committee through its many changes to become finally the Records Committee.

The B.S.B.I. owes him a great debt of gratitude. He, more than anyone else, was responsible for changing its nature and bridging the gap between what it is now and what it was, seeming in

these days to belong to a world long since past, when he first took office. This is the more remarkable as his first inclination was always to resist change, seeing clearly the virtues of what was passing and demanding that its replacement should be by something equally sound. He was in every sense truly conservative; and politics were, almost by common consent, the only topic we never discussed in my long association with him.

His services were sought by many other societies: the London Natural History Society elected him its recorder for flowering plants (from 1942), its President (1962–64) and Chairman of its Botanical Section. His affection for the South London Botanical Institute remained throughout his life, and after the death of Sherrin in 1955 he acted as the honorary curator for the following 13 years.

Notwithstanding the many meetings he had to attend, he never lost any opportunity to do field work. He made a number of important discoveries including *Veronica praecox* in Suffolk, readily recognized by him as a plant new to Britain, and in Buckinghamshire the Military Orchid, a plant feared to have become extinct in Britain. The species he added to the alien flora were numerous. He had his foibles; to my shame I once confronted him with a herd of cows, his dislike of which arose from a narrow escape he had in his early days in the field.

He wrote a great deal and all was exceedingly well written, be it the seemingly more trivial items such as reports and plant notes or his major works. His very best writings were probably his reviews of the works of others, whose merits he, with his wide knowledge, could well appreciate. No carping criticisms or clever comments came from his pen. His review of Clapham, Tutin & Warburg's *Flora of the British Isles* stands reading many times. His last major work published in his lifetime was *Flora of the Isles of Scilly* (1971), a model of all that a Local Flora should be. It was the result of many visits made during 40 years at all times of the year, and many of the specimens that he collected needed critical examination.

His final work concerned, most appropriately, his very first love, Surrey. When he was a young man of 24, C. E. Salmon's *Flora of Surrey* was published and proved to be not completely satisfactory, as the author had died before publication. Lousley had long hoped to see a more satisfactory Flora and played a leading part in the formation in 1957 of the Surrey Flora Committee, the secretary of which was Mrs B. Welch, for so long a valuable co-worker in the B.S.B.I. He eagerly awaited the new Flora; but its publication was delayed by the unfortunate death in 1972 of Dr D. P. Young, who was well advanced with the collation of the records made by members of the committee. In 1973 Lousley undertook to write the Flora, which at the time of his death was in the process of printing. The Surrey Flora Committee did much more than collect records and made, among other exercises, reports on the reserves of the Surrey Naturalists' Trust, of which Lousley had been Vice-President since its formation in 1961.

At the time of his death he was also preparing for the B.S.B.I. an account of the members of the Polygonaceae to be found in the British Isles. This would have included the genus *Rumex*, which still held an interest for him. Among other groups of plants of which he had a special knowledge was *Verbascum*.

He much resented having to retire from banking in 1967 on his 60th birthday, when he had good reason to consider that he was still in his prime. Retirement, however, enabled him to devote more attention to imparting to others the knowledge he alone had acquired, thus fulfilling a long-felt desire. He had for many years been interested in the work of the Field Studies Council and after retirement became able to conduct courses himself at various centres. Nearer to home he was appointed a University of London Extension Lecturer, taking courses, always well attended as they were also much appreciated, in field botany at Morley College. Here he also lectured on problems of retirement. He was also the guide for many tours to the Continent and the Mediterranean islands, for his knowledge of plants extended far beyond those of the British Isles.

Few honours came to him apart from the honorary membership and presidencies of most societies with which he was connected. He was in 1963 the very first recipient of the Bloomer Award given by the Linnean Society of London in recognition of important contributions to biological science made by an amateur naturalist. Had he lived longer, other honours could not have been long delayed.

He died suddenly with what would have been his best botanical work (the *Flora of Surrey*) unpublished. A full congregation of his botanical and banking friends paid their last respects to him at a Memorial Service at St Olave's Church in the City, appropriately so with its associations

with William Turner, the 'father of English botany'. His large herbarium has been presented by Mrs Lousley to the Botany Department of Reading University and his valuable bibliographical index to the B.S.B.I. The index is being kept and updated at the Botany Department, British Museum (Natural History), where so much of his work was done. His library is being disposed of privately.

J. Edward Lousley had many virtues. He was an excellent colleague upon whom fellow officers could depend for co-operation and for support in times of stress. He dealt with an almost overwhelming correspondence and may perhaps be best remembered for the patient manner in which he dealt with the more trivial items, of which there were many, which came his way. When he began to be interested in plants he was grateful for the encouragement given to him by those much his senior. In his turn he was ever ready to assist and encourage those who approached him. Any debt we owe to him can best be repaid in the manner which was so essentially his.

In preparing this tribute I have been grateful to Mrs Lousley for lending me biographical notes made by Mr Lousley himself, to which she has been able to supply additional material. I wish also to thank A. W. Graveson and E. C. Wallace for recalling lively memories of Lousley's earlier days.

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# J. E. Lousley and plants alien in the British Isles

D. McCLINTOCK

*Bracken Hill, Platt, Sevenoaks, Kent, TN15 8JH*

## INTRODUCTION

I have been asked to write on Ted Lousley's contribution to the knowledge of alien plants in our islands. This was possibly his major work. To do it justice demands more time, research and space than is available: all the more grateful therefore am I to Mrs Lousley, Dr J. G. Dony and Mr D. H. Kent for reading the draft of this summary.

Lousley was nearly omnivorous in his interests in wild plants, whether called native in this country or not. In later life he was stricter in his views on what he considered to be wild or naturalized, approaching the old professional attitudes. All the same he would always be glad to add to his collection specimens of marginal plants he rejected as wild. He did not know garden plants really well (too few field botanists do), so he was least at home among garden throw-outs and with successful ground-cover and surviving hedge-plants. Thus he missed the gardeners' name, the correct one, *Hebe* × *franciscana*, for the hedging Veronica well-known in the south-west, calling it *H.* × *lewisii* (Green 1973). But his knowledge widened here too, especially in recent years, and his last note (1976), on *Fagopyrum dibotrys*, was very useful.

It is probably true to say that he actually first found relatively few new aliens or sources for them: to do so indeed is usually a matter of luck and opportunity. But it is equally true to say that he knew a great deal about them (Lousley 1953a). As soon as any were found, he was at once eager, eyes alight, to see and collect them himself; and his expertise often enabled him to name at sight plants which defeated others, and to say what the telling characters were. Indeed it might be said that the greatest fillip to the knowledge of our alien flora came from the enthusiasm he radiated and infectiously passed on, an enduring influence with many able members of the younger generation building on his work. It was always a pleasure to go in the field with him and perhaps never more usefully than among the aliens he knew so well—and with his deep knowledge of the British flora he could detect an alien origin or form in an otherwise native species.

His strength in all this stemmed from his assiduous training, his wide and long experience, his excellent memory and eye, his orderly methods, his remarkable card index (now at the British Museum (Nat. Hist.)) and immense, 25,000 strong, herbarium (now at Reading University) with so many critical sheets named by specialists (and, in addition, he distributed *exsiccata* widely), his extensive library, his large collection of photographs and, for aliens, the seedlings and other plants he grew on in a cold frame or in the open bed in his small garden (and still leaving room for purely decorative plants, so that it always looked bright and tidy). A story typical of his ability and way of putting things is told of 'two flashy vetches'. A national institution named them *V. cracca*; the finder was not satisfied. A second expert said *V. cracca* and *V. tenuifolia*; finder still dissatisfied. Then Lousley was asked. With his own particular gleam he snorted '— says that, does it? Well, it can think again. One is *V. villosa* and the other *V. dasycarpa*'.

## *RUMEX*

He completed his scholarly papers on this, understandably neglected, genus as the war was being waged (Lousley 1939, 1944). Here he cleared up such matters as the distinctions between *R. patientia* and *R. cristatus* (*R. graecus*), and the alien subspecies of *R. obtusifolius* and *R. pulcher*. He also detected other aliens, such as *R. confertus*, hybridizing with British species (Lousley 1955, Lousley & Williams 1975): indeed he named *R. wrightii* (*R. conglomeratus* × *R. frutescens*

(*R. cuneifolius*)) as new to science (Lousley 1953b)—it is still growing in his garden. *R. triangularis* (*R. salicifolius*) was another alien dock he usefully drew attention to; and he disposed of many erroneously applied names in these still unsuperseded papers.

### GRAIN ALIENS

After the war, lease-lend seed, notably of carrots, contained impurities welcome to the botanist, who would be beckoned to suitable fields by waving stems of *Echinochloa* or upstanding Amaranths. *Amaranthus quitensis* was one species noticed, I think, first by Lousley. But these were not strictly grain aliens: they occurred elsewhere, notably in docks and sidings.

His good friend Dr R. C. L. Burges (1901–59) for long kept close watch on alien plants resulting from the malting activities at Burton on Trent and Lousley was a frequent visitor there, especially after the war. One area where foreign grain was landed was the Cleethorpes/Grimsby/Humberstone district of Lincolnshire. His detailed check list of 1955/6 from there is included on pp. 299–302 of *The flora of Lincolnshire* (Gibbons 1975). The flow of unusual plants resulting from the mixtures bird-lovers ever increasingly put out, and the birds missed, was carefully observed by Lousley and there is no doubt a full tally in his herbarium.

### THE BOX HILL BOMB CRATER

It was in 1948 that Lousley, with his frequent companion Rex Graham, first visited the wood on the north slope of Box Hill (which, it later proved, had been first noticed in 1945). In it were some score of foreign plants, as well as native species, that did not belong to the district. Guesses abounded to account for their presence, particularly as it was wartime—most of them were central European; and the press added other extraordinary theories (Lousley 1951, p. 6). 'The mystery grows on the hole in the hill' headlined the *Daily Mirror* on 10th April 1950. Lousley himself wrote various accounts, including an illustrated article in the *Illustrated London News* for 19th August 1950. Gradually natural succession took over and the aliens were eliminated, although some clung on for many years. Eventually the man came forward who had managed to obtain this surprising assortment of seeds, and to sow them and to get them to grow in the crater.

### WOOL ADVENTIVES

The discovery by Dr J. G. Dony immediately after the war of the wealth of alien plants in wool waste (shoddy) used in market gardens on light soils in Bedfordshire opened up a large field for research. The story of how the source of these was traced back to the wool districts of the West Riding was told by Lousley (Lousley & Dony 1952, Lousley 1958, 1961). This in turn led to the rediscovery of the areas on Tweedside where Hayward & Druce (1919) had gathered similar plants a generation earlier, and to other sites being found in about two dozen vice-counties. Many of the plants were in fact European, Mediterranean mostly, which had been carried in the fleeces of the Merino and other sheep taken to the Antipodes when the sheep-rearing industry was founded in the last century (*c.f.* Lousley 1960). Some of these species had there developed their own varieties, such as the large and nutritious *Trifolium subterraneum* var. *oxaloides*; but most were identical with their congeners. These appeared mixed with native Antipodean species, many of which had not been properly delimited in their own countries.

The bulk were Australian, but others came from elsewhere, notably S. America and S. Africa. With such a huge potential area to search, the difficulties of finding correct names were immense. But Lousley was in the forefront, right to the end of his life; he and I were revisiting the Worcestershire shoddy fields in his last September. The search for these aliens became an esoteric enthusiasm for an eager, mostly amateur band. Their discoveries were collated and published by Lousley in 1961; after 14 years work no less than 529 species were listed, and that excluded many varieties and, inevitably, many which had not been named. His up-dated manuscript of this list

is now with Mr E. Clement (who has also his notebooks with lists of alien species seen from '23.10.55 to 30.10.64'). In the 15 years since, the work has continued, with Lousley sharing his knowledge—too much of which never got into print.

## BOMBED SITES

No reference to Lousley's work on alien plants can omit his careful recording of those which ever increasingly colonized the bombed sites of the City of London during and after the last war, although only a minority of these were not species wild somewhere in Britain. In *The natural history of the City* (Fitter & Lousley 1953) he listed 'at least 269 wild flowers, grasses and ferns' within the Square Mile, some of them sown garden plants. Perhaps his favourite was the re-appeared *Sisymbrium irio*, which he watched for years after it was found in 1947, and which is still to be seen. Another was the pretty, but invasive, poppy *Papaver atlanticum*, now to be seen in many parts of Britain. This was first noted in the City in the area of Gresham Street in 1946 and six years later was common. Lousley took particular care naming it (Lousley 1949). Earlier it had been referred by Dr Turrill to *P. lateritium*. Various attempts were made to find distinctions that did not exist to justify the two names; but only after Turrill's death in 1961 was it finally established that Lousley was right and all the plants were *P. atlanticum*.

Two other London plants are specially connected with him. One is the American willow-herb *Epilobium ciliatum* (*E. adenocaulon*), now so abundant, which he was the first to notice there, in 1945 (Kent 1975); the other, the 'New hybrid *Senecio* from the London area' (Lousley 1946) *S. squalidus* × *S. viscosus*. This he first noted in 1943, on the way to tea with his parents, just after the late N. Y. Sandwith, who agreed that Lousley should be the one to name it. This he did, as *S.* × *londinensis*.

## ISLES OF SCILLY

The warmest parts of our islands naturally harbour most exotic, more or less tender, species, usually coming via gardens and making themselves at home in the wild. The Isles of Scilly are perhaps the most extreme example we have, so Lousley's work there had special problems to contend with. Prominent among these were the 'Mesems', the showy succulents of the Aizoaceae. These were described in no British book (*Carpobrotus edulis* apart), in no one work anywhere. They are in any event difficult to name, incompletely known, unmonographed throughout their range and make ghastly herbarium specimens. More work is needed on *Carpobrotus*, but Lousley brought welcome clarity into the otherwise obscure field of the small-flowered genera. They are well set out and depicted in his Flora (1971).

His Flora does not include all the species which several other people consider adequately naturalized there, such as *Chrysocoma coma-aurea*, *Aristea cf. caerulea* or *Watsonia ardernei*, but this is just a reflection of his hardening attitude as to what constituted a naturalized plant. His '*Fascicularia pitcairniifolia*' there is *Ochagavia carnea* (McClintock 1975).

## RUBBISH TIPS

The B.S.B.I. and the London Natural History Society have run visits to the various municipal rubbish dumps around the metropolis for many years. Lousley must have attended dozens of these meetings, quite apart from his private visits, and his presence was always welcomed for his unfailing friendliness and helpfulness. Here too he passed on his enthusiasm so well that the next generation is carrying on and developing his work in a heart-warming way, as ever new species are detected. The constituents of these dumps have varied over the years with the supply, notably from the fashions in garden plants and the constituents of bird-seed mixtures.

I accompanied Lousley on many trips all round our island and, as many know, he was a discerning, shrewd, cheerful, stimulating and efficient companion, with a very broad base to his knowledge. He had specimens of nearly all the aliens I collected without him and rightly so, for,

as I have said elsewhere, I owe a great deal to him over very many years. I only wish this account could have been as thorough as his beneficial influence deserved: a thorough examination of his herbarium should be rewarding.

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# The distribution and history in the British Isles of some alien species of *Polygonum* and *Reynoutria*

A. P. CONOLLY

*Botanical Laboratories, University of Leicester*

ABSTRACT

An account is given of the escape from garden cultivation of four members of the Polygonaceae introduced from Eastern Asia: *Reynoutria japonica* Houtt., including the dwarf var. *compacta* (Hooker fil.) Buchheim, *R. sachalinensis* (Friedrich Schmidt Petrop.) Nakai, *Polygonum polystachyum* Wall. ex Meissner and *P. campanulatum* Hooker fil., and of their establishment in a variety of habitats, which is illustrated by a series of maps for each species showing their distribution in the British Isles at successive time periods since introduction. Introduction ranges from 1825 for *R. japonica* to *c* 1910 for *P. campanulatum*. The former alone is widely naturalized, and like *P. polystachyum* is commoner in western Britain. *R. sachalinensis* is now most frequent in south-eastern England. A hairy variant of *P. polystachyum* is considered and is distinguished from *P. molle* D. Don. In the usually functionally dioecious *Reynoutria*, the occurrence of male-fertile plants is indicated and, in *R. sachalinensis*, the rare polygamous condition is confirmed.

## INTRODUCTION

The escape of European plants when introduced into distant countries—*Hypericum perforatum* L. in North America, for example—has led on occasion to a weedy invasion of agriculturally serious or even dramatic proportions. The corresponding escape and spread of so-called alien plants introduced into the British Isles from outside Europe has not led to devastation of such magnitude. Nevertheless, there have been rapid, even explosive, invasions and spread through the country in suitable, usually man-made habitats. The importance of following the chronological sequence and pattern of spread of newly introduced species was first established by Salisbury (1932) using maps based on the vice-comital annual extension; *Matricaria matricarioides* (Less.) Porter and *Veronica persica* Poir. were shown to have spread throughout the country within a hundred years or less. Davey (1953, 1961) has mapped the infiltration into 'natural' vegetation of *Epilobium brunnescens* (Cockayne) Raven & Engelhorn, a native of New Zealand. Detailed, fully documented accounts of the spread of *Senecio squalidus* L. have been given by Kent (1956b–1964c) and of *Veronica filiformis* Sm. by Bangerter & Kent (1957, 1962, 1965), the latter illustrated by dot and grid-square maps for two successive periods. Alien species of *Polygonum* and *Reynoutria* occurring in the London area were described by Bangerter & Welch (1955). The late J. E. Lousley had studied the alien species of these genera for a number of years and had collected a wide range of specimens (**RNG**).

The large, perennial species of *Polygonum* and the species of *Reynoutria*, introduced mainly as decorative horticultural plants from Eastern Asia and the Himalayas, show varying degrees of ability not only to persist 'out of cultivation' but also to naturalize and to compete with natural vegetation by means of vegetative spread. The species considered here are *Reynoutria japonica* Houtt. (*Polygonum cuspidatum* Siebold & Zucc.), *Reynoutria sachalinensis* (Friedrich Schmidt Petrop.) Nakai (*Polygonum sachalinense* Friedrich Schmidt Petrop.), *Polygonum polystachyum* Wall. ex Meissner, and *P. campanulatum* Hooker fil. Of these four, *R. japonica* alone has, to date, effectively become part of the British scene. The two species of *Polygonum* belong to sect. *Aconogonon* Meissner. The only other species of this section which are naturalized in Britain are *P. molle* D. Don, which is discussed later, and *P. alpinum* All., but the latter is not covered here as it has been recently dealt with by Lousley (1976a).

The four species are discussed separately and their spread illustrated by 1 to 4 maps each. The

documentation is based on a variety of sources: the Biological Records Centre, Monks Wood; herbaria (**BIRM, BM, CGE, DBN, DHM, E, HLU, K, LANC, LDS, LIVU, LSR, LTR, MANCH, NMW, OXF, RNG, UCNW**); a wide range of local Floras and other literature sources; information supplied by vice-county recorders and others; and personal observation. For reasons of space, only a few of the records cited are fully documented here.

### *REYNOUTRIA JAPONICA* HOUTT. (*POLYGONUM CUSPIDATUM* SIEBOLD & ZUCC.)

*R. japonica*, a native of Japan, Taiwan and northern China (Ohwi 1965), was first introduced to Britain in 1825 (Synge 1956). Hooker (1880a) was under the impression it had been sent to Kew from Holland about a 'quarter of a century' prior to 1880. Cultivated as an ornamental plant, and on the Continent apparently also for fodder since the 1840s (Hegi 1910, Lawalrée 1953), this large and vigorous perennial has frequently escaped, to become established in waste places, along railway and canal embankments and river and stream sides, and, especially in western Britain, has become increasingly common on roadsides, with all the appearance of being native.

The early history of the escape of this species from cultivation and its subsequent naturalization is not easy to ascertain, since all intermediate situations exist between a relic of cultivation at one extreme and a fully naturalized colony at the other. The earliest British herbarium specimens traced are labelled 'Little Chelsea, Middlesex, I. Irving, 1861' (**BM**) and 'near Little Chelsea, A. Irvine, 1863' (**MANCH**), but both are without indication of status and could be from plants in gardens. On the Continent it was noted by Schemmann (1884) as long since established as an escape near a coal-mine on the banks of the Ruhr in Westphalia, Germany.

Four phases of spread in the British Isles may be distinguished.

#### PHASE 1: UP TO 1919 (FIGURE 1)

In the British Isles the first report of certain naturalization appears to be that of Storrie (1886), who referred to its growing in abundance on cinder tips at Maesteg, Glam. Then, in 1887, in an account of the wild and cultivated flora of Alexandra Park, Oldham, S. Lancs., comes the comment that it 'turns up unexpectedly in nearly every piece of cultivated ground' (Walters 1887). Kidd (1956) said it is quite common in this area in recent years on waste ground and railway embankments.

Gardens must have provided the source of all the early, i.e. primary, records. Early herbarium specimens of known garden cultivation come from diverse, widely separated places, e.g. in and near Leicester, Leics., 1881, 1892 (**MANCH**); southern Kirkcudbright, 1889 (**MANCH**); Ledbury, Hereford, 1900 (**MANCH**); Southport, S. Lancs., 1907 (**MANCH**). It was also known to grow in a derelict garden in Swindon, N. Wilts, in *c* 1910 (J. D. Grose *in litt.* 1961), and must have been grown in the Oxford Botanic Garden around the turn of the century. These and other garden stations must have acted as centres from which later spread could occur.

Very early reports of escapes and naturalizations come from Scotland. Druce (1929, p. 71) gave his own record of 1894 as the first for W. Ross; this could refer to the Braemore site, but not certainly so. Then, in Aberdeen, Trail (1899), who had been keeping under observation a piece of waste ground formed by the filling in, in 1896, of an old channel of the River Dee and subsequently used for railway sidings, first noted 'three stems' of *R. japonica* in 1898, i.e. within two years.

At the turn of the century two further records, presumably of escapes, come from Glamorgan: Aberdare, 1900 (**BM**), and Llwdcoed, 1902 (**BM**). Druce (1926) reported it from rubbish heaps in Langley, Bucks., also in 1902. Between the years 1902 and 1904 there are several records from the vicinity of Edinburgh, all from sites on waste-ground, by railways or nursery gardens (Evans & Evans 1904, Fraser 1905, Fraser & McAndrew 1904). In Ireland, again in 1902, Colgan (1904) commented on a stretch of *R. japonica* planted alongside the Rathmines waterworks south of Dublin as already looking wild there and 'not unlikely to become naturalized in this station'. In 1903 Melville (1904) had observed its spread near Church Stretton, Salop, into the roadside habitat 'mingling with the native vegetation . . . abundantly in one place and sparingly in another'; and he further prophesied that 'twenty or thirty years hence it will have so largely increased as to have the semblance of a truly indigenous production'. There is a specimen dated 1907 (Bailey, **MANCH**)

from Cardingmill Valley (by Church Stretton); it persists there to this day (1962, **LTR**). However, a poor specimen of Melville's from Church Stretton is more probably *R. sachalinensis* (**BM**).

Up to about 1910 most occurrences are clearly either direct garden escapes by vigorous vegetative growth or are outcasts on rubbish heaps. For the most part, too, they come from south-western Britain: 1908, near Exeter, S. Devon (Druce 1910a); by 1909, already from five places in Cornwall, all 'perfectly naturalized' (Davey 1909); in 1907, listed for Glamorganshire (Riddelsdell 1907) as a 'frequent escape' and as occurring in all but one district; and in 1911 in Carmarthenshire it was deemed 'general' without mention of localities (Hamer 1911). In western Ireland, Druce (1907) reported it in 1906 between Sligo and Glencar, Sligo, as 'not near houses'. From Scotland, there is a record from Stranraer, Wigtown, in 1909 (Druce 1910b) and from Loch Earn, Mid Perth, 1906 (**MANCH**). From the Midlands there is a specimen from near Leicester, Leics. in 1908 (**LSR**), but apparently little at this time (*c* 1910) in eastern England apart from London.

The earliest record as an established escape in London (apart from Little Chelsea) is uncertain, but it was listed in 1911 from a Bloomsbury, Middlesex, building site which had been cleared the previous year (Shenstone 1912) and by about 1914 it was certainly established on the embankment of the District Railway between Gunnersbury and Turnham Green, Middlesex (T. G. Tutin pers. comm. 1961). There are specimens from Yiewsley, Middlesex, for 1913 (**BM**) and from Finchley, Middlesex, for 1915 (**BM**). By 1913 too it was frequent near Liverpool, S. Lancs. (Wheldon 1914). From then up to 1919 an increasing but random scatter of localities are recorded ranging from the south coast (W. Sussex, 1914) to S. Aberdeen (1918), with rather many from Wales and Scotland.

PHASE 2: 1920 TO 1939 (FIGURE 2)

By 1939 *R. japonica* had established itself in many places in and around London, including several of the vast refuse-dumps used by the then London County Council, i.e. Dagenham, Tilbury, Hackney Marshes (Melville & Smith 1928). In Wales it had been recorded from all but two vice-counties. In Cardiganshire, as for Glamorganshire and Carmarthenshire at an earlier date, localities were too numerous to warrant detailed listing (Salter 1935), and from Monmouthshire there were already many records by 1935 (A. E. Wade *in litt.* 1961).

Scotland too was showing a mounting number of scattered records in a random pattern, from Westerness (1921) to Caithness (1926) and Kincardine (1926) to the Inner Hebrides (1937). There were, presumably, well-established though undocumented centres in the cities of Edinburgh and Aberdeen. From the latter it had spread to a few places in the immediate district (Trail 1923), and in the neighbourhood of Glasgow and the Clyde it was regarded as a 'common garden outcast' sometime within the period 1916 to 1928 (Grierson 1931).

Apart from the two early sites already mentioned, there is little documentation of naturalization in Ireland before 1939. Praeger (1934) did not refer to it, although judging by its later distribution it seems unlikely not to have escaped fairly frequently in this period.

In south-western England, Cornwall had another six published records by 1922 to add to the earlier ones (Thurston & Vigurs 1922); even so under-recording is suggested by the note on a specimen from Par, E. Cornwall, dated 1925 (**K**) 'a frequent hedge plant in West England spreading rapidly'. And in the mid-thirties, in a locality between Plymouth and Looe, E. Cornwall, it was known as 'Hancock's Curse'—having originally spread from a garden belonging to someone of that name; moreover a house thereabouts had a £100 reduction in price because the garden was overrun with it (Daniels pers. comm. 1972).

In southern England, vice-comital additions in this period include Surrey (1930), E. Kent (1931) and E. Sussex (1921), S. Wilts. (1937); and, in the Midlands, Staffs. (1923), Derbys. (1928) and Cheshire (1932). For Leicestershire, Horwood & Noel (1933) commented 'waste places becoming established, and spreading, a pest in gardens'. The first East Anglian occurrence was from Diss, E. Norfolk, in 1927, and it was also known from Colchester, N. Essex, sometime in the twelve years up to 1927 (Brown 1927). A notable addition in 1935 were two records from E. Yorks (Wilson 1938). Other additions at about that date include Jersey, Channel Islands, in 1925; Spalding, S. Lincs., in 1939; Isle of Wight in 1936; and the Isles of Scilly in 1939.

By 1939, the rest of the Midlands, the remainder of southern and eastern England, apparently almost all the rest of Yorkshire, the Lake District, and north-eastern England still had no or few records. Maybe this reflects in part the absence of botanists who thought it worth recording rather than a genuine absence. On the other hand G. C. Druce, who had been recording this species since

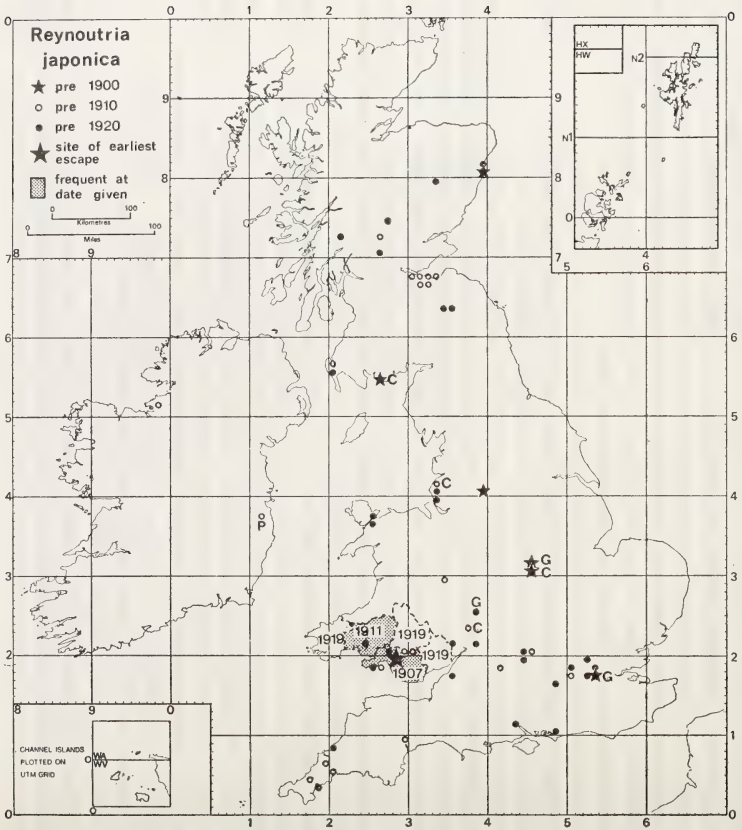



FIGURE 1

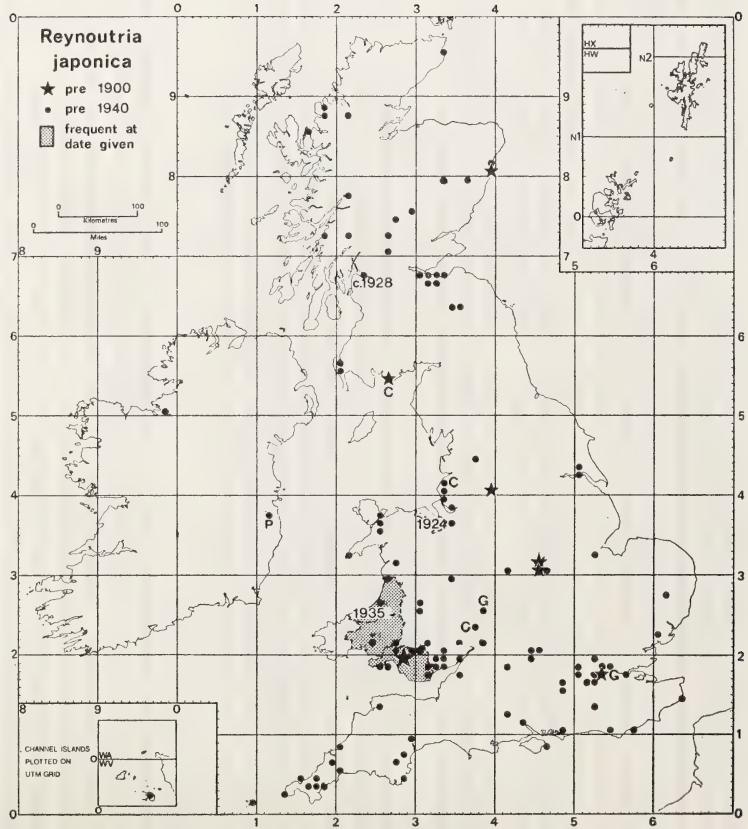



FIGURE 2

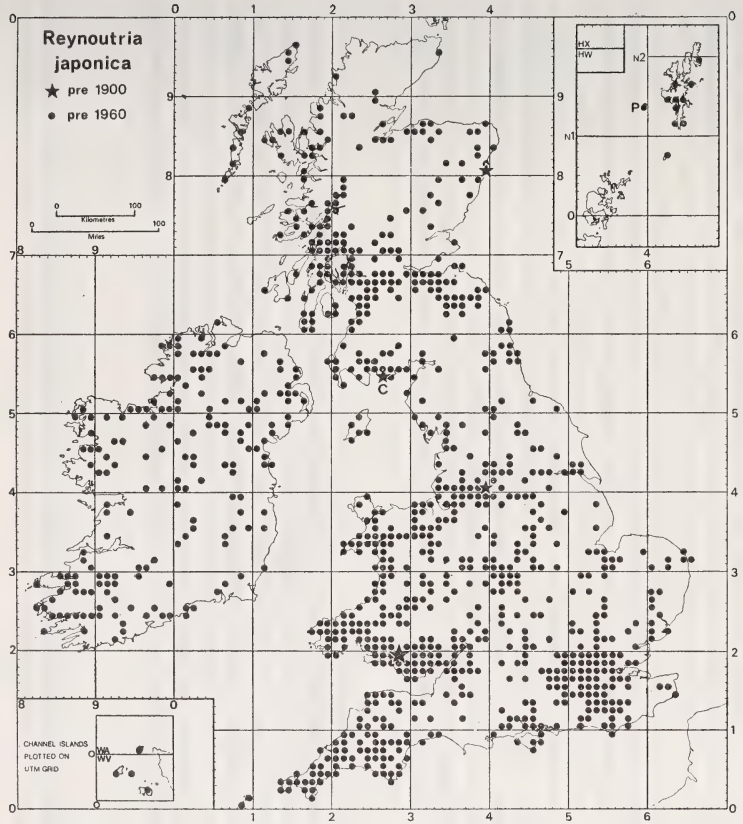



FIGURE 3

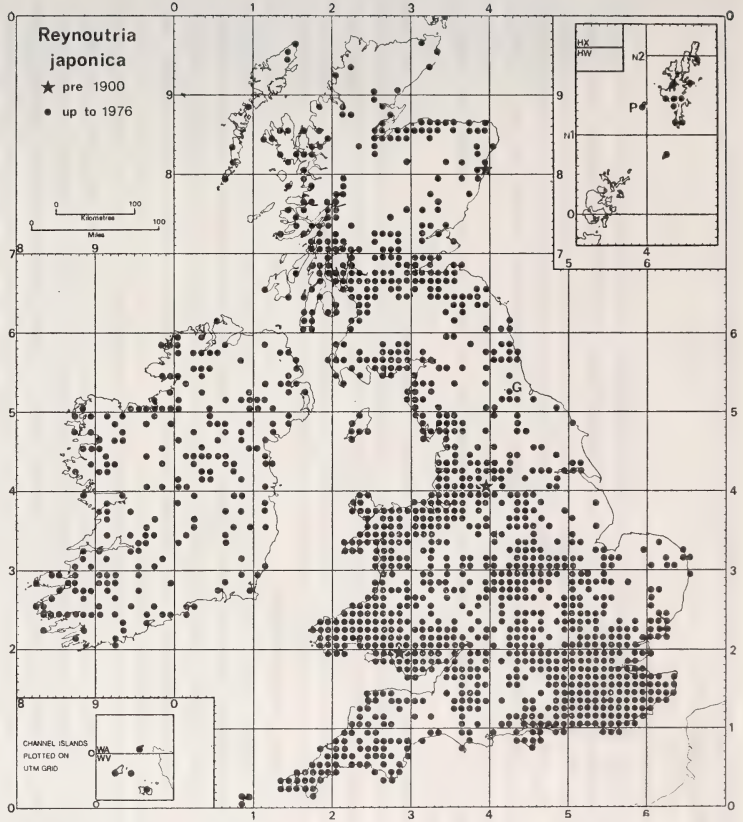



FIGURE 4

FIGURES 1–4. Distribution in the British Isles of *Reynoutria japonica* Houtt. for the four phases described in the text. Records are cumulative: older ones are repeated on later maps. Records known to be of garden origin are marked with G, those planted with P, and those marked C refer to early cultivated plants. Compiled from various sources, including the Biological Records Centre.

On Figs. 1 & 2 vice-counties for which records were too numerous for citation by the original author are shaded and the appropriate date given. Dates for unshaded vice-counties refer to unlocalised earliest dates.

1902 or earlier, certainly covered much of those parts of the Midlands for which there were still no published records at that time.

PHASE 3: 1940 TO 1959 (FIGURE 3)

Up to the start of the B.S.B.I. Maps Scheme in 1954 additional records showed little change in the above pattern. Denbighshire (1943) and Montgomeryshire (1939/41) completed the vice-county tally for Wales. Notable eastern records were from Cambridge, Cambs. (1946) and Hull, S.E. Yorks. (1950). In 1947 it was first recorded from Guernsey, Channel Islands. Comparison with the subsequent part of this phase, however, indicates considerable under-recording up to 1954.

The intense recording for the Maps Scheme culminated in the publication of the *Atlas of the British flora* (Perring & Walters 1962), and Fig. 3 is based on the map in that publication with a few additions and corrections.

Details of establishment in Ireland in the 1950s are still meagre. Webb (1953) referred to the several coarse perennial species of *Polygonum* (incl. *Reynoutria*) of which some were established as escapes. There is a specimen from Clare (1954) and in 1957 McClintock (1960) listed 12 localities from six vice-counties ranging from W. Galway and W. Donegal to Louth and Meath. The evenness of spread in Ireland shown in Fig. 3 contrasts with the concentration in Britain in the west and around major conurbations elsewhere.

In Scotland, the 1950s show an extension of range to more remote areas: Jura, S. Ebudes; Mull, Mid Ebudes; Skye, N. Ebudes; Shetland; and Moray. For some of these, the records refer to little more than rampant relics of derelict cottage gardens (Haa, Fair Isle; Skye). Why it should be absent from Orkney whilst relatively common in Shetland is not known, but could merely reflect the haphazardness of island colonization by plants.

The lateness of records for eastern England is marked by the first for N. Lincs. in 1950 followed by others in the late 1950s for both N. and S. Lincs. (Gibbons 1975), the second for E. Norfolk in 1958 (Swann *in litt.* 1976), and seemingly the earliest for Hunts. in 1950. Evidence of naturalization in Cambridgeshire is sparse; it was already known from a Cambridge roadside in 1946 (**LTR**) and from Cottenham in 1956 (Perring & Sell 1959), but it had been known locally in Ely for some ten years prior to 1961 (S. Bishop pers. comm. 1961) and it was reported as 'widespread' in the Wisbech area in 1959 (Perring 1961). In Bedfordshire, Dony (1953) commented 'increasing in waste places and recorded for all districts except [three]'. In north-eastern England additions at this time include Durham (1954), S. Northumb. (1958) and N.W. Yorks. (1959).

The data incorporated into Fig. 3 indicate a number of vice-counties not previously mentioned and for which locality details have not been sought or traced, viz— Cheviot, Cumberland, Westmorland, W. Lancs. and N.E., S.W. and Mid-W. Yorks. in northern England, and a long list in Scotland including almost all vice-counties in southern Scotland and several vice-counties from Kintyre and Clyde Is. to N. Aberdeen, Outer Hebrides and E. Sutherland. Elsewhere notable additions are the Isle of Man, S. Somerset and the last English midland counties. In Ireland in this period records covered all vice-counties except, apparently, Dublin.

Compared with the earlier phases, the pre-1960 position indicates the incentive the *Atlas* gave recorders to notice these alien plants, with the resultant great increase in the number of 10km grid-squares added to the map.

PHASE 4: 1960 TO 1976 (FIGURE 4)

In the most recent period, the 1960s and 1970s, changes have been mostly those of consolidation. The addition of records for Dublin and Peebles (1976) has left only Orkney remaining without a record. Elsewhere a large number of records for extra grid-squares have filled in many areas, especially in the south-east and where Floras have recently been published or are in an advanced state of preparation. Despite this spurious concentration there does nevertheless seem to be a marked increase in records during the last few years, especially in the south-east and in Cumberland (Haworth 1976). Could it be that the recent run of mild winters has been a genuine contributing factor?

DISCUSSION

The sequence of stages in the spread of this vigorous weed follows the generalized pattern seen in many other alien plants: a pioneer phase of scattered primary occurrences; a rapid extension with

secondary spread from the primary foci; and a final era of consolidation. But the pattern of this spread for *R. japonica* differs regionally. In the west, early spread was rapid and secondary spread must have quickly followed with the colonization of river and railway embankments and establishment on roadside sites with a merging of stands so that any original locus was obscured. In South Wales it was already common almost throughout Glamorgan by 1907; common through three or four Welsh vice-counties by 1918; and known from almost all of Wales by the 1930s. Observations in South Wales in recent years demonstrate the abundance of this plant in many areas, for example the derelict sites and waste ground in the Swansea–Neath, Glam. area, already noted as abundant here in 1930 (A. E. Wade *in litt.* 1961), around Cwmbran, Mon. (D. I. Morgan-Huws *in litt.* 1964), or the streambanks of Porth Talbot and Bridgend, Glam. In North Wales too, roadside colonies away from habitation abound south of Machynlleth, Montgomery and about Portmadoc, Caerns.

In contrast to the west, spread in the east and north-east has been both tardy and slow, and more restricted in the habitats invaded. The lack of spread from Aberdeen, one of the earliest sites of establishment, contrasts sharply with the rapid engulfment of the South Wales derelict areas. It was barely recorded in East Anglia or in the Durham–Northumberland region till the 1950s. In the east too, in contrast to the west, roadside stands away from centres of population are infrequent. Up to the 1960s only around Metropolitan London was there any concentration of localities. Here, along the railway embankments, there has been an abundance of stands not adjacent to stations within the densely built-up area, at least since the early 1960s, but further out of London these become restricted to the immediate vicinity of stations or goods-yards. Thus on the old L.M.S. railway line out of St Pancras, inter-station stands are common as far as Elstree, but further north they are conspicuous only at stations: St Albans, Luton, Bedford and then Leicester. And the same can be seen on the Southern lines out of Victoria and Waterloo, with the change at about East Croydon and Weybridge respectively.

These contrasts between the performance in the east and west of Britain suggest some climatic control restraining its spread in the east and north-east and encouraging its aggressiveness in the west; not, perhaps, surprising for a species coming from an oceanic area. Comparison with rainfall maps does show a correlation between high precipitation and greater frequency of sites, but does not account for the high incidence in and around London so prominent in the earlier phases. *R. japonica* is cut back by the first sharp frost in autumn, often before there would have been time for fruit to form. Field observations of the dramatic effect of the late spring frost of May 1961, when severe damage was widespread over Carmarthenshire, for example, and on the Argyll coast (C. A. Sinker pers. comm. 1962), point to a possible factor which would normally be of much more frequent occurrence in the east and on high ground than in the west. It would also account for the conurbation effect, for the amelioration of centres of population on the incidence and severity of frost is well known. The results of the severe late frosts of 1965 were studied in western Wales by Savage (1965), who included *R. japonica* in his 'most severely damaged' category. That the apparent great increase in frequency in south-eastern England in recent years is connected with the recent run of mild winters is a further possibility. During the drought and hot sunny weather of the 1976 summer, scorching and withering of leaves was noticed in August—again suggesting an inimical influence of a more continental climate. Whether repetitive cut-back by frost leads to reduction of 'growth-potential' sufficient to reduce the vigour of the extending rhizomes is an open question. Komarov (1936) noted that *R. japonica* was very hardy, even in Leningrad, although he recommended the plant for regions where the soil does not freeze in winter. The resilience of the rhizomes is such that they have been seen growing up through asphalt, and their resistance to a variety of weed-killer chemicals has been shown by Fuchs (1957). The readiness to colonize cinder-tips, railway ballast and similar well-drained pioneer habitats is not surprising for a species which in its native Japan is characteristically an early colonist of volcanic soils and occurs even on the sulphurous soils of fumaroles with a pH below 4 (Yoshioka 1974).

Vegetative spread to new sites, either by direct extension of the aggressive rhizomes or indirectly by the removal and cartage of earth, is the usual means of dispersal. Floating cut stems have been seen throwing up new shoots, so that water-transport could be an additional means of dispersal. Whether establishment in the British Isles ever occurs from fruit is doubtful. Fruit is set apparently only very occasionally and then only after a 'hot dry summer' (note on a fruiting specimen from Richmond, Surrey, B. Welch, 1955, **BM**). However, a specimen from Cambridge (1946, **LTR**) must have another explanation. Fruiting following the 1976 hot summer has been observed in

western London (D. H. Kent pers. comm. 1976) and in N. Hants., but here, as for the previous records, there is no evidence that these fruits are viable. Seedlings or observations of germination have not been reported, at least not in the wild. Moreover, as the majority of plants in this country are male-sterile, it is more likely, as D. McClintock (pers. comm. 1961) has pointed out, that the rare occurrence of fruit coincides with the rare availability of effective pollen.

The flowers of *R. japonica* are functionally dioecious (Hooker 1880a). In the commoner plant, functionally female, the stamens are included within the perianth and the small, rusty-pink anthers are either empty or have aborted pollen. The ovary enlarges and nuts may develop enclosed in the winged fruiting-perianth. In the far less common male-fertile plants, the long stamens are exserted and the large, cream anthers have good pollen (up to 80% or more stainable); the ovary remains small and aborts.

Dwarf variants have long been sold by nurseries; they were described by Hooker (1880b) as *Polygonum compactum* Hooker fil., although in Japan it is not considered a distinct species (Ohwi 1965). Under *Reynoutria* the combination is *R. japonica* var. *compacta* (Hooker fil.) Buchheim. Not more than one metre (and sometimes only 30cm or so) tall, it has small, thick-textured leaves which are characteristically as broad as long with an abruptly cuspidate apex, very truncate base and undulate margins. The inflorescence is said to be erect and scarcely branched. This dwarf variety is likewise functionally dioecious, and both male and female plants are cultivated. A red coloration on the stems and petioles extending to the perianth adds to the decorative appearance, and can in the female give striking, red-winged fruiting perianths; male plants are less often so red. Specimens have been seen from N. Devon, N. Somerset, E. Gloucs., S. Lancs., Main Argyll and Roxburgh (male plants), and from Surrey, Herts., Cambs., Glam., W. Lancs., Easterness and Shetland (female plants).

Some plants collected from coastal sites in western Ireland and south-western Scotland show undulate leaves and hence resemble var. *compacta*, but this is probably only the result of the saline environment. Herbarium sheets rarely give details of plant height, and it is possible that the very few British male-fertile specimens seen of *R. japonica* are in fact the var. *compacta*. Where both sexes of var. *compacta* are cultivated together, D. McClintock (pers. comm. 1976) has observed that viable seed is set and that seedlings arise; these are all dwarf and of both sexes. This gives weight to the idea that in var. *japonica* also good seed is produced only on the rare occasions of pollen availability.

### *REYNOUTRIA SACHALINENSIS* (FRIEDRICH SCHMIDT PETROP.) NAKAI (*POLYGONUM SACHALINENSE* FRIEDRICH SCHMIDT PETROP.)

A native of southern Sakhalin and of northern Japan (Ohwi 1965), *R. sachalinensis* is generally assumed to have been introduced in 1869 (Synge 1956). However, Hooker (1881) commented that, although the first notice of its being cultivated was in the Moscow Zoological Garden, where it was seen in 1869, it was in fact apparently known in England before that date, and he recollected it in cultivation at Kew 'at least 20 years ago', i.e. about 1861. Moreover Regel (1864) had already referred to the succeessful cultivation of this species overwintering in the open without cover in St Petersburg. It was apparently introduced in the first place for forage and only subsequently grown as a decorative horticultural plant. In 1896 W. Foggitt of Yorkshire, writing to J. H. Davies in Northern Ireland, told of its being brought to England and grown for forage, and that it was said to produce 80–120 tons of green fodder per acre, and that horses were especially fond of it (*fide* Davies 1896). Foggitt further told Davies that the farmers of Wensleydale were planting it 'at the base of oozy hillsides' and added 'its beauty seems to have recommended it to horticulturists, and it is now to be seen in many gardens in Yorkshire'. More recently Komarov (1936) also referred to its economic importance and its successful cultivation in the Leningrad area, and said that the young shoots are readily eaten by horses and cows. Four phases of spread may again be recognized.

#### PHASE 1: UP TO 1929 (FIGURE 5)

It was Davies (1896) who first published an account of this species growing outside cultivated areas in the British Isles. He described an extensive and longstanding growth on waste ground by the Lagan Canal at Lisburn, Antrim, where it was considered locally as 'growing wild' and not to

have been planted. Davies surmised that it had been brought by lighters, which were repaired in a nearby dry dock and which had carried coal, shipped from northern England, from Belfast to Lisburn. It does not seem to be there now. It must be stated that Druce (1929, p. 72) in fact gave 1894 as the date for his record from Braemore, W. Ross., but, as elsewhere in this Flora (p. xviii) he mentioned adding *R. sachalinensis* in 1923, there must (in the absence of specimens or other evidence) be some uncertainty about the earlier (1894) date. It still grows near Braemore.

Persistence of stands spreading from gardens or naturalizing from cast-out plants were only rarely published early this century. In 1901/2 a single plant was reported (Colgan 1904) naturalizing beneath the cliffs of Howth, near Dublin, and evidently derived from a garden above, and, in 1903, the alien Reynoutrias collected by J. C. Melville from Church Stretton, Salop, included a specimen of *R. sachalinensis* (**BM**), though there has previously been doubt as to its determination. Several of G. C. Druce's early collections have been renamed at various times from inadequate herbarium specimens. His specimen from Par, E. Cornwall (**OXF**, 1908) was labelled '*Polygonum cuspidatum*' but it has been correctly renamed '*P. sachalinense*' by H. J. M. Bowen. Between 1917 and 1926 Druce noted and collected both species from Marston Brickyard, near Oxford (**CGE, E, NMW, OXF**), evidently derived from the Oxford Botanic Garden; some were correctly but others incorrectly determined. His collection of *R. sachalinensis* from Dagenham, S. Essex (**OXF**), probably dates from before 1930 (Brown 1940). Known since 1925 near Forres, Moray, it was originally determined as *R. japonica* and only recently has it been recognized as *R. sachalinensis* (det. R. M. Harley; M. McC. Webster pers. comm. 1976). There are reports or specimens from Renfrew (Giffnock, 1926), S. Devon (Countess Weir, 1929), and W. Gloucs. (Blaize Castle, 1929, **NMW**).

PHASE 2: 1930 TO 1949 (FIGURE 6)

Records are still sparse in this phase outside Devon. They doubtless reflect the whereabouts of disillusioned gardeners or those unable to restrain their decorative plantings. Published records or specimens come from Surrey (Weybridge, 1934 and Holmbury St Mary, 1938), and S. Hants. (Milford-on-Sea, 1935). Several localities were listed by Martin & Fraser (1939) from Devon, of which that at Plymouth Hoe, S. Devon, can be dated 1937. In 1938 it was collected from Amroth, near Saundersfoot, Pembs. (**NMW**) and it still grows there on the coast at the old county boundary with Carmarthenshire. In this period two sites were recorded in Londonderry: by the R. Bann at Coleraine, and by the R. Foyle at Londonderry (Praeger 1938), both apparently between 1934 and 1938. It was collected from Phoenix Park, Dublin, in 1937 (**herb. V. Gordon**).

J. E. Lousley collected it from Chewton Glen, S. Hants., in 1945 (**RNG**). There are records from Down in 1942; Merioneth (near Brithdir) in 1941, though here merely spreading in a garden where it had been introduced *c* 1919; Westerness (near Fort William) in 1947; Outer Hebrides in 1946; and Middlesex (Brent Reservoir) in 1944 (Kent 1975).

PHASE 3: 1950 TO 1959 (FIGURE 7)

In the 1950s records were added for the following vice-counties: E. Gloucs. (1955), Radnor (1956), Cheshire (1952) and S. Lancs. (1953) in the west and north-west; N.W. Yorks (1959) and N.E. Yorks. in the north; E. Norfolk (1959), Cambs. (1959), E. Suffolk (1957) and W. Suffolk (1958) in East Anglia; Notts. (1952) in the Midlands; N. Somerset (1956), Wight (1956), E. Sussex (1952), W. Kent (1956/7) and Bucks. (1958) in the south.

In Scotland, vice-counties added in the 1950s were: Main Argyll (1958) and Shetland (1958) in the north, and Ayr (1956), Dumfries (1957), Wigtown (1956) and Berwick (1960) in the south. The last, from Dun's Castle, had, however, been known locally 'for many years before this' (A. G. Long *in litt.* 1976). In Ireland, vice-county additions in this period were mostly in the north and north-west, but also from W. Cork and Wexford.

Further records from vice-counties already covered range from Cornwall and E. Sussex in the south to Ayr and Main Argyll in the north. Others come from northern Ireland; there were several from Greater London in Surrey and W. Kent as well as from the City of London.

PHASE 4: 1960 TO 1976 (FIGURE 8)

In the 1960s and 1970s a number of new vice-counties gave important extensions in the north of England: Mid-W. Yorks. in 1967, Westmorland in 1961, Cumberland in *c* 1965, Durham in

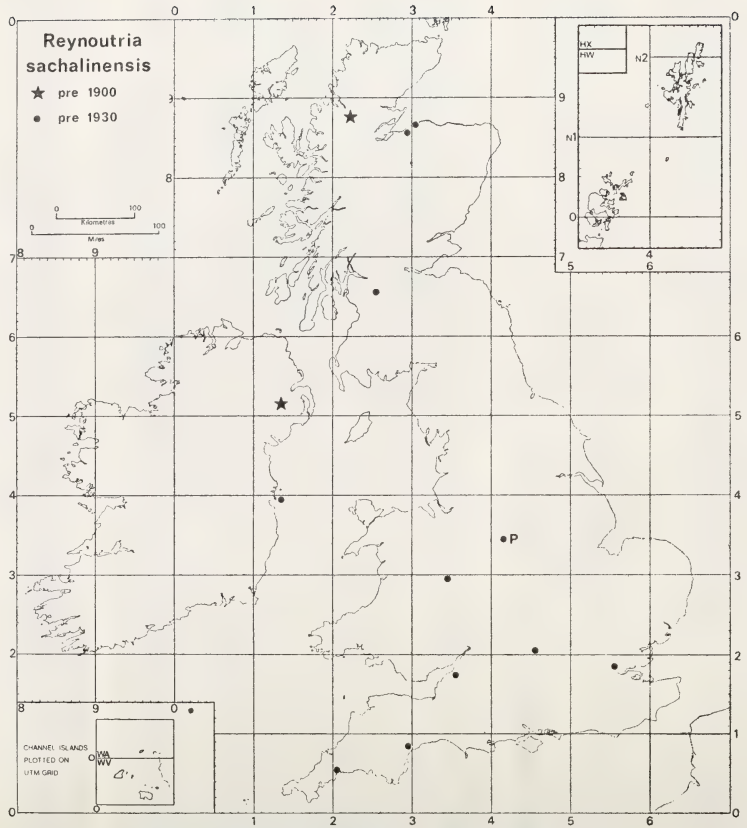



FIGURE 5

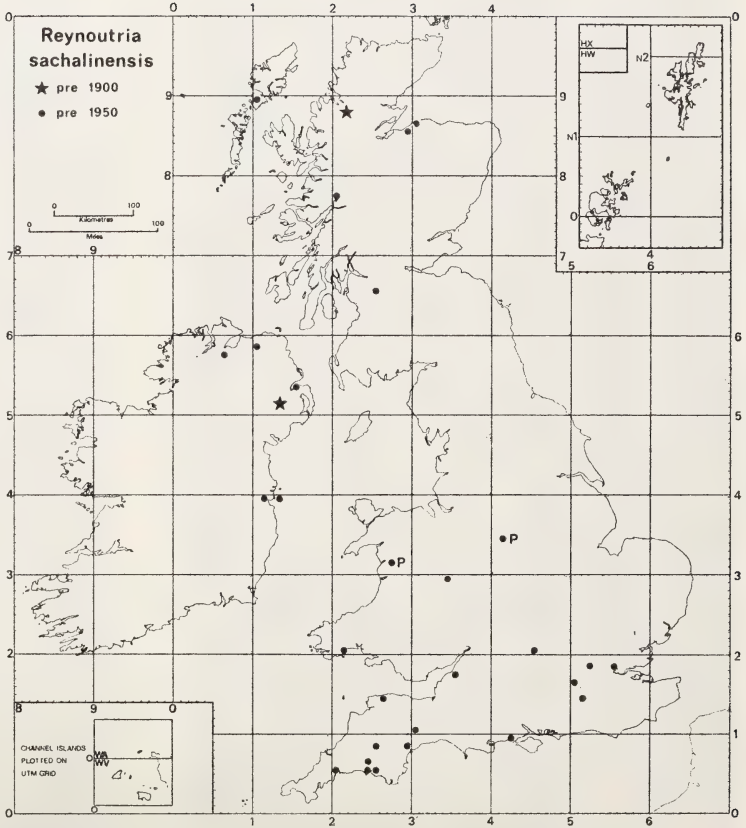



FIGURE 6

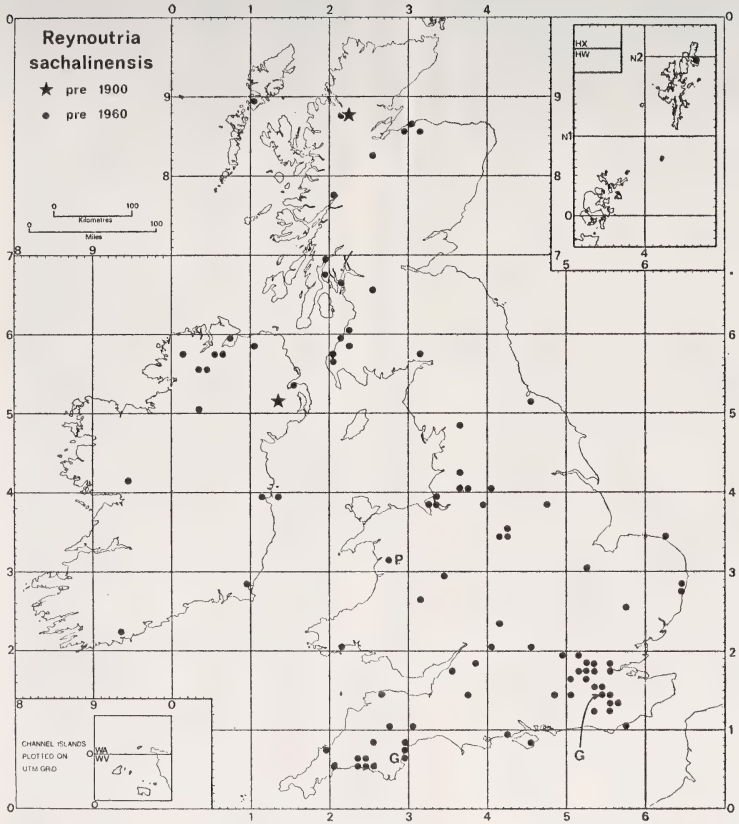



FIGURE 7

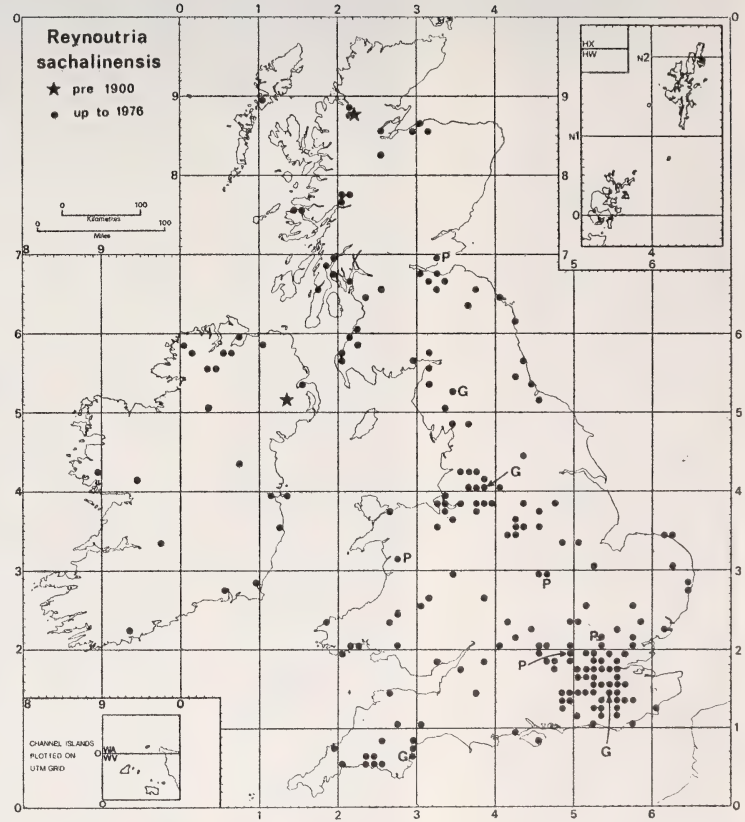



FIGURE 8

FIGURES 5–8. Distribution in the British Isles of *Reynoutria sachalinensis* (Friedrich Schmidt Petrop.) Nakai for the four phases described in the text. Records are cumulative. Those known to be of garden origin are marked with G, and those planted with P. Compiled from various sources, including the Biological Records Centre.

1960 and Cheviot in 1966. In Scotland notable additions were Edinburgh (1960), Fife (1962) and the Isle of Mull (Mid Ebudes, 1967), and in Ireland, W. Galway in 1965 and Wicklow in 1971. In Wales, five new vice-counties were recorded: Glam. (1963), Mon. (1969) and Carms. (1957–67) in the south and Caerns. (1965) and Flint (1961) in the north. Other new vice-counties range from Worcs. and E. Kent to S. Lincs. and Leics. in England, and Kintyre to E. Ross in Scotland. Other records in this period add stations to vice-counties already recorded; in particular to the London area, to Surrey and to Herts.; to Cheshire (Newton 1971) and S. Lancs.; and to Oxon. (S. R. J. Woodell pers. comm. 1976). Elsewhere a scatter of such records come from central and south-eastern England, from Wales, from Scotland and from W. Donegal in Ireland. Eleven new localities from Essex (Jermyn 1975), as well as some from other areas, could date from an earlier decade.

## DISCUSSION

The pattern of spread in the early stages shows most sites were in southern and western Britain, with a few in northern Ireland and northern and western Scotland. The later position shows a marked increase in Surrey and elsewhere around London, but still mostly south-west of a line from the Ribble to the Wash. In the last phase the main increase is not only in the south-east but also in Cheshire, S. Lancs., Derbys. and in western and south-western Scotland. In view of all the hillside and garden plantings last century, the lack of records and especially the late date of those from Yorkshire and north-eastern England suggests some climatic restraint to spread. In this *R. sachalinensis* parallels *R. japonica*. On the other hand, in contrast to the latter, sites are sparse in Wales and very sparse in Ireland except the north. Nor is there much sign of spread or extension from the early sites in Devon and Cornwall. *R. sachalinensis*, in comparison with *R. japonica*, has not spread to anything like the same extent: the maps reflect mainly the incidence of many independent primary escapes and/or establishments; indeed a number are no more than vigorous garden plantings that have become well established and extensive over the years but can barely carry the status of 'naturalized'. The rest are almost all primary escapes, or cast-outs at the site of deposition that have taken hold on waste-ground, embankments and so on. There is nothing comparable with the innumerable secondary sites of *R. japonica* seen in so many London, Welsh and western Scottish areas, with the merging of stands into vast stretches. Only around greater London can *R. sachalinensis* now be considered at all common. The *Flora of Surrey* (Lousley 1976b) is alone among recent Floras in not citing individual records; the relevant map gives 34 tetrads in sixteen 10km grid-squares, but even here individual stands are often far apart. The most extensive stands noted are along 30 yards of a river bank at Penicuick, Edinburgh (Beattie 1962, Biological Records Centre card), a large clump extending 'some 20 yards . . . in a moorland field' at Saddleworth, S.W. Yorks. (Kidd 1956), and for a quarter of a mile along the R. Foyle, Londonderry (Praeger 1938). Far less a menace to gardeners than *R. japonica*, *R. sachalinensis* hence gets thrown out far less often, has therefore far fewer opportunities to become established on waste-ground, and, being so much less aggressive, stays more restricted to primary sites. In Japan, characteristic habitats include unstable, moist soils on volcanic detritus and basaltic lava flows, and somewhat stabilized scree below coastal cliffs (Ishizuka 1974, Yoshioka 1974).

Although mature-looking fruits do occur on occasion, there are no reports of seedlings; spread is invariably by vegetative means.

On occasion there has been some confusion between *R. japonica* and *R. sachalinensis*, herbarium specimens with atypical leaves having been variously determined as one or the other. Such specimens are inadequate, for they do not have the essential basal leaves which could assure correct identification. These two species are known to be much more variable in their native areas than in the British Isles, and introductions on different occasions may well have been of different variants. But the question remains as to the constancy of the characters separating the two species; some herbarium specimens probably of *R. sachalinensis* lack one or more of the characteristic features of that species, so that their identity remains uncertain. It also raises doubts as to the authenticity of certain early records not supported by voucher material, particularly some of G. C. Druce.

As in *R. japonica* the flowers of *R. sachalinensis* are functionally dioecious. The male plants have exserted stamens, large anthers with good pollen, and vestigial ovaries. Examples are from Chewton Glen, S. Hants., 1945 (**RNG**); Nant-y-Frith, near Wrexham, Flint, 1961 (**LIVU**); and Dingwall, E. Ross, 1971 (**E**). Female plants have included stamens, small, empty anthers and nuts enclosed

in well-developed winged fruiting perianths. Many examples have been seen. Other specimens point to a more complex condition; some from the Edinburgh region (E) with predominantly male flowers show a few nuts developing as well, and a plant from Ware, Herts (LTR, RNG), bears not only male and female flowers with nuts containing seeds, but also apparently hermaphrodite flowers having nuts and exserted stamens, although the seed is ill-formed. Material from Amroth, Pembs. (NMW), shows a similar range in a single inflorescence. A polygamous condition is, therefore, indicated, as had been suspected by Hooker (1881), and not a dioecious one as stated by Webb (1964). It is not known whether even the best-formed nuts contain viable seed in this country.

### *POLYGONUM POLYSTACHYUM* WALL. EX MEISSNER

Introduced as a horticultural plant from the Himalayas, *P. polystachyum* has only occasionally established itself as a naturalized garden escape, for most reports refer either to garden plantings that have persisted in abandoned or neglected areas, or to stands still remaining at the site of dumping from nearby gardens. Natural extension by vegetative growth beyond the confines of a garden or estate, or the invasion of surrounding vegetation from dumped material, has been less common. But such sites may well act at some future time as centres of spread, as has happened with some many other alien invaders. For this species five phases of spread may be delimited.

#### PHASE 1: UP TO 1929 (FIGURE 9)

Early records for *P. polystachyum* are sparse. A reference to cultivation in 1904 comes from Lyss, N. Hants. (K), and it was in cultivation in the Royal Botanic Garden, Edinburgh, by 1900 (E), and in Trinity College Dublin Botanic Gardens by 1911 (K). The Royal Botanic Gardens, Kew, received a garden specimen from Salop in 1914 (K), and in 1917 it was grown at Welbeck, Notts. (OXF), but the precise date of introduction into Britain does not seem to be known.

The earliest authentic evidence of escape seems to be in 1917, when a Miss Cobbe from Lynton, N. Devon, reported it 'almost naturalized in these parts' (*in sched.*, OXF). Subsequently, further reports indicate its frequency and establishment in that district; Druce (1929) recorded it 'in great abundance near Woody Bay and along the railway from Barnstaple to Lynton' (OXF). There are further reports there in 1933, 1960 and 1961, and extending east to Luccombe, S. Somerset, in 1961 and west to Combe Martin, N. Devon., in 1970 or before. As with *Reynoutria japonica*, many others of these earliest records come from the west country: S. Devon in 1920 (OXF) and W. Cornwall in 1925. Others come from Ireland (W. Donegal in 1928), from Scotland (Moray in 1925, Caithness in 1927 and two places in W. Ross in 1926), and from Wales (nr Bala, Merioneth, 1921, LANC; Bettws-y-Coed, Caerns., 1928). The first from the home counties is from Herts. in 1927. In 1917 and 1921 an interesting hairy variant was collected from a sandpit near Woodhall Spa Golf Links, N. Lincs. (BM, OXF).

#### PHASE 2: 1930 TO 1949 (FIGURE 9)

In the next two decades the predominance of western records is shown by the number from Wales: Cards. (1936, 1941, 1942), Merioneth (two in 1941), Denbigh (1943), Flint (1942) and Monmouth (1942). Most of these were noted by J. A. Webb, who was perhaps less cautious than some in recording garden plants scarcely then naturalized. From Ireland, W. Galway (1935), W. Cork (1936) and Fermanagh (1947) were added, as well as Fife (1934) in Scotland and N. Somerset (1943) in England. There was also a group of new vice-county records from metropolitan London and the home counties: Surrey in 1930, Bucks. in 1913, N. Hants. in 1933 and Middlesex in 1948. It appeared on a bombed site in Coventry, Warks., in 1943, on waste-ground near the Lickeys, Worcs. in 1945, and in E. Sussex around 1946.

#### PHASE 3: 1950 TO 1959 (FIGURE 10)

The western emphasis is continued in the 1950s with over 30 Irish records: at least five from Galway (1955–57), and several from Donegal (1953–57), especially from south of Glenties. Others range from Waterford and Clare to Antrim, including seven new vice-county records. This marked increase in Irish records partly reflects renewed activity in recording and of taking note of aliens.

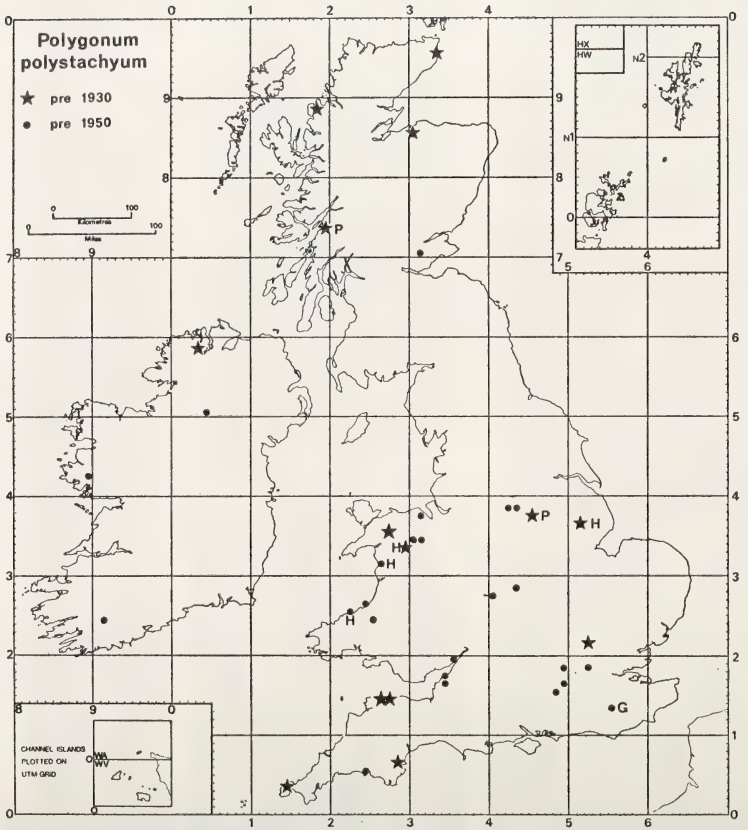



FIGURE 9

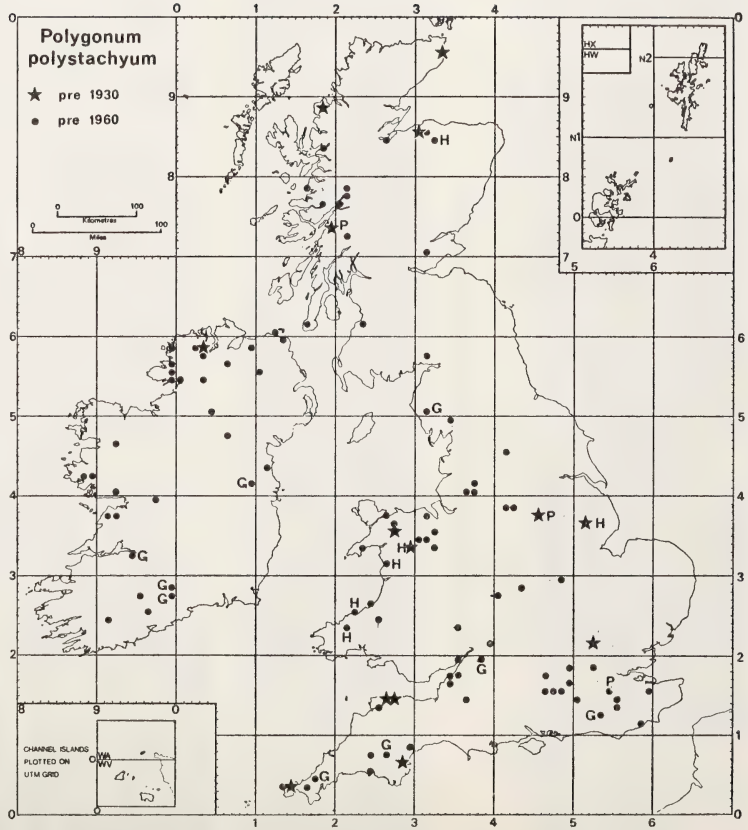



FIGURE 10

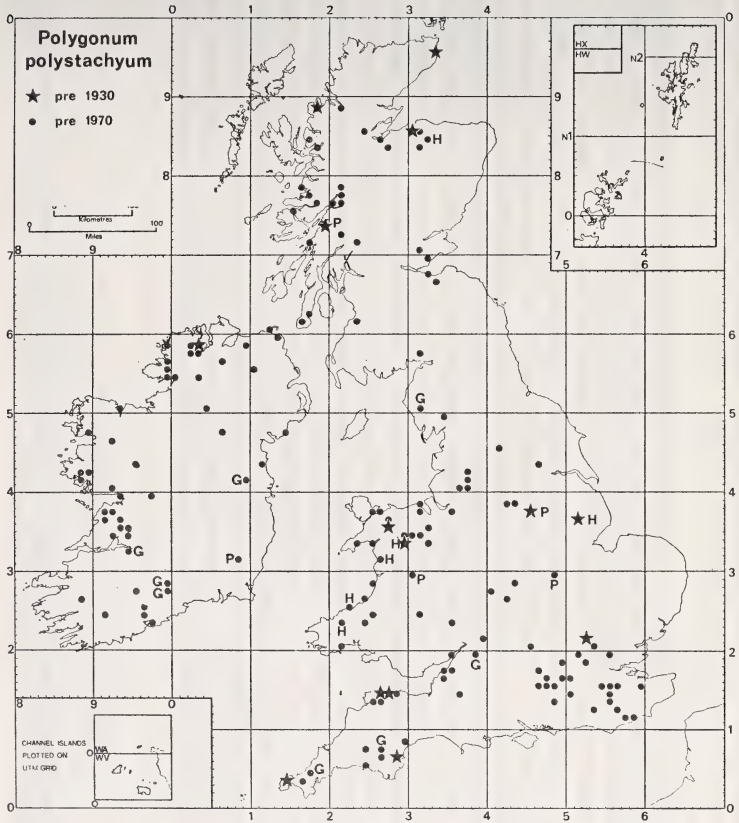



FIGURE 11

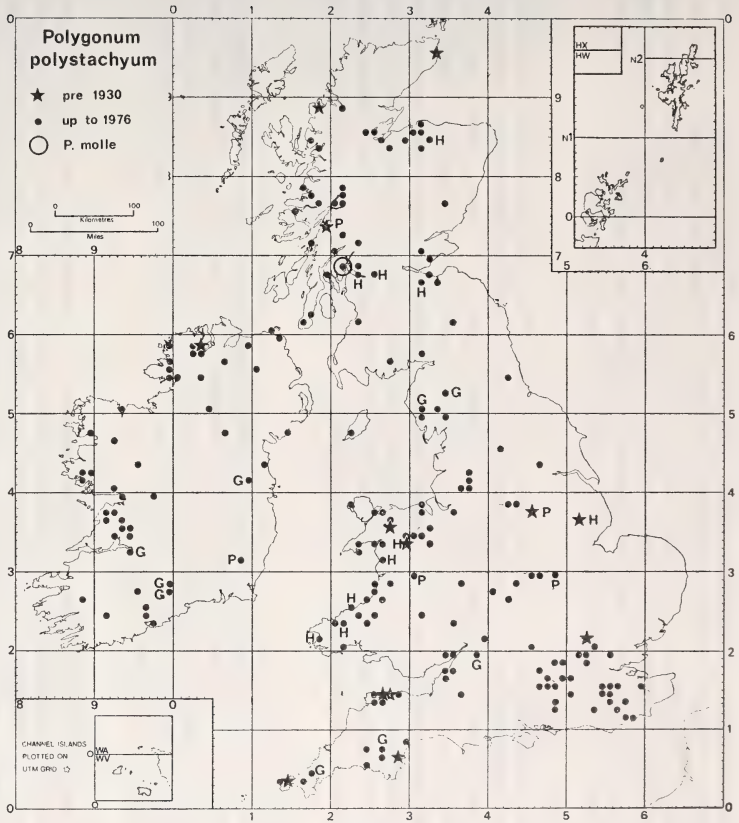



FIGURE 12

FIGURES 9–12. Distribution in the British Isles of *Polygonum polystachyum* Wall. ex Meissner for the five phases described in the text. Records are cumulative. Those known to be of garden origin are marked with G, those planted with P, and those referring to hairy-stemmed plants with H. The location of *P. molle* D. Don is shown in Fig. 12. Compiled from various sources, including the Biological Records Centre,

In England newly recorded vice-counties range from Hereford (1950) to W. Kent (1957) and northwards to Mid-W. Yorks. (1959) and Cumberland (1958). It had, however, been noted from Eskdale, Cumberland in the 1930s (V. Gordon *in litt.* 1976). In Scotland, Banff (1956), Easterness (1952), Westerness (1950), Main Argyll (1959) and Kintyre (1956) were added in the north and west, and Dumfries (1957) and Ayr (1957) in the south. Additional localities come from W. Cornwall, S. and N. Devon, and elsewhere in southern England, Wales and Scotland.

PHASE 4: 1960 TO 1969 (FIGURE 11)

The relatively high number of western records continues in the 1960s with the addition, in Ireland, of N.E. Galway (1960), Carlow, E. Donegal and W. Mayo (all 1961). For Scotland, new vice-county records are from Edinburgh (1965), W. Perth (1966), E. Ross (1966) and Mid Ebudes (1967). In Wales, Carms. (1961), Radnor (1963), Pembs. (1964), Anglesey (1966) and Montgomery (1968) were added. And for England, where perhaps less interest was focused, new records added S. Somerset (1961), S. Essex (1964) and S.E. Yorks. (1961). Further sites from previously recorded vice-counties came from Clare and W. Galway in Ireland, from three vice-counties in Scotland and from seven vice-counties in Wales; there were others from southern England and the Midlands.

PHASE 5: 1970 TO 1976 (FIGURE 12)

Even within the last few years there has been an apparent extension and increase in frequency of records in western Wales and in Scotland, in part because of concentration of interest there. Additional records of special note are those from Durham (1971), Leics. (1976), Forfar (1971), Roxburgh (1973) and Dunbarton (1975). The first record from the Isle of Man was reported in the last four years (D. E. Allen pers. comm. 1977).

DISCUSSION

*P. polystachyum* is best established in the west; the finest stands of naturalized plants must be along the old railway from Barnstaple to Lynton, around Woody Bay and by the R. Heddon at Parracombe, N. Devon. It has frequently been reported too from the Glenties region in W. Donegal. Reports of abandoned gardens where hundreds or even thousands of square yards have been engulfed come from Harlech, Merioneth and also from Craigend Castle, Mugdock, Stirling (A. J. Silverside *in litt.* 1976).

Plants of *P. polystachyum* are normally sparsely hairy with stems and ochreae glabrous and the leaves only lightly hairy on the veins beneath and on the margin. Plants with very hairy stems and leaves, and inflorescence rachides with long hairs, have been recently discussed in relation to *P. molle* D. Don (McClintock 1975, Lousley 1976a). A naturalized stand of *P. molle* D. Don (in the sense used by Lousley (1976a), i.e. including *P. rude* Meissner and *P. paniculatum* Blume) grows by L. Eck, at Coylet, Main Argyll. Specimens from this site and cultivated material of *P. molle* can be distinguished from *P. polystachyum* by the much smaller perianths (*c* 1·5mm), the segments of which are all of equal size (cf. Meissner 1856, Hooker 1886, Steward 1930), by the very short styles, and by the fruiting perianths (observed only in the cultivated material), which are bacciform, becoming fleshy and dark in colour. In *P. polystachyum*, in contrast, the perianth is large (*c* 3mm or more), the segments are unequal in size, the two outer narrower than the inner ones, the styles are relatively long, and the fruits are not bacciform; the perianth withers and the nut becomes narrowly winged. All the hairy-stemmed naturalized plants examined so far, with the exception of that from Coylet, Main Argyll, agree precisely with *P. polystachyum* in these features and not with those of *P. molle*. They therefore represent a hairy variant of *P. polystachyum* (cf. Meissner's (1856), var. *pubescens*). Plants of this sort have been seen by me from Wales (Pembs., Cards. and Merioneth) and from Scotland (Banff), and are indicated along with others on Figs. 9–12. The plant from Woodhall Spa, N. Lincs. (Rev. F. Alston, 1917, **OXF**; 1921, **BM**) must also belong here and not to *P. molle* D. Don as Lousley (1976a) stated, despite the smallness of the perianth.

*POLYGONUM CAMPANULATUM* HOOKER FIL. (FIGURE 13)

*P. campanulatum*, a native of the Himalayas and western China (Stapf 1925, Stearn 1969), is the least commonly reported of the species here considered. Attention was drawn to the possibility

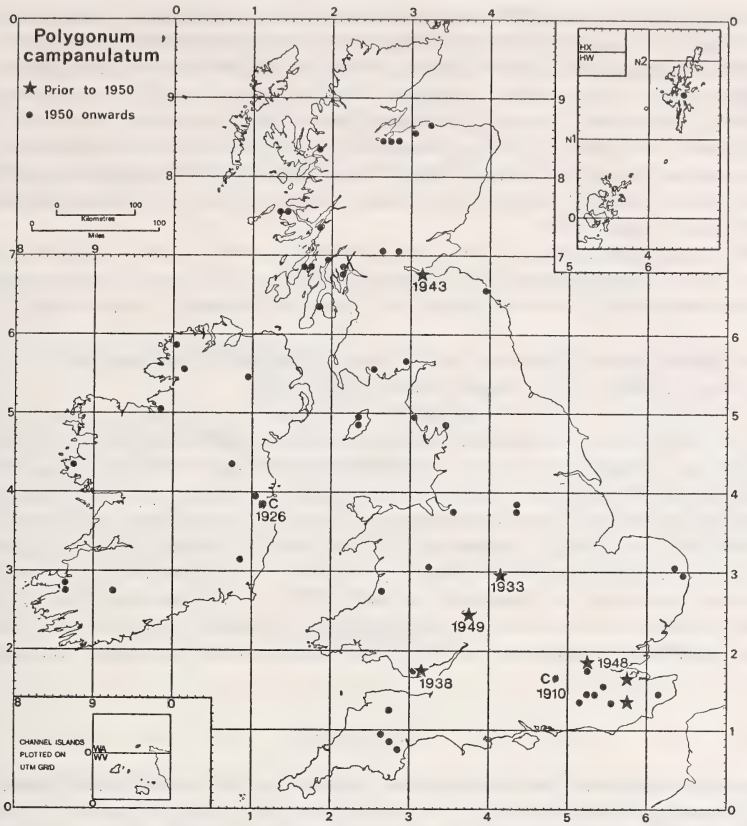



FIGURE 13. Distribution in the British Isles of *Polygonum campanulatum* Hooker fil. Records marked C refer to early cultivated plants. Dates are given for records prior to 1950. Compiled from various sources including the Biological Records Centre.

of this species escaping and becoming naturalized in Britain by Kent (1956a), who gave a short description and mentioned the four records then known to him. The earliest of these was dated 1949, and came from Herefordshire. Later records, like the first four, show randomly and widely separated sites for the incidence of escape or of establishment in wild places from garden outcasts. But doubtless this in part reflects merely the chance location of originally cultivated plants which have long persisted in or escaped from abandoned or untended estates, or else formed the source of jettisoned material, and, in part, the chance location of interested observers.

A specimen collected in 1938 from Maindy Pool, Cardiff, Glam. (**OXF, NMW**), which predates that of 1949 from Herefordshire, is thought by A. E. Wade (G. Ellis *in litt.* 1976) to have been only a casual—a garden throwout and unlikely to have got naturalized before the site was destroyed. This is itself predated, however, by a plant noted by the late R. C. L. Burges from Sutton Park, Warks. in 1933 (Cadbury *et al.* 1971). It has remained at this site. A much earlier record still, made by S. Andrews, comes from Walderslade, near Chatham, W. Kent. It is dated 1917, but there is no specimen (F. Rose pers. comm. 1976). Then in 1943 it was reported from a canal-side east of Ratho, Edinburgh, in 1946 from near Goudhurst, W. Kent (F. Rose pers. comm. 1976), and in 1948 from Kenwood, Middlesex, where it was originally planted but is now naturalized (Kent 1975).

Thereafter, between 1950 and 1959, recorded stands—in hedges, by streams, in fields, in plantations, by roads or lake-sides—are from Bovey-Tracey, S. Devon (1954), near Belstone, N. Devon (1957), Wimbledon Common, Surrey (1952, 1954, 1955, 1960), near Tunbridge Wells, W. Kent (1957) and Westerham, W. Kent (1958) in England. There are also records from Sligo (1952),

Tyrone (1959) and Mid Cork (1958) in Ireland; and from Easterness (1955), S. Ebudes (1957), W. Perth (1954), W. Ross (1953), Nairn (1954) and Moray (1956, 1959) in Scotland.

In the 1960s records came from S. Kerry (1960, 1964), Wexford (1961), Meath (1965), W. Donegal (1966) and W. Galway (two localities, 1966) in Ireland; and from Berwick (1960), Kirkcudbright (1969, but known for nearly 20 years before this), Kintyre (1961), W. Perth (1964), Main Argyll (1968) (Macpherson & Macpherson 1975) and Mull, Mid Ebudes (1968) in Scotland. There are reports too from Cumberland (1960), Westmorland (1965), Cheshire, E. Norfolk (1963) and W. Sussex (since 1966). It was seen in Wales (Cards.) in 1961, but is now lost at that locality (A. O. Chater pers. comm. 1976).

In the 1970s stands have been recorded from Shetland, in two places in the Isle of Man, Dublin (1973), Glam. (1972), Montgomery (1976), Derbys. (1972) and E. Kent. There were also additional localities in the 1960s and 1970s from Surrey, N. Devon, W. Donegal, Main Argyll, Kirkcudbright and Nairn.

The most extensive naturalized stand is that which stretches 'for at least half a mile on the bank of the Camp river', S. Kerry (M. Long *in sched.* 1969, **DBN**).

As yet the records are too few to discern a trend reliably, but the preponderance of western sites, and the scarcity from most of inland England, is perhaps significant. Indeed Synge (1956) said 'hardy or almost so', though others have considered it quite hardy (Irving 1912, Stapf 1925).

Hooker first found this plant (in 1848) and named it *P. campanulatum* in 1886 (Stapf 1925). The first introduction to England (and presumably to Europe) was of seed sent from Calcutta and grown to flower first in 1910 in a garden at Binfield, Berks. (Irving 1912). Jekyll was growing it by 1917 (**BM**) near Godalming, Surrey, and it was grown at Rathfarnham, Dublin, by 1925.

The flowers are dimorphic, as described by Stapf (1925), with long- and short-styled flowers on separate plants, which may account for the reported lack of seed-set. Spread is invariably vegetative, and there is in general little expansion at the site at which thrown-out plants are dumped.

## CONCLUSIONS

Of the four aliens considered, two (*Reynoutria japonica* and *R. sachalinensis*) came from Japan, and two (*Polygonum polystachyum* and *P. campanulatum*) from the Himalayas. In the British Isles these species are all of garden origin and only occur outside of cultivation as the result of vigorous vegetative growth, the taking over of abandoned gardens, or after rhizomes have been dumped outside with subsequent establishment and spread. The earliest to be grown, *R. japonica*, introduced in 1825, was observed in London (Chelsea) some 30 years later in 1861, perhaps as an escape; it had begun its 'riotous career' in parks and gardens by 1887 and was already very abundant on waste-ground in southern Wales by 1886 (61 years after introduction). *R. sachalinensis*, first cultivated in Britain in the 1860s, was recorded in Scotland apparently in 1894 and as a long-standing escape in Ireland in 1896, not more than 35 years after introduction. *P. polystachyum* has no precise date of introduction, but it is likely to have been during the latter part of last century; it was in cultivation in 1900 in Edinburgh and in 1904 in N. Hants. Its first record as a well-established escape comes in 1917. *P. campanulatum*, not even described until 1886, was first grown just prior to 1910. The earliest field record is in 1917, less than ten years later. But these differing 'time-lags' may not be significant.

Comparison of present-day achievements by these species shows marked contrasts, but the differing dates of introduction account only in part for the differing present-day coverage. *R. japonica* is now well ahead of the others, and *P. campanulatum* is still only in the pioneer stage, but it is at least as widespread as were *R. japonica* or *R. sachalinensis* at a comparable time. *R. sachalinensis* and *P. polystachyum* are still expanding but are beginning to consolidate. The rate of spread of *R. sachalinensis* has been not unlike that of *R. japonica* but contrasts in the region of its greatest advance. *R. japonica* is much the most naturalized and alone can be said to have 'gone wild', especially in the west from Cornwall to Main Argyll. *P. polystachyum* was strongly established in N. Devon long ago, and is now increasing in western Wales and parts of Scotland. *R. sachalinensis*, though like *P. polystachyum* having begun mainly in the southern half of Britain, has latterly increased greatly in the south-east and is now, unlike *P. polystachyum*, not more prevalent in the west. The effect of a climatic deterrent may be emerging. For *R. japonica* and

*P. polystachyum*, in contrast, it would seem that the absence of severe frost has always been important to successful naturalization. Differing rates of spread and of frequency will naturally also depend on differing popularity with gardeners, their location and their subsequent desire to get rid of the plants.

Gaps and problems remain—it is hoped that the shortcomings of this compilation will act as an incentive and stimulus to the assembling of further data and, in particular, further investigation into the behaviour and incidence of the sexual variants in *R. sachalinensis* and of the occurrence of hairy-stemmed plants of *P. polystachyum*.

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# The herbarium of J. E. Lousley

S. L. JURY

*Plant Science Laboratories, Reading University*

The important private herbarium of Job Edward (Ted) Lousley was recently presented to the herbarium of Reading University (**RNG**) by his widow Mrs Dorothy Lousley.

Ted Lousley at one time considered moving to live in Berkshire, the county whence his ancestors came (the Lousley family have resided in Berkshire for some 800 years), and it is therefore happily appropriate that his collection be deposited at Reading.

His herbarium certainly seems to have been the largest and finest in private hands in the country. It was kept in exact order according to Dandy's (1958) *List of British vascular plants*, with almost as many additions in blue pencil as printed entries. On arrival at Reading the collection was sorted for incorporating into the main herbarium. As each sheet had to be handled individually before incorporation, the opportunity was taken to record each carefully. It was not practicable to keep the herbarium separate, as a special collection.

The herbarium was found to consist of a total of 24,465 gatherings mounted on 19,950 sheets: many sheets had several specimens from different localities, but all were clearly labelled. All but 344 gatherings (1·5%) were collected in the British Isles. As J. E. Lousley wrote the *Flora of the Isles of Scilly* (1971) and the *Flora of Surrey* (1976), a note was kept of the number of gatherings from these areas, vice-counties 1b and 17; these amounted to 860 (4%) from the Isles of Scilly and 3,570 (15%) from Surrey. Ted Lousley's passion for 'horrible things with horrible prickles'—aliens introduced with imported wool shoddy fertiliser mainly from Australia and South America, made it necessary to record these as well. There were at least 4,000 (16%) gatherings of wool-shoddy and other aliens collected from throughout the British Isles.

The herbarium gives a very comprehensive cover of the flora of the British Isles, as may be expected of an enthusiastic and knowledgeable botanist who claimed to have seen every one of its native vascular plant species in its natural habitat.

Critical and difficult groups are well represented and in the main have been carefully verified by specialists. The notable exceptions are the *Rubus fruticosus* aggregate, represented by only three gatherings, and *Taraxacum*, represented by 35. Other critical groups are represented as follows: *Salix* 181, *Rumex* 1,126, *Polygonum* 326, *Chenopodium* 308, *Atriplex* 112, *Sagina* 151, *Silene* 114, *Arenaria* 56, *Ranunculus* 246, *Fumaria* 115, *Lepidium* 120, *Alchemilla* 64, *Potentilla* 92, *Rosa* 66, *Vicia* 179, *Trifolium* 387, *Medicago* 218, *Erodium* 152, *Geranium* 132, *Euphorbia* 114, *Viola* 204, *Epilobium* 145, *Gentianella* 83, *Galium* 138, *Myosotis* 96, *Mentha* 176, *Solanum* 105, *Euphrasia* 298, *Veronica* 208, *Verbascum* 95, *Senecio* 105, *Hieracium* 644, *Centaurea* 108, *Potamogeton* 242, *Allium* 78, *Juncus* 301, *Vulpia* 104, *Bromus* 271, *Poa* 219, *Festuca* 99, *Agrostis* 156, *Eragrostis* 178, *Carex* 949, *Scirpus* 118 and *Dactylorhiza* 116.

These figures may be of interest to anyone working on any of these genera. Such persons are welcome to consult the material but prior notice should be given to the curator by intending visitors. As is nowadays customary, loans are made to recognized institutions, but not to private individuals.

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PLATE 1. J. E. Lousley at Wicken Fen, 1960.



PLATE 2. Isotype of *Rumex* × *lousleyi* D. H. Kent (*R. cristatus* DC. × *R. obtusifolius* L.) **(BM)**.

*Watsonia*, **11**: 313–314 (1977). 

# *Rumex* × *lousleyi* hybr. nov. (*R. cristatus* DC. × *R. obtusifolius* L.)

D. H. KENT

*75 Adelaide Road, London W13*

ABSTRACT

A new hybrid, **Rumex** × **lousleyi** (*R. cristatus* DC. × *R. obtusifolius* L.), is described from material collected by the late J. E. Lousley in London.

*Rumex cristatus* DC., a native of southern Italy, the southern Balkans and western Anatolia (Rechinger 1933), is closely allied to *R. patientia* L., but differs in having distinct teeth on the valves, which all bear tubercles, and by the leaves with characteristic lateral veins, which make almost a right-angle to the mid-rib (Lousley 1939, 1950). *R. patientia*, from Austria and Czechoslovakia to southern Russia, has long occurred as an established alien in Britain (Lousley 1939), but *R. cristatus*, formerly not well understood, was first recorded from near Cardiff by Lousley (1939); it is now known to be established in a number of localities in the London area, the Thames estuary and elsewhere. *R. obtusifolius* L. is a common, if variable, species of disturbed waste-ground, roadsides, field-borders, hedgerows, etc. (Cavers & Harper 1964, Lousley 1939).

*R. patientia* is locally plentiful in the Lea Valley, Middlesex, v.c. 21, and has been known there for over 20 years (Kent 1975). It was not, however, until the early 1970s that the presence of *R. cristatus* in the area was detected by the late Ted Lousley. He was particularly interested in a colony at Tottenham, and in 1973 discovered the hybrid *R. cristatus* × *R. obtusifolius* growing there together with the parent species (Lousley 1974). Only one hybrid involving *R. cristatus* was previously recorded from Britain, namely *R. crispus* × *R. cristatus* = *R.* × *dimidiatus* Hausskn., nom. nud. (Lousley & Williams 1975); this has been found in a few places in the London area and in the Thames estuary (Kent 1975, Lousley & Williams 1975). The only other hybrid with *R. cristatus* likely to be encountered is *R. cristatus* × *R. patientia* = *R.* × *xenogenus* Reichb., which, though known on the Continent, has yet to be found in Britain (Lousley & Williams 1975).

The native range of *R. cristatus* is included in that of *R. obtusifolius*, and the two species no doubt also grow together in many parts of northern Europe where the former is adventive. Accordingly, the occurrence of a hybrid between the two is to be anticipated, but a search of the pertinent literature has failed to produce any reference to such a plant. *R. cristatus* × *R. obtusifolius* is, therefore, not only an addition to the British flora, but appears to be new to science. It is my intention to name this hybrid (Plate 2) after its finder, Ted (J.E.) Lousley, in recognition of his considerable work on the genus *Rumex* in Britain.

**Rumex** × **lousleyi** D. H. Kent, **hybr. nov.** (*R. cristatus* DC. × *R. obtusifolius* L.)

Planta perennis, *R. cristato* similis. Caules 100–200 cm, erecti, crassi, valde costati. Folia basalia crassa, late lanceolata, subacuta, 20–30 × 10–15 cm, margine undulata, basi cordata. Folia superiora minora, anguste lanceolata, 10–15 × 3·5 cm, dentata. Panicula magna, 45–60 cm, ramulis adscendentibus instructa; verticilli congesti, ei inferiori bracteis suffulti; pedicelli tenues, valvis sesquilongiores. Valvae triangulares, reticulatae, eisdem *R. cristati* similes sed dentibus multis irregularibus acutis obsitae.

Plant perennial, superficially resembling *R. cristatus*. Stems 100–200 cm, erect, stout, strongly ribbed. Basal leaves thick, broadly lanceolate, subacute, 20–30 × 10–15 cm, undulate at the margins, cordate at the base. Upper leaves smaller, narrowly lanceolate, 10–15 × 3·5 cm, toothed.

Panicle large, 45–60 cm, with ascending branchlets; whorls crowded, the lower subtended by bracts; pedicels slender, up to 1½ times as long as the valves. Valves triangular, reticulate, superficially like those of *R. cristatus* but with many irregular, acute teeth.

HOLOTYPUS: By towpath of River Lea, north of Ferry Lane, Tottenham, Middlesex, v.c. 21, GR 51/349.896, 14 July 1973, *J. E. Lousley* (**RNG**; isotypus, **BM**)

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Note added in press: A record of this hybrid appears in Jermyn, S. T. (1975), *Flora of Essex*, p. 122: Hadleigh Marshes, bank of old brickworks railway, 1949, J. E. Lousley. This is about 50 km due east of the Middlesex locality and evidently the record was subsequently overlooked by Lousley.

# J. Edward Lousley's published works

D. H. KENT

*75 Adelaide Road, London W13 9ED*

The published writings of J. Edward Lousley span more than half a century and range from major works, e.g. *Wild flowers of chalk and limestone* (1950) and *The flora of the Isles of Scilly* (1972), to book reviews and short notes. Book reviews from his pen were among his best works, and all are included in this compilation. Likewise, many of his notes, particularly 'Plant Notes' in the *Report of the Botanical Society and Exchange Club of the British Isles*, *Watsonia* and *Proceedings of the Botanical Society of the British Isles*, and referee's notes in the *Report of the Botanical Society and Exchange Club of the British Isles*, contain many important data; and a large selection of them are also included here.

**1925**

Some notes on the flora of Kent. *J. Bot., Lond.*, **63**: 339–340. [Chiefly Dover–Folkestone–Deal area.]

**1927**

Wild plants that catch insects. The strange feeding habits of the so-called 'criminals' of the plant-world. *Country-side*, n.s., **8**: 21–22.

A very rare British plant. *Op. cit.*, n.s., **8**: 59. [*Dactylorhiza purpurella* and *D. maculata* subsp. *ericetorum* × *purpurella* in the upper Tees valley.]

A plant to beware of—the Deadly Nightshade. *Op. cit.*, n.s., **8**: 68–69.

**1928**

The story of the primrose. *Country-side*, n.s., **8**: 109–110.

How plants travel: A chat on seed dispersal by animals. *Op. cit.*, n.s., **8**: 170–172.

Our vanishing wildflowers. A reply to Mr Salt. *The common weal*, **4**: 441–445. [*c.f.* Salt, H.S. *Our vanishing wildflowers, and other essays*. London (1928).]

*Gentiana verna* L. *Rep. botl Soc. Exch. Club Br. Isl.*, **8**: 311. [In Teesdale.]

Upper Teesdale. *Rep. Watson bot. Exch. Club*, **3**: 413–414. [Short account of the flora.]

**1929**

Further notes on the Bee Orchis. *Country-side*, n.s., **8**: 349–350.

**1930**

The protection of nature. *Country-side*, n.s., **8**: 488–489.

**1931**

The *Schoenoplectus* group of the genus *Scirpus* in Britain. *J. Bot., Lond.*, **69**: 151–163.

The botany of a piece of waste ground. An outline of a plant survey near London. *Country-side*, n.s., **9**: 32–34.

**1932**

Plant parasites. *Sch. Nat. Study*, **27**: 17–22, 53–57, 85–90, 97–100. [*Lathraea*, *Orobanche*, etc.]

The Toothwort. The story of a strange British wild flower. *Country-side*, n.s., **9**: 211–213.

†147/3(2). *Genista elatior* Koch. *Rep. botl Soc. Exch. Club Br. Isl.*, **9**: 554.

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**1933**

*Hypericum dubium* × *perforatum*. *Rep. botl Soc. Exch. Club Br. Isl.*, **10**: 431–432.
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**1935**

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641/1. *Myrica gale* L. *Op. cit.*, **12**: 686–687.
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**1948**

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**1954**

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**1955**

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**1956**

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**1958**

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588/1. *Plantago indica* L. *Op. cit.*, **3**: 47–48.
690/2. *Asparagus officinalis* L. subsp. *officinalis*. *Op. cit.*, **3**: 48–49.
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*Senecio* × *londinensis* Lousley (*S. squalidus* L. × *S. viscosus* L.). *Rep. botl Soc. Exch. Club Br. Isl.*, **12**: 871 (1946).
*Rumex* × *wrightii* Lousley (*R. conglomeratus* Murray × *R. cuneifolius* Campd.). *Watsonia*, **2**: 396 (1953).

The following combinations were made by J. E. Lousley:
*Rumex obtusifolius* L. subsp. *agrestis* (Fries) Danser forma *purpureus* (Poiret) Lousley. *Rep. botl Soc. Exch. Club Br. Isl.*, **12**: 125 (1939).
*R. conglomeratus* Murray forma *subsimplex* (Trimen) Lousley. *Op. cit.*, **12**: 133 (1939).
*R. palustris* Smith forma *nanus* (Boenninghausen) Lousley. *Op. cit.*, **12**: 141 (1939).
*R. maritimus* L. forma *humilis* (Petermann) Lousley. *Op. cit.*, **12**: 142 (1939).
*Stellaria holostea* L. var. *lousleyi* (Druce) Brenan & Lousley. *Op. cit.*, **12**: 843 (1946).
The last-mentioned is the only taxon in which his name is commemorated apart from *Rumex* × *lousleyi* D. H. Kent (*R. cristatus* DC. × *R. obtusifolius* L.) in *Watsonia*, **11**: 313–314 (1977).

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# The occurrence of B chromosomes in *Festuca ovina* L. *sensu lato* from Scotland

A. ÖNDER and K. JONG

*Department of Botany, University of Aberdeen*

ABSTRACT

The occurrence of B chromosomes in Scottish populations of *Festuca ovina* L. *sensu lato* is reported. Cytological observations revealed that one or two of these accessory chromosomes are found to be present in varying frequencies in both diploid and tetraploid chromosomal races.

## INTRODUCTION

In the genus *Festuca* L., the presence of B chromosomes has been reported for several species (Battaglia 1964, Bolkhovskikh *et al.* 1969, Jones 1975) and the most detailed study has been made on *F. pratensis* Huds. ($2n = 14+0–21B$) by Bosemark (1950, 1954a, 1954b, 1956a, 1956b, 1957).

*Festuca ovina* L. (sheep's fescue) is a polymorphic species or species group of wide distribution in the British Isles and the northern temperate zone, and various chromosome numbers have been reported for it, including $2n = 14$, 21, 28, 42, 49 and 70 (Bolkhovskikh *et al.* 1969). It is represented in Britain by two chromosomal races, diploid with $2n = 14$ and tetraploid with $2n = 28$ (Watson 1958). Most authors now consider the sexual variants of these two races as separate species: the diploid *F. tenuifolia* Sibth. and the tetraploid *F. ovina sensu stricto*.

The present paper is a report of a cytological survey of Scottish populations of this species complex in which B chromosomes have been observed. We shall use the name *F. ovina* to cover both diploids and tetraploids.

## MATERIALS AND METHODS

The plants used in this study form part of a biosystematic investigation of Scottish populations of *F. ovina*, and originate from the 11 localities listed in Table 1.

Young panicles were fixed in Carnoy's fluid (6 ethanol: 3 glacial acetic acid: 1 chloroform) and stored at −20°C until required. Anther squashes in aceto-carmine were prepared according to standard procedure (*cf.* Darlington & La Cour 1962).

Since the frequency of cell division was generally low in root-tips, observations on somatic chromosomes were made mainly in squash preparations of young shoot tissue, which yielded a higher frequency of well-spread metaphases. The intercalary meristem located at the base of an internode (just above soil level) in a growing shoot was freed of its ensheathing leaf-bases, excised under a dissecting microscope and pretreated for three hours in sat. aqueous alpha-bromonaphthalene at 20°C. The squashes were prepared, with slight modifications, according to Bennett's (1964) schedule for grass-leaf chromosomes and stained with lacto-propionic-orcein (Dyer 1963). Softening in an enzyme mixture (consisting of an equal proportion of 4% solutions of pectinase (Sigma, P–4625) and cellulase (Sigma, C–7202)) for 1 to 1½ hours at room temperature greatly improved spreading of the chromosomes. The preparations were made permanent with the aid of dry-ice (Conger & Fairchild 1953).

Voucher herbarium specimens are lodged in the Herbarium of the Department of Botany, University of Aberdeen (**ABD**).

## RESULTS AND DISCUSSION

This cytological survey (Table 1) of 11 Scottish populations of *F. ovina* collected from a range of habitats confirms the presence of two cytological races, $2n = 2x = 14$ and $2n = 4x = 28$, and in addition reveals, for the first time in Britain, the existence of B chromosomes in individuals of both races.

The B chromosomes show the same staining reaction to carmine or orcein as the A chromosomes and are apparently not heterochromatic. They are smaller than the smallest A chromosomes and have a median centromere (Plates 3A and 3C).

B chromosomes show a similar meiotic behaviour in both diploid and tetraploid individuals. In plants with a single B (Plate 3B), this chromosome in the pollen-mother-cells divides at anaphase I. In individuals carrying two Bs, these chromosomes may form a small bivalent which is readily distinguishable from all the A bivalents (Plates 3D & 3F), or remain unpaired (Plate 3E). The B chromosome bivalent shows normal orientation and congression on the spindle (Plate 3D) and regular disjunction at anaphase I (Plate 3G).

Although it is too early to draw any definite conclusions about the relative frequency of B chromosome-carrying individuals among diploid and tetraploid chromosomal races, it is interesting to note that 21 of the 60 individuals examined (35%) contain either one or two B chromosomes and that approximately 40% of the tetraploid plants possess B chromosomes (Table 1).

TABLE 1. DISTRIBUTION OF B CHROMOSOMES IN DIPLOID AND TETRAPLOID RACES OF *FESTUCA OVINA* IN 11 SCOTTISH POPULATIONS

| Population | Locality | Grid Ref. | Altitude (in feet) | No. of plants with B chromosomes | | | | | | Total plants examined |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *Diploid* | | | *Tetraploid* | | | |
| | | | | 0B | 1B | 2B | 0B | 1B | 2B | |
| P78 | Turriff, v.c. 93 | 38/724.562 | 200 | 1 | 2 | — | — | — | — | 3 |
| P64 | Bettyhill, v.c. 108 | 29/693.573 | 500 | — | 1 | — | — | — | — | 1 |
| P52 | Dinnet, v.c. 92 | 37/431.997 | 600 | 13 | — | 1 | 1 | — | — | 15 |
| P89 | Crianlarich, v.c. 87 | 27/414.255 | 650 | 2 | 1 | — | — | — | — | 3 |
| P85 | Ballater, v.c. 92 | 37/326.968 | 950 | — | — | — | 9 | 3 | 2 | 14 |
| P55 | Braemar, v.c. 92 | 37/128.902 | 1150 | — | 1 | — | 3 | — | — | 4 |
| P34 | Tomintoul, v.c. 94 | 38/131.208 | 1250 | — | — | — | 2 | — | 1 | 3 |
| P21 | Schiehallion, v.c. 88 | 27/724.563 | 1250 | 1 | — | — | 5 | 2 | 1 | 9 |
| P19 | Tomphubil, v.c. 88 | 27/778.546 | 1300 | — | — | — | — | 2 | — | 2 |
| P 8 | Coyles of Muick, v.c. 92 | 37/332.908 | 1650 | — | — | — | — | 1 | — | 1 |
| P82 | Glenshee, v.c. 92 | 37/138.782 | 3000 | — | — | — | 2 | 1 | 2 | 5 |
| | | | | 17 | 5 | 1 | 22 | 9 | 6 | 60 |
| | | % with B chromosomes | | 26% | | | 40% | | | 35% |

The high incidence of B chromosomes in the present limited survey is somewhat intriguing and contrary to expectation, in view of the fact that the only other record of B chromosomes in *F. ovina* is in some of the French populations studied by Bidault (1964, 1968). B chromosomes were not reported in Watson's (1958) extensive cytological survey of British populations.

The occurrence of B chromosomes in polyploid species or intra-specific polyploid cytotypes was at one time regarded as a rare phenomenon, but, according to Jones (1975), such chromosomes are now known to be present in at least 31% of polyploid angiosperms and thus should no longer be considered as exceptional. Within the genus *Festuca*, in addition to *F. ovina*, B chromosomes have previously been observed in polyploid taxa in four other species (Table 2).

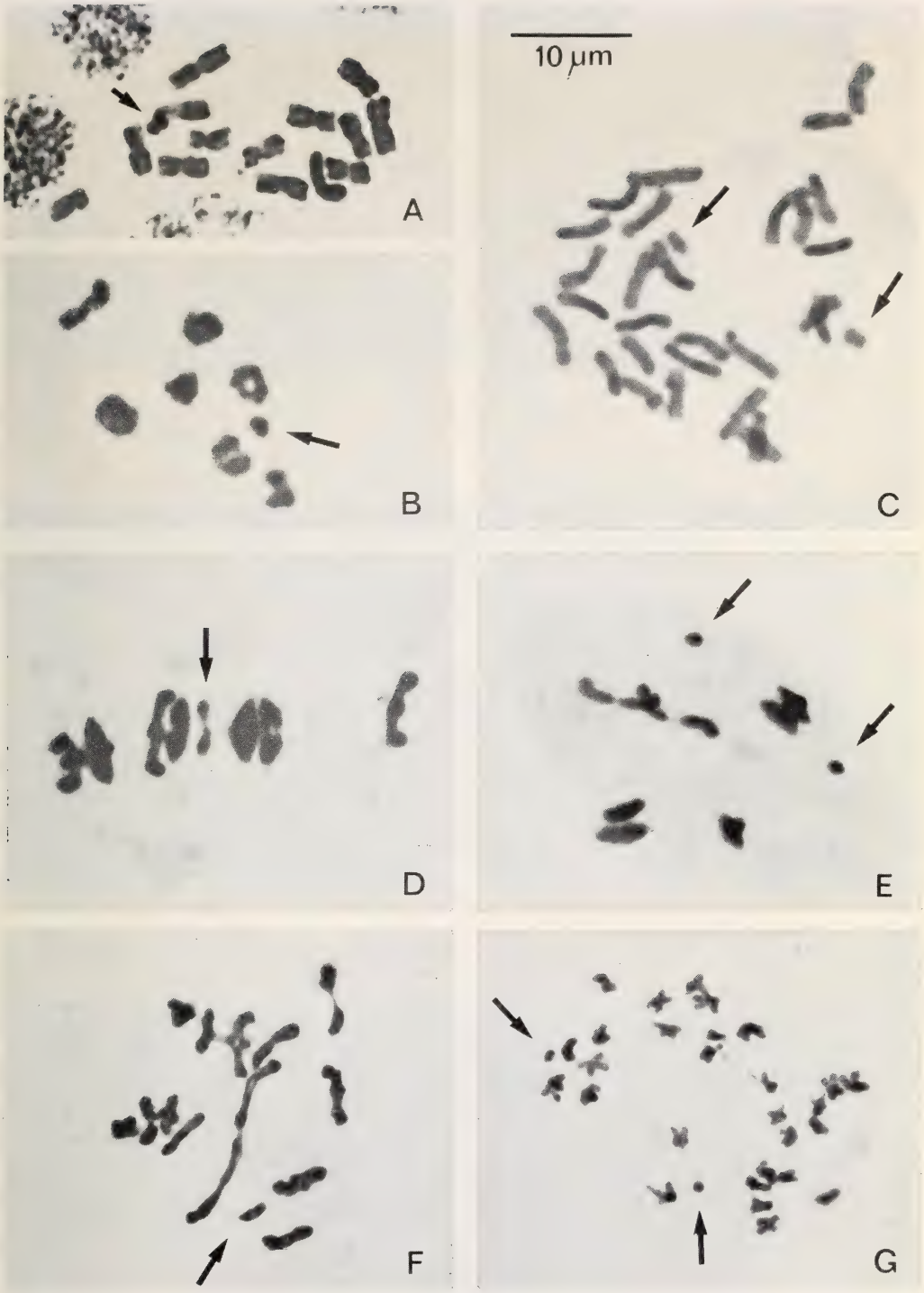



PLATE 3. Chromosomes of *Festuca ovina sensu lato*. Code numbers of populations refer to those in Table 1. Arrows indicate B chromosomes. A: Population P64. Somatic C-metaphase ($2n = 14+1B$) in shoot intercalary meristem. B: Population P64. Meiotic metaphase I ($n = 7II+1B$) in p.m.c. from same individual as in Plate 3A. C: Population P85. Somatic C-metaphase ($2n = 4x = 28+2B$) in shoot intercalary meristem. D: Population P52. Meiotic metaphase I ($n = 7II+2B$) showing a B bivalent. E: Population P52. Meiotic metaphase I from same individual as in Plate 3D, showing two B univalents. F: Population P85. Meiotic metaphase I ($n = 12II+1IV+1BII$) in p.m.c. from same individual as in Plate 3C. G: Population P85. Meiotic anaphase I from same individual as in Plate 3F, showing regular disjunction of B chromosomes and unequal distribution of A chromosomes (13 and 15).

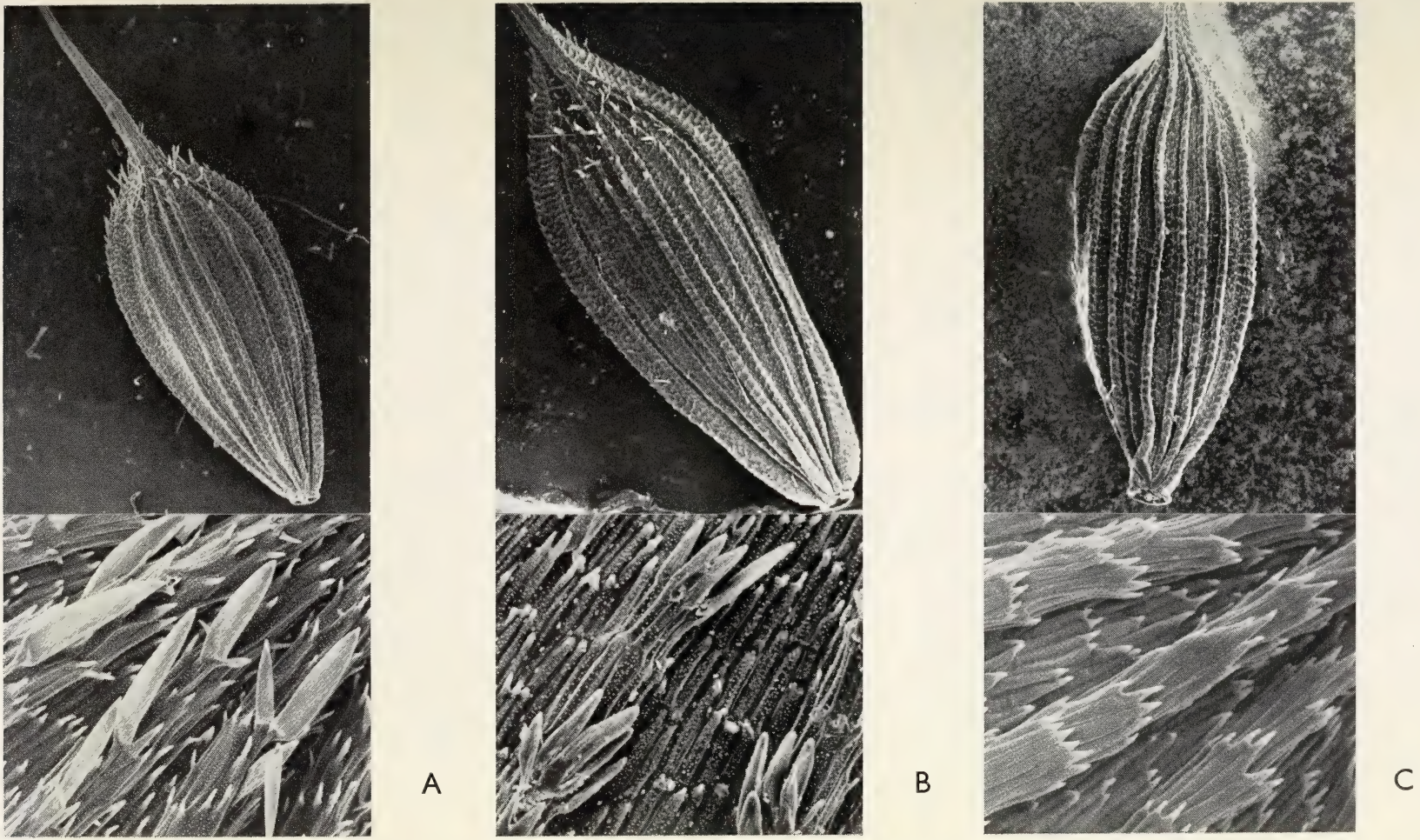



PLATE 4. Achenes of A. *Lactuca serriola*, B. *Lactuca virosa*, and C. *Lactuca saligna*. Above: whole achene × 20; below: enlarged view of faces near the beak × 200.

TABLE 2. B CHROMOSOMES IN POLYPLOID TAXA IN *FESTUCA* L.

| | Polyploid level ($x = 7$) | No. of B chromosomes | Reference |
|---|---|---|---|
| *F. arundinacea* Schreb. *sensu lato* | 6*x* | 0–3 | Borrill *et al.* (1971, 1976) |
| | 8*x* | 0–4 | Borrill *et al.* (1971, 1976) |
| *F. mairei* St Yves | 4*x* | 0–6 | Malik & Tripathi (1970) |
| *F. ovina* L. *sensu lato* | 4*x* | 0–4 | Bidault (1964, 1968) |
| | | 0–2 | Present study |
| | 6*x* | 0–2 | Bidault (1968) |
| | 8*x* | 0–2 | Bidault (1968) |
| *F. rubra* L. | 6*x* | 0–1 | Flovik (1938, 1940) |
| *F. varia* Haenke | 4*x* | 0–2 | Rougeot (1974) |
| subsp. *eu-varia* Hack. | 6*x* | 0–2 | Rougeot (1974) |

There is now a strong body of evidence that points to the influence of B chromosomes on recombination of A chromosomes at meiosis; thus they probably exert an important effect on the adaptive variability of diploid species (Rees 1974, Jones 1975). Their role in polyploid cytotypes still remains to be investigated. A detailed analysis of their influence on chiasma frequency and other features of the genetic system in the two cytological races of *F. ovina*, and of the ecological distribution of the various cytotypes, is now in progress.

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# Prickly Lettuce (*Lactuca serriola* L.) in Britain

S. D. PRINCE and R. N. CARTER

*Department of Plant Biology and Microbiology,*
*Queen Mary College, University of London*

ABSTRACT

*Lactuca serriola* L. has cauline leaves which are either runcinate-pinnatifid or else unlobed, the latter being the more common in Britain; intermediate forms do not occur. The plants with pinnatifid leaves have a more restricted distribution in Britain, but are the commoner form in continental Europe. The



FIGURE 1. Location of *Lactuca serriola* sites studied (crosses) showing the limit of common occurrence in Britain (dashed line) and the occasional occurrences (circles) outside the limit. Data partly supplied by the Biological Records Centre.

taxonomic treatment of leaf-shape variation in *L. serriola* is revised; the pinnatifid-leaved form is given the name *L. serriola* L. forma *serriola* and the unlobed-leaved form is given the name *L. serriola* L. forma **integrifolia** (S. F. Gray) S. D. Prince & R. N. Carter, **comb. et stat. nov.**

The characters which distinguish *L. serriola*, *L. virosa* L. and *L. saligna* L. (the three wild British species) are reviewed and emphasis is placed on achene morphology. The geographical distribution and habitat preferences of the three species are described and a key to the British members of the genus *Lactuca*, including *L. sativa* L., is provided.

## INTRODUCTION

*Lactuca serriola* L. is a conspicuous plant of waysides and disturbed sites in south-eastern England. Its distribution (Fig. 1) is limited to the area south-east of a line from Exeter to Birmingham—taking in the part of South Wales bordering the Severn estuary—and south of the line from Birmingham to Boston on the east coast. Within this area it is most common in the counties bordering on London.

Only two other species of *Lactuca* are native in Britain—*L. virosa* L. and *L. saligna* L. However, all three species are members of the Section *Lactuca* Sub-section *Lactuca* (Feráková 1976) and have morphological similarities, so that it is difficult for the newcomer to the genus, even with the help of the keys and descriptions in modern Floras, to determine to which species a specimen belongs. Such difficulties are derived, at least in part, from published descriptions which underestimate phenotypic variation and neglect some useful characters, among them the existence of two relatively distinct leaf-shapes in *L. serriola*. Having examined approximately 70 sites in which *L. serriola* grows (Fig. 1) we are able to provide a more accurate description of the British material and an improved key to separate the British species of *Lactuca*.

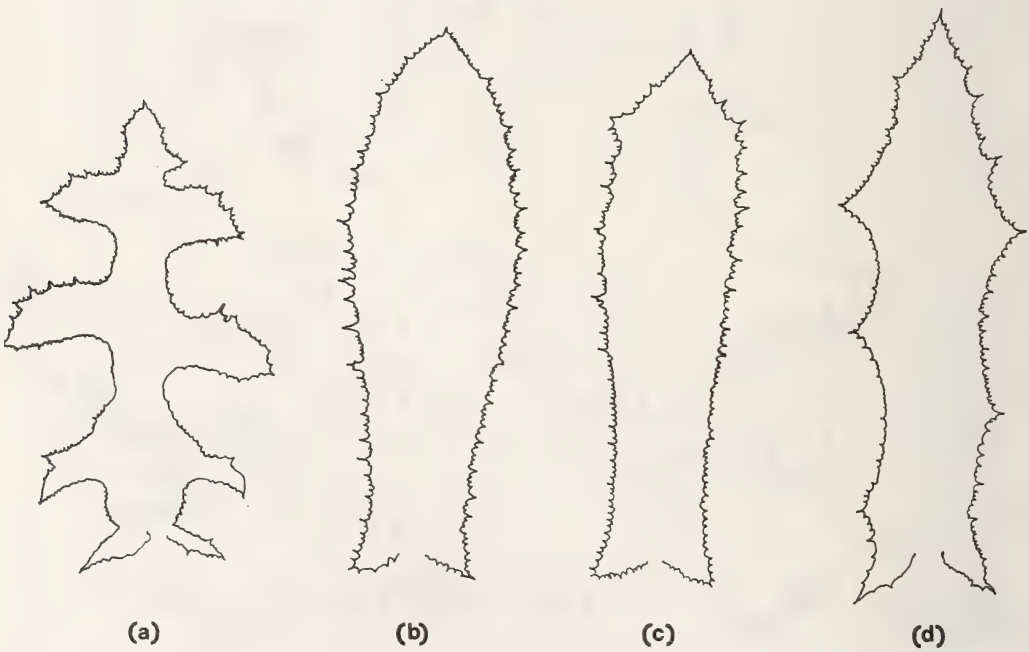



FIGURE 2. Outlines of cauline leaves of *Lactuca serriola* from Britain. (a) Runcinate-pinnatifid leaf of forma *serriola*; (b) and (c) unlobed leaves of forma *integrifolia*, (c) showing the triangular tip; (d) lobed leaf of a lateral stem of forma *integrifolia*.

INFRASPECIFIC VARIATION

All the plants in the 70 wild populations of *L. serriola* can be assigned without difficulty to one of two distinctive forms characterized by the shape of the cauline leaves, which may be either unlobed (Fig. 2b), often with a triangular tip (Fig. 2c), or else pinnatifid (Fig. 2a); both leaf-shapes have irregularly denticulate to dentate, spinose-ciliate margins. These two forms have been found together in some of the sites but no intermediates were found. The leaf shapes are maintained in cultivation and are undoubtedly inherited. Feráková (1970) described similar variation in leaf-shape in other species of *Lactuca*.

The absence of intermediate leaf-shapes suggests either that the plant is an inbreeder or that a single gene controls leaf-shape. In fact both explanations appear to apply to *L. serriola*. The structure of the *Lactuca* floret is such that self-pollination normally occurs, although cross-pollination can be achieved artificially. Clearly there are no absolute barriers to cross-pollination,

TABLE 1. INFRASPECIFIC VARIATION IN RATE OF DEVELOPMENT OF *LACTUCA SERRIOLA*

| Origin | Experiment 1,* 1975 | | | | Experiment 2,* 1976 |
|---|---|---|---|---|---|
| | Stage of development (No. of plants) | | | Days from planting to first flower | Date of 50% capitula shedding |
| | Rosette | Bolted | Flowering | | |
| British collections | | | | | |
| Waltham Abbey, Bucks., v.c. 24 | 14 | | | 171 | 23 July |
| Aylesbury, Bucks., v.c. 24 | 12 | 6 | | 150±28 | 25 July |
| Oxford, Oxon., v.c. 23 | 14 | 3 | | 121±67 | |
| Pershore, Worcs., v.c. 37 | 18 | | | 187±26 | |
| Bedford, Beds., v.c. 30 | 17 | 1 | | 167±42 | |
| Rugby, Warks., v.c. 38 | 16 | 2 | | 127±20 | |
| Peterborough, Northants., v.c. 32 | 18 | | | 181±48 | |
| Tixover, Rutland, v.c. 55b | 6 | 12 | | 111±6 | |
| Southampton, S. Hants., v.c. 11 | 17 | 1 | | 156±67 | |
| Continental European collections | | | | | |
| Godollo, Hungary | 14 | 3 | | 184±16 | |
| S. Slovakia, Czechoslovakia | 18 | | | 189±13 | |
| Liège, Belgium | 16 | 2 | | 166±22 | |
| Berlin, E. Germany | 17 | | | 167±19 | |
| Warsaw, Poland | | 17 | 1 | 74±2 | |
| Erevan, U.S.S.R. | 6 | 4 | | 114±14 | |
| Portugal | | 16 | | 82±12 | |
| Lund, Sweden | 18 | | | 190 | 19 August |

* Experiment 1. 18 plants of each collection grown in 7·5cm pots in glasshouse, minimum temperature 15° C. Sown 25 April. Stage of development assessed 30 June. Mean days to opening of first flower and 95% confidence limits.

Experiment 2. 5 plants of each collection sown in field plots at Dytchleys, Essex, October 1975. Capitula counted each day after first opening, 50% shedding estimated from curve of accumulated number against time.

but in *L. sativa* natural cross-pollination of varieties grown in adjacent rows does not exceed 2·87% (Thompson *et al.* 1958). On the other hand, Lindqvist (1958) has proposed that leaf-lobing in *L. serriola* is controlled by two alleles at a single locus—pinnatifid leaves being dominant and unlobed leaves recessive; he also found a dominant allele which determines an 'oak' leaf-shape in Italy but we have not found any plants with leaves of this type in Britain. Lindqvist examined specimens from Harwich and Romford and found them to be homozygous for the recessive and dominant alleles respectively. Since in the many populations we have examined there were no intermediate leaf-shapes, it seems reasonable to accept that the difference is a result of a single gene,

In an attempt to encourage cross-pollination, two 250 × 350 mm trays each containing 15 plants. some with pinnatifid leaves and others with unlobed leaves, were kept in the open throughout the flowering period and the leaf-shapes of their progeny were examined. In all cases the maternal leaf-shape was maintained. Under these particularly favourable conditions for cross-pollination, the failure to detect pinnatifid-leaved plants among the progeny of unlobed-leaved female parents (as would have been expected given the genetic system proposed by Lindqvist) suggests that, although there are no absolute barriers to natural cross-pollination, it is nevertheless an extremely rare occurrence. Our failure to detect segregation of leaf-shapes in these, or in any other of our collections of pinnatifid-leaved plants, suggests that, like those examined by Lindqvist, they are homozygous for the alleles controlling leaf-shape.

Unlobed-leaved plants occasionally bear leaves with very slight lobing (Fig. 2d). These are generally found on the lateral stems arising from the base of the plant. However, the indentations are shallow and unlobed leaves are always to be found elsewhere on the plant.

Most Floras correctly describe the runcinate-pinnatifid leaf-shape, but either neglect to mention the unlobed leaf-shape or suggest that it is uncommon. In our experience, however, unlobed-leaved plants are much the commoner; of the 70 sites examined only 8 contained pinnatifid-leaved plants, and only at Aylesbury was the population composed exclusively of such plants.

Infraspecific variation can be demonstrated in a number of physiological characters and an example is given in Table 1. For the collections listed there, there is less variation among the British plants than there is among those from continental European sites—for example the range in mean number of days to flowering in the Continental plants is 74 to 189 days compared with 111 to 187 days in the British plants. The experiments so far have not been sufficiently extensive to establish any correlation of phenological variation with the climate at the site of origin, except that the British collection which flowers most rapidly is from a site near the northern limit (Tixover, v.c. 55b). The British material examined is likely to be more representative of the variation among British plants than are the few available Continental collections of continental European plants as a whole and so it is probable that the range of variation present on the Continent is even more extensive than we have found so far.

Apart from the different leaf-shapes, there is relatively little genetic variation in morphology between British collections of *L. serriola*, but there is great phenotypic plasticity. Under favourable conditions plants are commonly 1·8m high with 10 or more lateral branches from the base reaching almost the same height and together bearing 2,000 capitula, whereas plants growing under unfavourable conditions may be as little as 0·15m high with a single stem and 20 capitula. Such small plants are often found on compacted ground or in dense grass swards near stands of taller *L. serriola* plants. Most Floras, e.g. Clapham (1962), underestimate the maximum height: the range for British plants in the wild is (0·15–) 0·3–1·9 (–2·1)m.

## COMPARISON OF *L. SERRIOLA*, *L. VIROSA* AND *L. SALIGNA*

The three members of the genus found wild in Britain are easily identified when fruiting, although it is also possible to identify non-fruiting, and even vegetative plants. A list of the most useful diagnostic features is given in Table 2. The characters are based on plants growing in the wild, and remain constant in cultivation.

The achenes (cypselae) we have examined from populations of each species have no primary dormancy and on shedding in late summer will germinate as soon as the soil surface is wet. The rate of germination declines during the winter but increases during mild periods and again in the spring. Young plants of all three species form rosettes which can be identified once the first true

TABLE 2. COMPARISON OF DIAGNOSTIC CHARACTERS OF *L. SERRIOLA*, *L. VIROSA* AND *L. SALIGNA*

| | *L. serriola* | *L. virosa* | *L. saligna* |
|---|---|---|---|
| Overwintering rosette | Leaves oblong-obovate, unlobed or, later in development, indented, green | Leaves oblong-obovate, unlobed, broader than *L. serriola*, grey-green, often with maroon veins | Leaves pinnatifid, green. Rosette often with prostrate, spreading lateral stems each terminated with a smaller leafy rosette |
| Stem leaves | Unlobed or runcinate-pinnatifid, flat | Unlobed or pinnatifid, margins undulate | Lower stem leaves runcinate-pinnatifid, upper linear-lanceolate, flat |
| | Prickly, particularly on underside of main veins | Prickly, particularly on underside of main veins | Few stiff hairs only on underside of main veins |
| | Leaves held twisted at the base, often all arranged in the same vertical plane, the white stem and midribs giving a 'herring-bone' pattern visible from a distance | Some leaves twisted at base, but not all arranged in the same vertical plane | Leaves not obviously twisted |
| Height | Up to 2·1m | Up to 2·5m | Less than 1m |
| Bracts | Spreading auricles | Auricles clasping stem | Auricles clasping stem |
| Colour | Leaves often glaucous with white midrib | Leaves green, often with maroon patches especially along veins | Leaves green |
| | Stems whitish | Stems maroon | Stems whitish |
| | Inflorescence green | Inflorescence tinged maroon | Inflorescence green |
| Inflorescence shape | Inflorescence branches (as distinct from lateral stems) arising only from upper half of stem, erect | Inflorescence branches arising from lower part of stem as well as upper part, large and spreading | Inflorescence essentially a single stem with tightly clustered capitula on short branches |
| Achenes | Olive-grey, mottled | Maroon | Olive-grey, mottled |
| | (2·8–)3–4(–4·2) × 0·8–1·3mm | (4–)4·2–4·8(–5·2) × (1–)1·3–1·6(–1·7)mm | 2·8–3·5 × 0·7–1·2mm |
| | Broadest $\frac{2}{3}$–$\frac{3}{4}$ from base | Broadest in middle | Broadest $\frac{2}{3}$–$\frac{3}{4}$ from base |
| | Margins narrow | Margins broad | Margins narrow |
| | Very bristly on the sides where it narrows into the beak and on the faces above, bristles simple | Bristles mainly on the faces near the beak, palmate | No bristles |
| | 5–7(–8) ribs | (6–)7–8(–9) ribs | 7–10 ribs |
| | Beak equalling or slightly shorter than achene | Beak much shorter than achene | Beak longer than achene |
| Life cycle | Annual or winter annual | Winter annual or biennial | Annual or winter annual |

leaves are fully expanded. In *L. serriola*, the rosette leaves are oblong-obovate and bright green; the first are always unlobed but, in pinnatifid-leaved plants, those appearing later may have indentations. In *L. virosa* they are broader and grey-green, often with maroon patches on the veins and lamina. In *L. saligna* they are bright green and pinnatifid from an early age; well-grown rosettes may have prostrate lateral stems spreading radially, each terminated with a smaller rosette of leaves. Autumn- and spring-germinated *L. serriola* and *L. saligna* plants normally flower in the following summer and are therefore winter or spring annuals. Autumn-germinated *L. virosa* plants are normally winter annuals, but occasionally poorly-grown plants behave as biennials passing the first summer as rosettes, as do spring-germinated plants.

The species are easily distinguished from each other when the leafy stems extend in early summer, prior to flowering. The leaves of *L. serriola* have a broad, white midrib, the same colour as the

stem. The midribs are twisted at the base such that the laminas lie in the same vertical plane, in two rows which are on opposite sides of the white stem (Hegi 1928). This results in a characteristic herring-bone pattern readily seen from a distance. The undersides of the midribs bear large, regularly spaced, spines. In *L. virosa*, the lower cauline leaves are unlobed while the upper leaves may be either unlobed or pinnatifid. Although the midribs are often twisted at the base causing the laminas to be held vertically at right-angles to the axis of the stem, the laminas are still arranged spirally around the stem and not orientated into two rows as they are in *L. serriola*. The stems are maroon, in marked contrast to the other two species. In *L. saligna*, the lower cauline leaves are runcinate-pinnatifid and the segments are very narrow. The upper leaves are linear-lanceolate, with no lobes and no spines on the underside of the midrib. The whole plant rarely exceeds 0·5m in height, whereas the other species often approach 2m.

The inflorescences have characteristic shapes. The branches of the *L. serriola* inflorescence are held upright and many terminate at approximately the same height, producing a sub-corymbose panicle. Well-grown *L. virosa* plants have large inflorescence branches which spread and create an asymmetric, diffuse panicle. In *L. saligna* they are contracted to give clusters of capitula along the spike-like inflorescence.

Ripe achenes provide an easy and reliable means of identification, but about these there is a degree of confusion in some Floras. Plate 4 illustrates achenes of each species; clearly there are differences in shape, size and the presence of bristles on the upper parts of the achenes; another character is the colour—olive-grey, mottled with lighter and darker patches in *L. serriola* and *L. saligna*, deep maroon in *L. virosa*. Exact dimensions of the achenes are given in Table 2. The achenes of *L. virosa* are both longer and broader than those of the other two species; they are more oval in outline and have a broad, wing-like border. Only *L. serriola* and *L. virosa* have bristle-like appendages on the upper part of the achenes. These bristles are very obvious in *L. serriola* since they are colourless and contrast with the olive-grey achene, and are particularly numerous on the sides of the achene where it narrows into the beak. Maroon bristles which have a palmate structure are a constant character in *L. virosa*. The length of the beak (the distance from the insertion of the pappus to the point where achene pigmentation starts) also differs between the species: in *L. saligna* the beak is longer than the achene, in *L. serriola* it is about the same length, and in *L. virosa* it is shorter. Using the colour, size, bristles and beak-length it is possible to identify each of the wild species.

## ACHENE CHARACTERS OF *L. SATIVA*

*L. sativa*, the cultivated lettuce, exists in many varieties and all of the 31 we have examined have achenes shaped like those of *L. serriola*, although in most cases they are somewhat larger ((3·2–) 3·5–4(–5) × (1–)1·2–1·5mm). Their colour is either olive-grey, as in *L. serriola* (and commercially referred to as 'black-seeded'), or colourless ('white-seeded'); and there is a range from those with no bristles to some with large, simple bristles identical with those of *L. serriola*. The *L. virosa* achene-type, with palmate bristles, is not found in *L. sativa*.

## HABITATS

*L. serriola* behaves as a ruderal in Britain. It is most commonly, though not always, found in places where large amounts of earth have been moved; new housing estates and the verges of new roads are typical sites. Very occasionally it is reported from natural habitats such as shingle banks, but in the main it is confined to places affected by man's activities. It is never found on waterlogged ground although it may occur on the well-drained sides of dykes in low-lying districts. It is not found on acid peat although it grows well on fen peat; it is rarely found on skeletal calcareous soils.

*L. virosa* is more usually found in naturally unstable habitats, such as sand-dunes and cliff-ledges, although it is also found on gravel workings, quarries, industrial estates and roadside verges. It is frequently found on chalk and oolitic limestone and can occur at woodland margins. It is found further north than *L. serriola*, reaching the River Tweed and possibly the Firth of

Forth. *L. saligna* is known to us only on one sea wall in W. Kent (v.c. 16), although colonies have been reported at Rye, E. Sussex (v.c. 14) up to 1975 and at Seasalter, E. Kent (v.c. 15). *L. saligna* has not been found at the inland sites near Earith, Hunts. (v.c. 31) for a number of years and is probably extinct there.

## NOMENCLATURE

Linnaeus made no mention of *Lactuca serriola* in the first edition of *Species Plantarum* (1753). He first published the name in *Centuria II Plantarum* (1756), validating it by reference to several earlier descriptions. Also in 1756 he published the name *Lactuca scariola* in *Flora Monspeliensis*, but he did not describe it or refer to any earlier description; this omission was corrected when the work was later reprinted in *Amoenitates Academicae* IV (1759) and *L. scariola* appears in the second edition of *Species Plantarum* (1762). The existence of two Linnaean names for the same plant inevitably gave rise to confusion, both being used by nineteenth century authors, but *L. serriola* is the correct name having the earlier valid publication (Stearn 1973).

Taxonomists have long distinguished *L. serriola* plants having unlobed leaves from those having pinnatifid leaves. Several early authors described them as altogether different plants, e.g. Ray (1690), although Magnol had earlier (1676) referred to them as variants of the same taxon. There are good reasons for according these leaf-shape variants taxonomic recognition and in our opinion the appropriate rank is that of forma. Whereas the pinnatifid-leaved plant is the less common variant in Britain (having a particularly restricted south-eastern distribution), on the Continent it is the more abundant of the two. The arguments for this treatment of polymorphic variation in general are presented by Valentine (1975).

Linnaeus treated the pinnatifid-leaved form of *L. serriola* as typical, referring in *Centuria II Plantarum* (1756) to *Lactuca sylvestris laciniata*, Morison, *Hist.* 3: 58, S7, t.2, f.17 (1715), which is a pinnatifid-leaved plant as both the description and the illustration show. The only *L. serriola* specimen in **LINN** (labelled *L. scariola*) is a pinnatifid-leaved plant. This argument is supported by the fact that *L. serriola* var. γ in *Centuria II Plantarum* (1756) is an unlobed-leaved plant based on *Lactuca sylvestris annua costa spinosa, folio integro colore caesio*, Morison, *Hist.* 3: 58, S7, f. 15 (1715).

The first post-Linnaean reference to an unlobed-leaved plant was by Allioni (1785) who gave it the name *L. augustana*; but this plant had no prickles (Lindqvist 1960) and is not found in Britain. Gray (1821) described a variety of *L. virosa* with unlobed leaves and called it var. *integrifolia*; this was based on *Lactuca sylvestris folio non-laciniato* Ray (1690), the description of which agrees with unlobed-leaved *L. serriola*. Although there is no Ray specimen labelled with this name there is one in the herbarium of the Rev. Adam Buddle, now incorporated in the Sloane Herbarium (H.S. 118 folio 2, **BM**), and this is definitely unlobed-leaved *L. serriola*. In his introduction to the third edition of Ray's *Synopsis* (1724), Dillenius acknowledged Buddle's herbarium, stating that 'it is of great value in determining the plants of the *Synopsis*'. Because many of the older British Floras, e.g. Bentham (1865), suggested that all unlobed-leaved forms of *Lactuca* should be assigned to *L. virosa*, there has been much confusion among British botanists over the correct name of the unlobed-leaved form of *L. serriola*, and many pre-1910 herbarium specimens were wrongly named (e.g. in **BM**). Around 1920 the error was realized and varietal names of Continental origin were adopted (e.g. Druce 1913, Little 1931, Lousley 1933); however none of these were published as early as Gray's var. *integrifolia*. We now propose a name for the unlobed-leaved plant and give the synonymy of both forms.

*Lactuca serriola* L. forma *serriola*
*L. scariola* var. *vulgaris* Bischoff, *Beiträge Flora Deutschlands und der Schweiz*, 189 (1851)
*L. scariola* var. *typica* Rouy, *Flore de France*, **9**: 198 (1905)
LECTOTYPUS: Herb. Linn. 950.3 (**LINN**)

*Lactuca serriola* L. forma **integrifolia** (S. F. Gray) S. D. Prince & R. N. Carter, **comb. et stat. nov.**
*L. virosa* var. *integrifolia* S. F. Gray, *Natural Arrangement of British Plants*, **2**: 417 (1821)
*L. scariola* var. *integrata* Grenier & Godron, *Flore de France*, 320 (1850)
*L. scariola* var. *integrifolia* Bogenhard, *Flora von Jena*, 269 (1850)
*L. scariola* var. *integrifolia* Bischoff, *Beiträge Flora Deutschlands und der Schweiz*, 189 (1851)

*L. dubia* Jordan, *Pugillus Plantarum Novarum*, 119 (1852)
*L. integrata* (Grenier & Godron) A. Nelson, *New Manual of Botany of the Central Rocky Mountains*, 596 (1909)
LECTOTYPUS: *A. Buddle*, H.S. 118 folio 2 (**BM**)

KEY TO BRITISH SPECIES OF *LACTUCA*

1 Cauline leaves entire, margins not spinose-ciliate; involucral bracts appressed to the ripe achenes .. .. .. .. .. .. .. .. .. .. *L. sativa*
1 Cauline leaves pinnatifid or, if not lobed, margins spinose-ciliate; involucral bracts patent or reflexed at maturity
2 Midrib on underside of cauline leaves glabrous or sparsely hispid, without spines; inflorescence narrow with capitula tightly clustered on short branches; ripe achenes not bristly at apex .. .. .. .. .. .. .. .. *L. saligna*
2 Midrib on underside of cauline leaves spinose; inflorescence a broad panicle; ripe achenes bristly at apex
3 Ripe achenes (4−)4·2–4·8(−5·2) × 1·3–1·6(−1·7)mm, maroon; stem maroon; upper stem leaves undulate and, if held vertically, not all in one plane *L. virosa*
3 Ripe achenes (2·8−)3–4(−4·2) × 0·8–1·3mm, olive-grey; stem and midribs of leaves whitish; upper cauline leaves flat, held vertically, often all in one plane
4 Cauline leaves deeply runcinate-pinnatifid .. .. *L. serriola* forma *serriola*
4 Cauline leaves undivided or shallowly lobed .. .. *L. serriola* forma *integrifolia*

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# *Sorbus torminalis* (L.) Crantz in Derbyshire

A. WILLMOT

*Division of Biological Sciences, Derby College of Art and Technology*

ABSTRACT

The recorded history and present distribution of *Sorbus torminalis* (L.) Crantz in Derbyshire are described and the species is reassessed as native in the county.

## INTRODUCTION

*Sorbus torminalis* (L.) Crantz is a rare but widely distributed tree of old woods and hedges in southern Britain, extending up the eastern coast as far as the Humber and further north up the western coast to Cumbria. It occurs mostly on clay soils, though it also grows on limestone and occasionally on sand. 'Old woods' is used here to refer to woods that have a long and continuous history and which are possibly remnants of the original woodland cover. The rarity of the species has meant that it is unfamiliar to many botanists, which has led to its being under-recorded and to its status being misinterpreted. The current national survey of the species is, to a large extent, correcting this lack of information. The work reported here was inspired by this survey and the finding of the species in two new and apparently native, widely separated sites in 1974.

## RECORDED HISTORY IN DERBYSHIRE

Glover (1831) gave the first record of the species in the county, but this was not localized and later workers have considered his plant records as unreliable (Linton 1903). There is, however, a localized 19th century record from an herbarium specimen (**DBY**): 'The Hagg Rocks, Matlock 1860', although the collector of this specimen is uncertain. There were a number of Floras, both local and county, published in Derbyshire around the turn of the century. Garneys (1881), covering just the parish of Repton, did not mention the species nor did Painter (1889); however, it was recorded for Repton by P. B. Mason (Anon. 1897). The supplement to Painter's Flora (Painter 1902) omitted the species, but Linton (1903) recorded it as 'scarcely native' and cited a specimen from Repton in P. B. Mason's herbarium. Mason's herbarium survives (**BON**) but unfortunately no longer contains any Derbyshire specimens of this species.

Jackson & Sheldon (1949) recorded trees and young plants of *S. torminalis* at Markland Grips in north-eastern Derbyshire. This record, however, appears to have been overlooked as Perring & Walters (1962) gave only one record for Derbyshire (GR 43/2.4) and that a supposed introduction; this may be an error, as it cannot now be traced. Clapham (1969) assessed the species as 'Very doubtfully native', gave no recent records and referred only to the record given by Linton (1903).

The recorded history of *S. torminalis* in Derbyshire is, therefore, fairly long but rather chequered, with some authors recording the species and others apparently ignorant of these records or believing them to be introductions.

## PRESENT OCCURRENCE IN DERBYSHIRE

*Sorbus torminalis* has six recent localities in Derbyshire known to me (Fig. 1, Table 1). I have seen it at five of these since 1974, but I have failed to find it on a number of visits to the sixth locality, at Markland Grips (Jackson & Sheldon 1949). However, Prof. C. D. Pigott (pers. comm.




FIGURE 1. The distribution of *Sorbus torminalis* in Derbyshire and parts of adjacent counties. The distribution in Derbyshire is shown by dots, and in parts of adjacent counties areas where the species is relatively frequent are surrounded by dashed lines (NF = Needwood Forest, ML = Magnesian Limestone of southern South Yorkshire). The grid lines are the 10 kilometre lines of the National Grid; the areas of dense shading are the built-up areas of Derby (D) and Chesterfield (C); and the area of light shading is the parish of Repton.

1974) saw the species there in 1959. In the county the species occurs in two distinct habitats: species-rich hawthorn hedges (3 records), and woodlands (3 records). 'Species-rich hedges' is used here to refer to hedges that contain a number of abundant woody species. Four of the localities are on limestone (3 woodland and 1 hedge) and there is one record each on Keuper Marl and Coal Measure Shales. At each site the species is very rare, existing as only one or two individuals, except in Scarcliffe Park where about 25 are known and at Markland Grips where Jackson & Sheldon (1949) indicated that there were more than one or two individuals.

At Church Broughton, on the Keuper Marl, the species occurs in a hedge on a field boundary which is known to date back to the earliest field map of the parish (1626). Here there is a small tree which produces abundant flowers, seeds and suckers. Germination tests showed that less than 5% of the seeds germinated after one winter. This is a species-rich hedge containing eight woody species. *Tilia cordata* occurs in three adjacent hedges but neither species occurs in any of the other 1,104 hedges examined in the parish or in a further 400 hedges examined within twenty kilometres of Derby, except that *T. cordata* occurs in obviously planted situations in one or two hedges near houses. At Staveley, on the Coal Measure Shales, *S. torminalis* occurs along 20ft of a hedge which contains 13 woody species. This hedge is alongside an unmade road between farms. The third hedge site is at Whitwell, on the Magnesian Limestone, where again the species occurs along 20ft of the hedge. This hedge similarly contains 13 woody species and is alongside an unmade field lane.

Two of the woodland sites are on steep-sided valleys with rock outcrops: Markland Grips, on the Magnesian Limestone, and Hagg Rocks, on the Carboniferous Limestone. At the latter site there are two individuals—a gnarled bush and a vigorous, small, standard tree, growing in a patch of mixed scrub at the edge of the *Tilia* woods described by Pigott (1969). Leaves from the gnarled bush and the specimen in **DBY** dated 1860 differ from typical leaves of the species in being less indented which suggests that the two collections came from the same population. The Markland Grips site is a species-rich deciduous woodland and the population there consisted of trees and seedlings (Jackson & Sheldon 1949). The record of seedlings is interesting as the species is only rarely recorded as producing seedlings in the wild in Britain (Pigott 1973, Pollard 1973). The third woodland site, Scarcliffe Park, consists mostly of recent plantations but contains areas of mixed woodland with a species-rich shrub layer (Elkington 1969) and it is from one of these that the record in Table 1 comes. No obvious seedlings occur here but suckers around the one small tree are abundant. The species has been found at two further sites in the wood since the record in Table 1 was made. At one of these, in a habitat very similar to the first, there are ten small trees with suckers but at the second new site, in a young conifer plantation, only suckers are present.

The present distribution of the species in Derbyshire may therefore be summarized as follows: the species is very scattered in woods and species-rich hedges on a wide range of soils in southern and eastern Derbyshire up to an altitude of about 500ft.

## STATUS OF THE SPECIES IN DERBYSHIRE

At two sites, Markland Grips and Hagg Rocks, the species occurs in mixed deciduous woodland on steep-sided valleys with crags, which are considered the most natural areas of vegetation on the Derbyshire limestones (Elkington 1969). Furthermore, these particular localities have been singled out as bearing woodlands of a much greater age than the majority of similar sites in the county (Jackson & Sheldon 1949, Pigott 1969). At two of the *Sorbus torminalis* sites at Scarcliffe Park there is a species-rich shrub and herb flora with a dense growth of *Mercurialis perennis*; both of these features are considered characteristic of old woods. Hedges are man-made features but the hedges in which the species occurs are species-rich, a feature which has been shown to be indicative of age by Pollard, Hooper & Moore (1974) for the Midlands in general, and by Willmot (1977) for southern Derbyshire.

The most interesting species associated with *Sorbus torminalis* (Table 1) are *Tilia cordata* and *T. platyphyllos*; these species are not common in Derbyshire and are generally associated with old woods (Clapham 1969). Pigott (1973) recorded a similar association between *Sorbus torminalis* and *Tilia cordata* in old woods in Lancashire and Cumbria, and in the Midlands. Other associated

TABLE 1. LISTS OF VASCULAR PLANTS FOR THE DERBYSHIRE *SORBUS TORMINALIS* SITES

| Name of Site | Church Broughton | Staveley | Whitwell | Scarcliffe Park | Markland Grips | Hagg Rocks |
|---|---|---|---|---|---|---|
| Grid Reference | 43/219.325 | 43/423.765 | 43/532.788 | 43/513.713 | 43/508.748 | 43/297.575 |
| Type of Habitat | Hedgerow | Hedgerow | Hedgerow | Woodland | Woodland on cliff edge | Woodland on cliff edge |
| Altitude (ft) | 200 | 200 | 350 | 350 | 350 | 450 |
| Sub-soil | Keuper Marl | Coal Measure clay | Magnesian Limestone | Magnesian Limestone | Magnesian Limestone | Carboniferous Limestone |
| Date of Survey | 3.8.1974 | 19.10.1974 | 22.7.1975 | 20.8.1974 | c 1949 | 20.10.1974 |
| Species | | | | | | |
| (a) Woody | | | | | | |
| *Acer campestre* | * | * | * | * | | * |
| *A. pseudoplatanus* | | | | * | | * |
| *Betula* sp. | | | | * | * | |
| *Buxus sempervirens* | | | | | | * |
| *Crataegus monogyna* | * | * | * | * | * | * |
| *Corylus avellana* | * | * | * | * | * | * |
| *Euonymus europaeus* | | | * | | | |
| *Fagus sylvatica* | | | | * | | * |
| *Fraxinus excelsior* | | * | * | * | * | * |
| *Hedera helix* | * | * | * | | * | |
| *Ilex aquifolium* | * | | * | | * | |
| *Ligustrum vulgare* | | | | * | | * |
| *Malus sylvestris* subsp. *sylvestris* | | * | | * | | |
| *Populus tremula* | | * | | | | |
| *Prunus spinosa* | * | * | * | | | |
| *Quercus robur* | * | * | * | | * | |
| *Rhamnus catharticus* | | | | | * | |
| *Rosa* sp. | * | * | * | * | | |
| *Rubus fruticosus* | * | * | * | * | * | * |
| *Salix* sp. | * | * | | | | |
| *Sambucus nigra* | | * | * | | * | |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Sarothamnus scoparius* | | * | | | | |
| *Sorbus aria* | | | | | | * |
| *S. aucuparia* | | | * | | * | |
| *Taxus baccata* | | | | | * | |
| *Thelycrania sanguinea* | | 1 | * | | * | * |
| *Tilia cordata* | 1 | | | | | * |
| *T. playphyllos* | | | | 1 | * | 1 |
| *Ulmus glabra* | | * | * | * | * | * |
| *Viburnum opulus* | | | | | * | |
| (b) Herbaceous | | | | | | |
| *Ajuga reptans* | | | | * | | |
| *Angelica sylvestris* | | | | * | | |
| *Arum maculatum* | | * | * | | | * |
| *Brachypodium sylvaticum* | | | | | * | |
| *Campanula trachelium* | | | | * | | |
| *Digitalis purpurea* | | * | | | | |
| *Dryopteris dilatata* | | | | | | * |
| *D. filix-mas* | * | | | * | | |
| *Endymion non-scriptus* | | * | | * | | |
| *Galium mollugo* | | | * | * | | |
| *Glechoma hederacea* | | | | * | | |
| *Holcus mollis* | | | * | | | |
| *Lamiastrum galeobdolon* | | | * | | | |
| *Mercurialis perennis* | | * | * | * | * | * |
| *Pteridium aquilinum* | | | * | | | |
| *Sanicula europaea* | | | | * | * | |
| *Silene dioica* | * | * | | | | |
| *Stachys sylvatica* | | | | * | | |
| *Tamus communis* | | | * | | | |
| *Torilis japonica* | | | | * | | |
| *Urtica dioica* | | | | | | * |
| *Viola riviniana* | | | | | * | |

The lists for the hedgerow sites refer to the hedge in each case, while those for the woodland sites refer to the immediate vicinity of the *S. torminalis* plants. The lists for the woody species are complete but those for the herbaceous species include only woodland species.
1—Species occurring in an adjacent hedge or in the same wood but not in the immediate vicinity of *S. torminalis*.

species of interest are *Acer campestre*, *Corylus avellana* and *Mercurialis perennis*; these are all species which, in the Midlands, are associated with hedges which have a long and continuous history (Pollard 1973). Clapham (1969) also recorded an association between *A. campestre* and old woodlands in Derbyshire.

There are two areas just outside Derbyshire where populations of the species occur more frequently than elsewhere. These are on the Magnesian Limestone of southern South Yorkshire and the Needwood Forest area of Staffordshire. The Derbyshire populations at Whitwell Wood, Scarcliffe Park and Markland Grips are evidently part of a wider area of distribution on the Magnesian Limestone which includes the South Yorkshire populations. Similarly, the Derbyshire population at Church Broughton is clearly part of an area of distribution which includes the Needwood Forest population. The old record for Repton also probably represented part of this area. The other two records for Derbyshire, those at Hagg Rocks and Staveley, appear to represent isolated populations. The overall distribution of the species in Derbyshire and adjacent areas is clearly the same as for the species in England and Wales as a whole: areas of relatively high frequency separated by areas where the species is absent or represented by only isolated populations (Roper 1976).

Three lines of evidence, therefore (habitat, associated species and distribution), all indicate that *Sorbus torminalis* is native in Derbyshire. However, this raises problems concerning the absence of the species from two areas where it might be expected to occur. These are the Millstone Grit and the Carboniferous Limestone (except for the Hagg Rocks locality which is on the edge of the outcrop). The Millstone Grit produces acid, sandy soils but the species grows well on the acidic Tunbridge Wells Sand of the Weald of south-eastern England. The absence of the species on Millstone Grit is probably an example of the restriction of the ecological range of a species to its more favoured habitats as it reaches the limits of its geographical range. The Carboniferous Limestone in Derbyshire consists of a plateau at 1,000–1,200ft dissected by narrow steep-sided dales. The altitudinal limit of the species in Britain is 750ft (P. Roper pers. comm. 1975) and this, combined with the lack of hedges and old woods, probably explains the absence of the species on the limestone plateau. Its absence from the well-botanized dales is much more problematical.

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# The *Hieracium* flora of chalk and limestone quarries in England

B. N. K. DAVIS

*Institute of Terrestrial Ecology, Monks Wood Experimental Station, Abbots Ripton, Huntingdon*

ABSTRACT

22 species of *Hieracium* were identified from chalk and limestone quarries in 23 vice-counties in England during 1974–1976. Species thought to be introduced into Britain accounted for half of all the records and for five of the seven new vice-county records. This survey doubles the number of individual records of *Hieracium* from chalk and limestone quarries published in county Floras since 1948 or held on record cards at the Biological Records Centre at Monks Wood. The number of *Hieracium* species recorded in these habitats is increased by 50%. The importance of quarries for the establishment and spread of *Hieracium* species is discussed.

## INTRODUCTION

An ecological survey of chalk and limestone quarries in England was made during 1974–1976. The purpose was to record the distribution of species in such habitats and to examine the geographical and historical factors that are important in determining colonization. Chalk or limestone quarries occur in every English administrative county except four—Cheshire, Greater Manchester, Merseyside and West Midlands. The selection of sites was based partly on lists of quarries which were thought to be of some biological interest by the Nature Conservancy Council, county naturalists' trusts and others; and partly on lists of quarries produced by the Ministry of Housing and Local Government during the 1950s for a series of Regional Limestone Conferences. Random samples were taken from the Conference lists roughly in proportion to the numbers of quarries in each county. Over 200 quarries were visited altogether but some of these were in operation and highly disturbed and others had been completely filled in.

*Hieracium* species are frequent and sometimes abundant constituents of the flora of quarries, but they present great difficulties in identification and are therefore frequently omitted in surveys. As with all critical or unpopular groups, records tend to reflect the activities of experts or, as in this case, collections submitted to an expert. The *Hieracium* records from this survey (excluding *H. pilosella*) are presented here as a contribution to the ecology of this genus. Other data from the survey will be published separately.

## RESULTS

About 150 specimens were collected from 59 quarries in 23 vice-counties. Table 1 lists 22 species in taxonomic order within Sections and gives their distributions (nomenclature follows Perring & Sell (1968)). Seven new vice-county records and 40 new 10 km square records are indicated against the appropriate vice-county number or quarry. Several specimens could not be named with certainty beyond the Section to which they belonged, either because they were not fully in flower or were collected outside the main flowering period for the Section. The features needed for distinguishing species are often not fully developed under these circumstances, e.g. number of cauline leaves, types of hairs on leaves and bracts, colour of style. Eight such specimens which were clearly additional to the named species from individual quarries are listed at the end of the table to encourage further study at these sites.

TABLE 1. *HIERACIUM* SPECIES FROM CHALK AND LIMESTONE QUARRIES IN ENGLAND

| Section<br>Species | National Status | Vice-county | Quarry<br>Geological horizon and grid reference |
|---|---|---|---|
| *Cerinthoidea* | | | |
| *ampliatum* | Endemic | 64 Mid-W. Yorks. | Salt Lake B 34/77.78. |
| *Oreadea* | | | |
| *caledonicum* | Endemic | 57 Derbys. | Ricklow B 43/16.66. |
| *Vulgata* | | | |
| *exotericum* s.str. | Introduced | 16 W. Kent | Borough Green R 51/60.56. |
| *exotericum* agg. | Introduced | 17 Surrey | Betchworth C 51/20.51. |
| | | 57 Derbys. | Rutland B 43/16.56. |
| *grandidens* | Introduced | *20 Herts. | Redbournbury C 52/12.10.† |
| | | 66 Durham | Wingate P 45/37.37.† |
| *sublepistoides* | Introduced | *6 N. Somerset | Tedbury Covert B 31/74.48.† |
| | | 16 W. Kent | Borough Green R 51/60.56. |
| | | 17 Surrey | Betchworth C 51/20.51.<br>Brockham C 51/19.51. |
| | | *66 Durham | Bishop Middleham P 45/33.32.† |
| *pellucidum* | Native | 57 Derbys. | Hopton Wood B 43/26.55. |
| *stenstroemii* | Native | 33 E. Gloucs. | Coopers Hill J 32/88.14. |
| | | 36 Hereford | Rudge End S 32/58.35. |
| *cymbifolium* | Endemic | 57 Derbys. | Millers Dale B 43/13.73. |
| *crebridentiforme* | Endemic | 64 Mid-W. Yorks. | Salt Lake B 34/77.78. |
| *maculosum* | Native | 64 Mid-W. Yorks. | Salt Lake B 34/77.78. |
| *maculatum* | Introduced | 6 N. Somerset | Emborough B 31/62.50.<br>Shipham Hill B 31/45.56.<br>Tedbury Covert B 31/74.48.<br>Windsor Hill B 31/61.45.† |
| | | 8 S. Wilts. | Whitesheet C 31/93.23† |
| | | 16 W. Kent | Wouldham C 51/71.63.† |
| | | 17 Surrey | Betchworth C 51/20.51.<br>Brockham C 51/19.51. |
| | | 55b Rutland | Ketton J 43/97.05. |
| *diaphanum* | Introduced | 6 N. Somerset | Shipham Hill B 31/45.56.† |
| *strumosum* | Introduced | 16 W. Kent | Cliffe C 51/72.75.† |
| | | 23 Oxon. | Ardley J 42/53.27. |
| | | 38 Warks. | Cross Hands J 42/26.29.†<br>Harbury J 42/38.58.†<br>Stockton J 42/44.64. |
| | | 54 N. Lincs. | Ferriby Cliffe C 54/00.21.†<br>Maws J 44/94.01.†<br>South Ferriby C 44/99.21.† |
| | | 55b Rutland | Clipsham J 43/98.15.†<br>Ketton J 43/97.05. |
| | | 56 Notts. | Aldgate Street P 43/53.45.† |
| | | 57 Derbys. | Coalhill B 43/28.55.<br>Dene B 43/28.56.<br>Hopton Wood B 43/26.55.<br>Millers Dale B 43/13.73.<br>Ricklow B 43/16.66.<br>Rutland B 43/16.56. |
| | | 59 S. Lancs. | Bankfield B 34/75.43.<br>Cross Hills B 34/74.43. |
| | | 63 S.W. Yorks. | Kiveton P 43/50.82.† |
| | | 64 Mid-W. Yorks. | Burton Leonard P 44/32.63.†<br>Jackdaw Crag P 44/46.41.†<br>Skipton Rock B 44/00.52. |
| | | 65 N.W. Yorks. | Harmby B 44/12.90.† |
| | | *70 Cumberland | Clints B 35/00.12.† |
| *cheriense* | Introduced | *32 Northants. | Ben Johnsons J 53/12.02.† |

*continued*

| Section<br>Species | National Status | Vice-county | Quarry<br>Geological horizon and grid reference |
|---|---|---|---|
| *subamplifolium* | Endemic | 6 N. Somerset | Shipham Hill B 31/45.56.† |
| | | 34 W. Gloucs. | Stenders B 32/65.18. |
| *lepidulum* | ? Native | 16 W. Kent | Offham R 51/65.57.† |
| | | 18 S. Essex | Grays Thurrock C 51/60.78.† |
| | | | Warren C 51/59.79.† |
| | | *55b Rutland | Clipsham J 43/98.15.† |
| *rubiginosum* | Native | *54 N. Lincs. | Clapgate Pits J 44/96.10.† |
| *vulgatum* | Native | 54 N. Lincs. | Clapgate Pits J 44/96.10. |
| | | | Ferriby Cliffe C 54/00.21. |
| | | | Maws J 44/94.01. |
| | | 57 Derbys. | Hartington Station B 43/15.61. |
| | | | Hopton Wood B 43/26.55. |
| | | | Millers Dale B 43/13.73. |
| | | 59 S. Lancs. | Bellman Park B 34/75.42. |
| | | 63 S.W. Yorks. | Castle Hill P 44/51.18.† |
| | | 64 Mid-W. Yorks. | Burton Leonard P 44/32.63.† |
| | | 65 N.W. Yorks. | Harmby B 44/12.90.† |
| | | | Hulands B 45/01.13. |
| | | 66 Durham | Bishop Middleham P 45/33.32. |
| | | | Chestergarth B 35/94.41. |
| | | | Fulwell P 45/38.60.† |
| | | | Running Waters P 45/33.40. |
| | | | Trimdon Grange P 45/36.35. |
| | | | Wingate P 45/37.37. |
| | | 69 N. Lancs. | Plumpton B 34/31.78. |
| *Tridentata* | | | |
| *calcaricola* | Endemic | 56 Notts. | Aldgate Street P 43/53.45.† |
| *Sabauda* | | | |
| *vagum* | Native | 38 Warks. | Stockton J 42/44.64.† |
| | | 56 Notts. | Aldgate Street P 43/53.45.† |
| | | 63 S.W. Yorks. | Kiveton P 43/50.82.† |
| | | | Lindrick P 43/55.82.† |
| | | 66 Durham | Bishop Middleham P 45/33.32. |
| | | | Fulwell P 45/38.60.† |
| | | | Garmondsway P 45/33.33. |
| | | | Wingate P 45/37.37. |
| | | 70 Cumberland | Clints B 35/00.12.† |
| *perpropinquum* | Native | 57 Derbys. | Rutland B 43/16.56.† |
| | | 66 Durham | Trimdon Grange P 45/36.35.† |
| | | | Wingate P 45/37.37.† |
| Additional specimens identified only to Section | | | |
| *Oreadea* | | 57 Derbys. | Hopton Wood B 43/26.55. |
| *Vulgata* | | 64 Mid-W. Yorks. | Threshfield B 34/97.64. |
| *Tridentata* | | 23 Oxon. | Enstone J 42/38.25. |
| | | 55b Rutland | Clipsham J 43/98.15. |
| *Sabauda* | | 32 Northants. | Ben Johnsons J 53/12.02. |
| | | 36 Hereford | Rudge End S 32/58.35. |
| | | 57 Derbys. | Millers Dale B 43/13.73. |
| | | 64 Mid-W. Yorks. | Jackdaw Crag P 44/46.41. |

* = new vice-county records † = new 10 km square records
S = Silurian, B = Carboniferous, P = Permian, J = Jurassic, C = Chalk, R = Kentish Rag

Fig. 1 shows the distribution of 10 km squares visited and the numbers of *Hieracium* species recorded in each square. Derbyshire was particularly productive but other noteworthy areas were the Mendips, the North Downs and the magnesian limestone quarries of Durham. No records were obtained from the South Downs, Dorset or East Anglia. However, most quarries

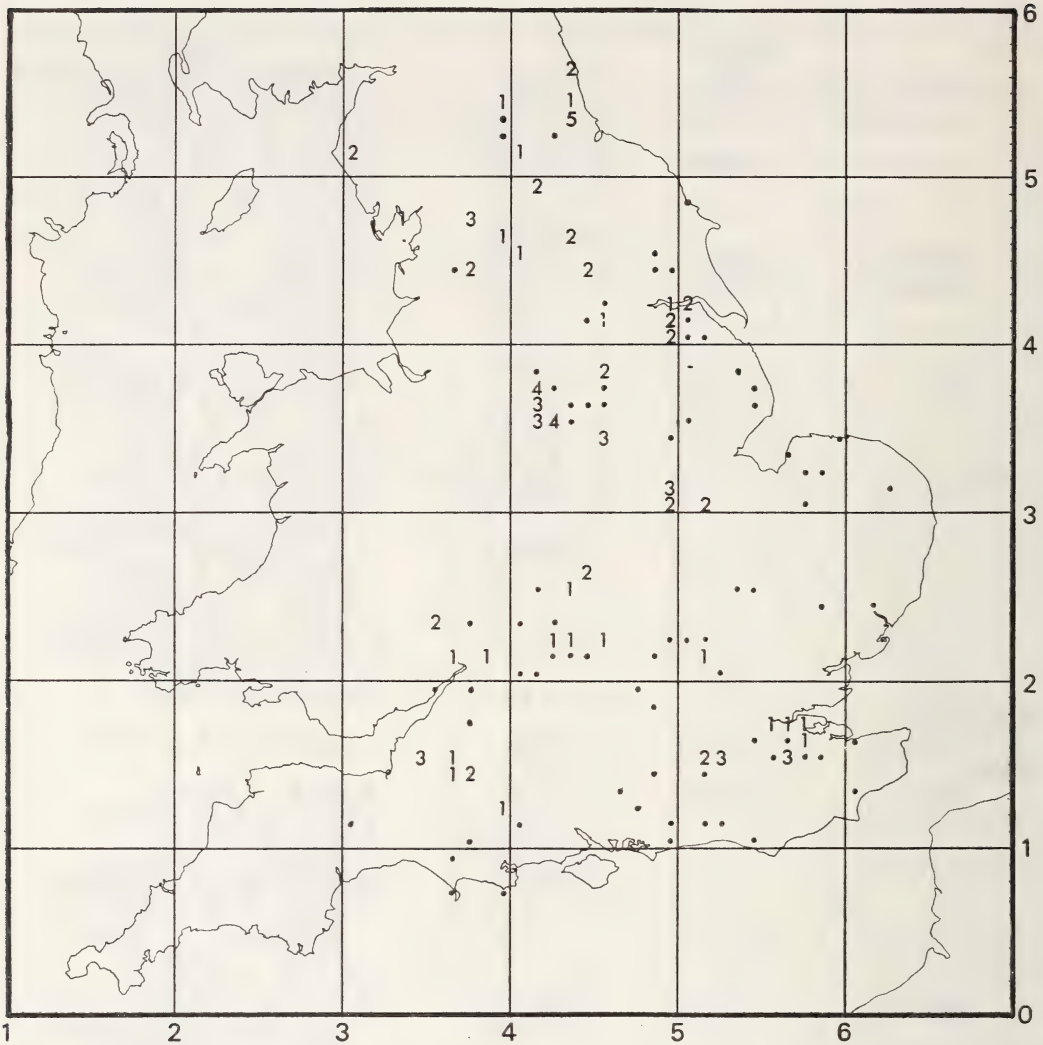



FIGURE 1. Number of *Hieracium* species recorded in the 10km squares visited. Dots represent nil records.

were visited only once, between the beginning of June and the end of August, so some records will have been missed particularly of early flowering species, such as *H. exotericum* and *H. sublepistoides*, and late season species like *H. vagum*. (*H. perpropinquum* is also a late species but is associated more with sandy habitats).

The two commonest species were *H. strumosum*, recorded in 25 quarries and 12 vice-counties, and *H. vulgatum* in 19 quarries and 9 vice-counties. These were followed by *H. vagum* in nine (possibly 12) quarries and *H. maculatum* in nine quarries. There were six endemic species (see Table 1), six or seven other native species and nine or ten introduced species (*H. exotericum sensu stricto* is a distinct species from that so far identifiable only as *H. exotericum* agg.).

Large colonies of *Hieracium* species were often associated with spoil mounds or areas of stone scree produced by waste material tipped down hillsides. Such colonies were especially well developed at the Hopton Wood, Millers Dale, East Buxton and Rutland quarries in Derbys., Shipham Hill in N. Somerset, Betchworth in Surrey, Redbournbury in Herts., Stockton in Warks., Maws and South Ferriby in N. Lincs. and Clints in Cumberland. Quadrat samples were

taken from some of these sites and from several other quarries where *Hieracium* species were locally frequent (Table 2). Where two or three species of *Hieracium* were present in the sample area which could have been confused within the quadrat itself (e.g. at the rosette stage) they are bracketed together. Following the initial ten species of *Hieracium* in the table are 31 species arranged by relative frequency in the 14 quadrat samples and headed by *H. pilosella*. Species occurring in only one or two samples are omitted. For each quarry site, the last date of working is given so far as this can be determined. In most cases the dates refer to the closure of the quarry and the particular areas sampled could have been undisturbed for a decade or so before then. The oldest sites were at Stenders, Betchworth and Hopton Wood.

TABLE 2. QUADRAT RECORDS FROM 14 QUARRIES IN WHICH DENSE COLONIES OF *HIERACIUM* SPECIES OCCURRED

Rooting frequencies (1–9) within 1 sq.m. quadrats

| | Quarry | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| *Hieracium exotericum* agg. | | | | | + | + | | | | | | | | |
| *H. grandidens* | | | | | . | . | | | 8 | 9 | | | | |
| *H. lepidulum* | | | | | | 9 . | | | | | 5 | 9 | | |
| *H. maculatum* | | | | | . | | | | | | | | 9 | |
| *H. pellucidum* | | | | + | . | 9 . | | | | | | | | |
| *H. strumosum* | 9 | 9 | + | + | + | . | | | | | | | | |
| *H. subamplifolium* | | | . 9 | . 9 | | . | | | | | | | | 9 |
| *H. sublepistoides* | | | | | | + | | | | | | | | |
| *H. vagum* | | | . | . | | | | | 1 | | | | | |
| *H. vulgatum* | | | + | + | | | 7 | 7 | | | | | | |
| *Hieracium pilosella* | | 9 | 9 | | 9 | 9 | 9 | 3 | 6 | | 9 | 4 | 4 | 9 |
| *Leontodon hispidus* | 8 | 4 | | 9 | 7 | 6 | 8 | 9 | 3 | | | | 9 | 9 |
| *Festuca rubra* | 4 | 9 | | 9 | 5 | 1 | 9 | 9 | 5 | 8 | | | | 1 |
| *Lotus corniculatus* | | 2 | | | 4 | | 9 | 9 | 9 | 9 | | 7 | 9 | 9 |
| *Linum catharticum* | | 2 | 9 | | 9 | 4 | 9 | 9 | | 3 | 3 | | | 9 |
| *Medicago lupulina* | | 2 | 8 | | | 7 | 1 | | | 3 | | 1 | 2 | 4 |
| *Tussilago farfara* | 3 | 1 | | | | 2 | 1 | 2 | | 9 | | 8 | 2 | |
| *Dactylis glomerata* | | 2 | | 2 | 4 | | | 4 | | 5 | | 1 | 3 | 1 |
| *Taraxacum officinale* agg. | 1 | 1 | | 4 | | 1 | 2 | | | | | 2 | 1 | 1 |
| *Fragaria vesca* | | | | 4 | | 1 | | | | | 9 | 9 | 2 | 2 |
| *Briza media* | | | | | | 9 | 1 | 1 | 9 | | | | 3 | 2 |
| *Trisetum flavescens* | | | | 9 | 1 | 1 | | | | | 1 | 2 | 2 | |
| *Prunella vulgaris* | | | | 1 | | | 3 | | | | 5 | 3 | 1 | 2 |
| *Euphrasia officinalis* agg. | | | | | 2 | 1 | 2 | 7 | | | | 5 | | |
| *Chrysanthemum leucanthemum* | 2 | 4 | | | 3 | 3 | | | | | 2 | | | |
| *Plantago lanceolata* | | | | | | | 3 | 7 | 1 | | | 1 | 1 | |
| *Erigeron acer* | | | | | 1 | 4 | 1 | | | | | 5 | | 1 |
| *Hypericum perforatum* | | | | | | 4 | | | | 4 | 9 | 2 | | |
| *Carlina vulgaris* | | | 8 | | 4 | 1 | 5 | | | | | | | |
| *Gentianella amarella* | | | | | 9 | | 5 | 2 | | | | | | 1 |
| *Daucus carota* | 5 | | | | | 2 | | | | | 2 | | 1 | |
| *Senecio jacobaea* | | 1 | | | | 3 | | | | | | 2 | 2 | |
| *Arrhenatherum elatius* | | 2 | 3 | | | | | | | 1 | | | 1 | |
| *Crataegus monogyna* | | | | | | 2 | 1 | | | | 2 | | | 2 |
| *Thymus drucei* | | 4 | | | | | 9 | 9 | | | | | | |
| *Clinopodium vulgare* | | | | | | 8 | | | | 4 | | 9 | | |
| *Carex flacca* | | | | 3 | | | | | 2 | | | | | 9 |
| *Scabiosa columbaria* | | | | | | | 1 | 8 | 5 | | | | | |
| *Chamaenerion angustifolium* | | | | 6 | | | | | | | | 5 | 1 | |
| *Pastinaca sativa* | 2 | | 3 | | | | | | | 3 | | | | |
| *Holcus lanatus* | | | | 5 | | | | | | | 1 | 1 | | |
| Additional species | 4 | 1 | 2 | 6 | 1 | 10 | 1 | 11 | 3 | 2 | 5 | 13 | 2 | 6 |

TABLE 2 *continued.*

| Quarry and sample date | Habitat | Slope | Aspect | % Cover | Age |
|---|---|---|---|---|---|
| 1. Stockton, Warks., 10.7.75 | Spoil mound | 30° | 270° | 40 | 1956 |
| 2. Clints, Cumberland, 19.7.75 | Spoil mound | 25° | 310° | 40 | 1956 |
| 3. Maws, N. Lincs., 14.7.75 | Spoil mound | Level | | 45 | 1934 |
| 4. Hopton Wood, Derbys., 21.6.76 | Scree | 35° | 320° | 60 | 1920 |
| 5. Rutland, Derbys., 24.7.74 | Floor | Level | | 50 | 1949 |
| 6. Betchworth, Surrey, 13.6.76 | Spoil mound | 36° | 240° | 80 | 1900–20 |
| 7. Bellman Park, S. Lancs., 17.7.75 | Stone mound | Level | | 99 | 1959 |
| 8. Running Waters, Durham, 13.8.75 | Spoil mound | Level | | 100 | 1950 |
| 9. Wingate, Durham, 29.6.76 | Terrace | Level | | 90 | ?1931 |
| 10. Redbournbury, Herts., 3.7.75 | Talus | 31° | 260° | 40 | 1965 |
| 11. Offham, W. Kent, 14.6.74 | Spoil mound | 20° | 110° | 80 | 1936 |
| 12. Clipsham, Rutland, 11.6.76 | Spoil mound | 5° | — | 80 | 1941 |
| 13. Windsor Hill, N. Somerset, 6.7.76 | Floor | 5° | — | 90 | ?1944 |
| 14. Stenders, W. Gloucs., 10.6.75 | Spoil mound | 30° | 270° | 100 | 1918 |

## DISCUSSION

For the sake of comparison, all records of *Hieracium* species stated to come from quarries were extracted from English county Floras and supplements published since 1948, and from all the record cards in the Biological Records Centre. 13 out of 20 Floras made some reference under *Hieracium* to quarries, though the mineral was not usually specified, whilst 58 record cards specified quarry habitats which could be ascribed with some confidence to chalk or limestone. Together these referred to 22 *Hieracium* species of which only 11 were the same as in my survey. Again, *H. strumosum* was the most widespread species with records in 14 vice-counties, followed by *H. maculatum* and *H. diaphanum* in nine vice-counties and *H. vulgatum* in eight vice-counties. The remaining species were *H. anglicum*, *H. angustisquamum*, *H. brigantum*, *H. calcaricola*, *H. diaphanoides*, *H. exotericum*, *H. hypochoeroides*, *H. lasiophyllum*, *H. leyanum*, *H. pellucidum*, *H. perpropinquum*, *H. rubiginosum*, *H. salticola*, *H. stenstroemii*, *H. subamplifolium*, *H. subbritannicum*, *H. trichocaulon* and *H. umbellatum*. These were all confined to one or two vice-counties apart from *H. perpropinquum*, which occurred in five, and *H. salticola*, which occurred in three. In contrast to my survey, *H. vagum* was not recorded in quarries at all. There are doubtless many other known *Hieracium* records for quarries which have not been formally listed or are included under 'waste places'.

With the taxonomic difficulties mentioned earlier it is not surprising that *Hieracium* species have not been fully mapped. New vice-county records among the introduced species were mainly modest infillings or extensions of range: for example, *H. grandidens* in Herts., *H. strumosum* in Cumberland and *H. cheriense* in Northants. All the localities for *H. lepidulum* were new 10 km records, which supports the view that this is an introduced species which is spreading in artificial habitats. The largest jump in distribution is shown by *H. sublepistoides*. The nearest previous records to the Durham locality were from northern Derbys. (Perring & Sell 1968) and West Lancs. (G. Halliday pers. comm. 1977).

The endemic species were mostly confined to old quarries or parts of quarries that had not been worked for 50 years or more: Salt Lake (with *H. ampliatum* and *H. crebridentiforme*) was worked up till 1899, Ricklow (*H. caledonicum*) until 1905, Millers Dale (*H. cymbifolium*) between 1878 and 1930 and Stenders (*H. subamplifolium*) until 1918. These four quarries were also all located in upland areas (230–300m) of semi-natural calcareous grassland and woodland where these species occurred naturally. *H. calcaricola* was found in a small, recently worked and still-used quarry (Aldgate Street) on the outskirts of Nottingham and must surely have been introduced there. The other record of *H. subamplifolium* was from a quarry near Cheddar worked from the late 19th century to 1969. There is one other record for the whole of Somerset, made in 1965 by P. D. Sell; this is also from a disused limestone quarry on the Lias about 27 km away so both may be introductions from W. Gloucs. or South Wales.

Of the other native species, *H. pellucidum*, *H. stenstroemii* and *H. maculosum* could have colonized the quarries in which they were found from nearby natural habitats where they are known to occur. *H. rubiginosum*, on the other hand, was found a long way from other known sites but the grassy spoil banks of Clapgate Pits near Scunthorpe are very old and it is more likely that the species has persisted there for a long time than that it has been introduced. *H. vulgatum* and *H. vagum* are both common native species that have colonized habitats such as roadsides and railway banks.

There are over 250 species of *Hieracium* in Britain, many of which have a markedly northern or upland distribution. The genus as a whole is commonly associated with cliffs or ungrazed rocky areas. The species dealt with in this paper represent less than 10% of this flora and consist mainly of those with a southerly distribution and a marked affinity for base-rich habitats. Most of the species in Table 2 are clearly pioneer colonists of spoil mounds, rock ledges and stony ground such as are found in quarries. The conditions of low nutrient status, pronounced water deficit and high insolation which prevail here prevent many ruderal species from becoming established at all and reduce the vigour and thus the competition of aggressive species (Grime 1973). Railway banks, which feature commonly in county Floras as habitats for *Hieracium*, provide similar habitats. The railways date mainly from the early or mid-19th century and have therefore had longer to become colonized than most quarries. They also offer easy means of dispersal. However, the growth of the quarrying industry during this century has provided new sites for ruderal species all over the country (Davis 1976), whilst the increasing movement of vehicles and materials into and out of quarries must materially assist the dispersal of species. The active spread of several species of *Hieracium* which is therefore probably taking place is worth documenting.

ACKNOWLEDGMENTS

I am most grateful to P. D. Sell for identifying all the *Hieracium* material for me. I should also like to thank F. H. Perring and T. C. E. Wells for their helpful comments on drafts of this paper.

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# *Ranunculus repens* L. in Europe

S. M. COLES

*Department of Botany, Birmingham University**

ABSTRACT

The variation shown by *Ranunculus repens* L. within Europe has been examined. This has shown *R. repens* to be so continuously variable that no taxonomic recognition is justified for any of the variation, although numerous infraspecific taxa have previously been recognized within the species in Europe. Great variation is shown by plants from any single locality, but distinct clines in the variation of some characters such as leaf-shape and hair-cover are found across Europe.

## INTRODUCTION

*Ranunculus repens* L. belongs to the subgenus *Ranunculus* section *Ranunculus*. Species in this section are characterized by having a nectary scale attached only at its base, compressed achenes with a distinct beak, and a receptacle which in fruit is not more than three times its length when in flower (Tutin 1964). The majority of the European members of this section can be placed in two clearly definable groups. The first of these has a base chromosome number of $x = 7$, and is characterized by having terete pedicels, globose flower buds and glabrous receptacles (e.g. *R. acris* L.). The second group, to which *R. repens* belongs, has a base chromosome number of $x = 8$, and is characterized by having sulcate pedicels, ovoid flower buds and pubescent receptacles. *R. repens* can be distinguished from all other members of section *Ranunculus* in Europe in that it produces numerous creeping stolons which root at their nodes. It could possibly be confused with, and is closely related to, *R. nemorosus* DC., one subspecies of which produces more or less procumbent stems which readily root at their nodes.

*R. repens* is a perennial species; in winter its rootstock forms a short stout rhizome, which is usually vertical. The apical bud and the upper lateral buds of the over-wintered rosette produce flowering stems, which grow up to 60 cm in height. The lower lateral buds usually give rise to creeping stolons, but there is no absolute division into these two kinds of stems and the relative proportions of the two can vary greatly. The parent plant does not persist for more than one flowering season and it is replaced by daughter rosettes which are formed at the nodes of the stolons.

*R. repens* is generally distributed over Europe. It extends in the north to Iceland, the Faeroes and northernmost Norway. To the south it reaches the Mediterranean and is recorded from the mountains of Morocco and Algeria and from the Nile Delta (Harper 1957). It is, however, generally rare in the eastern Mediterranean, and is absent from the Balearic Islands and Crete (Tutin 1964). It is less common eastwards but continues through Siberia to reach the Pacific coast. It has been introduced and is fairly widespread in N. America (Benson 1948) and New Zealand (Fisher 1965) and it also occurs in most countries of Central and South America.

*R. repens* is most commonly found as a constituent of grassland communities; it occurs on a wide range of soil types, but it is most abundant on soils which are heavy and wet. It is especially abundant where drainage is impeded, and it also occurs in such habitats as marshes and fens. It is also common on areas of disturbed ground where its stolon production can be so great as to make it a serious weed. It can flourish under much drier conditions on disturbed ground than it tolerates in closed communities. Its efficiency at vegetative reproduction is well illustrated by

* Present address: Institute of Terrestrial Ecology, Colney Research Station, Colney Lane, Norwich NR4 7UD.

one parent plant which during one season produced stolons totalling 92½ ft in length with a total of 479 nodes (Anon. 1958). In closed communities, however, its spread by means of vegetative reproduction is limited, the number of new plants being produced by the stolons only more or less replacing the parent plants. Details of the ecology of *R. repens* in Britain are given by Harper (1957).

## MATERIAL AND METHODS

This study was largely based on herbarium material from the following herbaria: British Museum (**BM**), Cambridge (**CGE**), Coimbra (**COI**), Edinburgh (**E**), Florence (**FI**), Leicester (**LTR**), Madrid (**MA**), Porto (**PO**), Stockholm (**S**), Uppsala (**UPS**) and Vienna (**W**).

Plants of known wild origin were grown from as wide a range of localities as possible. They were from 18 localities in Britain and from 21 localities from 12 countries on the Continent.

Characters were investigated from as many parts of the plant as possible. Breeding experiments were carried out to find the breeding system operating in *R. repens*, and inter-locality crosses were made to see if there were any sterility barriers within the species. The interfertility of *R. repens* with other species was also tested.

## VARIATION OF CHARACTERS

Most characters investigated were found to vary very greatly in plants from any one locality. Few clearly showed any geographically-based variation. Those which were found to show regional variation most clearly were the degree of dissection of the leaf and the hair cover of the plants.

### GROWTH-FORM OF PLANT

The relative number of stolons and the height of the plant have often been used as diagnostic characters, but the growth-form of any plant is very plastic and such characters must have been largely based on phenotypic differences.

No great differences were shown in the growth-form of most of the plants grown in uniform conditions in cultivation. The only group of plants which were different in this respect were plants from northern Finland, which produced a very much higher proportion of flowering stems to stolons. Plants from four separate localities all showed this characteristic, but it was observed only once among the numerous herbarium specimens examined from the same region.



a. Inner rosette leaf. b. Leaf on a stolon.

FIGURE 1. Variation in shape of leaves produced by a single plant (Col de Port, Ariège, France).

THE LEAF

The basal leaves are usually divided into three or more leaflets, and the stalk of the terminal leaflet is lengthened so that the leaflets are pinnately arranged. The degree of dissection of a leaf varies according to its position on the plant and the season in which it is produced. The most finely-divided basal leaves are the innermost ones produced on an over-wintered rosette. The leaves on the stolons and on any subsequent daughter rosettes produced during the same growing season are less finely divided. This difference is often very marked (Fig. 1).




FIGURE 2. Measurements made on the leaves. L—length of terminal leaflet. W—width of main lateral lobe of terminal leaflet at position just above its main dissection. Leaf a. has 1 petiolule on its main axis, leaf b. has 2 petiolules on its main axis.

For reasons of comparability, measurements of leaf-shape were made only on the innermost leaves of an over-wintered rosette and all further discussion of leaf-shape refers to these leaves only. The characters which were found to show most geographical variation were the degree to



FIGURE 3. Variation in shape of inner rosette leaves produced by plants from a single locality (Burton Dassett, Warks.).






FIGURE 4. Distribution of leaf characters in *R. repens*.

FIGURE 4. Distribution of leaf characters in *R. repens*.



FIGURE 5. Plants of *R. repens* from Estartit, Gerona, Spain (upper left), and Stora Karlsö, Gotland, Sweden (lower right).

which the leaf was divided into separate leaflets and the degree of dissection of the leaflets. The degree to which the leaf was divided up into separate leaflets was measured as the number of petiolules occurring on the main axis of the leaf (Fig. 2). The degree of dissection of the leaflets was measured by the ratio W/L, where L is the length of the terminal leaflet and W is the width of the main lateral lobe of the terminal leaflet at the position just above its main dissection (Fig. 2).

The results of the leaf measurements are shown in Fig. 4. Leaf-shape was found to be exceedingly variable even among plants from the same locality (Fig. 3) and a full range of leaf-shapes was found in many geographical regions. This is probably due to the wide ecological tolerance and ecotypic variation shown by *R. repens*. However, when the relative frequency of the different leaf-shapes is scored, certain clinal trends are found to be apparent. Leaves with only one petiolule were found to be most frequent in south-western Europe, whereas leaves with two petiolules are more frequent in the north-east. Undivided leaves are omitted as these are only phenotypic dwarfs, and leaves with three petiolules are omitted as only three such plants, all in the extreme north-east, were ever seen. The degree of leaflet dissection follows a similar cline: the most broadly lobed leaves are in the south-west and leaves with the most finely dissected leaflets are in the north-east. Examples of plants from these two extremes are shown in Fig. 5.

### HAIRS

The hairs are single-celled and simple in form. Measurement of hair characteristics was made on the petioles of the leaves which were used for comparing leaf-shapes. This standardization was necessary as the density of the hairs varies on the same organ produced at different seasons or positions on the plant. Thus the petioles of the inner leaves of an over-wintered rosette are often glabrous, whereas petioles produced later are often hairy.

The density of the hairs, when present, was scored using three arbitrary categories: few, frequent or dense (see Fig. 6 for further details). The position of the hairs relative to the petiole was scored using two categories: appressed or spreading.

The results are shown in Fig. 6. As in the case of leaf-shape, great variation is found in plants from any single locality, but certain regional trends are apparent. Plants with glabrous petioles are most frequent in southern, eastern, and north-eastern Europe whereas the densest hair cover is found on plants from western Europe. A similar trend is shown by the types of hairs, with spreading hairs being most frequent in western Europe.

### FLOWER AND ACHENES

The flowers and achenes were found to be very variable in character (see Fig. 7 for an example of the achene-shapes found among plants from a single field). No clinal trends in these characters were apparent across Europe except that the petals and achenes tended to be slightly larger in plants from the western oceanic regions than they were in plants from eastern and north-eastern Europe.

## CHROMOSOMES AND BREEDING EXPERIMENTS

The normal number of chromosomes in *R. repens* is $2n = 32$ and in the limited number of counts made in this present study this was the only number found. It is also the only number found in some extensive searches such as most of those cited by Neves (1944), but occasional variations in this number have been recorded (Coonen 1939, Gregson 1965, Neves 1944) and these are frequent enough not to be dismissed as all errors. Gregson (1965) recorded both a trisomic and a monosomic plant among her experimental progeny and she often found accessory chromosomes in the shoot tissue. Pervova *et al.* (1971) reported a high percentage of aneuploid cells in the root meristem, including $2n = 16$, 18, 20, 24 and 28, and they claimed correlations between the percentage of such cells and vegetative characteristics.

Breeding experiments were carried out using a series of plants from a wide range of localities. The plants used were grown in a greenhouse and the flowers were individually covered by cellophane bags. The occurrence of agamospermy was tested by emasculating a series of flowers. In no case did any seed-set occur. Self-sterility was looked for by selfing several flowers from all the plants used in the crossing experiments. Achenes were only set in about 10% of the cases and then only one or two per head. This is a high enough percentage not to be dismissed as due only to experi-



FIGURE 6. Distribution of hair characters in *R. repens*.

FIGURE 6. Distribution of hair characters in *R. repens*.

TABLE 1. EXPERIMENTAL CROSSES BETWEEN CULTIVATED PLANTS OF WILD ORIGIN
Results are expressed as percentage seed-set per flower

| ♀ \ ♂ | Oundle, England | Cawston, England | Burton Dassett, England | Roan Head, England | Lammi, Finland | Tarascon, France | Budapest, Hungary | Estartit, Spain | Granada, Spain | Coimbra, Portugal |
|---|---|---|---|---|---|---|---|---|---|---|
| Oundle, Northants., v.c. 32, England | | 88,91<br>94,91 | 92,99<br>97 | 96 | 90,93<br>97,8 | 91,93<br>93,94 | 86,56<br>97 | 95,97<br>14,95 | 89,95<br>36 | 37,82<br>91,79<br>62 |
| Cawston, Warks., v.c. 38, England | 83,90<br>86,63 | 68,77<br>81,75<br>88 | 92,81<br>88,80<br>87,76<br>88 | 96,93 | 82<br>89<br>76 | 90,98<br>88 | 75,86<br>82,94<br>61,85 | 86,69 | 92,84 | 83,80<br>89 |
| Burton Dassett, Warks., v.c. 38, England | 68<br>83<br>62 | 73,78<br>64 | 98,90<br>78 | 60 | 80 | 75,73<br>70,61 | 98,86 | 72 | 70,88 | 58,76<br>77 |
| Roan Head, Westmorland, v.c. 69, England | 96,92<br>88 | 96,85<br>96,83<br>92,93<br>96 | 88,84<br>86 | 68 | 96,80<br>97,93 | 67,85<br>89,90<br>65,95<br>83,9 | 17,64<br>90,92 | 96,93<br>90 | 50,90<br>93 | 42,89<br>79 |
| Lammi, Pappilankylä, Etela-Hame, Finland | 68 | 66,65<br>83,78 | 43,76 | 80,82<br>61,60 | 75<br>94,77<br>89 | 58,45<br>73,84<br>28 | 79,66<br>82,81 | 62,64<br>58,36 | 79,30 | 62,75<br>64 |
| Tvärminne, Ussimaa, Finland | 86,72<br>82,85<br>86 | 90,84<br>77,66<br>80 | 76,59<br>75,85<br>84 | 93,90<br>92,73 | 69,66<br>85,28<br>89 | 28<br>82 | 86,0<br>58,59<br>66 | 78,39 | | 79,85<br>88 |
| Nowa Ruda, Wroclaw, Poland | 80 | 85,92<br>82,64 | 79,92<br>85 | 73,17<br>89,83<br>80 | 80,32<br>33,74<br>52 | 92,70<br>27<br>36 | 75,53<br>21,86 | 82,44<br>87 | 64,71 | 58,71<br>82,35 |
| Tatry Malolaczniak, Poland | 50 | 65,54<br>86,54<br>71,50<br>54,52 | 75 | 53,50<br>75 | 27,29<br>70 | 52,59<br>44 | 58 | 50,45<br>38 | | 71 |
| Normandie, France | 70<br>59 | 87,66<br>68,94<br>75,81 | 86,50<br>68 | 54,88<br>66,82 | 82,70<br>48,40 | 50<br>74 | 84,23<br>55,75 | 68,64<br>89 | 78,83<br>71,45<br>68,73 | 85,70<br>83,87<br>78 |
| Tarascon, Ariège, France | 75 | 90,85<br>73,92<br>62 | 61,72<br>79 | 83,62 | 76,96<br>76,84 | | | 81,82 | 90,79<br>82,59 | 44,48<br>55 |
| Budapest, Hungary | | 92 | 90,66 | 78,76<br>30,23 | 71,39<br>45,52 | 63<br>37 | 57<br>46 | 54,78<br>35 | 72 | 87,0 |
| Genova, Liguria, Italy | 59,61<br>44,75 | 46,82<br>64,72 | 84<br>90 | 48,42<br>54 | 69,70<br>27,36 | 55<br>48<br>34<br>67 | 48,54<br>67,55 | 41,73<br>70,69 | 0,64 | 31,70 |
| Estartit, Gerona, Spain | 79<br>75<br>73 | 62,76<br>83 | 81,87<br>92,88 | 57,65<br>85,92<br>50 | 78,77 | 67,66<br>28 | 67<br>66<br>28 | 80,89<br>70,84<br>62,68 | 62,71<br>27,75 | 65,66<br>40,63 |
| Coimbra, Beira Litoral, Portugal | 50 | 80,0 | 80 | 61 | 83<br>64 | | | 84,73 | 87,87<br>60,64 | |

mental error. When similar tests were carried out on *R. bulbosus* in the same greenhouse at the same time only three cases of seed-set were recorded. Thus, although *R. repens* appears usually to be self-sterile, it is possible that a low level of selfing can occur.

The interfertility of plants from different geographical regions and of different morphological types was tested by means of a series of experimental crosses. The percentages of seed-set in each cross are given in Table 1. The results obtained were very variable, but no cross was made where a

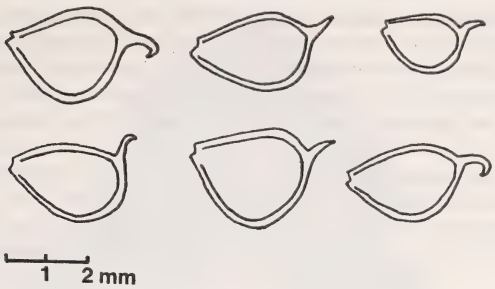



FIGURE 7. Variation in the shape and size of achenes, as shown by plants from a single locality.

high seed-set could not be obtained. The results indicate that there are no signs of even a partial sterility barrier to crossing between plants from widely differing geographical regions.

An estimate of the apparent fertility of the parent and hybrid $F_1$ plants was made by staining the pollen in cotton blue. Measurements of apparently viable grains were made only on the first flower produced on a stem, but such values fluctuate widely in any one plant and give only a rough guide to the fertility of a plant. Also the proportion of viable pollen grains varies greatly in different anthers of a single flower; measurements were therefore made on samples taken from anther squashes made from whole flowers.

No evident reduction in fertility was found when the values of viable pollen for $F_1$ plants were compared with their parental plants. Comparisons are difficult because, as in other perennial *Ranunculus* species, very low pollen fertility (or even totally female plants) naturally occurs in *R. repens* very frequently. In Fig. 8 histograms of the percentages of viable pollen are shown for both the parent and the $F_1$ plants (maximum of 5 plants per cross). The pollen fertility of *R. repens* was found to be generally higher than that found in either *R. acris* (Coles 1971) or *R. bulbosus* (Coles 1973).

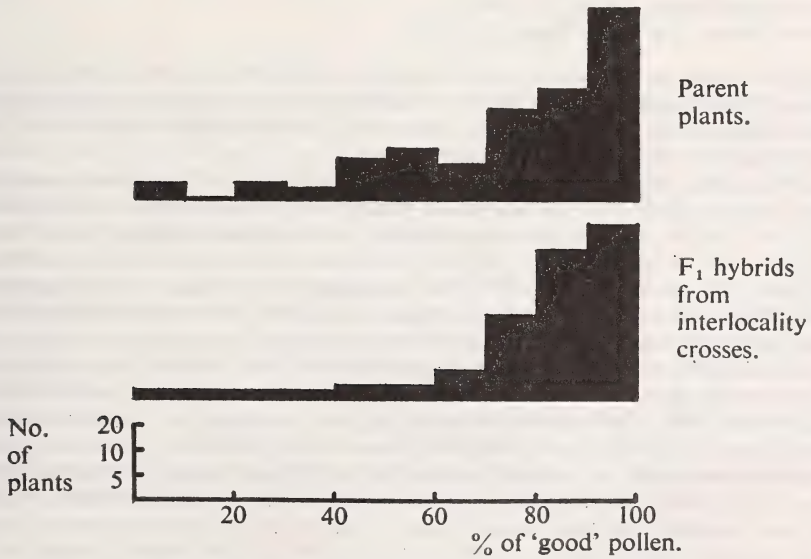



FIGURE 8. Histograms of percentages of 'good' pollen.

HYBRIDS WITH OTHER SPECIES

The only records of hybrids between *R. repens* and other species are of dubious validity (Candlish 1975). Gregson (1965) found that when pollen was applied to *R. repens* from a wide range of other *Ranunculus* species a few apomictic seeds were produced. Such findings may well explain other

results such as those of Marsden-Jones & Turrill (1929) who, when they pollinated *R. acris* with *R. repens*, obtained a low level of seed-set, but with the resulting progeny identical with *R. acris*.

A series of reciprocal crosses were carried out with *R. repens* and other species, mainly out of the same group (*R. nemorosus* DC., *R. sardous* Crantz, *R. trilobus* Desf. and *R. bulbosus* L.). No apomictic seed was ever set. When *R. repens* as the female parent was crossed with the morphologically similar species *R. nemorosus* ($2n = 16$), up to 20% of the carpels showed enlargement, and up to 85% when *R. nemorosus* was used as the female parent; however, no good achenes were ever formed. No carpel enlargement was found when *R. repens* was crossed with *R. sardous*, *R. trilobus* or normal diploid *R. bulbosus*, but when a tetraploid *R. bulbosus* ($2n = 32$) (produced by colchicine treatment) was pollinated by *R. repens* some carpel enlargement occurred.

## NOMENCLATURE

Specific synonyms of *R. repens* are surprisingly scarce when compared with other common species such as *R. acris* and *R. bulbosus* (Coles 1971, 1973). Only just over 20 names are given as synonyms of *R. repens* in *Index Kewensis* and over half of these appear to be incorrectly attributed to *R. repens*. These latter names mostly refer instead to an American species *R. septentrionalis* Poir. and its allies (Benson 1948). This is because for many years in the nineteenth century *R. septentrionalis* was supposed by American botanists to be conspecific with *R. repens*. Names which appear to be genuine synonyms of *R. repens* are given below.

*R. repens* L., Sp. Pl., 554 (1753)
*R. prostratus* Poir. in Lam., *Encycl. Méth. Bot.*, **6**: 113 (1804)
*R. pubescens* Lag., *Gen. Sp. Nov.*, 19 (1816)
*R. intermedius* Eaton, *Man. Bot.*, 3rd ed., 424 (1822)
*R. lagascanus* DC., *Prodr.*, **1**: 43 (1824)
*R. clintonii* Beck, *Bot. N. & Mid. States*, 9 (1833)
*R. oenanthifolius* Ten. & Guss., in *Atti Accad. Napoli*, **6**: 318 (1843)
*R. reptabundus* Jordan, *Diagn.*, 83 (1864)
*R. hortensis* Schur, *Enum. Pl. Transs.*, 21 (1866)

It is difficult to explain this lack of specific synonyms for such a variable European plant. However it is more than made up for by the very many infraspecific taxa which have been described. These latter have not been studied in detail here as the variation pattern found in *R. repens* does not appear to justify such taxonomic recognition.

The varietal names most often encountered in determinations of herbarium material are var. *erectus* DC., *Prodr.*, **1**: 38 (1824) for tall robust plants with few runners and var. *prostratus* Gaud., *Fl. Helv.*, **3**: 547 (1828), or 'var. *reptabundus* (Jord.)' for prostrate creeping plants. Other names commonly used are var. *glabratus* DC. (*op. cit.*), for more or less glabrous plants, and var. *villosus* Lamotte, *Prodr. Fl. Centr. Fr.*, **50** (1877), for excessively hairy plants. Further names have been used to describe plants with varying degrees of leaf dissection. The application of such names has always been problematical as most of the names are based principally on single characters, although differing combinations of these characters occur in any one plant. Probably due to the difficulty of applying such names many collectors have not been adverse to coining their own names for minor variants. Gerbault (1917), for example, when studying the variation of *R. repens* in western France, described six subspecies, only one of which was based on any previously described taxon.

There is, however, a distinct horticultural variant of obscure origin which often occurs as an escape from old gardens and it is fairly well represented in the herbarium collections. Specimens were seen from several European countries and from Bolivia. It occurs in many places in the north-eastern United States (Benson 1948). Not only does it have double flowers but it is also vegetatively distinct, having very broad, much-toothed leaves (Fig. 9) unlike those of any of the truly wild plants examined. The following names refer to this variety:

*R. repens* var. *degeneratus* Schur, *Enum. Pl. Transs.*, 21 (1866)
*R. hortensis* Schur, *Enum. Pl. Transs.*, 21 (1866)
*R. repens* var. *pleniflorus* Fern., in *Rhodora*, **19**: 139 (1917)



FIGURE 9. Leaf of *R. repens* var. *degeneratus*.

It is most commonly labelled on herbarium sheets as var. *florepleno* but this is not a valid name for it (Fernald *op. cit.*).

## DISCUSSION AND CONCLUSIONS

*R. repens* is found to be so continuously variable that there is no justification for any division of the species into infraspecific taxa within Europe. In support of such a treatment it is significant that all plants tested appeared to be freely interfertile, with no noticeable reduction in the fertility of the resulting offspring. No apomixis was found in *R. repens* but possibly a low level of selfing can occur. As many characters as possible were examined. For the measurements to be truly comparable it was necessary to make them on organs produced in the same season and at the same position on any plant. This greatly restricted the number of herbarium specimens from which measurements could be obtained. Only leaf-shape and hair-type were found clearly to show any clear clinal variation. The clines are not as clear-cut as are found in some other species (e.g. *R. acris*) and, although it would be possible to tell the geographical origin of many plants on the basis of their morphology, there remains a large proportion of plants with which this would be almost impossible.

This present study concentrated on the widespread geographical variation shown by *R. repens*. Great variation was often noted in plants from any one locality and this was not examined in any detail. Examination of the small-scale, possibly ecotypic variation of this species, which occurs in a wide range of habitats in any one locality, would be of great interest.

## ACKNOWLEDGMENTS

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# Notes on wool-alien species of *Lepidium* in the British Isles

T. B. RYVES

44 *Galsworthy Road, Kingston Hill, Surrey*

ABSTRACT

An artificial key is provided to identify wool-alien and other species of *Lepidium* found in the British Isles, and some possible relationships and synonyms are briefly discussed. A new species, **L. fallax**, is described and a few recent British records are given.

## INTRODUCTION

The genus *Lepidium* L. (Cruciferae) consists of some 150 species of cosmopolitan distribution, of which about 20 have occurred more or less regularly as wool-aliens in Europe over the past 100 years. The principal monograph of the genus, by Thellung (1906), gives critical descriptions of a great number of species, in sections based on their distribution by continents, which makes the identification of aliens originating from unknown countries difficult and uncertain. Many more modern accounts have appeared, including those by Marais (1970) for southern Africa, Hitchcock (1936) and Mulligan (1961) for N. America, Hitchcock (1945) and Boelcke (1964) for S. America, Black (1963) for S. Australia, and Vasconcellos (1964) for Europe. However, there appears to have been no serious attempt since 1906 to review the whole genus on a world-wide basis, or to contrast the differences (if any) between species described from different continents. The conclusions reached in this paper on identification and synonymy are based mainly on recently collected wool-alien material, and some might be controversial.

Over the past century several species were originally described from wool-alien material, including *L. calycinum* Godron from Toulouse, France, and *L. pseudo-didymum* Thell., *L. peregrinum* Thell. and *L. sagittulatum* Thell. from Galashiels, Selkirk, v.c. 79. In the present paper yet another new species, from Blackmoor, S. Hants., v.c. 12, is described.

The main purpose of this paper is to provide a key to the wool-alien species, but to increase the usefulness of the key other alien and also native British species have been included.

## COMMENTS ON THE TAXONOMY

Most of the wool-alien *Lepidium* species are either apetalous or have inconspicuous petals, and are self-fertilized or grow in small isolated populations, so that considerable intraspecific variation occurs. Many of the species are consequently difficult to define unambiguously. In particular, the shapes of the basal and cauline leaves have often been used as key characters, but most specimens have already lost their basal leaves by the time they fruit, and in any case the leaf shape is somewhat variable. Similarly the degree of hairiness of the plant is found in practice to be very variable, so that a range from subglabrous to densely puberulent may be encountered in different individuals of the same species. The shape of the nectaries is a difficult character to observe because they are often minute, and they often become obscured in herbarium material. The size and shape of the siliculae (taking mature fruit from near the middle of the raceme) provide more evident and reliable characters, but even here the full range is found to exceed greatly that given in many accounts of the genus. It is noted that identical, too-restricted silicula dimensions of some species are repeated in a large number of different regional Floras, suggesting that they have all too often been copied uncritically from a common source. Another useful character is whether or not the seeds have hyaline margins, which are especially evident in fresh material before the seeds

become too ripe, but may become difficult to determine in old herbarium material.

A modern tendency has been to reduce the number of species, such as those described by Thellung based on rather indefinite leaf characters, and this practice is enthusiastically followed here. It is mentioned in many accounts of the genus that herbarium specimens often do not strictly adhere in all their characters to one species, suggesting that the definition of species is too narrow. In addition the occurrence of hybrids with intermediate characters has been suggested, e.g. by Hitchcock (1936).

## ARTIFICIAL KEY

The wool-alien and other species can be identified by the application of the rather detailed artificial key given below, which sets out to define them within a framework of obvious contrasting characters, amplified with additional characters applicable to individual species. Consequently the possible differences between some critical species have been submerged, as they are considered here to be local variants of one variable species. For the *L. campestre* group (couplets 1–4) the key in *Flora Europaea* (Vasconcellos 1964) is used.

The following species listed by Probst (1949) and Hayward & Druce (1919) as British wool-aliens have been omitted because it has been impossible to form any definite opinion on their identification: *L. devauxii* Thell., *L. ecklonii* Schrad., *L. iberis* Sieber, *L. peregrinum* Thell.

1 Siliculae 4 mm or more, with the prominent wing connate with lower part of style; upper leaves amplexicaul
  2 Annual or biennial; siliculae densely covered with small vesicles; style usually not projecting from notch .. .. .. .. .. .. .. 1. *L. campestre*
  2 Perennial; siliculae with few or without vesicles; style projecting fron notch
    3 Siliculae hairy, at least when young .. .. .. .. .. 2. *L. hirtum*
    3 Siliculae glabrous
      4 Pedicels glabrous in fruit .. .. .. .. .. .. .. 3. *L. villarsii*
      4 Pedicels hairy in fruit .. .. .. .. .. .. 4. *L. heterophyllum*
1 Siliculae usually less than 4 mm, with style free from the narrow wing (except sometimes in *L. sativum*) or wing absent; upper leaves usually not amplexicaul
  5 Leaves strongly dimorphic, the upper ovate and amplexicaul (appearing perfoliate), the lower bipinnate; petals yellow, longer than sepals .. .. 5. *L. perfoliatum*
  5 Leaves not strongly dimorphic, although the upper sometimes lanceolate gradually passing into the lower bipinnate ones; petals white or absent
    6 Petals evident, at first exceeding sepals (often decreasing in size as fruit matures) (see also 12. *L. desertorum*)
      7 Pedicels of fruit rigidly appressed; plant usually procumbent; flowers at first clustered, fruiting racemes greatly elongating .. .. .. 7. *L. aucheri*
      7 Pedicels of fruit spreading; plant erect
        8 Perennial; siliculae unwinged, with notch very small or absent and style projecting
          9 Siliculae 2 mm, orbicular; plant *c* 50–130 cm; inflorescence a large, dense, pyramidal panicle .. .. .. .. .. .. 6. *L. latifolium*
          9 Siliculae 2·5–4 mm, elliptic; plant up to *c* 50 cm; inflorescence laxly branched .. .. .. .. .. .. .. 8. *L. graminifolium*
        8 Annual; siliculae winged, with fairly deep notch and included style
          10 Siliculae 3–5 × 5–6 mm, broadly elliptic to orbicular; plant more or less glabrous .. .. .. .. .. .. .. 9. *L. sativum*
          10 Siliculae 2–4 mm, orbicular; plant more or less hairy .. .. 10. *L. virginicum*
    6 Petals obscure, shorter than or equal to the sepals or absent
      11 Racemes at first in short terminal corymbs or fascicles, sometimes elongating to 4 (–8) cm in fruit (see also 7. *L. aucheri*)
        12 Upper leaves linear, slightly auriculate; siliculae obovate, distinctly

contracted towards base; style sessile in very small notch 13. *L. fasciculatum*
12 Upper leaves usually oblanceolate, petiolate; siliculae almost orbicular, broader in lower half; style projecting from very small notch 12. *L. desertorum*
11 Racemes elongate (usually more than 10 cm), especially in fruit
13 Sepals persistent until fruit maturity
14 Siliculae *c* 2 mm, orbicular, with notch less than 1/10 length; leaves not auriculate .. .. .. .. .. .. .. 19. *L. fallax*
14 Siliculae 2·5–3·5 (–4) mm, ovate, with notch more than 1/10 length; leaves sometimes slightly auriculate
15 Perennial; stem often branched from half-way; upper leaves pinnatifid with broad segments; stem more or less hairy above 16. *L. bipinnatifidum*
15 Annual; stem often branched from near base; upper leaves entire or pinnatifid with narrow segments; stem often densely puberulent above .. .. .. .. .. .. .. .. 17. *L. aletes*
13 Sepals quickly deciduous before fruit maturity (sometimes subpersistent in 18. *L. spicatum* and 21. *L. pseudo-didymum*)
16 Siliculae 4–6 mm, deeply notched, often purplish when ripe; stem with many coarse, white hairs
17 Notch narrow; stem hairs blunt, almost papillose .. .. 22. *L. papillosum*
17 Notch broad; stem hairs acute, bristly .. .. 23. *L. oxytrichum*
16 Siliculae less than 4 mm, rather shallowly notched, usually green when ripe; stem hairs not as above
18 Siliculae more than 2·3 mm wide, ovate to orbicular or prolate, often reticulate when mature
19 Basal and lower leaves bi- or tri-pinnatifid; upper leaves usually pinnatifid
20 Siliculae 1·8–2·6 × (2·2–)2·3–3·2 mm, obcordate, strongly reticulate; seeds oblong, unwinged .. .. 21. *L. pseudo-didymum*
20 Siliculae 2·5–3·5(–4·0) mm, ovate or orbicular, hardly reticulate; seeds semi-circular, winged .. .. .. .. 20. *L. bonariense*
19 Basal and lower leaves pinnatifid, or deeply toothed, lobed or laciniate like the upper leaves
21 Perennial; siliculae 2·5–3·0 mm, ovate to orbicular, weakly reticulate, with notch *c* 1/15 length; seeds unwinged; fruiting racemes often few, narrow (5–7 mm), with pedicels shorter than fruit and often sub-erect .. .. .. .. .. 18. *L. spicatum*
21 Annual; siliculae (2·0–) 2·5–3·5 (–4·0) mm, ovate to obovate, not reticulate, with notch *c* 1/10 length; seeds narrowly but distinctly winged; fruiting racemes often numerous, rather broad (8–14 mm), with pedicels longer than fruit and spreading .. .. .. .. .. .. .. 11. *L. densiflorum*
18 Siliculae usually less than 2·3 mm wide, ovate to elliptic, not reticulate
22 Fruiting pedicels appressed; style longer than notch (see also 7. *L. aucheri*) .. .. .. .. .. .. .. 24. *L. schinzii*
22 Fruiting pedicels spreading; style usually shorter than notch
23 Siliculae 2·3–3·0 × 1·6–2·1 mm, elliptic; style longer than notch; hispid perennial .. .. .. .. .. .. 25. *L. capense*
23 Siliculae elliptic to ovate; style shorter than notch (or occasionally slightly projecting)
24 Cauline leaves linear, dentate, sub-sagittate at base; siliculae *c* 2·5 × 1·5 mm, elliptic .. .. .. 14. *L. sagittulatum*
24 Cauline leaves attenuate at base
25 Perennial, often woody at base, with long flexuous branches from base upwards; siliculae elliptic to oblong; notch with rounded lobes

26 Glabrous; siliculae 1·9–2·6 × 1·2–1·5 mm; seeds 0·8–1·0 mm .. .. .. .. 26. *L. divaricatum* subsp. *trifurcum*
26 Puberulous; siliculae 2·3–3·7 × 1·7–2·3 mm; seeds 1·3–1·5 mm .. .. .. 27. *L. divaricatum* subsp. *divaricatum*
25 Annual or biennial, rarely perennial, with relatively short, rigid branches mostly in upper part
27 Seeds narrowly winged; siliculae obovate to orbicular; plant sometimes densely hairy .. .. 11. *L. densiflorum*
27 Seeds unwinged; siliculae elliptic to ovate; plant often sparsely hairy
28 Plant usually less than 30 cm; mid and upper leaves linear, entire, less than 2 mm wide; basal leaves bipinnate; racemes forming dense, intricate, rather compact inflorescence; siliculae 2·0–2·5 × 1·5–1·8 (–2·0) mm, often elliptic-ovate with rather acute lobes to the notch .. .. .. .. .. 28. *L. ruderale*
28 Plant often more than 30 cm; leaves not as above; racemes forming rather lax, spreading inflorescence; siliculae 1·8–3·0 × 1·3–2·0 mm
29 Mid and upper leaves lanceolate-oblong, dentate, serrate or incised; basal leaves similar but larger; plant sparsely hairy .. .. .. .. 29. *L. africanum*
29 Mid and upper leaves lanceolate, pinnate or laciniate; basal leaves bipinnate; plant hairy 15. *L. pseudo-ruderale*

## NOTES ON SPECIES

Records given without authority are the author's and specimens are in **herb. T.B.R.**; the other records (MMcCW.) have been contributed by M. McC. Webster and specimens are often in **K** or **E.** Species for which no records are given are native, common casuals, or rare casuals with no known recent British records.

1. *L. campestre* (L.) R.Br. Europe, Asia Minor, introduced in N. America. Native and casual in Britain.
2. *L. hirtum* (L.) DC. W. Mediterranean to Greece. A rare casual, perhaps a variant of *L. heterophyllum*.
3. *L. villarsii* Gren. & Godron. French Alps and mountains of N.E. Spain. A rare casual, perhaps a variant of *L. heterophyllum*.
4. *L. heterophyllum* Benth. (*L. smithii* Hook.). W. Europe, naturalized widely. Native.
5. *L. perfoliatum* L. C. and E. Europe to W. Asia. A rare casual near docks and in grass-seed mixtures, recorded from wool-shoddy on the Continent.
6. *L. latifolium* L. Europe, N. Africa and S.W. Asia, formerly cultivated. Native near the sea in S. and E. Britain.
7. *L. aucheri* Boiss. Asia Minor and E. Mediterranean, naturalized in Australia. A rare wool-alien.
8. *L. graminifolium* L. Mediterranean and S. Europe. A rare dock alien.
9. *L. sativum* L. Egypt and W. Asia, cultivated widely. A common casual on tips.
10. *L. virginicum* L. N. America, widely naturalized in temperate countries. A rare casual in Britain. Blackmoor 1973. According to Strausbaugh & Core (1971) it is very similar to *L. densiflorum* and sometimes almost inseparable. Here it is differentiated only by the conspicuous petals and orbicular (not obovate) siliculae.
11. *L. densiflorum* Schrad. (*L. apetalum* Aschers.). N. America, widely naturalized, especially in S. Europe, where it is as common as *L. ruderale*, with which it may be confused. A rare alien in Britain. Blackmoor 1970 (conf. I.C. Hedge). Several closely related species are here

considered to be forms of *L. densiflorum*, including *L. neglectum* Thell., which is treated as a synonym in modern N. American Floras, and *L. ramosissimum* Nelson, with many short axillary racemes, which is said by Weber (1967) to be practically impossible to separate consistently. The occurrence of hybrids between *L. virginicum* and *L. densiflorum*, with intermediate characters, was suggested by Hitchcock (1936).

12. *L. desertorum* Eckl. & Zeyh. S. Africa. Blackmoor 1971; Galashiels 1960, 1963 MMcCW.
13. *L. fasciculatum* Thell. Australia. Blackmoor 1971; Galashiels 1970 MMcCW.
14. *L. sagittulatum* Thell. Australia. A rare wool-alien. The fruit is reminiscent of that of *L. africanum*, but the upper leaves are slightly auriculate as in *L. fasciculatum*.
15. *L. pseudo-ruderale* Thell. Australia. A rare wool-alien. The fruit is reminiscent of that of *L. africanum*, but the leaves are more pinnate and the plant is more hairy.
16. *L. bipinnatifidum* Desv. S. America. Blackmoor 1969 (det. J. P. M. Brenan), 1971.
17. *L. aletes* Macbride (*L. calycinum* Godron). S. America. Blackmoor 1969, 1971. It is apparently very close to (if not identical with) *L. auriculatum* Regel & Körnicke and *L. subvaginatum* Steud.
18. *L. spicatum* Desv. S. America. Blackmoor 1968 (det. Kew), 1970. The typical plant is very well illustrated by Boelcke (1964).
19. **L. fallax** T. B. Ryves, **sp.nov.**
Herba perennis; caulis erectus 30 cm, setosus, dimidio superiore ramosus racemis densiusculis; folia inferiora bipinnatipartita; folia caulina media et superiora pinnatipartita, basi non auriculata; petala nulla; sepala persistentia; siliculae rotundae, circa 2 mm longae et latae, apice modice emarginatae (sinu ad 1/12 longitudinis septi extendente), valvulis modice reticulatis; stigma ad basin sinus subsessile; semina compressa, subrotunda, 1·1 mm diam. distincte marginata.

HOLOTYPUS: Shoddy alien, Blackmoor, N. Hants., v.c. 12, Oct. 1971, *T. B. Ryves* (K).

*L. fallax* shows affinity with several S. American species, and clearly originated from that continent. It is intermediate between *L. bipinnatifidum* and *L. spicatum*, resembling the former in leaves, seeds and habit, and the latter in the shape of the siliculae, but the siliculae are smaller than in either species. The specimen has also been examined by C. C. Townsend, who considers (*in litt.* 1976) that the plant is closest to *L. bonariense* and *L. pseudo-didymum*, from which it differs in having less sharply notched, weakly reticulate siliculae, persistent sepals, a different indumentum on the pedicels and elsewhere, and a different habit.

20. *L. bonariense* L. S. America, widely naturalized. Blackmoor 1965 MMcCW, 1970, 1971, 1973 (conf. I. C. Hedge); Galashiels 1960–63 MMcCW. The upper leaves are usually characteristically 1- or 2-pinnate.
21. *L. pseudo-didymum* Thell. (*L. inclusum* O. E. Schulz). S. America. Galashiels 1960 MMcCW (K) (det. C. C. Townsend). A very distinct species, which is illustrated by Boelcke (1964).
22. *L. papillosum* F. Mueller. Australia. A rare wool-alien.
23. *L. oxytrichum* Sprague. Australia. A rare wool-alien. This species is apparently closely related to *L. papillosum*.
24. *L. schinzii* Thell. S. Africa. Galashiels 1962 MMcCW.
25. *L. capense* Thunb. S. Africa. Blackmoor 1970.
26. *L. divaricatum* Ait. subsp. *trifurcum* (Sond.) Marais. S. Africa. A rare wool-alien.
27. *L. divaricatum* Ait. subsp. *divaricatum* S. Africa. Blackmoor 1966 MMcCW, 1971; Galashiels 1963 MMcCW.
*L. divaricatum* is apparently often confused with *L. africanum*.
28. *L. ruderale* L. Europe, widely naturalized. Rare as a wool-alien, but formerly abundant on rubbish tips around London, although now becoming scarcer there. Some S. American plants have been confused with variants of *L. myrianthum* Phil. and *L. spicatum*.
29. *L. africanum* (Burm. f.) DC. (*L. divaricatum* subsp. *linoides* (Thunb.) Thell.). Tropical and S. Africa. Frequent at Blackmoor 1970–75. Specimens of *L. africanum* in K from E. Africa are apparently indistinguishable from *L. hyssopifolium* Desv., the common Australian weed, and are here treated as the same species.

ACKNOWLEDGMENTS

I wish to thank C. C. Townsend for making a critical examination of the new species described, Dr I. C. Hedge for confirming some of the identifications, Miss M. McC. Webster for supplying many plant records, and Lady A. Brewis for permission to visit Blackmoor Fruit Farm, often with other members of the London Natural History Society.

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# Short Notes

## *CAREX SPICATA* HUDS. NEAR LAW, LANARK

*Carex spicata* Huds. is a sedge common in the south-eastern part of Britain but less so in Cornwall, western Wales and northern England, and rare in Scotland. The *Atlas of the British flora* shows three post-1930 and one pre-1930 records for the plant in Scotland. Of these, the pre-1930 record for 37/2.7, Forfar, v.c. 90, and the records for 25/8.5, Kirkcudbright, v.c. 73, and 37/4.3, Forfar, v.c. 90, cannot be confirmed either by herbarium or literature references. The record for 37/6.4, Forfar, v.c. 90, is still extant. In addition, there is a 1960 record for 37/7.6, Kincardine, v.c. 91, and a more recent find in 26/0.2, Arran, Clyde Is., v.c. 100. There is an unconfirmed record for 28/7.6, Easterness, v.c. 96. There are therefore three recently confirmed stations for the plant in Scotland, one unconfirmed and four others for which there have been records in the past but in which the plant can no longer be found or for which the original record cannot be confirmed.

On the 16th July, 1976, we observed a colony of the plant (confirmed by R. W. David) growing on the roadside verge of the B7011 road west of Law Village at 26/809.518, Lanark, v.c. 77. The location was a damp, open area in an otherwise unbroken stretch of tall herb and grass communities dominated by *Chamaenerion angustifolium*, *Rumex obtusifolius*, *Dactylis glomerata* and *Deschampsia cespitosa*. The extent of the *Carex spicata* was assessed by estimating the number of 1 sq. ft quadrats in which *C. spicata* was the dominant vascular plant. In this way, the population was estimated as covering 16 quadrats with between 12 and 30 fruiting heads per quadrat. A minimum of 200 fruiting heads were present. The largest single area over which *C. spicata* was dominant was $2 \times 3$ ft. The species immediately associated with the plant were: *Heracleum sphondylium*, *Dactylis glomerata*, *Vicia cracca*, *Deschampsia cespitosa*, *Arrhenatherum elatius*, *Holcus lanatus*, *Dactylorhiza fuchsii*, *Carex flacca*, *C. nigra*, *C. ovalis*, *Juncus effusus*, *Ranunculus acris*, *Lathyrus pratensis*, *Centaurea nigra*, *Cynosurus cristatus*, *Potentilla anserina*, *Prunella vulgaris*, *Trifolium repens*, *T. pratense*, *Odontites verna*, *Plantago lanceolata*, *Achillea ptarmica* and *Acrocladium cuspidatum*. Other species occurring in the general vicinity, but not directly associated with the plant, were *Cirsium arvense*, *Rumex obtusifolius*, *Chamaenerion angustifolium*, *Phleum pratense*, *Rosa canina* agg. and *Tragopogon pratensis*.

On 9th August a second area, a quarter of a mile north-west of the first, was examined and two isolated tussocks of *C. spicata* were found growing in association with *Juncus articulatus*, *Carex ovalis*, *Achillea ptarmica* and *Salix cinerea* agg. on the edge of a *Juncus/Filipendula* dominated depression. This depression is being infilled with soil and domestic refuse. The area is also grazed by sheep and cattle.

Jermy & Tutin (1968) list the habitats of *C. spicata* as ditch- and pond-sides, wet meadows, hedgebanks and rough grasslands; our colonies appear successful in situations either where ground is in the early stages of plant colonization or in areas kept at subseral stages by either edaphic or anthropogenic factors. At our first station the plant occurs in a section of the road verge which is subjected to disturbance (a small but well-used footpath runs right through the colony) and is directly beneath overhead power cables, suggesting that the ground has been disturbed in the past. At our second station the boggy area is grazed as well as subjected to regular disturbance by tipping. It is interesting to note that all confirmed Scottish records occur on or adjacent to footpaths and, all but our stations near Law, on or near the coast. The wide separation of stations for *C. spicata* could suggest it is an under-recorded species or perhaps that it has been introduced by chance. Its association with footpaths and disturbance would certainly support the latter.

ACKNOWLEDGMENTS

We acknowledge the assistance of the Biological Records Centre, Miss U. K. Duncan, R. W. David and A. McG. Stirling in forwarding information on the status of *C. spicata* in Scotland.

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E. M. & S. M. Bignal

## CHROMOSOME NUMBERS OF SOME EURASIAN SPECIES OF *CRATAEGUS*

Recent publications by Byatt (1975a, 1976) have shown that hybridization plays an important role in the evolution of *Crataegus* populations. Although Gladkova (1968) has counted the chromosomes of many Eurasian species of the genus, other species, particularly European ones, remain uncounted. Since it is important to know whether hybrids are the progeny of parents with the same or different chromosome numbers, this note contains the results of our investigations of some Eurasian species of *Crataegus*.

For mitotic studies actively growing root-tips were collected and pretreated in a saturated solution of para-dichloro-benzene for 18–24 hours at 4° C. They were then fixed overnight in ethanol/acetic acid (3:1) and stained by the Feulgen method. Meiosis was observed in pollen-mother-cells of young flowers that had been fixed in Carnoy's fluid (ethanol:chloroform:acetic acid, 6:3:1) and stained in aceto-orcein.

The results are given in Table 1. The chromosomes are small, approximately 1·0$\mu$m long and metacentric or submetacentric. With the exception of some of the plants from the Forest of Cernay, the species are all either diploid or tetraploid, with a basic number of $x = 17$. *C. wattiana*, a species that grows in the mountains of central Asia, has been included because it is almost certainly conspecific with *C. altaica* Lange, in which case the name *C. wattiana* has priority, as pointed out by Riedl (1969). *C. altaica* was reported by Gladkova (1968) to be tetraploid and our observations confirm this. The plants of *C. laevigata* come from a population studied by Bradshaw (1953, 1971) and Byatt (1975a, 1975c) at Horish Wood, W. Kent. These are the first counts for this species from

TABLE 1. CHROMOSOME NUMBERS OF SOME EURASIAN *CRATAEGUS* SPECIES

| | Chromosome No. | Origin |
|---|---|---|
| *C. heldreichii* Boiss. | $2n = 34$ | Mt Parnes, Attica, Greece[1] |
| *C. laevigata* (Poiret) DC. | $n = 17$ (2 plants) | Horish Wood, Maidstone, W. Kent, v.c. 16[2] |
| *C. nigra* Waldst. & Kit. | $2n = 34$ | R.B.G. Kew No. 753[3] |
| *C. pentagyna* Waldst. & Kit. ex Willd. | $2n = 34$ | Forest of Babadag, Dobrogea, Romania[1] |
| *C. wattiana* Hemsley & Lace | $2n = 68$ | R.B.G. Kew No. 854[3] |
| *Crataegus* sp. | $2n = 34$ (2 plants) | Forest of Cernay, Haut-Rhin, France[1,3] |
| | $2n = 52$ (3 plants) | |

[1] Living plants at Westfield College.
[2] Voucher specimens deposited at K.
[3] Living plants at the Royal Botanic Gardens, Kew.

European material of natural origin. The count for *C. pentagyna*, made from plants grown from seed collected in the Forest of Babadag, Romania, agrees with that made by Gladkova (1968) from material collected in the Crimea. Chromosome numbers for *C. nigra* and *C. heldreichii* have not previously been published. The young plant of *C. heldreichii* was collected from a population growing in the classical area for the species, where it appeared to be spatially well isolated from other species of the genus. The plant of *C. nigra* growing at the Royal Botanic Gardens, Kew, is known to have originated from the Botanic Garden at Leningrad.

The un-named plants collected from the Forest of Cernay have two different chromosome numbers. Byatt (1976) has described the structure of this population and has shown that three taxa are present inside the wood: *C. laevigata*, *C. curvisepala* Lindman subsp. *lindmanii* (Hrabětová-Uhrová) Byatt (see Byatt 1975b) and *C.* × *macrocarpa* Hegetschw. The young plants studied were growing under mature plants of *C. laevigata* and *C.* × *macrocarpa*. The two plants with $2n = 34$ are probably *C. laevigata* and the three with $2n = 52$ are probably hybrids that arose from crosses between *C. laevigata* and *C. curvisepala* (which was reported by Gladkova (1968) to be tetraploid) and their progeny.

ACKNOWLEDGMENTS

The young plants used in this study were collected on the Westfield College expedition to south-eastern Europe, which was jointly financed by the Royal Society, the University of London Central Research Fund and the Godman Fund (British Museum).

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J. I. Byatt & B. G. Murray

## *MYRIOPHYLLUM AQUATICUM* (VELLOSO) VERDC. (*M. BRASILIENSE* CAMB.) IN BRITAIN

During a tour of the Lizard area of W. Cornwall, v.c. 1, on 17th April, 1976, a visit was made to Croft Pascoe Pool on the Goonhilly Downs. My attention was taken by the young, green tufts of a *Myriophyllum* against the blackish mud. A length of rhizome was taken and a few days later transferred to my garden pool at Driffield, S.E. Yorks., v.c. 61.

At that stage the plant was clearly either *M. verticillatum* L. or the S. American *M. aquaticum* (Velloso) Verdc., which appears at present to be better known as *M. brasiliense* Camb., the name used by Cook (1968) in *Flora Europaea*. In addition the latter is known in horticulture as *M. proserpinacoides* Gillies ex Hooker & Arnott and popularly as Parrot's Feathers. *M. verticillatum* seemed unlikely from the distribution map in the *Atlas of the British flora*; moreover *M. aquaticum* is naturalized in south-western France (Cooke 1968).

Only female flowers have been reported on plants of *M. aquaticum* cultivated in Europe or N. America. In early May my specimen flowered, also producing only female flowers. A drawing and subsequently the flowering shoot, when it seemed certain that no male flowers were likely, were sent to Professor C. D. K. Cook, who determined the plant as *M. aquaticum*. He also gave the useful information that this species will flourish indoors in wet soil, which proved to be true with the specimen to hand, whereas *M. verticillatum* will not do so. When once seen, the blueish-green of the aerial leaves, which are completely covered by minute glands (× 15 lens), and the very small (1·5mm), white, apetalous, female flowers are distinctive. Many aquarists stock the plant and this is probably the easiest way to become familiar with it, and no doubt the origin of my find.

Initially it was thought that this was the first record for Great Britain. However, L. J. Margetts (pers. comm. 1976) found it some years ago at Penzance in a stream flowing from a park, and also in a quarry in the Redruth area, both W. Cornwall, v.c. 1. It may well have been found on other occasions and not been reported because it is an alien, reputedly exceptionally frost-tender and not expected to survive.

Since the Goonhilly plant had obviously overwintered, its hardiness in suitable areas in the south-west may allow it to be referred to as naturalized. Both Mr Margetts' finds failed to persist,

but Mrs B. E. M. Garratt informs me (pers. comm. 1976) that the plant has survived for seven years in her garden, which overlooks the valley of the River Fal, W. Cornwall, and it is in the garden pond of my brother, L. Chicken, at Cottingham, S.E. Yorks., v.c. 61, where it survived last winter (1975–76) even though thin ice formed on the pond.

Temperature data for Penzance and for Culdrose near Helston (the nearest recording centre to Croft Pascoe Pool and similar in altitude and distance from the sea) show that the average minimum yearly temperature for the years 1971 to 1975 is −2·6°C at Penzance and −3·2°C at Culdrose. For the previous ten years the figures are −4·2°C and −5·0°C respectively. At Culdrose the average number of days per month with a grass minimum temperature below 0·0°C during the period 1963 to 1972 reaches a maximum in February with 12·5 days, compared with, for example, 2·4 days for May and 0·1 days for August. It may well be that the overwinter survival of *M. aquaticum* depends largely on the depth of water and mud over the rhizome, and it will be interesting to see what happens to this species at Croft Pascoe Pool over the next few years.

ACKNOWLEDGMENTS

My thanks go to the correspondents named and to the Director of the Meteorological Office for weather data.

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E. Chicken

## A SECOND STATION FOR *DIAPENSIA LAPPONICA* L.

*Diapensia lapponica* L. is a plant of the arctic, extending as far south as *c* 60° N. in Norway, to the C. Urals and to New York State. It was first found growing in Britain by C. F. Tebbutt in Westerness, v.c. 97, on 5th July, 1951 (Roger 1952). This site, at *c* 2,500 ft on a hill in the neighbourhood of Glenfinnan, to the west of Fort William, at *c* 56° 40′ N., has remained the only known station for the succeeding 25 years.

The area to the north of this site is very wild and penetrated by only two minor roads before the main road through Glen Shiel, some 20 miles to the north. Several of the mountains exceed 3,000 ft, and provide popular routes for hill-walkers. While walking in the Loch Quoich region of Westerness (GR 18/9.0), some 15 miles north of the original site, on June 1st, 1976, we found a small colony (about ten plants within an area of about 100 m²) of *Diapensia* on an exposed ridge at about 850m. The plants were all small, no more than 10cm across, and were growing in dry broken quartzite with *Alchemilla alpina*, *Antennaria dioica*, *Loiseleuria procumbens* and *Salix herbacea*. The identification has been confirmed from colour slides by Dr F. H. Perring of the Biological Records Centre.

We have not visited the original station, but, from discussions with those who have, it would appear that the two are very similar, the broken quartzite and altitude being common factors. The individual plants are apparently much smaller than those of the first station. Knowledge of this region of Westerness suggests to us that there may be more colonies of *Diapensia* awaiting discovery between Glenfinnan and Glen Shiel.

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A. F. & S. M. Craven

## THE DISTRIBUTION OF *CAREX MONTANA* L. IN BRITAIN

The geographical centre of *Carex montana* L. is central Europe, where it is not uncommon locally, especially in sub-alpine regions, preferring open habitats on heaths and in light woodland, generally on calcareous soils. It extends eastwards into Asia at least as far as the Urals, but in the south does not go beyond northern Spain, Corsica, northern Italy and north-western Bulgaria. It is absent from northern Russia, from Scandinavia (except southern Sweden) and from Scotland; and Gliemann's record, made in 1824, for Iceland has been generally rejected by later botanists as an error for *C. pilulifera* L.

In England and Wales, therefore, *C. montana* is at the extreme north-western limit of its range, and this may partly account for its curiously disjunct distribution here. For, though the plant may be extremely abundant, indeed dominant, where it occurs, the areas of occupation are very sharply delimited and one may be separated from the next by as much as 100 miles. Habitats are very varied, from ledges of limestone cliffs to marshy pastures with *Narthecium*, and from dry heaths in full sun to woodlands on heavy clay. The pH, as measured so far, ranges from 4·61 to 7·67, and the altitude from 50 to 2,000 ft. I am led to conjecture that, at least in Britain, the health of *C. montana* is controlled by some soil-factor not yet determined.

The British stations are listed below. The relative abundance of the sedge in each is indicated by the letters A (less than 20 plants), B (20 to 100), C (hundreds) and D (thousands). The numbers are very approximate, for the growth-form of the plant (tufts of leaves from many points on a radiating network of rhizomes, which often dies out in the centre leaving a ring of surviving tufts) makes precise counting difficult. All the estimates given have been made in the field since 1970. In some stations the plant has not been refound, or is extinct, though authentic specimens exist in herbaria; for others the record is unconfirmed. All these are also noted.

W. Cornwall, v.c. 1: 10/5.3, Carbis Bay (B); 10/7.5, Cross Coombe (B).

E. Cornwall, v.c. 2: 10/9.6, Hustyn Wood, W. Curnow, 1878 (Davey 1906), **BM** (not refound despite repeated searches).

S. Devon, v.c. 3: 20/5.6, Bickleigh Common/Roborough Down, **BM, K** (became extinct *c* 1880); 30/1.8, Sidmouth (Harris 1927) (unconfirmed).

N. Devon, v.c. 4 (?): 20/5.8 or 20/5.9 (?), 'foot of Yeast Tor [? = Yes Tor] on dry tufts in peat bog', W. Waterfall, 1876, **K** (not refound).

N. Somerset, v.c. 6: 31/5.5 just extending into 31/4.5, Charterhouse, 3 places (C, C, D). (Outliers are indicated in the literature but have not been recently located.)

Dorset, v.c. 9: 41/0.1, 'moist woodland, Edmondsham' (Linton 1909), **BM, CGE** (not refound).

Wight, v.c. 10: 40/4.9, Park Gate Forest (Druce 1920), **BM, OXF** (not refound).

S. Hants., v.c. 11: 40/2.9, Lymington (B), Sway (A), Wootton Enclosure, J. H. Salter, 1917, **NMW** (not refound); 41/1.1, Deadman Hill (B); 41/2.1, Fritham Plain (B), Ocknell Plain (A), Broom Hill (Townsend 1904) (unconfirmed); 41/3.0, Brockenhurst, 6 places (A, A, A, B, B, B), 'heath near Beaulieu', A. B. Jackson, 1908, **BM** (not refound); 41/3.2, Baddesley (Townsend 1904) (unconfirmed, site now built over).

E. Sussex, v.c. 14: 51/3.2, Chailey, 2 places (A, B). (Well known since 1896, but not seen since 1974); 51/5.1, near Heathfield station, **BM** (though some of the specimens are *C. pilulifera* others are authentic), **NMW, OXF** (became extinct probably *c* 1900); 51/5.3, Broadwater Forest, a single plant on a roadside (the original British station for *Carex montana*, just off the Eridge road, W. Mitten, 1843, **BM, CGE, K, NMW, OXF**, was destroyed in 1969–71).

E. Kent, v.c. 15: 51/9.6, Bysing Wood, Faversham, and 61/1.6, Thornden Wood, Canterbury, both F. J. Hanbury, 1875, **BM** (not refound).

Berks., v.c. 22: 41/8.6, Bracknell, **BM, CGE, K, OXF** (became extinct in 1974). The original finder, J. Higgens, labelled his first sheet (1917, **OXF**), 'Bagshot Heath, Berks', but a second (1918, **BM**) is labelled 'Bracknell', and Druce (1918) takes these stations to be the same.

Bucks., v.c. 24: The finding of a single specimen near Chalfont St Peter (51/0.9) was reported by Armitage (1891). The specimen is in **OXF**, and I have no hesitation in determining it as *C. pilulifera* L.

W. Gloucs., v.c. 34: 31/5.9, Pen Moel, 2 places (A, A), Tidenham Chase, 4 places (A, C, C, C); 32/5.1, Symonds Yat (A).

Mon., v.c. 35: 31/5.9, Wyndcliff, **BM, CGE, NMW, OXF** (reported as extinct *c* 1969). Presumably

the same station as 'limestone wood between Tintern and St Arvans', W. H. Purchas, 1847.
Hereford, v.c. 36: 32/5.1, Great Doward (C).
Worcs., v.c. 37: 32/7.7, Wyre Forest south of Dowles Brook, 2 places (A, C).
Salop, v.c. 40: 32/7.7, Wyre Forest north of Dowles Brook, 4 places (A, A, C, C).
Glam., v.c. 41: 21/8.7, near Newton, Miss E. M. Thomas, 1942, **NMW** (not refound; possibly but improbably the same station as the next), Ogmore Down and Old Castle Down (D); 21/9.7, Old Castle Down and Ewenny Down (D); 32/0.0, Morlais Castle Hill, Miss E. Vachell, 1932, **NMW** (not refound).
Brecon, v.c. 42: 22/7.1, Afon Twrch (B); 22/8.1, Penwyllt, 2 places (B, D); 22/8.2, Hydfer valley (C), Bannau Brycheiniog (A); 22/8.5, Abergwesyn (B); 22/9.0, Penderyn, 3 places (A, B, C); 22/9.1, Ystradfelte, 2 places (B, D); 22/9.2, Craig Cerrig Gleisiad (C); 32/0.0, near Cefn-coed, 2 places (C, D); 32/0.1, Dolygaer (B); 32/2.1, Cwm Clydach (C).
Carms., v.c. 44, 22/7.2, Carreg yr Ogof (discovered in 1976 but not visited personally).
Denbigh, v.c. 50: 33/2.4, 'fields, Llangollen', W. Wild, 1880, **NMW** (not refound).
Derbys., v.c. 57: 43/5.7, Markland Grips, 2 places (B, B).

The brittleness of the woody rhizomes makes *Carex montana* vulnerable to disturbance, and this explains many of the extinctions. On the other hand, I suspect that it is frequently overlooked, if only because in certain seasons it is very shy-flowering and in certain localities regularly so. When present, sometimes as early as the end of March and persisting until late May, the dark purplish-black inflorescences, on long, very thin stalks that become decumbent as the utricles ripen, are distinctive. Non-flowering tufts may also catch the practised eye, for the patches of narrow, more or less erect and more or less straight-sided leaves, in spring a clear, milky green and in later summer with a strong yellowish tinge, stand out from the surrounding herbage. In the last five years one quite new station has been discovered in Cornwall, four in the New Forest, no fewer than ten in Brecon, and one in Carmarthen.

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R. W. DAVID

## THE *RUBI* OF SUTHERLAND

The study of the British *Rubi* is at present in such a fluid state that it is very difficult for the authors of local Floras to present an accurate account. Determinations made when the information for the Flora was being collected are sometimes out of date when the book is published. I hope therefore that the author of *John Anthony's Flora of Sutherland* (Kenworthy 1976) will permit the following corrections to the *Rubus* list in that book.

I am said to have named the *Rubi*, but I did not see specimens of all the records, nor did I give a firm determination for all those I did see. I suggested the name *R. purpureicaulis* W. C. R. Wats. (now merged with *R. conjungens* (Bab.) Warren) for the bramble recorded for Skelbo Street, Dornoch, but it was not a confident determination and should not have been published. I named many specimens *R. villicaulis* sensu Rogers, but I told John Anthony that it was not the plant described by Weihe & Nees. The Scottish bramble has since been recognized as *R. septentrionalis* W. C. R. Wats. (Edees 1973). Finally, Weber (1972) has discovered that *R. leptothyrsus* G. Braun is an earlier valid name for *R. danicus* (Focke) Focke.

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E. S. EDEES

## A NEW BRAMBLE OF NORTH-WESTERN ENGLAND

While examining *Rubus* sheets at **CGE** some years ago, I encountered specimens collected by A. Ley, W. H. Mills and others in W. Lancs., v.c. 60, and Westmorland, v.c. 69, which seemed to represent a taxon distinct from *R. egregius* Focke and *R. mercicus* var. *bracteatus* Bagnall (= *R. varvicensis* Edees), to which the specimens had been referred.

Since then I have collected the same plant myself at several places in v.c. 60 and 69 and in Cumberland, v.c. 70, and have recognized gatherings sent to me by D. E. Allen from Man, v.c. 71, as the same. I have also seen and collected both the other *Rubi* mentioned above; the three are distinct taxa. The most obvious features of the northern plant in the field are the dark green foliage and the very floriferous, white-flowered panicles, which are dense at the top and spreading below.

**Rubus cumbrensis** A. Newton, **sp. nov.**

Turio viridis vel fuscovirescens, subpruinosus obtusangulus superficiebus concavis, aculeis ad angulos dispositis brevibus e basi lata exortis rectis declinatis armatus. Folia 4–5(6–7)-nata digitata olivacea supra subnitida infra griseoviridia pubescentia. Foliolum terminale orbiculare vel obovatum basi truncata breviter cuspidatum dentibus serratis haud profundis.

Inflorescentia longa pyramidata supra subcorymbosa densa, infra ramulis nonnullis subracemosis patentibus vel laxe adscendentibus. Rachis flexuosa pilosa aculeis brevibus rectis declinatis e basi lata exortis praedita. Flores circa 2·5cm diam.; sepala reflexa ovata griseoalba villosa parum aculeolata albomarginata; petala alba vel primo pallide rosea obovata utrinque pubescentia. Stamina stylos flavescentes longe superantia; anthera glabra. Carpella glabra vel sparsim pilosa.

Stem greenish to dull reddish-brown, subpruinose, blunt-angled with furrowed sides and scattered simple hairs; prickles confined to the angles, rather short, mostly straight, slanting from broad bases. Leaves 4–5(6–7)-nate-digitate, olive-green, shining above, somewhat plicate, grey-green felted and pilose below, the terminal roundish to obovate with an entire base, cuspidate, shallowly and regularly compound-serrate with a few recurved teeth, fringed with scattered minute glands, the veins beneath yellowish and prominent.

Panicle long-pyramidal, dense, subcorymbose above with several simple and ternate leaves with leaflets greyish beneath, with many patent or laxly ascending subracemose branches below. Rachis strongly flexuous, angled, hirsute, felted above. Prickles short, straight, declining from broad bases, some small. Flowers *c* 2.5cm diameter; sepals reflexed, ovate, grey-white felted, slightly aculeolate, with white margins; petals white or pink-blushed in bud, distant, broadly obovate or oblong, downy on both sides and erose at the tip. Filaments white, greatly exceeding the yellowish styles; anthers glabrous. Carpels glabrous or with a few hairs.

HOLOTYPUS: Emmetts, Abbotstead, W. Lancs., v.c. 60, 15/8/71, *A. Newton* (**CGE**)

The chief differences from *R. varvicensis* are: leaves more softly hairy beneath, rounder; panicle narrower in the upper part and more floriferous; rachis lacking glands and acicles; petals white rather than pale pink. It belongs to *Rubus* section *Sylvatici*, and lies between *R. pyramidalis* Kalt. and *R. polyanthemus* Lindeb.

The following specimens in **CGE** are regarded as representative (paratypes):

W. Lancs., v.c. 60: Lancaster–Clitheroe, 9/1938, *W. H. Mills*, as *R. bracteatus*
Hedge near Inskip, 5/8/1895, E. S. Marshall, as *R. silurum* teste W. M. Rogers

Westmorland, v.c. 69: Windermere, 5/9/1836, *S. Hailstone*, as *R. carpinifolius*
Windermere, 9/1883, *J. G. Baker*, as *R. calvatus*
Ambleside and Coniston, 12/7/1905, *A. Ley*, as *R. mercicus* var. *bracteatus*
Troutbeck, near Ambleside, 5/9/1909, *S. H. Bickham*, as *R. bracteatus*
Coniston to Ambleside, 9/1912, *J. Comber*, as *R. bracteatus*
Roadside north of Elterwater, 28/7/1953, *W. H. Mills*, as *R. egregius*

I have specimens in my own herbarium from the Fylde and the foothills of the Forest of Bowland, v.c. 60; the shores of Ullswater, v.c. 70; and Skelwith Bridge, v.c. 69, where it grows with *R. plicatus*, *R. nemoralis* (*R. selmeri*), *R. furnarius*, *R. errabundus*, *R. infestus* and *R. wirralensis*. It appears to be characteristic of the fringes of upland oakwood and the edges of ancient (now drained) lowland mosses.

A. Newton

## *RUBI* COMMON TO THE BRITISH ISLES AND NORTH-WESTERN CONTINENTAL EUROPE

Following visits by A.N. to Germany and Belgium in 1974 and by H.E.W. to Britain in 1976 in each other's company, supplemented by examination of the literature, inspection of herbarium specimens in many European institutions, and much correspondence, we agree that the following *Rubus* species occur both in the British Isles and north-western continental Europe, and that additions to this list are likely to be few:

*R. nessensis* W. Hall
*R. scissus* W. C. R. Wats.
*R. sulcatus* Vest
*R. bertramii* G. Braun (*R. opacus* auct., non Focke)
*R. plicatus* Weihe & Nees
*R. affinis* Weihe & Nees
*R. divaricatus* P. J. Muell.
*R. integribasis* P. J. Muell. (*R. holsaticus* Erichs.)
**R. allegheniensis* Porter
**R. pergratus* Blanchard
*R. sublustris* Lees (*R. warmingii* f. *glaber* Frider. & Gel.)
*R. balfourianus* Blox. ex Bab. (*R. nemorosus* auct. an Hayne ex Willd.?)
*R. gratus* Focke
*R. sciocharis* Sudre
*R. adspersus* Weihe ex Weber (*R. carpinifolius* auct.)
*R. platyacanthus* Muell. & Lefèv. (*R. carpinifolius* auct.)
*R. nemoralis* P. J. Muell. (*R. selmeri* Lindeb.)
**R. laciniatus* Willd.
*R. lindleianus* Lees
*R. egregius* Focke
*R. macrophyllus* Weihe & Nees
*R. silvaticus* Weihe & Nees
*R. pyramidalis* Kalt.
*R. leptothyrsos* G. Braun (*R. danicus* (Focke) Focke)
*R. septentrionalis* W. C. R. Wats.
*R. polyanthemus* Lindeb.
*R. rhombifolius* Weihe ex Boenn. (*R. incurvatus* var. *subcarpinifolius* Rogers & Riddelsd.)
**R. elegantispinosus* (Schumach.) Weber
*R. cardiophyllus* Muell. & Lefèv.
*R. lindebergii* P. J. Muell.
**R. procerus* P. J. Muell. (*R. armeniacus* Focke)
*R. sprengelii* Weihe
*R. arrhenii* (Lange) Lange
*R. vestitus* Weihe & Nees
*R. mucronulatus* Bor. (*R. mucronifer* Sudre)
*R. anisacanthos* G. Braun (*R. albisequens* Weber)
*R. infestus* Weihe ex Boenn. (*R. taeniarum* Lindeb.)
*R. radula* Weihe ex Boenn.
*R. rudis* Weihe & Nees
*R. micans* Gren. & Godr. (*R. anglosaxonicus* Gel.)
*R. flexuosus* Muell. & Lefèv.
*R. fuscus* Weihe & Nees
*R. pallidus* Weihe & Nees
*R. euryanthemus* W. C. R. Wats.
*R. scaber* Weihe & Nees
*R. raduloides* (Rogers) Sudre
*R. dasyphyllus* (Rogers) E. S. Marshall
*R. hartmanii* Gandog.
*R. bellardii* Weihe & Nees

* Species further discussed below.

In this context, north-western continental Europe comprises southern Norway, southern Sweden, Denmark, northern Holland and north-western Germany.

*R. pergratus* and *R. allegheniensis* are N. American species grown in Europe and naturalized both in the British Isles and on the Continent. *R. pergratus* (det. H.E.W.) was first recorded in Britain by us in 1976 as a well-established alien in Toft Wood, Cheshire, v.c. 58. A.N. has since seen a sheet of the same species collected by B. A. Miles in 1961 from Epping Forest, S. Essex, v.c. 18 (**CGE**). It is known from a few places in north-western Germany (Weber 1972). Its affinities are with *R. nessensis* (sect. *Suberecti*) but the strongly grooved, almost thornless stem is a distinctive feature. *R. allegheniensis* is 'rare, but persists' in the London area (Watson 1952) and is established on Lindow Common, Cheshire, v.c. 58; it is occasionally encountered in north-western Germany (Weber 1972). It also belongs to sect. *Suberecti* but, unlike any European example of this section, has frequent short-stalked glands on the panicle.

*R. elegantispinosus* is native on the Continent, but its history in Britain is as yet obscure. After collecting it in Germany, A.N. has recognized it from a number of British vice-counties, including v.c. 19, 26, 53, 62, 83 and 99; H.E.W. has seen and corroborated some gatherings in **herb. A.N.** Its localities in Britain are, however, similar to those of *R. procerus* (river and railway banks, hedgerows near gardens, etc.); whether it is native in Britain or (as is strongly suspected) of garden origin, is as yet unclear.

*R. procerus* is a Continental species grown in gardens and naturalized in the British Isles, while *R. laciniatus* is a garden species of unknown origin naturalized in much of Europe.

In A.N.'s view, the above list comprises slightly more than one-half of the total of non-endemic *Rubus* species currently thought to occur in the British Isles; almost 70% of the accepted, named British taxa appear, therefore, to be endemic. The eligibility of a few species (e.g. *R. pygmaeopsis* Focke) has still to be established conclusively. '*R. menkei*' of the British list is found to differ significantly from *R. menkei* Weihe & Nees, and is therefore described below as a new species.

**Rubus iceniensis** Newton & Weber, **sp. nov.**

*R. menkei* auct. angl., Sudre et al. ex parte, non Weihe & Nees in Bluff & Fingerhuth, Comp. Fl. Germ., **1**: 679 (1825). *R. tereticaulis* sensu Rogers, Handbook of British Rubi, 91 (1900); Set of British Rubi no. 103; non P. J. Mueller, Flora, ser. 2, **16**: 173 (1858)

Frutex haud omnino *Rubo menkei* Weihe & Nees dissimilis, a quo hoc modo distincte differt: Turio aculeis brevioribus et densioribus. Folia turionis *R. menkei* valde dissimiles; foliolum terminale ellipticum vel late obovatum, vulgo gradatim cuspidatum (non mucronatum) ± aequaliter serratum, dentibus principalibus (contrarie *R. menkei*) non manifeste excurvatis. Inflorescentia angustiora, aculeis brevioribus (ad rachidem 3–(4)mm non 4–> 5mm longis). Foliola terminalia foliorum ternatorum basi ± lata elliptica vel late obovata (non sicut in *R. menkei* basi ± anguste cuneata, truncata vel vix emarginata, prope apicem manifeste dilatata saepe angulato-obovata). Ramuli adscendentes, breviores (in *R. menkei* longi, ± patentes, nonnulli reflexi). Pedunculi multis (10–> 20) aculeis brevibus (circa 1·5mm longis), ± curvatis (in *R. menkei* rectis, saepe > 2mm longis), glandulis stipitatis brevibus circa 0·2–0·3(−0·7)mm longis (in *R. menkei* 0·8–1·5(−2)mm longis).

In some respects this plant is similar to *R. menkei* Weihe & Nees, but is clearly distinguished by the following characters: Stem with denser and more slender and shorter prickles. Leaf-shape quite different from that of *R. menkei*: terminal leaflet elliptic or broadly obovate, more or less gradually pointed and regularly serrate, lacking the characteristic incised serration of *R. menkei* with its longer and markedly excurved principal teeth (particularly in the upper part) and typical mucronate point. Panicle narrower, with much shorter prickles (on the rachis *c* 3(–4)mm compared with often more than 5mm in *R. menkei*). Terminal leaflets of the ternate leaves more broadly based, elliptic or broadly obovate (on *R. menkei* often more or less cuneate-based, even angled-obovate with the greatest width near the tip, like the leaves of the stem but without excurved teeth). Branches shorter, branched near the base, ascending, not long and patent (or sometimes even reflexed) and divided half-way as in *R. menkei*. The shape of the panicle is quite different in the two species: peduncles with many (10–> 20), short and more or less curved prickles only *c* 1·5mm (in *R. menkei* often > 2mm) and with very short glands 0·2–0·3(–0·7)mm (in *R. menkei c* 0·8–1·5(–2)mm).

HOLOTYPUS: Set of British Rubi no. 103; Wood on the borders of Sprowston and Rackheath, E. Norfolk, v.c. 27, 27/7/1893, *E. F. Linton*, as *R. tereticaulis* P. J. Muell. **(MANCH)**. Isotypi in **BM, CGE, LIV, OXF.**

The name commemorates the Iceni, ancient inhabitants of Norfolk, to which county, particularly on the heaths and woods around Norwich, this species appears to be confined.

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A. NEWTON & H. E. WEBER (*University of Osnabrück, W. Germany*)

## PEROXIDASE ISOZYMES IN SOME ELMS (*ULMUS* L.) OF EASTERN ENGLAND

Few taxonomically useful characters, other than foliar biometric characters, have been found with which to study the complex European population constituted by sect. *Ulmus* (sect. *Madocarpus* Dum.) of *Ulmus* L. Isozyme variation was, therefore, investigated in a search for independent discriminators. Initial screening of ten enzyme systems revealed surprisingly little variation within the complex, with the exception of peroxidase. Accordingly, peroxidase was used in all subsequent work.

Fresh leaves were collected in five vice-counties (Beds., Cambs., N. Essex, S. Essex, Hunts.) from 19 trees, identified, on the basis of leaf-shape and tree-form, according to the three-species concept (Richens 1968), as *U. glabra* Huds., *U. minor* Mill. sensu lato, *U. glabra* × *U. minor* and *U. procera* Salisb. A list of locations is incorporated in Fig. 1. The leaves were homogenized in cold acetone and the resulting powder stored at −20°C until required. Disc electrophoresis in acrylamide gels was used to separate the isozyme bands and the bands were stained in a catechol + $H_2O_2$ solution.

The resultant staining patterns are shown in Fig. 1. It is obvious that two bands with Rf values of 28 and 48 relative to a bromophenol blue marker were constant throughout the samples. Several of the trees had additional bands which are of interest. In the *U. glabra* sample (zymogram pattern F), two additional bands were noted, neither of which was present in any of the putative *U. glabra* × *U. minor* hybrids. Two extra bands occurred at Rf 49 and 51 in one tree of *U. minor* (pattern H) and one of *U. glabra* × *U. minor* (pattern I), both in N. Essex. Two *U. minor* specimens exhibited an extra band at Rf 42 (pattern G), sample 18 being the taxon with a unilateral branching habit often given specific rank as *U. plotii* Druce. Although no other qualitative differences in zymograms were noted, quantitative differences occurred which were characteristic and diagnostic of particular populations. Thus pattern C was only found in *U. procera*, pattern D comprised all the representatives of the Boxworth–Godmanchester population of *U. minor* (Richens 1967) plus one specimen of *U. procera*, and pattern E comprised all the representatives of the Grantchester–Sawston population of *U. minor* (Richens 1967) plus a specimen from N. Essex of uncertain affinity.

Feret & Stairs (1971), in the U.S.A., had examined the peroxidase isozymes in seven imported seed sources of *U. pumila* L. Up to six bands were present in each sample, their positions being highly variable within and between seed sources. To account for these observations, Feret & Stairs suggested genetic determination by nine alleles at one locus, one allele being silent. This picture contrasts strikingly with the present findings in which two bands are constant in position and up to four bands are present; also three populations appear to exhibit little or no internal isozyme variation. These differences may be explained by the fact that *U. pumila* had reproduced sexually while probably all the material examined in the present study, except the *U. glabra* specimen, had probably been propagated vegetatively. As Feret & Stairs' technique was different from ours, it

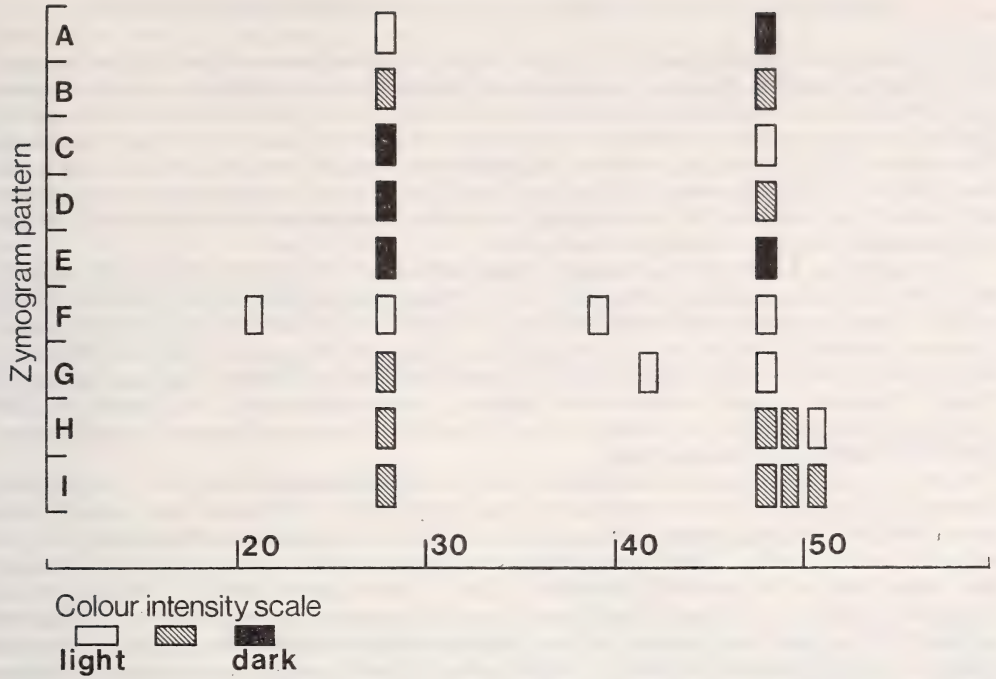



FIGURE 1. Peroxidase zymograms of *Ulmus*. A: (1) *U. minor*, Mundon, S. Essex; (2) *U. glabra* × *U. minor* 'Vegeta', Cambridge, Cambs. B: (3) *U. minor* 'Sarniensis', Cambridge; (4) *U. glabra* × *U. minor* 'Major', Cambridge. C: (5) *U. procera*, Cambridge, ungalled; (6) same tree heavily galled by *Eriophyes ulmicola* Nal.; (7) *U. procera*, Litlington, Cambs. D: (8) *U. minor*, Abbots Ripton, Hunts.; (9) *U. minor*, Lolworth, Cambs.; (10) *U. minor*, Shingay, Cambs.; (11) *U. procera*, Wrestlingworth, Beds. E: (12) *U. minor*, Cambridge; (13) *U. minor*, Barton, Cambs.; (14) *U. minor*, Horseheath, Cambs.; (15) *U. minor*, Goldhanger, N. Essex. F: (16) *U. glabra*, Orwell, Cambs. G: (17) *U. minor*, Wakes Colne, N. Essex; (18) *U. minor*, Cambridge. H: (19) *U. minor*, Salcott, N. Essex. I: (20) *U. glabra* × *U. minor*, Wakes Colne.

is not possible to ascertain whether any of the peroxidase bands that they reported correspond to any found here.

It is disappointing that no peroxidase bands were found in any of the putative interspecific hybrids, as this would have confirmed an *U. glabra* ancestry. The zymograms of hybrids either showed the two constant bands at Rf 28 and 48, or, if extra bands were present, they could be matched with those of supposedly pure *U. minor*. Possibly, *U. minor* carries inhibitors that suppress specific peroxidase isozyme genes from *U. glabra*. Without full genetic analysis, it is not possible to determine the number of genes responsible for the peroxidase complement in the material studied, but it is not improbable that the two bands at Rf 49 and 51 are both controlled by one gene, as they were found together at each of the two occurrences.

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N. J. PEARCE & R. H. RICHENS

## *CARDUUS PYCNOCEPHALUS* L. ON PLYMOUTH HOE, S. DEVON

In 1937 I undertook an investigation, on behalf of the Botanical Section of the Devonshire Association (then engaged on the preparation of a new Flora of Devon), to determine whether *Carduus pycnocephalus* L. still occurred on Plymouth Hoe, S. Devon, v.c. 3. Since that time I have regularly checked the situation and can report that the plant still survives, albeit somewhat precariously. This summer (1976) at least six clumps of the thistle were seen on a natural limestone cliff immediately east of the beach known as Pebbleside at West Hoe. Most of the plants were heavily infested with black-fly but appeared to be producing fruits and it is to be hoped that, despite the phenomenal drought, the plant will reappear next year.

*C. pycnocephalus* L. was first recorded for Plymouth Hoe by I. W. N. Keys (Keys 1868) and this record was later quoted and confirmed by T. R. A. Briggs (Briggs 1880). Before its destruction by air raids, there was a specimen in the herbarium of the Plymouth Institution at the Athenaeum, Plymouth, collected by Briggs on 2nd June, 1882, and labelled 'Slope under the Hoe, Plymouth'. The original record of Keys occurs under *C. tenuiflorus* Curt. and reads 'Hoe, and under the Citadel, Plymouth, in which situations the variety C. *pycnocephalus* Jacq. also occurs'. In 1937 both plants were seen in some abundance, but *C. tenuiflorus* has now disappeared and *C. pycnocephalus* is restricted to one small area.

At the time of my original investigation I was in communication with J. E. Lousley, who (Lousley 1935) published a short note on the plant, and with A. J. Wilmott, who allowed me to quote (Phillips 1939) his statement (Wilmot *in litt.* 1938) of the characters differentiating the two somewhat similar species. I have tested these characters with reference to Plymouth plants and have found them to be completely diagnostic. Later, I was in touch with J. T. Howell, of the California Academy of Sciences, San Francisco, whose account (Howell 1939) of Californian specimens of the two plants included further points of differentiation which, applied to Plymouth specimens, again proved to be valid. It would seem worthwhile, therefore, to repeat both statements here, to complement the information given in the standard Floras.

Characters based on A. J. Wilmott's original observations on Plymouth specimens and those in the European Herbarium of the British Museum (Natural History) are:

*Carduus pycnocephalus* L. Plant in general less spiny, with darker green leaves, white-tomentose below, and usually more tomentose phyllaries. Stem only slightly winged above, and some terminal capitula on unwinged, white-tomentose peduncles; capitula solitary or only 2 or 3 in each cluster; marginal veins of the strongly spinose median phyllaries strongly hardened and thickened, making a strongly three-veined, spinose termination. Capitula larger, 22–23mm long, more swollen below and therefore more ovate; florets normally exceeding the longest phyllaries, sometimes greatly so, the reddish-purple corollas more conspicuous as a result.

*Carduus tenuiflorus* Curt. Plant in general more closely spiny, with lighter green leaves, usually only somewhat tomentose below, and usually less tomentose phyllaries. Stem strongly winged above right up to the capitula; capitula clustered together in groups of 5 to 7 or more; marginal veins of the strongly spinose median phyllaries not strongly hardened and thickened, not making a strongly three-veined, spinose termination. Capitula smaller, 15–17mm long, less swollen below and therefore more or less cylindrical; florets normally shorter than the longest phyllaries, the light pink-mauve corollas less conspicuous as a result.

Additional points of differentiation from Howell (1939) are:

*Carduus pycnocephalus* L. Involucral bracts not membranous-margined, the tips of the outer and middle bracts more rigid, the margins and backs bearing tiny, rough, appressed trichomes especially on the prominent mid-vein. Achenes light tan or buff, usually with about 20 veins; pappus 1·5–2·0cm.

*Carduus tenuiflorus* Curt. Involucral bracts more or less membranous-margined, the tips of the outer and middle bracts glabrous and smooth except on the sub-ciliate margins. Achenes grey-brown, usually with 10–15 veins; pappus 1·0–1·5cm.

*C. tenuiflorus*, common on the southern coast of England, is regarded as a native species. *C. pycnocephalus*, however, is a native of the Mediterranean area, and is also naturalized in California together with *C. tenuiflorus*. Its status upon the Hoe at Plymouth is presumably that of an alien, perhaps originally introduced by shipping, which has established itself and survived. It is surprising, in view of the fact that *C. pycnocephalus* has been naturalized at Plymouth for over a hundred

years, that *Flora Europaea* (Franco 1976) does not include Britain in the list of countries given for that species. Identification poses no special problem to anyone familiar with the two species, but in case of difficulty the presence or absence of the minute trichomes on the spinose tips of the involucral bracts provides a completely diagnostic character easily observable with a × 10 lens.

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E. N. M. Phillips

## *VIOLA RUPESTRIS* SCHMIDT AND *JUNCUS ALPINUS* VILL. IN MID-W. YORKSHIRE

During 1976 substantial colonies of *Viola rupestris* Schmidt and *Juncus alpinus* Vill. (*J. alpino-articulatus* Chaix) were found in the limestone areas of Craven in Mid-W. Yorks., v.c. 64. Both species are particularly associated with Upper Teesdale, and their presence in Craven provides further parallels between the flora of the two areas. The *Juncus*, which occurs in two colonies in Craven, is unknown elsewhere in England except in Teesdale (although widespread in Scotland), whilst the *Viola*, which is frequent over the limestone plateaux on the south-eastern slopes of Ingleborough, seems to be more abundant there than in any of its three previously-known British stations.

The previous history of *Viola rupestris* has been detailed by Valentine & Harvey (1961). First discovered in Britain by James Backhouse in 1862 on the sugar limestone outcrops on Widdybank Fell, Upper Teesdale, Durham, v.c. 66, it remained unknown elsewhere until 1960, when the above-mentioned authors, following clues from herbarium specimens, found it near Arnside and on Long Fell above Brough, both in Westmorland, v.c. 69. The authors state that although these three sites differ in altitude—450 ft to 1,950 ft—and in aspect and associated species, each has a combination of a shallow, well-drained, richly alkaline soil, and a sunny open position, and conclude that: 'These discoveries encourage the idea that *Viola rupestris* may be found in other places too. The limestones of north and west England, especially the Craven district of Yorkshire, would seem to possess many possible localities . . .'

*Viola rupestris* was first found in Craven, Mid-W. Yorks., v.c. 64, on 25th May 1976. Several dozen plants were found growing along one of the tracks crossing the high limestone plateau between Clapham and Selside in Ribblesdale, at an altitude of 1,260 ft. Most plants grew in open bare soil at the edges of the track, with some sprouting from bare cracks in the bed-rock where this was exposed in the ruts. It was found that the colony extended along 150m of track, and in one place also on to two low hummocks of bare limestone clitter (gravel) adjacent to the track.

Associated plants on the track were *Arenaria norvegica* subsp. *anglica*, *Bellis perennis*, *Carex caryophyllea*, *C. flacca*, *Erophila verna*, *Festuca ovina*, *Minuartia verna*, *Plantago lanceolata*, *Ranunculus repens*, *Sesleria albicans*, *Taraxacum* sp. and *Thymus drucei*. There were fewer associates on the clitter areas: *Carex caryophyllea*, *C. flacca*, *C. panicea*, *Campanula rotundifolia*, *Festuca ovina*, *Sesleria albicans* and *Thymus drucei*. *Viola riviniana* var. *minor* grew in adjacent *Festuca* turf.

Many of the plants were in flower, and specimens submitted to Professor D. H. Valentine were confirmed as *V. rupestris*. The existence of plants on the less artificial clitter areas suggested that the plant might occur elsewhere, and on 12th June 1976 a further colony was found on a very similar area of exposed clitter on Moughton Fell at 1,200 ft, about 2·6km south-east of the first

site. The soil here seemed derived from more peaty deposits and new associates were *Antennaria dioica*, *Empetrum nigrum*, *Polygala serpyllifolia*, *Potentilla erecta* and *Vaccinium myrtillus*. Specimens from this site also were confirmed by Professor Valentine.

Continued exploration during the following months showed that the plant was widespread over much of the exposed limestone tracts from Sulber in the north, down the western flank of Crummockdale to Norber; in several colonies across the head of the dale; and thence on to Moughton Fell itself, where colonies were found almost wherever suitable habitat occurs, as far as the south-eastern corner at Foredale. Away from this plateau, two colonies were found on Smearsett Scar above Feizor, about 2 km south of its nearest station at Foredale. The range, as so far defined, covers an area 6 km long and 3·5 km wide, plants occurring in at least ten 1 km squares and three 10 km squares. If the glabrescent plants discussed below are included, nearly 20 colonies are now known, their populations varying from a dozen or so plants to many hundreds. All lie above 1,000 ft, and in one site reach 1,400 ft. The habitats are all very similar to those already described, open clitter hillocks and gentle slopes of fine screes comprising the most frequent sites.

Besides the usual hairy variant of *Viola rupestris*, another variant occurs widely in scattered colonies over the same range. Although agreeing with the typical plant in most respects (viz. leaf shape and size, corolla shape and colour, habit and habitat), the indumentum of short, backward-pointing hairs on the capsules, petioles, stems and peduncles, so characteristic of English *V. rupestris*, is in these plants reduced to a variable extent, and in a few cases lacking. The status of such plants is not yet clear. They are not the sterile hybrid *V. riviniana* × *V. rupestris*, since abundant ripe capsules and seed are produced.

*Juncus alpinus* was first found in Craven on 22nd July 1976 on a marsh near Malham Tarn, Mid-W. Yorks., v.c. 64, at an altitude of 1,250 ft. Mature specimens collected on 26th August 1976 were confirmed by Dr C. A. Stace. The habitat here is remarkably similar to some well-known 'flush' areas in Upper Teesdale, and contains many species in common. Seepage of lime-rich water on gentle gravelly slopes has produced zones of bare limey mud and gravel, interspersed with low hummocks carrying a rich variety of plants, including small populations of *Bartsia alpina*, *Carex capillaris* and *Polygala amarella*.

*Juncus alpinus* grows, as in Upper Teesdale, in the very open community on the bare patches between the hummocks, in a stretch at least 200 m across the flank of the marsh. The only associates are *Carex lepidocarpa*, *C. hostiana*, *Molinia caerulea* and *Juncus articulatus* (as very small and scattered plants). Where the substrate becomes less firm, as on the lower fringes of the flushed zone where peaty mud replaces the gravel, *J. alpinus* is replaced by robust plants of *J. articulatus*.

Another colony of *Juncus alpinus* was discovered on 4th September 1976, during a *Viola rupestris* search, near Austwick, about 14 km west-north-west of the Malham site. The Great Scar Limestone here lies unconformably on an impermeable bed of Silurian slate. At many points, the groundwaters of the limestone emerge as springs at the junction with the slate at around 1,000 ft.

A particular series of springs converges on a convex slope of slate to give a mosaic of rivulets and open gravelly areas, continuously irrigated by lime-rich water—even at the height of the 1976 drought. *Juncus alpinus* grows wherever the plant community is really open, scattered plants of *Molinia caerulea*, *Carex lepidocarpa*, *C. hostiana* and *J. articulatus*, as at Malham, being its only associates. Hummocks are not developed in this situation, swards of *Carex* tufts (in which the rush does not occur) occupying the stream edges. Other plants noted in the flush are *Saxifraga aizoides* and *Lycopodium selago*. The population is of the same order of size as the Malham colony—perhaps some hundreds of plants—but many plants, at least in the 1976 season, were much taller. One stem measured was over 36 cm.

Other suitable areas, both around Ingleborough and elsewhere in Craven, have been examined for *Juncus alpinus*, so far without success. It may be significant that *Schoenus nigricans*, which is very often present in flushes of this type in Craven, seems not to occur in the series containing *J. alpinus*.

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F. J. Roberts

## CYTOLOGICAL STUDIES IN *PLANTAGO CORONOPUS* L.

Investigations of chromosome numbers in *Plantago coronopus* L. by Böcher *et al.* (1953, 1955) have generally shown a diploid number of $2n = 10$. Four strains, however, proved to be trisomic and were found to be restricted to the extreme western and mostly coastal regions of Europe, from Jersey to Portugal. Chromosome counts determined by Böcher *et al.* (1955) from six Irish sites (two in W. Donegal, v.c. H35, two in W. Cork, v.c. H3, one in N.E. Galway, v.c. H17, and one in Dublin, v.c. H21) were all $2n = 10$.

During an investigation by me of morphological variation in *P. coronopus* subsp. *coronopus* along the northern coast of Antrim, v.c. H39, chromosome counts were also determined. The sites sampled are given in Table 1. At each site, a small number of plants were removed, potted in John Innes No. 2 potting compost and left for six months under greenhouse conditions to establish themselves. Subsequently, somatic chromosome counts were made on root-tip squashes from these plants. The root-tips were pretreated for three hours with 0·002M 8-hydroxyquinoline, fixed in acetic-alcohol (1:3), hydrolysed in 1N HCl and stained using the Feulgen method. Meiosis was also observed in pollen-mother-cells.

TABLE 1. CHROMOSOME NUMBERS RECORDED IN EIGHT POPULATIONS OF *P. CORONOPUS* IN ANTRIM, V.C. H39

| Irish GR | Locality | No. of plants | Total no. of cells | $2n$ | Abnormalities |
|---|---|---|---|---|---|
| 24/890.407 | Whiterocks, disused quarry | 6 | 23 | 10 | None |
| 24/947.448 | Giant's Causeway, Grand Causeway | 9 | 28 | 10 | One plant trisomic $(2n+1)$ |
| 24/952.452 | Giant's Causeway, cliff path | 6 | 34 | 10 | None |
| 34/038.454 | Ballintoy, harbour | 8 | 31 | 10 | One plant trisomic $(2n+1)$ |
| 34/037.455 | Ballintoy, exposed rocks | 10 | 37 | 10 | None |
| 34/039.454 | Ballintoy, limestone area | 8 | 30 | 10 | None |
| 34/036.450 | Ballintoy, arch | 8 | 24 | 10 | None |
| 34/198.421 | Murlough Bay, exposed rocks | 7 | 32 | 10 | None |

TABLE 2. PERCENTAGE OCCURRENCE OF METAPHASE I CHROMOSOMAL ARRANGEMENTS IN POLLEN-MOTHER-CELLS OF TWO TRISOMIC PLANTS AND NORMAL DIPLOIDS OF *P. CORONOPUS*

| Arrangement | Plant 1 (Grand Causeway) | Plant 2 (Ballintoy, harbour) | Normal diploids |
|---|---|---|---|
| 5II | — | — | 100 |
| 4II+1II+1I | 90·6 | 84·7 | — |
| 4II+3I | 7·8 | 14·3 | — |
| 4II+1III | 1·6 | 1·0 | — |
| No. of cells examined | 64 | 105 | 83 |

The results are presented in Tables 1 and 2. In all, 60 plants proved to be diploid, $2n = 10$, but two plants, one from the Grand Causeway population and one from the Ballintoy harbour population, proved to be aneuploid. Karyotype analysis of these plants indicated that the shortest chromosome of the complement, with a submedian centromere, was tripled. Further, these showed no degree of heterochromatinization, and it was concluded that these two plants were trisomics. As far as could be ascertained, they were in no way morphologically distinct from the rest of their respective populations.

The presence of the trisomics in Northern Ireland extends the geographical range reported by Böcher *et al.* (1955) for trisomics of *P. coronopus*. Details of chromosome numbers for the *P.*

*coronopus* group given by Chater & Cartier (1976) are misleading, since *P. serraria* is recorded as $2n = 10+0-3B$, $20+2B$ and *P. coronopus* as $2n = 10+0-1B$. The extra chromosomes in *P. serraria* are, according to Böcher *et al.* (1955), true accessory chromosomes, being smaller than chromosomes of the normal somatic complement and showing strong heterochromatinization. Those of *P. coronopus*, on the other hand, as shown by the present study and that of Böcher *et al.* (1955), are due to multiplication of one of the somatic chromosomes.

Observations of meiosis showed that it proceeded normally in the small number of diploids studied. Metaphase I chromosomal arrangements at meiosis in the trisomics produced three patterns: 5 bivalents and 1 univalent, 4 bivalents and 3 univalents, and 4 bivalents and 1 trivalent. The percentage occurrence of these three types is given in Table 2; the most frequently observed arrangement was 5 bivalents and 1 univalent. The observation of trivalent formation at metaphase I appears to be the first record in *P. coronopus* of such an arrangement, although Böcher *et al.* (1955) did observe trivalent formation at a very low frequency at diplotene and diakinesis.

The trisomics appear to originate from non-disjunction of the two short chromosomes (Böcher *et al.* 1955), although no direct observation of this was made by the present author in the normal diploids in which meiosis was studied. Other chromosomal aberrations, e.g. tetraploids (Gorenflot 1960) or hexaploids (Böcher *et al.* 1955), have not been found in the Irish material examined. However, the presence of trisomics serves to emphasize the chromosomal variability of this species.

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B. S. Rushton

## *PYROLA MINOR* L. IN PEMBREY FOREST, CARMARTHENSHIRE

*Pyrola minor* L. was first seen in Pembrey Forest (GR 22/385.023) in early May, 1970. It was then in leaf only and was not distinguished from *Pyrola rotundifolia* L. subsp. *maritima* (Kenyon) E. F. Warb., which had been known on the adjacent dunes since 1964 (Kay *et al.* 1974). This large patch of *P. minor*, which was then new to Carms., v.c. 44, made an almost pure stand, covering about $8 \times 10$ yards with very sparse plants of *Ammophila arenaria*, *Carex arenaria*, *C. flacca*, *Euphorbia portlandica*, *Oenothera* sp., *Prunella vulgaris* and *Rubus caesius* on an afforested dune under a 75% canopy of *Pinus nigra* subsp. *laricio*. In subsequent years the stand increased and measured about $12 \times 12$ yards by 1974, when flowering specimens were sent to Dr Q. O. N. Kay, who confirmed it as *Pyrola minor*.

In August 1974 two smaller stands were found about 30 yards from the first; these were under rather lighter canopy and in less well-drained conditions, one in fact in a wet dune hollow. Here there was more competition from other plants, the associates being *Carex flacca*, *Fragaria vesca*, *Hippophae rhamnoides*, *Lotus corniculatus*, *Rubus fruticosus*, *Salix repens* and *Viola riviniana*.

In June 1975, four further stands were detected; two were about 350 yards from the original site and were discontinuous along 30 yards of both verges of an access road. Here the *Pyrola* had to compete, on the wetter verge, with *Dryopteris filix-mas*, *Epilobium angustifolium*, *Festuca rubra*, *Plantago lanceolata*, *Rubus fruticosus* and *Salix repens*. On the opposite verge the *Pyrola*, on a dry bank under *Hippophae rhamnoides*, was even then in poor condition but did nevertheless survive the drought of 1976. The other stands were about 500 yards north of the first and deeper into the Forest, one in similar conditions to the first patch, the other in a damp hollow.

Mr F. W. Webb (*in litt.* 1976) and Mr N. S. Powell (*in litt.* 1975), the District and Local Forest Officers, have kindly given me details of the history of Pembrey Forest. After the failure of the initial direct sowing of tree seed, young stock was planted in the mid-1930s. This came from three sources: Inchnacardoch and South Laggan in the Inverness area; Glenbranter and Knapdale in the Argyll area; and the Tintern Nurseries, Monmouth. Tintern, about 70 miles to the east, is the nearest extant station for *P. minor*, although there is a record for it less than half that distance in the same direction at Scud Einion Gam in the Pyrddin valley above Pont Nedd fechan. This was found by Joseph Hooker in the early 1800s, but on which side of the Afon Pyrddin (which forms the boundary between Glamorgan and Brecon) is not known, nor has it been refound (G. Ellis *in litt.* 1976).

It is therefore reasonable to surmise that seeds or plants could have been introduced from Tintern with the young trees. Another possibility is that it could have been brought from the north by the Greenland White Fronted Geese (*Anser albifrons*) which formerly wintered in the Pembrey area in considerable numbers. Had either species of *Pyrola* been established in any quantity on these dunes by the mid-1930s, when A. E. Wade did extensive work on them, it is extremely unlikely that it would have escaped his observation. Current search by several botanists has, so far, found *P. minor* only in this limited area of the 2,400 acres of plantation.

## REFERENCE

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I. M. Vaughan

# Plant Records

Records for publication must be submitted in the form shown below to the appropriate vice-county Recorder (*List of members* (1976)), and *not* to the Editors.

Records are arranged in the order given in the *List of British vascular plants* by J. E. Dandy (1958) and his subsequent revision (*Watsonia*, **7**: 157–178 (1969)), but *Taraxacum* is arranged according to A. J. Richards (*Watsonia*, **9**, Suppl. (1972)). With the exception of collectors' initials, herbarium abbreviations are those used in *British Herbaria* by D. H. Kent (1958).

The following signs are used:

*before the record: to indicate a new vice-county record.
†before the species number: to indicate that the plant is not a native species of the British Isles.
†before the record: to indicate a species which, though native in some parts of the British Isles, is not so in the locality recorded.
[]enclosing a previously published record: to indicate that the record should be deleted.

1/4. LYCOPODIUM CLAVATUM L. **12**, N. Hants.: Chawton Park Wood, GR 41/67.36. Mrs K. L. Butcher, 1973, field record. Only extant record.

3/2. ISOETES ECHINOSPORA Durieu *__107__, E. Sutherland: Loch Migdale, nr Bonar Bridge, GR 28/62.91. U. K. Duncan, 1975, **herb. U.K.D.**, det. **BM**.

4/1. EQUISETUM HYEMALE L. **72**, Dumfries: by R. Nith, Mennock, GR 26/83.05. M. E. R. Martin, 1976, field record. 1st post-1930 record.

5/1. OSMUNDA REGALIS L. **43**, Radnor: Henfron, Elan, GR 22/89.64. T. Inskip & M. Davies, 1976. field record. 2nd record. (*Nature Wales*, **15**: 143 (1977)).

7/2. HYMENOPHYLLUM WILSONII Hook. **80**, Roxburgh: Black Burn, Newcastleton, GR 35/46.89. Shaded boulder. R. W. M. Corner, 1976, field record. 1st record this century.

15/6. ASPLENIUM VIRIDE Huds. *__79__, Selkirk: Muchra Burn, Yarrow, GR 36/22.16. Basic rock. R. W. M. Corner, 1976, **herb. R.W.M.C.**

21/6 × 7. DRYOPTERIS CARTHUSIANA (Vill.) H. P. Fuchs × D. DILATATA (Hoffm.) A. Gray *__73__, Kirkcudbright: Heart Moss, Rerrick, GR 25/76.47. A. C. Jermy, 1975, **BM**. Carruchan Moss, GR 25/94.73. O. M. Stewart, 1976, **E**, det. A. C. Jermy. 2nd record.

25/1/2 × 1. POLYPODIUM AUSTRALE Fée × P. VULGARE L. *__64__, Mid-W. Yorks.: Colt Park Wood, Ribblesdale, GR 34/77.77. F. J. Roberts, 1973, **herb. F.J.R.**, det. R. H. Roberts.

25/1/3 × 1. POLYPODIUM INTERJECTUM Shivas × P. VULGARE L. *__57__, Derbys.: Monks Dale, GR 43/13.74. A. Willmot, 1975, **BM**, det. A. C. Jermy.

†27/1. AZOLLA FILICULOIDES Lam. *__57__, Derbys.: Whatstandwell canal, GR 43/33.55. J. Feetham, 1965, field record. Shiningcliff Wood, GR 43/33.52. Pond. A. Willmot, 1976, field record. 2nd record.

29/1b. OPHIOGLOSSUM VULGATUM L. subsp. AMBIGUUM (Coss. & Germ.) E. F. Warb. *__109__, Caithness: Dunnet Head, GR 39/20.76. Grassland. A. J. C. Malloch, 1974, field record.

†43/2. ANEMONE RANUNCULOIDES L. *__80__, Roxburgh: by R. Teviot, below Hawick, GR 36/52.16. River banks. M. E. Braithwaite, 1973, field record.

46/18. RANUNCULUS TRIPARTITUS DC. *__13__, W. Sussex: 3.5 km N.E. of Ashington, GR 51/14.18. Pond-margin. V. & S. J. Heyward, 1976, field record, det. E. J. Salisbury.

46/20. RANUNCULUS CIRCINATUS Sibth. **12**, N. Hants.: Fleet Pond, GR 41/82.54. A. Mundell, 1976, **herb. A. Brewis**, det. F. Rose. Yateley, GR 41/82.61. Gravel pit. A. Brewis, 1976, **herb. A.B.** 1st records since 1850.

46/22b. RANUNCULUS AQUATILIS L. subsp. PELTATUS (Shrank) Syme ***73**, Kirkcudbright: Kenmure Holms, GR 25/63.76. Old drainage channel. A. C. Jermy no. 12064, 1975, **BM**.

55/1. NYMPHAEA ALBA L. ***79**, Selkirk: W. end of Clearburn Loch, GR 36/33.15. R. W. M. Corner, 1976, field record.

56/1. NUPHAR LUTEA (L.) Sm. ***106**, E. Ross: Gledfield, Ardgay, GR 28/58.90. U. K. Duncan, 1976. field record.

56/1 × 2. NUPHAR LUTEA (L.) Sm. × N. PUMILA (Timm) DC. **73**, Kirkcudbright: pond by R. Dee S. of Waterside, GR 25/72.67. O. M. Stewart, 1976, **E**. 1st record since 1905.

66/6b. FUMARIA MURALIS Sond. ex Koch subsp. BORAEI (Jord.) Pugsl. ***109**, Caithness: Isle of Stroma, GR 39/35.78. Ploughed field. J. K. Butler, 1974, **herb. J.K.B.**, det. M. G. Daker.

†80/2. CORONOPUS DIDYMUS (L.) Sm. **66**, Durham: Hartlepool docks, GR 45/51.32. R. T. McAndrew, 1975, **SUN**. 1st record for 100 years.

†81/1. CARDARIA DRABA (L.) Desv. **80**, Roxburgh: Roxburgh junction, GR 36/69.30. R. W. M. Corner, 1975, **E**, det. **E**. 1st record for 100 years.

88/5 × 1. COCHLEARIA DANICA L. × C. OFFICINALIS L. ***45**, Pembs.: St Ann's Head, GR 12/80.03. Cliff-turf. J. H. Barrett & T. A. W. Davis, 1975, **BM**, **NMW**. (*Nature Wales*, **15**: 146 (1977)).

102/2. RORIPPA MICROPHYLLA (Boenn.) Hyland. ***47**, Montgomery: Afon Cain, GR 33/21.19. F. H. Perring, 1976, field record. (*Nature Wales*, **15**: 149 (1977)).

102/3. RORIPPA SYLVESTRIS (L.) Bess. **47**, Montgomery: by Shropshire Union Canal, GR 33/25.19. Wet meadows. F. H. Perring, 1976, field record. 2nd record. (*Nature Wales*, **15**: 149 (1977)).

†111/1. DESCURAINIA SOPHIA (L.) Webb ex Prantl **12**, N. Hants.: Danebury, GR 41/32.36. Mrs A. Ohlenschlager, 1975, field record. 2nd record. **44**, Carms.: Wernddu Johnstown, Carmarthen, GR 22/37.17. Farmland waste. Mrs M. J. Dunn, 1976, field record. 1st localized record. (*Nature Wales*, **15**: 144 (1977)).

113/13. VIOLA RUPESTRIS Schmidt. ***64**, Mid-W. Yorks.: Crummackdale, GR 34/77.72, and Moughton Fell, GR 34/78.70. Both records F. J. Roberts, 1976, **herb. F.J.R.**, conf. D. H. Valentine. 1st two of several records.

115/1. HYPERICUM ANDROSAEMUM L. **107**, E. Sutherland: Dunrobin Glen Walk, Golspie, GR 29/84.01. Woodland. R. Kirby, 1976, field record. 2nd record.

115/6b. HYPERICUM MACULATUM Crantz subsp. OBTUSIUSCULUM (Tourlet) Hayek **80**, Roxburgh: Whitlaw, nr Hawick, GR 36/50.12. Old railway cutting. M. E. Braithwaite, 1975, field record, det. N. K. B. Robson. 1st post-1930 record.

115/6 × 5. HYPERICUM MACULATUM Crantz × H. PERFORATUM L. ***80**, Roxburgh: nr Belses Mill viaduct, Belses, GR 36/58.26. Railway embankment. M. E. Braithwaite, 1975, field record, det. N. K. B. Robson.

122/1. ELATINE HEXANDRA (Lapierre) DC. **12**, N. Hants.: Yateley, GR 41/82.61. Flooded gravel pits. A. Brewis, 1976, **herb. A.B.** Frensham Pond, GR 41/83.40. A. Brewis, 1976, field record, re-appearance after 50 years. The only 2 extant sites. **70**, Cumberland: Ennerdale Water, GR 35/08.14. R. Stokoe, 1976. **LANC**. 2nd record.

123/9. SILENE OTITES (L.) Wibel **29**, Cambs.: Swaffham Prior, GR 52/58.65. Old railway ballast. G. M. S. Easy, 1976, **herb. G.M.S.E.** 3rd record and only one outside Breckland.

123/12. SILENE NOCTIFLORA L. *12, N. Hants.: Waller's Ash Tunnel, GR 41/49.36. Cornfield. A. Brewis, 1967, field record. Swanthorpe House, GR 41/78.46. Lane. A. Brewis, 1976, **herb. A.B.** 2nd record. *69, Westmorland: 1 km N. of Brough, GR 35/79.15. Cornfield. L. D. J. Henderson, 1975, field record.

†128/1. VACCARIA PYRAMIDATA Medic. *69, Westmorland: 1 km N. of Brough, GR 35/79.15. Cornfield. L. D. J. Henderson, 1971, field record.

136/2. SAGINA CILIATA Fr. 73, Kirkcudbright: Borness, GR 25/61.45. O. M. Stewart, 1976, **E**, det. P. Harrold. 1st post-1930 record.

136/9. SAGINA SUBULATA (Sw.) C. Presl 78, Peebles: Neidpath, W. of Peebles, GR 36/23.40. Below the castle. C.S.S.F. Field Meeting, 1976, field record. 1st post-1930 record.

143/1. SPERGULARIA RUBRA (L.) J. & C. Presl *101, Kintyre: Daill Loch, Dunardry, GR 16/81.89. By forestry road. A. G. Kenneth, 1976, **herb. A.G.K.**

147/1. ILLECEBRUM VERTICILLATUM L. *†59, S. Lancs.: Aintree, GR 33/37.95. Disused railway track. V. Gordon, 1976, field record.

†154/13. CHENOPODIUM HYBRIDUM L. 57, Derbys.: Matlock Moor, GR 43/32.66. Refuse tip. M. C. Hewitt, 1975, field record, det. E. Clement. 1st record for 50 years.

†154/16. CHENOPODIUM GLAUCUM L. 29, Cambs.: Bourn, GR 52/32.56. Trackside. A. C. Leslie, 1976, **K**, conf. J. P. M. Brenan. 2nd record.

160/f. SALICORNIA FRAGILIS P. W. Ball & Tutin *46, Cards.: Teifi estuary, GR 22/16.48. A. O. Chater, 1976, **NMW**, det. I. K. Ferguson. (*Nature Wales*, **15**: 147 (1977)).

160/n. SALICORNIA NITENS P. W. Ball & Tutin *46, Cards.: Dyfi estuary, by mouth of Clettwr, GR 22/64.94. A. O. Chater, 1976, **NMW**, det. I. K. Ferguson. (*Nature Wales*, **15**: 147 (1977)).

164/1. LAVATERA ARBOREA L. *70, Cumberland: Eskmeals gunnery-range, GR 34/07.92. A. B. Warburton, 1976, field record.

164/t. LAVATERA TRIMESTRIS L. *29, Cambs.: Milton, GR 52/46.63. Sugar beet field. G. M. S. Easy, 1974, **herb. G.M.S.E.**

168/7. GERANIUM SANGUINEUM L. 44, Carms.: Pembrey Forest, GR 22/41.01. Forest ride. I. K. Morgan, 1976, field record. 2nd record. (*Nature Wales*, **15**:145 (1977)).

†183/2. LUPINUS ARBOREUS Sims *46, Cards.: Tywyn Warren, Gwbert, GR 22/16.49. A. O. Chater, 1976, **NMW**. (*Nature Wales*, **15**: 147 (1977)).

185/2. GENISTA ANGLICA L. *79, Selkirk: S.W. shoulder of Dun Rig, Douglas Burn, Yarrow, GR 36/24.30. R. W. M. Corner, 1975, field record. 1st definite record.

187/2. ULEX GALLII Planch. *66, Durham: 1½ km E. of Tow Law, GR 45/13.39. 850 ft. G. G. & P. S. Graham, 1976, **herb. G.G.G.**, conf. P. M. Benoit. 1st definite record. 74, Wigtown: Alticry, Port William, GR 25/27.49. R. W. M. Corner, 1975, field record. 1st post-1930 record.

192/1. TRIFOLIUM ORNITHOPODIOIDES L. *43, Radnor: Clyro, GR 32/24.45. Shingle bank in R. Wye. D. Merry, 1976, field record, det. Q. O. N. Kay. (*Nature Wales*, **15**: 144 (1977)).

192/13. TRIFOLIUM SUBTERRANEUM L. 29, Cambs.: West Road, Gamlingay, GR 52/23.52. New roadside verge. D. E. Coombe, 1975, cult. **CGE**. 1st record since 1859.

207/1. LATHYRUS APHACA L. *69, Westmorland: Kents Bank, Grange-over-Sands, GR 34/3.7. W. L. Smith, 1911, **LANC**. 1 km N. of Brough, GR 35/79.15. Cornfield. L. D. J. Henderson, 1971, field record. 2nd record.

207/2. Lathyrus nissolia L. *46, Cards.: Cardigan, GR 22/18.45. Old railway line. S. B. Evans & T. A. W. Davis, 1976, field record. (*Nature Wales*, **15**: 147 (1977)).

207/9. Lathyrus palustris L. *101, Kintyre: W. of Keppoch, Kilberry, GR 16/70.63. A. G. Kenneth, 1976, **herb. A.G.K.** New to Scotland.

207/10. Lathyrus japonicus Willd. 70, Cumberland: Seascale, GR 35/0.0. F. Jones, 1975. field record. Only extant locality.

211/11/14. Rubus conjungens (Bab.) W. C. R. Wats. *82, Haddington: Longniddry, GR 36/44.72. Near shore. C. W. Muirhead, 1972, E, det. E. S. Edees.

211/11/18. Rubus latifolius Bab. *69, Westmorland: nr Great Strickland, GR 35/5.2. Mrs W. S. & C. W. Muirhead, 1968, E, det. E. S. Edees. New to England. *70, Cumberland: between St Bees and Kells, GR 25/9.1. C. W. Muirhead, 1969, E, det. E. S. Edees.

211/11/80. Rubus pyramidalis Kalt. *34, W. Gloucs.: New Beechenhurst Enclosure, Speech House, GR 32/61.12. C. W. Bannister, 1971, **herb. C.W.B.**, det. A. Newton.

211/11/160. Rubus hebecaulis Sudre *33, E. Gloucs.: Hailes Wood, Cheltenham, GR 42/04.28. C. W. Bannister, 1970, **herb. C.W.B.**, det. A. Newton.

211/11/225. Rubus pseudadenanthus W. C. R. Wats. *70, Cumberland: nr Calder Bridge GR 35/0.0. C. W. Muirhead, 1969, **herb. C.W.M.**, det. E. S. Edees.

211/11/331. Rubus pygmaeopsis Focke *33, E. Gloucs.: Buckholt Wood, Cranham, GR 32/88.13. A Newton & C. W. Bannister, 1976, **herb. A.N.**, det. H. Weber & A.N.

212/13. Potentilla erecta (L.) Räusch. subsp. strictissima (Zimmet.) A. J. Richards *72, Dumfries: Devil's Beef Tub, GR 36/05.12. O. M. Stewart, 1975, E, det. A. J. Richards.

212/14 × 13. Potentilla anglica Laichard. × P. erecta (L.) Räusch. *66, Durham: Crimdon, GR 45/48.37. Roadside. M. J. Wigginton, 1976, **herb. G. G. Graham**, conf. B. Matfield.

216/3 × 1. Geum rivale L. × G. urbanum L. *109, Caithness: Dunbeath, GR 39/15.30. J. K. Butler, 1974, **herb. J.K.B.**, det. S. M. Walters.

220/2. Alchemilla conjuncta Bab. *109, Caithness: Thurso cemetery, GR 39/11.67. C.S.S.F. Field Meeting, 1972, field record. Long established.

220/9. Alchemilla glomerulans Buser 64, Mid-W. Yorks.: nr Horton-in-Ribblesdale, GR 34/81.70. F. J. Roberts, 1975, CGE, conf. S. M. Walters. 2nd record.

221/1. Aphanes arvensis L. 73, Kirkcudbright: Cairn Holy, GR 25/51.53. In short grass. O. M. Stewart, 1975, field record. 1st post-1930 record.

†224/1. Acaena anserinifolia (J. R. & G. Forst.) Druce [13, W. Sussex: the record in *Proc. bot. Soc. Brit. Isl.*, **2**: 371 (1957) belongs to the following species.]

†224/o. Acaena ovalifolia Ruiz & Pav. *13, W. Sussex: 2 km S. of Lower Beeding, GR 51/21.25. Woodland path. R. C. Palmer, 1955, **herb. R.C.P.**, det. D. McClintock.

225/10. Rosa obtusifolia Desv. *44, Carms.: Llangathen, GR 22/58.22. I. M. Vaughan, 1976, NMW. (*Nature Wales*, **15**: 145 (1977)).

225/14. Rosa rubiginosa L. 45, Pembs.: 1 km W. of Dinas, GR 12/99.39. T. A. W. Davis, 1976, field record, det. I. M. Vaughan. 2nd record. (*Nature Wales*, **15**: 146 (1977)).

225/15. Rosa micrantha Borrer ex Sm. *111, Orkney: Stenness, GR 57/30.10. H. Shearer, 1971, E, det. I. M. Vaughan.

†226/5. Prunus cerasus L. *12, N. Hants.: White Hill, Kingsclere, GR 41/51.56. Chalk downland nr road. R. P. Bowman, 1957, **herb. R.P.B.** Well established.

†232/4/1. Sorbus intermedia (Ehrh.) Pers. ***29**, Cambs.: Devil's Ditch, GR 52/61.61. Chalk grassland. P. D. Sell, 1973, field record. Cherry Hinton, GR 52/47.57. Railway embankment. G. M. S. Easy, 1975, **herb. G.M.S.E.**, det. P. D. Sell. 2nd record.

232/7. Sorbus torminalis (L.) Crantz **46**, Cards.: Coedmore, Llechryd, GR 22/19.44. M. Patterson, 1975, field record. 2nd record. (*Nature Wales*, **15**: 147 (1977)).

†237/r. Crassula recurva N. E. Brown ***17**, Surrey: Epsom, GR 51/20.59. Pond margin. Mrs L. M. P. Small, 1976, **K**, det. **K**.

239/2. Saxifraga stellaris L. **80**, Roxburgh: Cheviot Burn, GR 36/89.19. R. W. M. Corner, 1975, field record. 1st post-1930 record.

†239/5 × 4. Saxifraga spathularis Brot. × S. umbrosa L. ***109**, Caithness: Isauld, 10 km W. of Thurso, GR 29/97.65. J. K. Butler, 1971, field record.

239/8. Saxifraga tridactylites L. **67**, S. Northumberland: The Scroggs, GR 35/89.72. Floor of old quarry. M. E. Braithwaite, 1976, **herb. G. A. Swan**. 1st record for over 100 years.

†240/1. Tellima grandiflora (Pursh) Dougl. ex Lindl. ***73**, Kirkcudbright: King's Grange and Old Bridge of Urr, GR 25/77.67. O. M. Stewart, 1975, field record. ***78**, Peebles: Portmore, 1½ km N. of Eddleston, GR 36/25.48. C.S.S.F. Field Meeting, 1976, field record. Well established.

†257/1. Fuchsia magellanica Lam. ***109**, Caithness: Olrig Wood, GR 39/18.66. J. K. Butler, 1969, field record.

259/1. Myriophyllum verticillatum L. ***43**, Radnor: in R. Wye, Llanelwedd, GR 32/03.52. D. Merry, 1976, **BM**, det. **BM**. (*Nature Wales*, **15**: 144 (1977)).

259/4. Myriophyylum alterniflorum DC. **74**, Wigtown: W. side of Main Water of Luce at New Luce, GR 25/17.65. Pools in marsh. R. W. M. Corner, 1976, herb. R.W.M.C. 1st post-1930 record.

261/1. Hippuris vulgaris L. ***45**, Pembs.: Bosherston, GR 11/96.94. T. A. W. Davis, 1976, field record. (*Nature Wales*, **15**: 146 (1977)).

277/3. Torylis nodosa (L.) Gaertn. ***69**, Westmorland: Capon Crag, Milnthorpe, GR 34/51.83. J. A. Wood, 1974, field record. Wartbarrow, Allithwaite, GR 34/39.76. F. H. Woodman, 1976, **LANC**. 1st record for Westmorland and 1st post-1930 record for **69b** respectively.

285/1. Apium graveolens L. **73**, Kirkcudbright: Lot's Wife, Colvend, GR 25/91.56. Saltmarsh. O. M. Stewart, 1967, **E**. 1st post-1930 record.

285/4. Apium inundatum (L.) Reichb. f. ***79**, Selkirk: W. side of Girnwood Loch, GR 36/36.12. R. W. M. Corner, 1976, **herb. R.W.M.C.** **80**, Roxburgh: E. side of Girnwood Loch, GR 36/36.12. R. W. M. Corner, 1976, **herb. R.W.M.C.** 1st record for 100 years.

299/1. Seseli libanotis (L.) Koch **29**, Cambs.: Gog Magog Hills, GR 52/4.5. G. M. S. Easy, 1969, field record. 1st new record since 1833.

300/6. Oenanthe aquatica (L.) Poir. **12**, N. Hants.: Farringdon, GR 41/72.35. Pond. A. Brewis, 1976, **herb. A.B.**, det. F. Rose. 1st post-1930 record.

302/1. Foeniculum vulgare Mill. **70**, Cumberland: Bowness-on-Solway, GR 35/20.62. E. H. Rhone, 1976, field record. 2nd record.

†311/2. Heracleum mantegazzianum Somm. & Levier ***43**, Radnor: by R. Wye, Upper Cabalva, GR 32/24.46. A. C. Powell, 1976, field record. (*Nature Wales*, **15**: 144 (1977)).

†319/6. Euphorbia dulcis L. ***73**, Kirkcudbright: Haugh of Urr, GR 25/81.65. Hedgebank. O. M. Stewart, 1975, field record. Known for over 15 years. By Cairn Water, Drumpark, GR 25/87.80. O. M. Stewart, 1976, **DFS**. 2nd record.

319/13. Euphorbia paralias L. **73**, Kirkcudbright: Southwick Merse, GR 25/92.55. O. M. Stewart, 1976, E. 2nd record.

†319/15. Euphorbia esula L. **82**, Haddington: West Barns, Dunbar, GR 36/65.77. Railway embankment. E. P. Beattie, 1970, E. 2nd record.

320/13. Polygonum mite Schrank ***47**, Montgomery: by Shropshire Union Canal, S. of Carreghofa, GR 33/25.19. Wet meadow. F. H. Perring, 1976, field record. (*Nature Wales*, **15**: 149 (1977)).

†320/19. Polygonum cuspidatum Sieb. & Zucc. ***78**, Peebles: Portmore House, Eddleston, GR 36/2.4. Policy grounds. C.S.S.F. Field Meeting, 1976, field record. Well naturalized.

†320/21. Polygonum polystachyum Wall. ex Meisn. ***73**, Kirkcudbright: Castle Douglas, GR 25/76.62. Disused railway. N. F. Stewart, 1976, field record.

†320/22. Polygonum campanulatum Hook. f. ***73**, Kirkcudbright: Kirkdale Church, Cairnholy, GR 25/51.54. J. Anthony, 1969, E.

†321/1. Fagopyrum esculentum Moench ***73**, Kirkcudbright: Pipercroft Loch, GR 25/78.71. Turnip field. O. M. Stewart, 1976, **DFS.**

†325/5. Rumex alpinus L. **72**, Dumfries: Sundaywell, Dunscore, GR 25/81.84. Roadside by farm. J. D. S. Martin, 1975, field record. 1st post-1930 record.

328/8. Rumex longifolius DC. ***68**, Cheviot: N. of Berwick, GR 46/00.52. Sea-cliff. G. A. & M. Swan, 1975, **herb. G.A.S.** 80, Roxburgh: Caddroun Burn, Saughtree, GR 35/58.98. R. W. M. Corner, 1976, **herb R.W.M.C.** 1st post-1930 record.

342/4. Populus nigra L. ***13**, W. Sussex: 3 km N.E. of Midhurst, GR 41/91.22. M. Briggs, 1974, field record, det. E. Milne-Redhead. 1st record of species *sensu stricto*.

343/6. Salix purpurea L. **109**, Caithness: Halkirk, GR 39/13.57. J. K. Butler, 1974, **herb. J.K.B.**, det. R. D. Meikle. Loch of Watten, GR 39/21.58. E. R. Bullard, 1974, **K**, det. R. D. Meikle. 1st and 2nd localized records.

343/14. Salix nigricans Sm. ***109**, Caithness: Westfield, GR 39/05.64. J. K. Butler, 1972, **herb. J.K.B.**, det. R. D. Meikle. Loch of Watten, GR 39/21.58. Carr. E. R. Bullard, 1974, **K**, det. R. D. Meikle. 2nd record. **111**, Orkney: Quoykea Tankerness, GR 57/50.04. Burnside. E. R. Bullard, 1974, **K**, det. R. D. Meikle. 2nd record.

343/16b. Salix repens L. subsp. argentea (Sm.) G. & A. Camus ***109**, Caithness: Dunnet Head, GR 39/18.73. C.S.S.F. Field Meeting, 1972, **herb. J. K. Butler,** det. R. D. Meikle.

359/3. Pyrola rotundifolia L. **70**, Cumberland: Eskmeals gunnery-range, GR 34/07.93. A. B. Warburton, 1976, field record. 2nd record.

363/1. Diapensia lapponica L. **97**, Westerness: hills above Loch Quoich, GR 19/8.0. A. F. & S. M. Craven, 1976, field record. 2nd v.c. and 2nd British record.

365/5/1. Limonium binervosum (G. E. Sm.) C. E. Salmon ***46**, Cards.: 400 m N. of Gwbert Hotel, GR 22/16.50. Cliffs. A. O. Chater, 1954, **NMW**. 1st definite record. (*Nature Wales*, **15**: 147 (1977)).

382/4. Centaurium erythraea Rafn **80**, Roxburgh: Long Newton, St Boswells, GR 36/58.26. Railway cutting. A. J. Smith & R. W. M. Corner, 1975, **herb. R.W.M.C.** 1st post-1930 record.

384/1. Gentiana pneumonanthe L. **69b**, Furness: Newby Bridge, GR 34/37.86. H. Caldwell, 1975, field record. 2nd record.

406/4. Calystegia soldanella (L.) R. Br. **73**, Kirkcudbright: Southwick merse, GR 25/92.55. O. M. Stewart, 1976, E. 1st post-1930 record.

†413/3 × 4. SOLANUM NIGRUM L. × S. SARRACHOIDES Sendtn. ***29**, Cambs.: Gamlingay Cinques, GR 52/22.53. Market garden field. A. C. Leslie, 1975, **CGE**, conf. J. M. Edmonds. Apparently new to science.

†413/v. SOLANUM VILLOSUM Mill. ***29**, Cambs.: Botany School Field Station, Cambridge, GR 52/43.59. R. I. S. Brettell, 1976, field record, conf. J. M. Edmonds. Widely distributed weed.

416/1. VERBASCUM THAPSUS L. ***111**, Orkney: Evie, GR 57/3.2. R. Sinclair, 1935, field record. 1st definite record; persisted several years.

†416/3. VERBASCUM PHLOMOIDES L. **29**, Cambs.: Thriplow, GR 52/41.43. Roadside verge. G. M. S. Easy, 1972, **herb. G.M.S.E.** 2nd of several records.

416/5. VERBASCUM PULVERULENTUM Vill. ***29**, Cambs.: Rampton Road, Cottenham, GR 52/44.67. Roadside verges. Mrs M. I. Burkitt, 1975, field record. Well naturalized.

416/7. VERBASCUM NIGRUM L. ***80**, Roxburgh: Hawick, GR 36/50.14. Old railway yard. M. E. Braithwaite, 1975, field record.

†416/p. VERBASCUM PYRAMIDATUM Bieb. ***29**, Cambs.: Waterbeach, GR 52/48.65. P. D. Sell, 1958, **CGE**, det. A. C. Leslie. Burwell, GR 52/5.6. G. M. S. Easy & P. D. Sell, 1973, **CGE**. 2nd record.

†425/c × 1. MIMULUS CUPREUS Regel × M. GUTTATUS DC. ***78**, Peebles: Mosshouse, 1½ miles S.W. of Eddleston, GR 36/22.45. D. J. McCosh, 1976, **herb. A. J. Silverside,** det. A.J.S.

†425/c × 2. MIMULUS CUPREUS Regel × M. LUTEUS L. ***78**, Peebles: Neidpath, Peebles, GR 36/23.40. River shingle. C.S.S.F. Field Meeting, 1976, field record, det. A. J. Silverside.

†425/1 × 2. MIMULUS GUTTATUS DC. × M. LUTEUS L. ***78**, Peebles: Glen, 4 miles S.W. of Innerleithen, GR 36/30.33. C.S.S.F. Field Meeting, 1976, **herb. A. J. Silverside,** det. A.J.S.

†425/3. MIMULUS MOSCHATUS Dougl. ex Lindl. ***78**, Peebles: Cappercleuch, St Mary's Loch, GR 36/24.22. Ditch. D. J. McCosh, 1972, **herb. D.J.M.** Glen, 4 miles S.W. of Innerleithen, GR 36/30.33. C.S.S.F. Field Meeting, 1976, field record. 2nd record.

426/1. LIMOSELLA AQUATICA L. ***89**, E. Perth: Dowies Hole, Caputh, GR 37/13.40. By loch. F. H. Perring, 1976, **herb. Kindrogan Field Studies Centre.**

430/2. VERONICA ANAGALLIS-AQUATICA L. **47**, Montgomery: Gwern-y-ciliau, GR 33/21.19. F. H. Perring, 1976, field record. 2nd record. (*Nature Wales*, **15**: 149 (1977)).

430/20/1. VERONICA HEDERIFOLIA L. *45, Pembs.: St Bride's, GR 12/81.08. Shady stream bank. T. A. W. Davis, 1972, **NMW**, det. P. M. Benoit. (*Nature Wales*, **15**: 146 (1977)).

430/20/2. VERONICA SUBLOBATA M. Fischer ***45**, Pembs.: 2 km W. of St Ishmael's, GR 12/81.06. Disused quarry. T. A. W. Davis, 1973, **NMW**, det. P. M. Benoit. (*Nature Wales*, **15**: 146 (1977)).

†431/f. HEBE × FRANCISCANA (Eastwood) Souster ***46**, Cards.: S.W. corner of Aberystwyth Castle, GR 22/57.81. A. O. Chater, 1976, **K**, det. P. S. Green. Known for at least 40 years. (*Nature Wales*, **15**: 147 (1977)).

434/3. MELAMPYRUM PRATENSE L. subsp. COMMUTATUM (Tausch ex A. Kerner) C. E. Britton ***12**, N. Hants.: Vinney Copse, GR 41/73.45. Roadside. A. Brewis, 1975, **herb. A.B.,** det. F. Rose.

435/1/2. EUPHRASIA SCOTTICA Wettst. **109**, Caithness: Auchingill, GR 39/35.65. C.S.S.F. Field Meeting, 1972, **E**. 2nd record.

435/1/16. EUPHRASIA PSEUDOKERNERI Pugsl. **12**, N. Hants.: West Down, Chilbolton, GR 41/38.38. F. Rose, 1972, field record. 1st record since 1934.

439/1. LATHRAEA SQUAMARIA L. **78**, Peebles: Glen, 4 miles S.W. of Innerleithen, GR 36/30.33. C. O. Badenoch, 1973, field record. 1st localized record.

440/3. Orobanche rapum-genistae Thuill. **67**, S. Northumberland: S. of Whitley Chapel, GR 35/92.57. On *Sarothamnus scoparius*. A. F. Porter, 1976, **herb. G. A. Swan.** 1st post-1930 record.

440/10. Orobanche hederae Duby ***74**, Wigtown: Port Castle, N. of Burrow Head, GR 25/42.35. H. A. Lang, 1975, field record, conf. **E** on photographs.

442/4. Utricularia minor L. **74**, Wigtown: W. side of Main Water of Luce at New Luce, GR 25/17.65. R. W. M. Corner, 1976, **herb. R.W.M.C.** 1st post-1930 record. ***79**, Selkirk: Brown Moor Heights, Headshaw, GR 36/45.24. R. W. M. Corner, 1976, **herb. R.W.M.C.**

†445/6 × 5. Mentha longifolia (L.) Huds. × M. spicata L. ***68**, Cheviot: Alwinton, GR 36/92.06. Streamside. G. A. & M. Swan, 1973, **herb. G.A.S.**, det. R. M. Harley.

448/2. Thymus serpyllum L. **29**, Cambs.: Cambridge Gap, Devil's Ditch, GR 52/61.61. G. Crompton, 1976, **CGE**, conf. C. D. Pigott. 1st post-1930 record.

459/6 × 7. Stachys palustris L. × S. sylvatica L. ***47**, Montgomery: S. of Carreghwfa, GR 33/25.19. F. H. Perring, 1976, field record. (*Nature Wales*, **15**: 149 (1977)).

†462/6. Lamium maculatum L. **73**, Kirkcudbright: by R. Nith, nr Dumfries, GR 25/97.74. O. M. Stewart, 1973, field record. 1st post-1930 record.

465/4/2. Galeopsis bifida Boenn. **29**, Cambs.: Gamlingay, GR 52/23.51. A. C. Leslie, 1976, field record. 2nd record.

469/1. Scutellaria galericulata L. **78**, Peebles: Whim, 2 miles S.W. of Leadburn, GR 36/21.54. C.S.S.F. Field Meeting, 1976, field record. 2nd record.

473/1. Littorella uniflora (L.) Aschers. **47**, Montgomery: Llyn Gwyddior, nr Nant yr Eira, GR 23/93.07. Mrs H. Gribble, 1975, field record. 2nd record.

485/2. Galium boreale L. **44**, Carms.: Carreg yr Ogof, GR 22/77.21. 1850′. S. B. Evans & M. Massey, 1976, **NMW**. 2nd record. (*Nature Wales*, **15**: 145 (1977)).

485/3a. Galium mollugo L. subsp. mollugo **45**, Pembs.: 2 km W. of Dinas, GR 12/98.38. T. A. W. Davis, 1976, **NMW**. 2nd localized record. (*Nature Wales*, **15**: 146 (1977)).

485/3 × 4. Galium mollugo L. × G. verum L. ***73**, Kirkcudbright: nr Netherbar, N. of Corsock, GR 25/76.76. Roadside. O. M. Stewart, 1976, **E**.

485/13. Galium spurium L. **29**, Cambs.: Swaffham Prior, GR 52/56.63. Roadside. D. Jardine, 1974, **CGE**, conf. J. E. Raven. 3rd record. Thought to have been extinct in Britain since 1971.

†487/3. Sambucus racemosa L. ***46**, Cards.: Birchgrove, Trawscoed, GR 22/66.73. Woodland. A. O. Chater, 1975, field record. (*Nature Wales*, **15**: 147 (1977)).

†495/2. Valeriana pyrenaica L. ***109**, Caithness: Thuster, Wick, GR 39/30.51. Roadside. A. Durrand, 1976, field record.

495/3. Valeriana dioica L. **78**, Peebles: above Loch Eddy, 4½ miles S.W. of Innerleithen, GR 36/27.29. C.S.S.F. Field Meeting, 1976, **herb. D. J. McCosh**. 1st post-1930 record.

498/1. Knautia arvensis (L.) Coult. **78**, Peebles: Cambwell, Skirling, GR 36/07.40. Burnside. D. J. McCosh, 1976, **herb. D.J.M.** 1st post-1930 record.

†506/4. Senecio squalidus L. **78**, Peebles: Hare Laws, 1 mile N.W. of Eddleston, GR 36/23.48. C.S.S.F. Field Meeting, 1976, field record. 1st localized record.

†506/4 × 8. Senecio squalidus L. × S. vulgaris L. ***83**, Edinburgh: Western Dock, Leith, GR 36/25.77. O. M. Stewart, 1974, **E**.

512/5. INULA CRITHMOIDES L. ***44**, Carms.: Pembrey harbour, GR 21/42.99. I. K. Morgan, 1976, field record. (*Nature Wales*, **15**: 145 (1977)).

514/1. FILAGO VULGARIS Lam. **73**, Kirkcudbright: Kirknabreck quay, GR 25/47.56. O. M. Stewart, 1976, field record. 2nd record.

515/1. GNAPHALIUM SYLVATICUM L. **29**, Cambs.: Gamlingay, GR 52/2.5. A. C. Leslie, 1975, field record, conf. S. M. Walters. 1st record since 1919.

519/6. ASTER NOVI-BELGII L. ***29**, Cambs.: Wicken Fen, GR 53/56.70. J. Brown, 1864, CGE, det. P. F. Yeo. 1st of several records previously identified as *A. salignus* Willd.

†521/a. ERIGERON ANNUUS (L.) Pers. ***12**, N. Hants.: Longmoor air-strip, GR 41/81.31. A. Brewis, 1975, **herb. E. Clement.** Well established.

†534/1. COTULA CORONOPIFOLIA L. ***59**, S. Lancs.: Southport sands, GR 34/32.17. M. Jones, 1975, field record.

535/7. ARTEMISIA MARITIMA L. **73**, Kirkcudbright: nr Kirkcudbright, GR 25/68.49. P. Adams, 1974, field record. 1st post-1930 record.

537/1. CARLINA VULGARIS L. ***107**, E. Sutherland: Coul Links, 4 miles N. of Dornoch, GR 28/80.95. M. Marshall, 1975, field record, conf. J. E. Kirby.

538/1. ARCTIUM LAPPA L. **44**, Carms.: nr Salt House, Langharne, GR 22/29.09. Undercliff. I. M. Vaughan, 1976, NMW. 2nd record. (*Nature Wales*, **15**: 145 (1977)).

539/4. CARDUUS ACANTHOIDES L. **73**, Kirkcudbright: Kirkmabreck quay, GR 25/47.56 .O .M. Stewart, 1976, field record. 1st post-1930 record.

540/4 × 3. CIRSIUM ARVENSE (L.) Scop. × C. PALUSTRE (L.) Scop. ***29**, Cambs.: Hayley Wood, GR 52/29.53. R. I. S. Brettell & A. C. Leslie, 1976, field record, conf. P. D. Sell.

540/8. CIRSIUM DISSECTUM (L.) Hill ***101**, Kintyre: nr Kilberry, GR 16/70.65. A. G. Kenneth, 1976, **herb. A.G.K.** 1st record for Scottish mainland.

543/1. SAUSSUREA ALPINA (L.) DC. ***64**, Mid-W. Yorks.: Ingleborough, GR 34/73.74. F. J. Roberts, 1973, **herb. F.J.R.**

†544/2. CENTAUREA MONTANA L. ***80**, Roxburgh: nr Courthill, Hawick, GR 36/52.16. Railway cutting. R. W. M. Corner, 1973, **herb. R.W.M.C.**

545/1. SERRATULA TINCTORIA L. **72**, Dumfries: Penton Bridge, R. Liddell, GR 35/43.77. J. D. S. Martin, 1971, field record. 1st post-1930 record.

549/2. HYPOCHOERIS GLABRA L. **70**, Cumberland: Eskmeals dunes Nature Reserve, GR 34/08.94. C. C. Haworth, 1974, field record. 2nd record.

551/1. PICRIS ECHIOIDES L. **82**, Haddington: nr Prestonpans, GR 36/3.7. O. M. Stewart, 1974, E. 2nd record.

558/1/43. HIERACIUM IRICUM Fr. ***72**, Dumfries: Carrifran, GR 36/15.13. Burn-side. O. M. Stewart, 1975, **herb. O.M.S.**, det. C. West.

558/45. HIERACIUM LASIOPHYLLUM Koch ***46**, Cards.: Craig y Pistyll, GR 22/71.85. Cliffs. A. O. Chater, 1976, NMW, det. P. D. Sell. (*Nature Wales*, **15**: 148 (1977)).

558/1/84. HIERACIUM ANGUINUM (W. R. Linton) Roffey ***78**, Peebles: Garelet Hill, Talla, Tweedsmuir, GR 36/12.20. C.S.S.F. Field Meeting, 1976, **herb. D. J. McCosh**, det. P. D. Sell.

558/99. HIERACIUM GRANDIDENS Dahlst. ***46**, Cards.: 300m N.E. of Eglwys Newydd, GR 22/77.73. Walls by road. A. O. Chater, 1976, NMW, det. P. D. Sell. (*Nature Wales*, **15**: 148 (1977)).

558/1/127. HIERACIUM EUPREPES F. J. Hanb. ***78**, Peebles: Talla Linn, Tweedsmuir, GR 36/13.20. A. McG. Stirling, 1969, **CGE**, det. P. D. Sell.

558/1/143. HIERACIUM CALEDONICUM F. J. Hanb. ***46**, Cards.: W. of Penbryn, GR 22/28.52. Sea-cliffs. A. O. Chater, 1976, **NMW**, det. P. D. Sell. (*Nature Wales*, **15**: 148 (1977)). ***78**, Peebles: Winterhope Burn, Megget, GR 36/18.20. Burnside. C.S.S.F. Field Meeting, 1976, **herb. D. J. McCosh**, det. P. D. Sell.

558/1/149. HIERACIUM VULGATUM Fr. **78**, Peebles: Codleteth Hill, Talla, GR 36/13.20. F. H. Perring, 1956, **CGE**, det. P. D. Sell. 1st localized record.

558/1/221. HIERACIUM RIGENS Jord. ***83**, Edinburgh: Canonmills, Edinburgh, GR 36/24.76. Disused railway line. O. M. Stewart, 1972, **E**, det. C. West.

558/1/h. HIERACIUM HASTIFORME P. D. Sell. & C. West ***96**, Easterness: Sgurr na Lapaich, Glen Strathfarrar, GR 28/17.36. J. N. Mills, 1971, **herb. J.N.M.**, conf. P. D. Sell.

559/3. CREPIS SETOSA Haller f. **29**, Cambs.: The Limekilns, Newmarket, GR 52/66.66. G. M. S. Easy, 1976, **herb. G. M. S. Easy**. 2nd record. ***57**, Derbys.: Dronfield, GR 43/35.78. J. Hodgson, 1975, field record.

559/5. CREPIS BIENNIS L. **60**, W. Lancs.: Silverdale, GR 34/47.75. G. Halliday, 1975, **LANC, LIV**. 2nd and only localized record.

†559/t. CREPIS TECTORUM L. ***63**, S.W. Yorks.: Bingley, GR 44/10.39. F. J. Roberts, 1976, **BM**, det. J. B. Marshall. Site now built on.

560/1. TARAXACUM BRACHYGLOSSUM (Dahlst.) Dahlst. ***46**, Cards.

560/20. TARAXACUM PROXIMUM (Dahlst.) Dahlst. ***29**, Cambs.

560/21. TARAXACUM SIMILE Raunk. ***1**, W. Cornwall ***66**, Durham

560/25. TARAXACUM PSEUDOLACISTOPHYLLUM van Soest ***46**, Cards.

560/28. TARAXACUM OBLIQUUM (Fries) Dahlst. ***82**, Haddington

560/29. TARAXACUM PLATYGLOSSUM Raunk. ***66**, Durham

560/35. TARAXACUM LANDMARKII Dahlst. ***91**, Kincardine

560/40. TARAXACUM ACRIFOLIUM Dahlst. ***111**, Orkney

560/42. TARAXACUM EURYPHYLLUM (Dahlst.) M. P. Chr. ***109**, Caithness

560/43. TARAXACUM MACULIGERUM H. Lindb. f. ***91**, Kincardine

560/44. TARAXACUM PRAESTANS H. Lind. f. ***83**, Edinburgh

560/51. TARAXACUM LAETIFRONS Dahlst. ***1**, W. Cornwall ***109**, Caithness

560/61. TARAXACUM NORDSTEDTII Dahlst. ***46**, Cards.

560/64. TARAXACUM ADAMII Claire ***46**, Cards.

560/66. TARAXACUM OBTUSILOBUM Dahlst. ***106**, E. Ross.

560/68. TARAXACUM CYANOLEPIS Dahlst. ***1**, W. Cornwall

560/71. TARAXACUM SUBLACINIOSUM Dahlst. & H. Lindb. f. ***83**, Edinburgh

560/72. TARAXACUM STENACRUM Dahlst. ***1**, W. Cornwall ***12**, N. Hants.

†560/76. TARAXACUM LINGUATUM Dahlst. ***66**, Durham

560/77. TARAXACUM PALLESCENS Dahlst. ***46**, Cards.

560/81. TARAXACUM CROCEIFLORUM Dahlst. *46, Cards.

560/82. TARAXACUM LACERABILE Dahlst. *12, N. Hants.

560/85. TARAXACUM SUBUNDULATUM Dahlst. *12, N. Hants.

560/87. TARAXACUM TENEBRICANS (Dahlst.) Dahlst. *46, Cards. *90, Forfar

†560/91. TARAXACUM LACINIOSUM Dahlst. *1, W. Cornwall

560/94. TARAXACUM EKMANII Dahlst. *109, Caithness

†560/97. TARAXACUM COPIDOPHYLLUM Dahlst. *12, N. Hants.

560/99. TARAXACUM AUROSULUM H. Lindb. f. *109, Caithness

560/103. TARAXACUM CORDATUM Palmgr. *46, Cards.

560/106. TARAXACUM DAHLSTEDTII H. Lindb. f. *12, N. Hants.

560/110. TARAXACUM FULGIDUM Hagl. *1, W. Cornwall *12, N. Hants.

†560/112. TARAXACUM CHRISTIANSENII Hagl. *12, N. Hants. *109, Caithness

560/113. TARAXACUM BRACTEATUM Dahlst. *83, Edinburgh

560/114. TARAXACUM HAMATUM Raunk. *46, Cards. *109, Caithness *111, Orkney

560/117. TARAXACUM LATISECTUM H. Lindb. f. *66, Durham

560/118. TARAXACUM OBLONGATUM Dahlst. *29, Cambs.

560/119. TARAXACUM MACULATUM Jord. *46, Cards.

560/120. TARAXACUM FASCIATUM Dahlst. *66, Durham

560/121. TARAXACUM RAUNKIAERII Wiinst. *46, Cards. *89, E. Perth *91, Kincardine

560/125. TARAXACUM POLYODON Dahlst. *111, Orkney

560/127. TARAXACUM CRISPIFOLIUM H. Lindb. f. *109, Caithness

560/128. TARAXACUM CANOVIRIDE H. Lindb. f. *29, Cambs.

560/132. TARAXACUM COPHOCENTRUM Dahlst. *83, Edinburgh

†570/3. ELODEA NUTTALLII (Planch.) St John *12, N. Hants.: R. Wey at Deadwater, GR 41/80.35; Yateley, GR 41/82.61. Both records A. Brewis, 1976, **herb. A.B.**, det. E. J. Clement. 1st and 2nd records; flowering. *13, W. Sussex: Amberley Wild Brooks, GR 51/03.14. M. Briggs, 1975, **BM**. *16, W. Kent: Dartford marshes, GR 51/5.7. J. R. Palmer, 1975, **MNE**. *29, Cambs.: St John counter drain, Thorney, GR 52/23.98. J. H. Chandler, 1974, **herb. J.H.C.**, det. C. D. K. Cook. *33, E. Gloucs.: Poole Keynes, GR 41/00.94. Gravel pit. S. C. Holland, 1976, **LANC**, det. F. H. Perring.

†571/1. LAGAROSIPHON MAJOR (Ridl.) Moss *12, N. Hants.: Liss, GR 41/77.26. A. Brewis, 1976, **herb. A.B.**, det. E. J. Clement.

577/6. POTAMOGETON GRAMINEUS L. *107, E. Sutherland: Loch Brora, nr Brora, GR 29/85.06; Loch an Lagain, nr Bonar Bridge, GR 28/65.95. Both records U. K. Duncan, 1975, **BM**, det. J. E. Dandy. 1st and 2nd records.

577/7. POTAMOGETON ALPINUS Balb. 12, N. Hants.: Basingstoke canal at Winchfield, GR 41/77.53. A. Brewis, 1975, **herb. A.B.**, det. J. E. Dandy. 1st of several post-1930 records.

577/15. POTAMOGETON BERCHTOLDII Fieb. *107, E. Sutherland: Loch an Lagain, nr Bonar Bridge, GR 28/65.95. U. K. Duncan, 1975, **BM**, det. J. E. Dandy.

577/16. Potamogeton trichoides Cham. & Schlecht. *12, N. Hants.: Yateley, GR 41/82.61. A. Brewis, 1976, **herb. A.B.**, det. F. Rose.

580/1. Zannichellia palustris L. **82**, Haddington: West Barns, GR 36/65.78. E. H. Jackson, 1976, field record. 2nd record.

†595/1. Tulipa sylvestris L. **57**, Derbys.: Sudbury Hall, GR 43/15.32. J. Hodgson, 1976, field record. 1st record for 50 years.

596/1. Lloydia serotina (L.) Reichb. [**47**, Montgomery: the record in *Proc. bot. Soc. Br. Isl.*, **7**: 566 (1969) was based on a misidentification.]

597/1. Gagea lutea (L.) Ker.-Gawl. **106**, E. Ross: Kilcoy Castle, Black Isle, GR 28/57.51. M. McC. Webster, 1976, **E.** 1st record since 1912.

603/1. Paris quadrifolia L. **80**, Roxburgh: by Jed Water, Mossburnford, GR 36/66.16. M. E. Braithwaite, 1976, field record. 1st record for 100 years.

605/4. Juncus compressus Jacq. *98, Main Argyll: W. coast of Insh Island, GR 17/73.19. Mrs J. S. Thompson & C. W. Muirhead, 1975, **E.**

605/9 × 8. Juncus effusus L. × J. inflexus L. *29, Cambs.: Gamlingay, GR 52/23.51. A. C. Leslie, 1976, **herb. A.C.L.**

605/20. Juncus alpinus Vill. *64, Mid-W. Yorks.: Malham Tarn, GR 34/9.6.; Crummackdale, GR 34/7.7. Both records F. J. Roberts, 1976, **LTR**, conf. C. A. Stace. 1st & 2nd records.

605/22/2. Juncus kochii F. W. Schulz *12, N. Hants.: Woolmer Forest, GR 41/79.32. A. Brewis, 1975, **herb. A.B.**

†606/4. Luzula luzuloides (Lam.) Dandy & Wilmott **78**, Peebles: Black Barony, ½ mile W. of Eddleston, GR 36/23.47. C.S.S.F. Field Meeting, 1976, field record.

625/2. Epipactis helleborine (L.) Crantz **73**, Kirkcudbright: Arbigland, GR 25/98.57. N. F. & O. M. Stewart, 1976, field record. 1st post-1930 record. **74**, Wigtown: Cotland plantation, Bladnoch, GR 25/41.54. J. Martin, 1974, field record. 1st post-1930 record.

629/1. Neottia nidus-avis (L.) Rich. **1**, W. Cornwall: Trelissick, S. of Truro, GR 10/83.39. J. Nicholls, 1972, **herb. J.N.** 2nd record.

633/1. Corallorhiza trifida Chatel. **70**, Cumberland: Eskmeals gunnery-range, GR 34/07.93. A. B. Warburton, 1976, field record. 2nd and only extant record.

642/4. Orchis ustulata L. **12**, N. Hants.: Ladle Hill, GR 41/47.56. W. M. Keens, 1974, field record. Only extant record.

†648/1. Lysichiton americanus Hultén & St John *83, Edinburgh: Carberry Tower, GR 36/36.69. E. P. Beattie, 1976, field record. Present since 1956.

650/4. Lemna gibba L. **12**, N. Hants.: Basingstoke canal at Coxmoor Wood, GR 41/78.51. A. Brewis, 1975, field record. 2nd record.

652/4. Sparganium minimum Wallr. *80, Roxburgh: Murder Moss, Selkirk, GR 36/50.28. R. W. M. Corner, 1956, **herb. R.W.M.C.** 1st definite record.

655/12. Scirpus fluitans L. *107, E. Sutherland: Loch an Lagain, Bonar Bridge, GR 28/65.95. U. K. Duncan, 1975, **herb. U.K.D.**, det. J. E. Dandy. Loch Migdale, Bonar Bridge, GR 28/62.91. U. K. Duncan, 1975, field record. 1st & 2nd records.

656/4. Eleocharis multicaulis (Sm.) Sm. *44, Carms.: Llanllwch Bog, GR 22/36.18. S. B. Evans & M. J. Dunn, 1976, **NMW.** (*Nature Wales*, **15**: 145 (1977)).

656/a. Eleocharis austriaca Hayek **64**, Mid-W. Yorks.: by R. Ribble, nr Settle, GR 34/81.60. F. J. Roberts, 1975, **herb. F.J.R.**, conf. S. M. Walters. 2nd of several records.

660/1. RHYNCHOSPORA ALBA (L.) Vahl **109**, Caithness: Blàr Geal, S. of Halkirk, GR 39/10.51. J. K. Butler, 1974, **herb. J.K.B.** 2nd record.

663/8 × 4. CAREX DEMISSA Hornem. × C. HOSTIANA DC. ***73**, Kirkcudbright: Stroan Loch, GR 25/64.70. O. M. Stewart, 1976, **E**, det. A. C. Jermy.

663/21. CAREX ACUTIFORMIS Ehrh. **78**, Peebles: Putts Pool, Innerleithen, GR 36/34.37. D. J. McCosh, 1976, **BM**, det. A. C. Jermy. 1st post-1930 record.

663/23. CAREX STRIGOSA Huds. ***44**, Carms.: Allt y Wern, Llangathen, GR 22/58.21. S. B. Evans & I. M. Vaughan, 1976, **NMW**. (*Nature Wales*, **15**: 145 (1977)). ***73** Kirkcudbright: Nether Clifton, nr Lot's Wife, GR 25/91.55. Below willows. O. M. Stewart, 1976, **E**, det. A. C. Jermy.

663/28. CAREX LIMOSA L. ***79**, Selkirk: Clearburn Loch, GR 36/33.15. D. A. Ratcliffe, 1961, field record.

663/33. CAREX LASIOCARPA Ehrh. ***45**, Pembs.: Castlemartin Corse, GR 11/89.99. S. B. Evans, 1976, **NMW**. (*Nature Wales*, **15**: 146 (1977)). ***46**, Cards. & ***47**, Montgomery: Gors Lwyd, Elan/Ystwyth watershed, GR 22/85.75. A. O. Chater, 1976, **NMW**. (*Nature Wales*, **15**: 147, 148 (1977)). **109**, Caithness: Tister, Olrig, GR 39/20.61. E. R. Bullard & J. M. Gunn, 1975, field record. 2nd record.

663/37. CAREX MONTANA L. ***44**, Carms.: Carreg yr Ogof, Llandeusant, GR 22/77.21. Limestone ledges. M. Massey & S. B. Evans, 1976, **NMW**. (*Nature Wales*, **15**: 145 (1977)).

663/48. CAREX AQUATILIS Wahlenb. **78**, Peebles: by R. Tweed, Innerleithen, GR 36/34.37. D. J. McCosh, 1976, **BM**, det. A. C. Jermy. 1st localized record.

663/66. CAREX LEERSIANA Rauschert ***81**, Berwick: Thirlstane Castle, GR 36/53.47. Plantation. A. Younger, 1975, **CGE**, det. R. W. David.

663/67. CAREX SPICATA Huds. ***77**, Lanark: W. of Law, GR 26/80.51. Roadside. E. M. & S. M. Bignal, 1976, **herb. S.M.B.**, conf. R. W. David.

663/81. CAREX DIOICA L. ***44**, Carmarthen: Clogau Mawr, S. of Llangadog, GR 22/72.19. I. M. Vaughan, 1976, **NMW**, det. A. C. Jermy. (*Nature Wales*, **15**: 145 (1977)).

670/7. FESTUCA JUNCIFOLIA St-Amans †***50**, Denbigh: Kinmel Bay, nr Rhyl, GR 23/99.80. Sand-dunes. J. M. Brummitt, 1976, **NMW**, det. C. E. Hubbard. (*Nature Wales*, **15**: 151 (1977)).

672/3. VULPIA MYUROS (L.) C. C. Gmel. †***50**, Denbigh: Llanrwst railway station, GR 23/79.62. R. Cotton, 1971, **LTR**, det. C. A. Stace. (*Nature Wales*, **15**: 151 (1977)). †**80**, Roxburgh: Newtown St Boswells, GR 36/57.31. Old railway yard. J. Blance, 1975, **herb. R. W. M. Corner**, 1st post-1930 record.

673/2/1. PUCCINELLIA DISTANS (L.) Parl. **29**, Cambs.: Elm, GR 53/47.07. Filled-in canal G. M. S. Easy, 1972, **herb. G.M.S.E.** 2nd record.

673/2/2. PUCCINELLIA CAPILLARIS (Liljebl.) Jansen ***82**, Haddington: Bass Rock, GR 36/60.87. Mrs W. S. & C. W. Muirhead, 1974, **E**, det. C. E. Hubbard.

676/11. POA ANGUSTIFOLIA L. ***98**, Main Argyll: Insh Island, GR 17/73.19. Mrs J. S. Thompson & C. W. Muirhead, 1975, **E**, det. C. E. Hubbard.

676/12. POA SUBCAERULEA Sm. **79**, Selkirk: Wollrig Burn, Ashkirk, GR 36/43.23. R. W. M. Corner, 1975, **herb. R.W.M.C.**, det. A. Melderis. 2nd record.

†676/14. POA PALUSTRIS L. **12**, N. Hants.: Milford Lake, Highclere, GR 41/45.60. A. Brewis & M. Keens, 1976, **herb. A.B.** 2nd record.

†676/15. POA CHAIXII Vill. **78**, Peebles: Glen, 4 miles S.W. of Innerleithen, GR 36/29.33. C.S.S.F. Field Meeting, 1976, field record. 2nd record.

677/1. Catabrosa aquatica (L.) Beauv. *43, Radnor: Nantywylan Farm, Llanfihangel Rhydithon, GR 32/15.68. A. C. Powell, 1976, NMW. (*Nature Wales*, **15**: 144 (1977)). **69**, Westmorland: Hazelslack, Arnside, GR 34/47.78. M. Baecker, 1976, LANC. 1st post-1930 record for Westmorland.

681/1. Melica uniflora Retz. **84**, Linlithgow: nr Kinneil, GR 26/97.80. Roadside bank. E. P. Beattie, 1976, field record. 2nd record.

683/2. Bromus ramosus Huds. ***107**, E. Sutherland: Golspie Big Burn, GR 29/83.01. Shady ravine. J. E. Kirby, 1975, field record.

†683/4. Bromus inermis Leyss. **57**, Derbys.: Chesterfield, GR 43/36.72. Restored colliery site. M. C. Hewitt, 1976, **DBY**, det. C. E. Hubbard.

†683/9. Bromus tectorum L. ***29**, Cambs.: Kennett, GR 52/69.69. By gravel pits. G. M. S. Easy, 1970, **herb. G.M.S.E.**

684/2. Brachypodium pinnatum (L.) Beauv. ***46**, Cards.: Cardigan, GR 22/18.45. Disused railway embankment. S. B. Evans & T. A. W. Davis, 1976, NMW. (*Nature Wales*, **15**: 148 (1977)).

685/5 × 4. Agropyron junceiforme (A. & D. Löve) A. & D. Löve × A. pycnanthum (Grah.) Gren. & Godr. **68**, Cheviot: Snook Point, Holy Island, GR 46/09.43. G. A. & M. Swan, 1975, **herb. G.A.S.**, det. C. E. Hubbard. 1st record for over 100 years.

701/4. Agrostis gigantea Roth ***78**, Peebles: Bodlien, nr Tweedsmuir, GR 36/05.18. R. Hunter, 1969, field record.

708/3 × 2. Alopecurus geniculatus L. × A. pratensis L. ***109**, Caithness: Thurso, GR 39/11.66. Riverside. J. K. Butler, 1974, **K**, det. C. E. Hubbard.

# Book Reviews

*Hedgerow Plants*. Molly Hyde. Pp. 192, with 239 line-drawings. Shire Publications Ltd, Aylesbury, Bucks. 1976. Price (soft cover) £2·50.

Botanists are unlikely to be at a loss to find projects to fill the leisure which comes with retirement, and Mrs Molly Hyde is a member who has used this leisure to draw and to write about her favourite hedgerow plants. In this personal selection of 239 species, the plants are described and illustrated with line drawings by the author, who states that the work is not primarily for identification but is intended as a 'popular' book to appeal to the rambler and the motorist. For each species there is a short description, a note on distribution and a good measure of information on the uses, folklore and facts of interest associated with the plant together with many quotes from Mrs Hyde's favourite authors on country topics and flower lore, as for example, Jocelyn Brooke's description of *Galium verum* (Lady's bedstraw) as 'clothing dry banks with fine-spun gold'.

The author's love of plants is apparent throughout, and after 50 years of observation she gives a care for accuracy which is all too often missing from 'popular' plant books. There is no pretence of this book's being a botanical work, but Mrs Hyde has most commendably used English names from the B.S.B.I. publication *English names of wild flowers* (Dony, Rob & Perring (1974)) with some additional country names 'so that these lovely local names are not lost'.

Included in the Preface is a summary of the historical development and ecological value of hedges in Britain, and species providing food or shelter for insects and birds are described through the book. The importance of conservation is also stressed, with a mention of the *Conservation of wild creatures and wild plants Act* 1975. The line drawings are in pairs or in groups, with a one-inch buttercup flower shown in each figure to indicate the relative size. Additional aids for the reader are the 6-page Glossary and 2½-page Bibliography of sources.

The classification by chapter headings separates hedgerows from verges of different habitats, and the plants described include a large number of the common wild plants in Britain. This pleasant book can be recommended to awaken interest in field botany and as a book of general interest on hedgerow plants.

M. Briggs

*Botanical Systematics. An Occasional Series of Monographs*. Edited by V. H. Heywood. Vol. 1. Pp. v+392. Academic Press, London. 1976. Price £24·00.

The two papers included in this first volume of a new series of monographs are quite independent works and are therefore reviewed separately here:—

*Palynotaxonomic Investigation of* Fagus *L. and* Nothofagus *Bl.: Light Microscopy, Scanning Electron Microscopy, and Computer Analyses*. Sharon L. Hanks & David E. Fairbrothers. Pp. 1–142, with 47 black and white plates and 5 text-figures.

Recent increases in publication costs have meant that minimizing length is now a prime concern to authors of scientific papers. In practice, this is often used as an excuse for presenting data and then reducing their assessment to a point where there is little attempt at placing results in a broader context. This new series is a welcome opportunity to explain the significance of important results in a way that is not normally possible. But the availability of extra space carries with it a heavy responsibility to use that space effectively.

*Fagus* and *Nothofagus* are significant genera to the pollen analyst and the systematic botanist, and a survey of their pollen morphology is a worth-while undertaking. Hanks & Fairbrothers

have studied 11 species of *Fagus* and 30 of *Nothofagus* with the light and scanning-electron microscopes. They have overcome many of the shortcomings of the SEM by studying complete pollen and grains which have been ruptured by ultrasonics.

From their observations, they have drawn up detailed descriptions of the pollen of each species and confirmed the traditional separation of the species into four main pollen types. They have then used a computer to produce diagnostic keys to the pollen. It is hard to understand who the users of these keys will be. There is no suggestion that they should be used to identify herbarium specimens, and pollen analysts will not have access to a number of the characters employed, since they must be observed in the SEM or rely on ratios unobtainable with single grains.

More usefully, the computer has also produced phenograms. When pollen data alone were analysed, the resulting clusters of species were quite different from groupings produced by other fields of research. But, when the data from these other disciplines were used in conjunction with the pollen data, new ideas about the relationships of the pollen types could be suggested. *Fagus* appears to be more primitive than *Nothofagus*, and possible migration routes of their ancestors are put forward.

Taken as a whole, the study is a useful survey of the pollen of these two genera, but it does not attempt to see them in a broader context or to assess their relationships with other groups. I am not convinced that these aims justify 143 pages. For an expensive publication, the plates are very poorly reproduced.

G. C. S. Clarke

*Genisteae* (*Adans.*) *Benth. and Related Tribes* (*Leguminosae*). R. M. Polhill. Pp. 143–392, with 5 black and white plates and 42 text-figures.

Studies of parts of the tribe Genisteae (e.g. in the Mediterranean and South Africa) published in the last few years have revealed that the treatments of the tribe by Bentham and, more recently, by Hutchinson are unsatisfactory. The author has therefore reviewed the Genisteae, discussing in particular gross morphology, floral biology, seed anatomy, chromosome numbers and phytochemistry, in an attempt to reconcile these inconsistencies. He has emphasized the importance of variation in flower, fruit and seeds in the classification of this group of legumes, not only individually but as a syndrome. His chapter on 'The flower as a functional unit' is a good example of the synthetic approach to taxonomy. Thus, 'taking the flower as a unit rather than worrying about individual characters, the distinction [between *Cytisus* and *Genista*] is quite easy' (p. 168).

The line illustrations of floral parts, fruits and seed-morphology and -anatomy are particularly valuable, having been drawn clearly and arranged helpfully, whilst the photographs of pollen, testa surface and cells, and keel-petals are also useful. Owing to the absence of maps, however, the factors of distribution, which are shown to be important, have to be grasped through the printed word alone.

Dr Polhill concludes that the Benthamian tribe Genisteae should be divided into four tribes, viz. Bossiaeae (Australian), Liparieae (South African), Crotalarieae (mostly African, but with some genera in the Mediterranean, India, Australia and South America, and *Crotalaria* itself widespread in the tropics of both hemispheres) and Genisteae (centred in the Mediterranean, but extending into most of Europe and the Canary Is., and with one genus, *Lupinus*, widespread in America). As regards the British genera, he returns *Sarothamnus* to synonymy under *Cytisus* as sect. *Spartopsis* Dumort. but maintains *Genista* and *Ulex*.

Having gone so far towards sorting out the relationships in Bentham's Genisteae, it seems a pity that Dr Polhill has not gone further towards reflecting them in his classification. Admittedly, this would involve consideration of the more primitive tribes Podalyrieae and Sophoreae, and possibly even the whole Papilionoideae; but his several references to morphological links between these tribes on the one hand and the Australian Bossiaeae and South African Liparieae and Crotalarieae on the other suggest that his taxa are at least partly gradal. We must be grateful, however, for having the classification of the Genisteae *sensu lato* placed on a firm footing and should hope that it will not be long before Dr Polhill's fine work leads to a natural classification of the Papilionoideae as a whole.

N. K. B. Robson

*The Atlas of Breeding Birds in Britain and Ireland.* Compiled by J. T. R. Sharrock. Pp. 477. British Trust for Ornithology, Tring, Herts. 1976. Price £9·00.

*Atlas of the Non-marine Mollusca of the British Isles.* Edited by M. P. Kerney. Pp. vi+204. Conchological Society of Great Britain and Ireland and the Biological Records Centre, Institute of Terrestrial Ecology, Abbots Ripton, Huntingdon. 1976. Price £3·00.

It is 26 years since the Botanical Society of the British Isles pioneered recording on the now familiar basis of 10-kilometre grid squares; and the appearance almost simultaneously of these complete atlases will be of great interest to British field botanists, from whom the ornithologists and conchologists have learned a great deal. It may now be appropriate to ask what botanists may learn from them. Their task was by comparison simple, as they each had only about 200 species to consider compared with the 1,600 plants the botanists had to record. As a result of this the distribution maps in these new atlases are nearly two and a half times as large as those in the *Atlas of the British flora* (1962, rev. ed. 1976). Both use the Irish Grid rather than the National Grid extended to Ireland, an innovation which will most surely be welcomed by all field workers.

The bird atlas has red dots against a black outline to show the three stages of distribution of breeding (confirmed, probable or possible), within the limited period of five years. The slate has now been cleaned, for it is anticipated that in 25 years the exercise will be repeated, when it will matter little if the grid has been changed. Can botanists learn something here and prepare now to collect data within a strictly limited period of years?

The Mollusca atlas is a great credit to an astonishingly small team of diligent workers; but the result has some of the defects of the *Atlas of the British flora*, as the maps are based on all records for some species and post-1950 and pre-1950 records for others. Fossil records are sometimes included; if the time factor is to enter at all, it would be good to have it used consistently. The atlas is a work by specialists for specialists; and while cost prevented the addition of text and illustrations (included in the bird atlas), a little information could have been given to assist the ordinary reader.

Both atlases are a 'must' for all who count themselves general naturalists, and each will be more useful with overlays (not available at the time of publication). Those for the bird atlas will cost an additional £1·50, but no indication is given with regard to those for the Mollusca atlas. It is a terrible pity that the maps in the two atlases are not exactly the same size; for, if they had been, one set of overlays could have served for both.

J. G. Dony

*The Northwest European Pollen Flora*, 1. Edited by W. Punt. Pp. 145, with 54 black and white plates. Elsevier Scientific Publishing Company, Amsterdam, Oxford & New York. 1976. Price Dfl. 50.

This is an elegant hard-back volume containing an introductory chapter and accounts of the pollen morphology of seven families: Adoxaceae, Caprifoliaceae, Gentianaceae, Guttiferae, Primulaceae, Sparganiaceae and Typhaceae, as represented in a rather arbitrarily defined region including France (excluding the mountainous and Mediterranean regions), Belgium, Netherlands, adjacent Germany, Denmark, southern Norway and Sweden, the British Isles and Iceland. It is only fair to say that these accounts have already been published as separate papers in the *Review of Palaeobotany and Palynology*, **17**, **19** & **21**, and are reprinted unaltered here with just the addition of an index and errata list.

The treatment of each family adheres to a fairly rigid format and includes a pollen bibliography, a short section on terminology, citation of the voucher specimens used for the pollen study, a pollen key and full descriptions of the pollen types recognised. These are followed by very high-quality plates of micrographs, predominantly light micrographs but with some scanning-electron micrographs included in each treatment. The accounts conclude with full citation of the references used. The work is in the tradition of *An introduction to a Scandinavian pollen flora* by G. Erdtman *et al.* (1961, 1963), and the aims are very similar though the treatment is more comprehensive and more modern techniques are included.

This book is designed to provide pollen morphological descriptions and keys which it is thought will be of special interest to Quaternary palynologists and will also prove of value to those interested in pollen morphology and plant taxonomy. The emphasis on light micrographs of excellent quality and the generally simple and well-set-out pollen keys must go a long way towards meeting the needs of the former workers. Certainly the account of the pollen morphology of *Lysimachia* and *Steironema*, genera comprised of some 200 species of which the pollen morphology of the nine included are divided into four pollen types, serves to illustrate how this pollen Flora can give invaluable guidance to plant taxonomists on the use of further detailed palynological investigations of a group.

The citation of voucher specimens is commendable. In view of the statement in the introduction that the nomenclature and in general the taxonomy will follow that of *Flora Europaea* or of a recent monograph or Flora covering the area, it is regrettable that no information on these aspects is included in the account of Primulaceae. It is hoped that in subsequent parts authors will always be meticulous in indicating the taxonomic treatment they are following. The selection of species for inclusion is indeed arbitrary, as why the southern European *Viburnum tinus* and two *Cyclamen* species and the montane *Soldanella alpina* and *Androsace villosa* (to mention but a few) are included is not immediately clear. Some attention to the uniform citation of standard reference works seems a detail worth noting for subsequent parts. For example Kuprianova & Alyoshina's 'pollen flora' is cited in three different ways on pages 73, 123 and 142. It would seem preferable to include the references before the plate descriptions, as in the Adoxaceae account, and not to relegate them to the back of the last plate, as in many other parts. The plate descriptions could usefully be expanded without increasing the space occupied, as there are very wide right-hand-page margins. For example it would have been helpful if the plate descriptions of *Trientalis* had indicated that the pollen was dimorphic. However, these are all minor points in a generally excellent and useful work, and one has to congratulate Dr Punt and his co-editors on their industry and encourage them by eagerly awaiting further parts.

Despite the many excellent features, the reviewer cannot help wishing for a wider coverage to include some of the commoner montane and Mediterranean species. This would enhance the value of the volume considerably though admittedly increase enormously the effort required. It is to be hoped that the *Northwest European pollen Flora* will act as a stimulus to other workers to embark on complementary treatments for south-western or central Europe.

I. K. Ferguson

*A Handbook to the Natural History of the Lizard Peninsula* and *Supplement One—Flowering Plants of the Lizard arranged by Habitat, using common names*. Compiled and edited by F. A. & S. M. Turk. Pp. 88, with 5 maps, and pp. 50 respectively. Dept. of Extra-Mural Studies, Exeter University. 1976. Price: Handbook £1·50, Supplement 35p., plus postage and packing 29p. (Remittance payable to the University of Exeter). Available from J. S. Hurst, 5 Walsingham Place, Truro, Cornwall.

At the Lizard, much work has been done by amateurs and professionals on general and specialized aspects of many branches of natural history from historical ecology to geomorphology, but this information is scattered and some is relatively inaccessible in reports, in Field Club magazines, in manuscripts or even in the field note-books of certain individuals. There are also gaping holes in our knowledge. Thus a golden opportunity exists to root out (especially from individuals with vital but unpublished research) and assemble this information, to fill the gaps, to subvert busy experts to vet the appropriate pieces of the first draft, and finally publish the cardinal features of this mountain of fascinating scientific material.

Tragically, the present *Handbook* is only an introductory guide; but even so, it is unsuitable for beginners or amateur naturalists because on practically every page there are numerous errors of factual information and, in my opinion, interpretation, so that such persons are likely to be misled and confused. It is dressed up in scholarly fashion but is sadly lacking in scholarship.

The Foreword by the Professor of Adult Education is pathetic. The *Handbook* in the wrong hands could do far more harm than good. For example, the Conservation section lists no less than 4,078 acres which are Nature Reserves or S.S.S.I.s. It is not made clear that a mere 359

acres only are at all safeguarded from destruction. It is not stated that, in the past few years, hundreds of acres of Lizard S.S.S.I.s have been destroyed by agricultural reclamation, e.g. on the Crousa Downs S.S.S.I., where huge machines have scooped up the erratic blocks of gabbro, others have dug deep ditches (one alongside the only locality for *Pinguicula vulgaris*) and 'prairie-busters' have ploughed up the land, destroying acre upon acre of geological features, virgin soils and a superb wet-heath flora and associated fauna in an area hitherto comparatively little modified by man over its many *thousands* of years of existence.

The Professor describes the Supplement as the very first Flora for the peninsula and in the introductory notes it is claimed to be 'comprehensive'. It is not a Flora, not even a check-list, but consists of excessively repetitious lists of flower names using the English names of Dony, Rob & Perring (1974). Sadly the *Handbook* does not use the corresponding Latin names. Some Lizard plants are not included and the habitat range of several is under-recorded. Some of the specialized, biologically-fascinating habitats are not listed at all.

Let us hope that the present so imperfect attempt will encourage others to produce an accurate, critical, interpretative, comprehensive and comprehensible account, especially as time is running short for the survival of several of the most scientifically important sites.

L. C. Frost

*Chemotaxonomy of Plants*. Philip M. Smith. Pp. 313. Contemporary Biology Series. Edward Arnold, London. 1976. Price £13·00 (hardback); £6·50 (paperback).

The use of chemical characters in plant classification has had a long history, but the modern development of the subject really began as a distinct discipline only about 1963. Since then, it has made spectacular progress and the subject has made a considerable impact on plant systematists. Indeed its importance as a new approach in examining and assessing plant interrelationships is widely accepted, so much so that every student in plant science at university today needs to be aware of developments in this field. Although many books have been published on chemo-systematics, the only textbook specifically written at the student level was produced as long ago as 1963. The book in question, Alston & Turner's *Biochemical Systematics*, while a pioneering study and highly influential in its time, has unfortunately become rapidly out-dated. The need for a modern treatment has become more and more acute, so that the appearance of Philip Smith's study is very welcome and one can only be grateful to see the publication of this long-awaited volume.

The plan of the book follows to some extent the layout used by Alston & Turner, there being three sections entitled: possibilities and problems; the sources of evidence; and applications. The first section begins with a general introduction defining terms, a brief history and a useful chapter listing the various stages of a chemotaxonomic investigation. Section 2, the main body of the book, consists of nine chapters which provide in turn phytochemical summaries of the major classes of plant constituent utilised, together with critical appraisals of their taxonomic worthiness. The final section on applications consists of three chapters, one covering developments in bacterial chemotaxonomy, another on chemical evidence at various taxonomic levels and, finally, an account of macromolecules and phylogeny. The book concludes with an alphabetical list of 514 references and a handy subject-index.

Even in a work of this length, it has obviously not been possible for the author to include more than a few illustrative examples of each class of chemical compound; and while one might argue that certain important papers have been overlooked, nevertheless the general coverage is good and the balance achieved between say micro- and macromolecular data very fair. It is particularly good on serology and taxonomy, not surprisingly in view of the author's own research interests, and these sections of the book provide the best available introduction to this topic. I found this book generally a very useful one and am sure it will be widely appreciated by all those directly involved in the subject.

Whether it will make an ideal student text is, of course, another matter, and I have some hesitation in giving it an unqualified recommendation. The problem of deciding how much phytochemistry to include in a work of this sort is a difficult one; but since there are some excellent introductory texts in phytochemistry (e.g. T. Robinson's *Chemical constituents of higher plants*),

I believe the author could have saved space here, with advantage, and concentrated more on chemotaxonomy proper. As it is, each chapter of the middle section contains a considerable amount of phytochemical information, some of which is repetitive or inaccurate. It is unfortunate to find in a student text that a number of minor errors have crept into the chemical formulae, e.g. pisatin on p. 57 is lacking an oxygen, betanidin on p. 64 lacks a double bond and amentoflavone on p. 53 lacks two such bonds. Also, surely it is common knowledge that all the work of Franz Moewus is bogus; yet the author quotes one of his papers on flavonoids as algal sex hormones without any qualification. The style is also rather forbidding for a student audience, and it lacks the clarity, enthusiasm and fire of Alston & Turner's book. Very commendably, however, the author has rightly stressed the implications for chemotaxonomy of recent advances in the field of biochemical ecology.

In summary then, this is a valuable source book for all chemotaxonomists, if not the ideal introduction for students of the subject. It is also well illustrated and reasonably priced.

J. B. Harborne

*Biogeography and Ecology in the Canary Islands*. Edited by G. Kunkel. Pp. xvi+511, with 230 figures and 37 tables. Monographiae Biologicae, volume 30. Dr W. Junk b.v., The Hague. 1976. Price Dfl. 160.

The title of this work is something of a misnomer since in no way does it reflect the true contents of the book. In all there are 17 chapters devoted to the natural history of the Canary Islands but not, as indicated in the title, dealing exclusively with aspects of biogeography and ecology. Instead, they encompass a wide range of topics such as 'The prehispanic population of the Canary Islands', 'The names of the Canary Islands and their verification', 'Climatic characteristics of the Canary Islands' and 'The geology of the Canary Islands'. Although some of them have a bearing in one way or another on the title subject, these works would be better placed in books on anthropology, mythology, climatology and physical geography than in a book of this kind. Furthermore, chapter XI 'Natural products isolated from plants from the Canary Islands' is a simple inventory of secondary plant products, and chapters XII 'The influence of man on the island of Hierro' and XVII 'Conservation of fragile ecosystems in the Canary Islands' belong to the politics of conservation rather than the realms of ecology. Genuine accounts of systematic biogeography and ecology are to be found only in 'The endemic flora of the Canary Islands', 'The lichen flora and lichen vegetation of the Canary Islands', 'Introduction to a faunal study of the Canary Islands laurisilva with special reference to the ground beetles', 'Notas sobre la distribución y evolution de la avifauna Canaria', 'The amphibia and reptilia of the Canary Islands' and 'An account of the limnetic fauna of the Canary Islands'.

Although the book is extremely well produced, the standard of editing is very variable and at times downright abysmal. At one extreme is H.-U. Schminke's informative chapter on 'The geology of the Canary Islands', providing an excellent 117 pages on geological history, physical structure and petrology of the area. At the other extreme are Emil Schmid's anecdotal ramblings on the 'Laurisilva of Hierro', where the English is so bad as to be unintelligible and is coupled with a completely unscientific presentation. It is presumably this chapter which gives rise to the editorial disclaimer for 'language peculiarities'. Although the book is intended to reach a wider market by being written in English, J. J. Bacallado's interesting 'Notas sobre la distribución y evolucion de la avifauna Canaria' strangely enough is written in Spanish. For the sake of consistency it would have been better if all the contributors had written in their mother tongues.

There are several useful chapters for the botanist. A systematic account of the sparse Macaronesian fungal flora is compressed into eight pages by Habor Gjaerum. The chapter by G. Follman gives an excellent appraisal of the all-important lichen flora and its phytosociology, bringing together a vast amount of scattered information. Not a single page is given to the ferns, a dominant element of the native flora. There is little information to be gained on the phanerogams in Dr D. Bramwell's 'The endemic flora of the Canary Islands' that has not already been published in his earlier review in D. H. Valentine (ed.) *Taxonomy, phytogeography and evolution*, pp. 141–159 (1972). The ideas are substantially the same as in the earlier paper, and few of the obvious errors have been corrected. The phytogeographical commentary on disjunct distribution is incredibly

speculative and all too often based on unreliable, non-phylogenetic taxonomies. Descriptions of the non-endemic flora are absent, apart from a very brief anecdotal account of weeds and cultivated plants written by the editor.

Despite all of its faults this book brings together a considerable amount of data, being one of the most important compilations of Canarian biology to be made this century. It must be stressed, however, that only topics strictly associated with the Canary Islands are included in it. Furthermore, since it deals with a diverse range of topics and provides only a patchy coverage on biogeography and ecology (reminiscent of a symposium volume rather than an organized textbook), its high cost makes it an unpromising buy for the student of these subjects. It will, however, inevitably find its way on to library shelves as a reference volume.

C. J. Humphries

*British and Irish Orchids, a field guide.* D. M. Turner Ettlinger. Pp. v+141, with 52 black and white plates, 63 colour plates and 56 text-figures. Macmillan Press, London. 1976. Price £4·95.

Although on a world-wide basis the number of new books published on orchids is more or less in keeping with the vast size of the orchid family, which contained 18,500 species at the last count, relatively few books devoted exclusively to British and Irish orchids have appeared recently. The classical iconograph and monograph of Col. Godfery, published in 1933, was followed less than twenty years later by Victor Summerhayes' fascinating and eminently readable volume in the New Naturalist series. Since then, apart from a multitude of scientific papers dealing with aspects of taxonomy, nomenclature and ecology, there have been no accounts devoted entirely to British orchids, although, of course, mention must be made of the appropriate volume in Stella Ross-Craig's drawings (1971) and the invaluable technical accounts in 'Clapham, Tutin & Warburg' (2nd ed. 1962), the same authors' *Excursion Flora of the British Isles* (2nd ed. 1968) and Stace's *Hybridization and the flora of the British Isles* (1975).

The time is ripe for a new publication devoted exclusively to the orchids of the British Isles, in order to summarize and present to a wider audience the systematic, distributional and other scientific advances of the last two decades. The advent of incomparably better, and relatively cheaper reproduction of colour photographs could have made such a book visually desirable as well as of scientific and 'field' value.

Unfortunately Turner Ettlinger's book fails to fill this gap, even at £4·95 for a slim 141 pages. Mr Ettlinger's skill as a photographer is well known, and the coloured photographs grouped towards the end of the book amply support this assertion, although the predominantly grey and white plates that accompany the textual account of each species raise doubts! I must hasten to stress that I am sure that this is entirely due to the printing and is not a slur on Mr Ettlinger's abilities.

The author's knowledge as an aware field botanist is also well known, and the excellent text on many aspects of orchids is ample evidence of this.

What is unfortunate is the haphazard or ill-conceived structure and detailed design of the book. Distribution maps with symbols so small (at the scale used) as to be very indistinct, insistence on a complex dual system of English and scientific names, the separation of the black and white and colour photographs, the absence of a scale on the latter, the omission of an index and the apparently random sequence of contents, all these are disturbing features. Books of this type must be designed to be used, and it is a great disservice to the author and photographer, and to the long tradition of books on British plants, that the publisher had not realized this essential fact.

P. F. Hunt

*Biology of Plants.* P. H. Raven, R. F. Evert and Helena Curtis. 2nd edition. Pp. x+685. Worth Publishers, New York. 1976. Price £8·50.

This attractively produced, comprehensive and extremely up-to-date textbook deals with the whole field of plant biology in the widest sense, covering the biochemistry, physiology, genetics, structure and diversity of bacteria (including blue-green algae), viruses, algae, fungi and lichens,

bryophytes, pteridophytes and seed plants and emphasising the genetics, adaptations and ecology of the organism. Flowering plants are covered in the greatest detail, more than half of the book being concerned with their structure, evolution, physiology and ecology. The book is exceptionally well illustrated with colour and monochrome photographs, drawings and diagrams, which occupy considerably more space than the text. Bibliographies attached to each of the eight sections give, as suggestions for further reading, long lists of specialized textbooks and a few symposia but virtually no review articles or papers. A few semi-popular field guides to North American plants are also cited.

Although this very competently written textbook undoubtedly provides an admirably co-ordinated and assimilable introduction to much of modern plant biology for university students, and perhaps also for advanced sixth-form courses, the level of treatment is inevitably rather shallow in places. In the biochemical section, for example, the accounts of photosynthesis and the Krebs cycle are very cursory and simplified. The absence of any discussion of molecular evolution is disappointing, as is the omission of all but a few tantalizing references to fossil vascular plants from the otherwise praiseworthy account of the non-flowering vascular plants. There is also an unhelpful lack of detailed information about some of the illustrations and diagrams, both in the captions and in the text. As no references are given to the research papers on which many illustrations and diagrams are based, enquiring students may find themselves frustrated by, for example, the fascinating but virtually unexplained series of paintings of the flowers of 14 different members of the *Nigella arvensis* complex shown on pp. 160–161; space could easily have been found for a brief mention of Strid's study (Strid 1970) on which these paintings are based.

SI units are used throughout. A modern system of classification into five kingdoms, derived from the schemes of Whittaker and Margulis, has been adopted and is used very consistently (the five kingdoms are: Monera, consisting of the bacteria, blue-green algae and viruses; Protista, containing the rest of the algae, the slime moulds, and the protozoa; Fungi; Plantae, consisting of the bryophytes and vascular plants; and Animalia). Algae are accordingly, but rather surprisingly, not regarded as plants: 'In the sea, the plants are represented by only a few genera, all of them monocots . . . the algae are the predominant group of photosynthesizing organisms in the sea' (p. 568). Latin names are used freely and correctly for species and genera, and the *International Code* has been followed for the names of higher units.

There are very few misprints and errors, but the reiterated statement on p. 75 that all known tRNA molecules consist of 77 nucleotides is incorrect even for the one that is illustrated (yeast $tRNA^{Phe}$, with 76 nucleotides); in fact, known tRNAs have from 73 to 93 nucleotides (Rich & RajBhandary 1976); and, despite the statement on p. 139 that all gene products are proteins, rRNAs are among the gene products that are *not* proteins. The statement on p. 130 that bananas are propagated from seeds is rather misleading. The illustrations of *Rollandia angustifolia* and *Calochortus tiburonensis* on p. 585 have been transposed. These are, however, very minor flaws in an otherwise excellent textbook, not over-expensive by modern standards at £8·50, of which the ponderous weight (1·7 kg, equivalent to 4·3 *Excursion Floras*) and large size (28·5 cm × 21 cm) are the greatest drawbacks.

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Q. O. N. Kay

*Vegetation Maps of Phytosociology in Upper Teesdale*, with an explanatory booklet. Compiled by M. E. Bradshaw, A. V. Jones, M. Evans & I. Newton. Dept. of Extramural Studies, Durham University. 1976. Price: booklet 50p., 1: 10,000 map 50p., set of five 1: 2,500 maps £2·50. Available (post free) from The Secretary, Dept. of Extramural Studies, Durham University, England.

This extremely valuable work is in the form of a booklet and six maps which are coloured to show the phytosociology of the vegetation. The maps include one at 1:10,000 showing the whole area and five at 1:2,500 showing the more calcareous areas.

The work was done principally by Dr Alison V. Jones in some five years from 1968 and was funded by the Teesdale Trust (I.C.I.), as indeed was the publication. Dr Jones analysed the vegetation phytosociologically according to the Zürich-Montpellier School and made over 500 *Aufnahmen*, chiefly on Widdybank Fell. These she synthesised into some 33 'mapping units', following the method of M. E. D. Poore. Keys were constructed to test the integrity of these mapping units and to map the rest of the vegetation. The results were plotted on aerial photographs or tracings of photographs in the field, and Dr Jones and Mr M. Evans then together produced the maps.

Although this is not a work for those who simply require a guide to the localities of the rare plants in Teesdale, it will be of great interest and importance to phytosociologists and will no doubt be much used by them.

J. M. Mullin

*Plant Cytogenetics*. D. M. Moore. Pp. 64. Outline studies in Biology. Chapman & Hall, London. 1976. Price £1·30.

The stated purpose of this series, according to the Editor's Foreword, is to 'produce a brief outline of the subject assuming that the reader will have read and remembered much of a standard introductory textbook of biology. This outline then sets out to provide by building on this basis, the conceptual framework within which modern research work is progressing, and aims to give an indication of the problems, both conceptual and practical, which must be overcome if progress is to be maintained'.

Having read this, I turned to the contents with interest. The book is set out in a logical sequence: a brief historical résumé, followed by chapters on chromosome structure, division and behaviour, chromosome changes in structure, changes in number and, finally, chromosomes and plant evolution. Each chapter is a beautifully condensed summary of relevant factual information, much of which is already available in a range of current textbooks.

There is a danger in such condensation, though, that the undergraduate or layman may seize upon the facts, without always being quite clear about the underlying concepts. I would have liked to have seen more often a brief, clear statement of these underlying ideas. This would have scarcely increased the length of the book, but would have given a better understanding of the *aims* of the work being described; this must be the most important part of a work this size. As it is, this book has not lived up to the editor's ideals set out above; but it is an excellent factual mini-textbook, particularly suitable for students taking a course in this field.

P. F. Parker

*Natural History through the Seasons*. Richard Adams and Max Hooper. Pp. 108. Penguin Books, Harmondsworth, Middlesex. 1976. Price £1·50.

The idea here is a splendid one. Richard Adams writes about the countryside, his poetic eye sharp for the pleasures of the seasons, and Max Hooper explains and expands the scientific background to the scene. Three habitats (woodland, meadow and hedgerow, lake and stream) are illustrated for each season and one locality for each is chosen to be followed through the year, so that we can see, in David Goddard's beautifully meticulous, primitive-style drawings, the changes in colour and patterns of vegetation. Adrian Williams has illustrated the scientific sections with pleasantly straightforward line drawings, as well as some with colour wash. The subjects dealt with by Dr Hooper range from the effects of light and temperature changes on plants and animals, food and energy and the recycling of elements to topics such as display, hibernation dispersal and camouflage. Anybody with no knowledge of biology would find a wide variety of interesting facts laid before him.

But this brings us to the question 'for whom is this book really intended?'. Richard Adams writes nostalgically, in many instances recollecting his childhood, but the style and vocabulary

are far from the comprehension of the average, say, 12- to 14-year-old. The topics chosen by Dr Hooper include many covered in school natural history and biology lessons, but in general the level here is simpler than that required for teaching these subjects. This in itself need not matter. After all, many adults enjoy reminiscing, and the biological knowledge of those subjected to old-style biology lessons could do with a good deal of bringing up to date. What matters much more is that this book, in spite of its initial attractiveness, is difficult to use. The main illustrations are provided with key pictures, with the organisms numbered and named in classificatory order. Finding a particular object which appears on the list can be very difficult, as the numbers are dotted all over the picture. Beyond this, there are many minor errors of fact. One can perhaps forgive Mr Adams for blurring, in memory, the succession of spring flowers—in most parts primroses are practically over before the bluebells are really in flower—and perhaps also for calling the young of a roe deer a fawn rather than a kid. But in Dr Hooper's contributions there are rather more serious mistakes. Hazel catkins surely do not possess nectar (p. 14), neither do adult stag beetles burrow to avoid the cold (p. 86), although of course they pupate underground, and squirrels, at least in Britain, do not hibernate (p. 88), to mention only three. Some of the drawings should have been checked more thoroughly—a willow-herb fruit would be unrecognizable to anybody who thought that the illustration (p. 63) was anything like the truth. Further, the lack of scale or any indication of size can only be misleading, in many cases, to those who do not already know the organisms concerned. And why should we be told the Latin names of amphibians and reptiles, but of barely anything else, except where there is no vernacular term? And why, above all, is there no breath of conservation? Perhaps it was considered to be implicit that something so beautiful and pleasurable as the British countryside must be conserved; but while Mr Adams talks of the pleasures of picking wild flowers, a mention might have been made that it is better, on the whole, to leave them where they are.

All in all, the book is a disappointment, the more so since, at first sight, the level of production, the range of topics covered and the wealth and beauty of the illustrations make one feel that reading it will be a pleasurable and enlightening experience.

J. Pope

*Flora Europaea. Volume* 4. *Plantaginaceae to Compositae* (*and Rubiaceae*). Edited by T. G. Tutin, V. H. Heywood, N. A. Burges, D. M. Moore, D. H. Valentine, S. M. Walters and D. A. Webb, with the assistance of A. O. Chater, R. A. DeFillipps and I. B. K. Richardson. Pp. xxix + 505, with 5 maps. Cambridge University Press, Cambridge. 1976. Price £25·00.

The appearance of Volume 4 of *Flora Europaea*, completing the dicotyledons, is a major botanical event deserving detailed attention and universal acclaim. The Preface justifiably claims that *Flora Europaea* 'is now a well-established feature of the botanical scene in Europe', and, since reviews of the first three volumes have already appeared in *Watsonia* (**6**: 319–320 (1967), **8**: 66 (1970), **10**: 96–97 (1974)), we may here concentrate on the special points brought out in this latest volume.

Volume 4 contains only eight families but, with 505 pages, it is the longest volume to date (previous volumes range from 370 to 464 pages). The families covered are the Plantaginaceae Caprifoliaceae, Adoxaceae, Valerianaceae, Dipsacaceae, Campanulaceae and Compositae, and, somewhat out of sequence (of Melchior), Rubiaceae, which was not completed in time for inclusion in its proper place among the Gentianales in Volume 3. Some will consider this a happy accident! The Compositae, of course, form the bulk of this volume, with 181 genera and occupying 308 pages. Apart from the huge and problematical *Taraxacum* and *Hieracium* (incl. *Pilosella*), it boasts in *Centaurea*, with 221 species, easily the largest amphimictic genus in Europe. The only other really large genera in this volume are *Galium* (145 species) and *Campanula* (144 species).

While studying the pages of keys and descriptions the reviewer accumulates the usual long list of novel, puzzling or surprising features, of which it is his duty to mention a small selection. The British botanist will at first struggle to associate names such as *Logfia*, *Omalotheca*, *Filaginella*, *Cirsium helenioides*, *Chamomilla suaveolens*, *Matricaria perforata* and *Centaurea debeauxii* with taxa he knows well, and will note that, compared with Volume 1, the criteria for the inclusion of naturalised aliens have become markedly more strict. Thus, while *Myagrum*, *Calepina* and sundry *Lepidia* were recorded for Britain in Volume 1, *Ambrosia*, *Xanthium*, *Santolina*, *Senecio tanguticus*,

*Centaurea montana* and *Campanula alliariifolia*, among others, are not admitted. He will also be surprised to find that, despite recent comments by the same authors unequivocally stating the opposite opinion, *Hieracium* has been drawn up to include *Pilosella*, and *Arctium* is considered to include five European species, all of them recorded for Britain (one of them only as a naturalised alien). In the case of *Hieracium*, the cause of this anomaly is, sensibly, stated.

In a volume with 60 taxonomic contributors a noticeable degree of inconsistency in the concept of the various levels of taxa is inevitable. This in no way detracts from the value of the accounts; indeed, it adds interest. In *Galium* the splitters have had their way. *G. palustre* and *G. elongatum* are recognized as separate species (the former including diploids and tetraploids, the latter octoploids and dodecaploids), as are *G. mollugo* and *G. album*, and the Cheddar population of *G. pumilum* is placed in a separate species, *G. fleurotii*. Surprisingly, the diploid, western race of *G. sterneri* is not given even subspecific status. The species and subspecies of *Centaurea* also seem to have narrow circumscriptions. *C. debeauxii*, with five subspecies, and *C. nigra*, with three, are retained as separate species, despite the opinions of all recent British taxonomists, and *C. margaritacea*, confined in Europe to southern U.S.S.R., has 13 subspecies. *Dipsacus sativus* and *D. fullonum*, like *Matricaria maritima* and *M. perforata*, are also kept separate, and *Chrysanthemum* has been split into about ten genera. On the other hand *Centaurea* has been retained in its broadest sense and *Leucanthemum vulgare* has been drawn up to include all the segregates recognized by the majority of Continental cytotaxonomists; 15 of these segregates are listed under *L. vulgare* as binomials, along with their diagnostic characters. That famous pair, *Crepis neglecta* and *C. fuliginosa*, are relegated to two of the four subspecies of *C. neglecta*; the distribution of subsp. *neglecta* is given as throughout the range of the species, in contradiction to the classical cytological accounts of that taxon.

As in previous volumes, hybrids are in the main given scant attention. *Galium* × *pomeranicum* is, however, described and numbered like a species, apparently because it may form large populations and sometimes occurs independently of its parents, although this is no less true of a great number of other hybrids which receive no mention. The parentage of *G.* × *pomeranicum* is, incidentally, given as *G. album* × *G. verum*, which is presumably nomenclaturally correct but is patently not the origin of most populations so called in this country.

Some special comment should be made concerning the treatments of the mainly apomictic *Taraxacum* and *Hieracium*. Each genus is divided into infrageneric taxa (22 sections in *Taraxacum*; 2 subgenera and 38 lower, unspecified categories in *Hieracium* subgenus *Hieracium*), within which are described the numbered species or species-groups (30 in *Taraxacum*, 260 in *Hieracium*) Under many of the species-groups are listed further undescribed, un-numbered species with their distributions, the most widely distributed or commonest species being chosen for inclusion. Allocation to the appropriate species-group of a considerable number of further species can be made by reference to the main index. The pattern of treatment of these two genera thus parallels that of *Rubus* and other apomictic Rosaceous genera in Volume 2. The treatment of *Hieracium* is clearly fuller and more authoritative than that of *Rubus* or *Taraxacum*, and represents a major contribution to the taxonomy of this perplexing genus. Whilst the keying and description of a selected range of representative species or species-groups is undoubtedly the most helpful and practical approach to these otherwise unmanageable genera, the mere listing of extra taxa seems difficult to justify, unless all or nearly all the species can be so covered (as in *Alchemilla* and *Sorbus*). It is hard to conceive of any possible use of, for example, the two pages of names (with place of publication and countries in which each is recorded) of a certain proportion of the species within the *Taraxacum officinale* group, or of the many other similar long lists of species in *Taraxacum* and *Hieracium*. A considerable saving in space with no important loss of information would have been gained by relegating all these incomplete lists to the index. In *Hieracium* subgenus *Pilosella* 44 of the 64 numbered 'species' are given hybrid binomials and a suggested parentage (often of three or four parents), and most of the extra listed taxa are of the same sort. This information is valuable and welcome, but its provision is quite out of character with the rest of *Flora Europaea* and prompts one to enquire why the Editorial Committee could sanction it in this genus yet not in the many other genera in which it would have been at least equally appropriate (e.g. *Salix*, *Rosa*).

Such relatively minor criticisms do not deter one from the inevitable conclusion that here we have a magnificent Flora, representing one of the major taxonomic achievements of all time.

Besides the taxonomic accounts, Volume 4 presents us with all those now familiar extra items: the family key, the invaluable appendices, the remarkably reliable index, and the explanatory maps. The fifth and final volume, covering all the monocotyledons, is eagerly awaited; all the manuscripts for it have now (December 1976) been received by the Editorial Committee, and it should go to press in 1977.

C. A. Stace

*Trees and Bushes of Europe*. Oleg Polunin, with drawings by Barbara Everard. Pp. xvi+208, with over 1,000 photographs and drawings in colour. Oxford University Press, London. 1976. Price £5·25.

This is the latest in Oleg Polunin's distinctive and popular series of illustrated books on the wild plants of Europe. In this one, the shortest to date, the familiar photographs are dispersed throughout the book along with the relevant text, and are supplemented by Barbara Everard's drawings, most of which are partly black and white and partly coloured.

'Trees and bushes' are taken to include all woody plants growing over 2m in height, whether unsupported or climbing; but, apart from the climbers (e.g. *Lonicera*, *Smilax*, *Clematis*), other plants which are certainly not trees or bushes in the normal sense are included, such as *Opuntia*, *Agave*, *Arundo* and *Musa*. The book aims to cover all species native or naturalised in Europe, as well as those planted in plantations and on roadsides, etc., but many critical or otherwise closely similar species are omitted, as are many species which only grow over 2m in certain situations.

Identification is meant to be carried out in any of three ways: by perusal of the coloured illustrations; by reference to a series of symbols allocating the plants to groups based on leaf-shapes; and by the use of conventional dichotomous keys provided for several of the larger genera and families. The leaf-shape symbols are conveniently reproduced on each fly-leaf, but unfortunately they incorporate a bad error in that the symbol indicating palmately lobed leaves is clearly pinnately lobed, as are the leaves of *Liriodendron* and many of the Rosaceae for which that symbol is used. The 15 leaf-shape groups are further broken down, in the 'Leaf Check List', to smaller groups which should considerably narrow the number of illustrations which need to be studied during identification. All terms used are explained in an illustrated glossary.

The success of the book will clearly depend largely on the appeal of the photographs. These, inevitably, vary from excellent to poor in quality. Some have suffered through over-reduction, and others may have been poorly reproduced (were the originals of *Koelreuteria* so out-of-focus?). A number are of inadequate or poorly developed material; for example the fruits of *Prunus lusitanica* are unripe and thus bright red rather than purplish-black, the flowers of *Sorbus torminalis* have lost their petals, and the *Corylus* catkins have lost their pollen and withered. There are also surprising omissions, e.g. the flowers of *Coriaria*, so characteristic a sight in many parts of the French and Spanish Mediterranean coasts in Spring. The majority, however, show off their subjects very effectively (the genus *Acer* is particularly well covered), and many of the habit photographs are tantalizingly reminiscent of one's past summer holidays.

The drawings are in my opinion far less satisfactory. Many are over-reduced, poorly-coloured (*Zizyphus lotus*), sketchy or unlife-like (*Juglans regia*), and many illustrate features well represented in the photographs while ignoring others not covered there (*Sorbus torminalis*, *Morus nigra*).

The descriptive text is concise and well written and in the main conveys the right kind of information; it appears alongside the illustrations. Although a logical analysis of their juxtaposition will always lead one to the correct illustration, the redundant system of numbering and lettering employed serves only to confuse, whereas a single number attached to each species and its illustrations would have been simpler and far more helpful. Each species is furnished with its leaf-shape symbol and a clear distribution symbol, as well as signs indicating introductions and references to appendices.

The two appendices consist of a series of excellent photographs of typical barks, and an 11-page table of uses of selected species, which are arguably the best parts of the book. I feel they would have been more useful, however, had they been incorporated into the main text, especially as several points in the latter relate directly to uses described in the Appendix.

This book will doubtless appeal to many, and its scope and aims are well conceived. It is

therefore disappointing to find that most of its faults could have been eliminated by more careful attention to detail and more judicious selection and layout of photographs, drawings and text.

C. A. STACE

*Flora Reipublicae Popularis Bulgaricae*, Volume 6. Edited by D. Jordanov. Pp. 590, with numerous line drawings. Sofia. 1976. Price not stated.

The appearance of the sixth volume of the impressive new Flora of Bulgaria, devoted to the Leguminosae and taking us rather more than halfway through the project, provides a welcome opportunity to comment on this work as a whole and its significance for European taxonomic botany. The first volume appeared in 1963, two others in quick succession (1964, 1966), then three at more widely spaced intervals (1970, 1973, 1976). The whole work so far has been under the general editorship of Academician D. Jordanov, and each volume has had two or more special editors. Accounts of individual genera are contributed by many different Bulgarian taxonomists but conform reasonably well to a standard pattern. This pattern, so far as the species concept is concerned, is explicitly stated by Kuzmanov and Kožuharov, the special editors of this sixth and newest volume, as being 'more or less similar to that of *Flora Europaea*', in a very interesting and informative article in English describing the project (*Taxon*, **17**: 205–210 (1968)).

English botanists are prone to assume too readily that Floras in the less familiar European languages are inaccessible to them. This is an unnecessarily defeatist attitude; as W. T. Stearn showed, in an extraordinarily useful paper a good many years ago (*New Phytologist*, **46**: 61–67 (1947)), it is possible to use the multivolume *Flora of the U.S.S.R.* to great advantage, with no other knowledge than the Cyrillic alphabet. Certainly any botanist who has learned to find his way through the Soviet Flora will have no great difficulty with the Bulgarian one; if he can read a little Russian, the most useful extra piece of information might be that, in Bulgarian, a definite article (te, ta, to) can appear as a suffix to the noun. Moreover, the editors have greatly helped by providing, in an Appendix in each volume since the third, a most useful 'Vocabularium Bulgaro-Latinum' which lists all the technical terms used in the particular volume with their Latin equivalents. Further help is provided by the publication of all *novitates* in Latin as an Addendum to each volume; it is true, of course, that such Latin publication is a legal requirement, but in many cases the descriptions of new taxa (e.g. *Silene*, **3**: 592–597, *Alchemilla*, **5**: 414) are extensive ones well exceeding the legal minimum. It is also worth noting that the Plates of line-drawings (especially those of the more recent volumes) are on the whole very well done indeed, and that by using the Bulgarian-Latin appendix it is easy to read the legend attached to each Plate. Further, a pull-out Map of the Floristic Regions of Bulgaria, provided at the end of each volume from the third, has a legend in Bulgarian and English. Finally, much interesting information can be gained from the Preface in Bulgarian and English in each volume.

It is probably true to say that this Bulgarian Flora shows the useful and steadily increasing influence of the *Flora Europaea* project itself more clearly than any other national Flora. Not only do the Prefaces themselves make explicit references to co-ordination with *Flora Europaea*, but the citations of synonymy throughout the later volumes bear this out by including *Flora Europaea* where appropriate. The treatment of *Alchemilla* in volume 5 provides an excellent example. The *Flora Europaea* account by the late Professor Pawłowski and myself was published in 1968 (*Flora Europaea*, **3**), and was therefore available to Dr Assenov for his revision of the Bulgarian material. The few discrepancies between *Flora Europaea* and the Bulgarian Flora now represent solely genuine areas of new information or incompletely understood material, and Assenov's account provides a very good basis on which not only the Bulgarian species of *Alchemilla* but also those of the whole Balkan Peninsula can be understood. The effective co-ordination with European taxonomy as a whole is in no small measure due to Kuzmanov and Kožuharov themselves, the former as *Flora Europaea* Regional Adviser for Bulgaria and the latter as a *Flora Europaea* author; both have been able to visit Britain as Bursars under the *Flora Europaea* scheme, and have greatly extended their European contacts over the past decade. As *Flora Europaea* itself comes to an end (the fifth and final volume should be published in 1978), it is especially heartening to see what a real and lasting stimulus European botanical cooperation has been in a vigorous, continuing project like that of *Flora Reipublicae Popularis Bulgaricae*!

S. M. WALTERS

## Hybridization and the flora of the British Isles

Edited by C. A. STACE

A comprehensive account of each of the 975 hybrids that has been recorded from the British Isles based on accounts prepared by over 80 specialists and skilfully edited and brought together in a single volume by Dr Stace. Up-to-date data are provided on their appearance, identification, fertility and distribution, and on the results of any experimental work which has been carried out on them. Many of the so-called hybrids are mere fanciful identifications; the evidence in such cases is assessed. A literature list is given for each hybrid, and an introductory section provides a general background to the whole subject of hybridization. In addition, 464 hybrids between British species which have been found abroad but not yet in the British Isles are listed.

This reference work is an authoritative source of information for field botanists who wish to discover hybrids in the wild, and for professional botanists who wish to use hybrids for both research and teaching purposes. It also provides a stimulus for further research, as for the first time the gaps and deficiencies in our knowledge are precisely defined. The introductory section is a more complete synthesis of information on hybridization than has hitherto been available, and for the most part uses British and Continental examples to illustrate the principles discussed.

Published in collaboration with the Botanical Society of the British Isles by Academic Press, London, New York, San Francisco. Pp. xiv+640. 1975. Price £14·80/$39.25. Obtainable from Academic Press, London, etc., 24–28 Oval Road, London, NW1 7DX.

# Obituaries

## JAMES EDGAR DANDY
(1903–1976)

James Dandy was born at Preston in Lancashire on 24th September 1903 and was educated at Preston Grammar School and Downing College, Cambridge. After working for two years at Kew, he joined the staff of the Department of Botany at the British Museum (Natural History) in 1927 and served with great distinction (including ten years as Keeper of Botany) until his retirement in 1966, after which his botanical studies continued unabated until he became seriously ill in July 1976. He died at Tring on 10th November 1976.

Such are the vital statistics of a long and distinguished career and, since another obituary elsewhere will cover his role in international professional botany, it seems wise to restrict this short note to those aspects of his work that are of most direct relevance to the British flora. Although his expertise was widely known and appreciated, he was not personally well known to the membership of the B.S.B.I., and so I shall attempt to provide some glimpses of the man, rather than dwell in detail on his achievements.

Jimmy Dandy was a robust personality who, while never suffering fools gladly, would take great pains to help those who, like himself, wanted to get things right and were prepared to pay the price of excellence. He will be particularly remembered by members of the Society in three main contexts: water plants (especially, of course, *Potamogeton*), the Watsonian system of vice-counties and the nomenclature of the British flora. In the course of his work on *Potamogeton*, he examined countless specimens from museums, field botanists and recorders. All were meticulously recorded in a very large card index, which will be preserved for future consultation in the B.M. Department of Botany. Most botanists find Potamogetons difficult under ideal conditions; but when Dandy was asked to name material newly collected from the field, he used to delight in examining it through the semi-translucent 'flimsy' collecting cover. By seeing only a fuzzy outline, he was testing himself to the limit; but, even under this extreme self-imposed handicap, he usually got them right first time. This was in no sense 'showing off'—that would never have occurred to him; he really knew his plants and expected others to aim at similar standards of perfection. It is a great tragedy that we shall not now have the *Potomogeton* Handbook that had been planned. Like several other much-needed works, it was a victim of his own striving after ultimate accuracy and completeness; nothing was ever quite good enough for publication. His detailed investigation of the exact boundaries of the Watsonian vice-counties, which was published by the Ray Society, was an important service to British field recording, establishing once and for all the fossilized county boundaries as understood by Watson and their relation to later administrative areas, a matter of importance in the interpretation of old records and the establishment of new vice-county claims.

His reluctance to publish his own work was to some extent compensated for by the great pains to which he went in making improvements to the work of others, and, in the last analysis, he will probably be best remembered for his extraordinary expertise in the application of the *International Code of Botanical Nomenclature*. In this, his outlook was decidedly pragmatic and, in spite of his own immense learning, was in no way tainted by pedantry or esoteric obscurities. Although in the minds of some British botanists he may be 'one of those who are always changing names', he was adamant in his stand for nomenclatural stability, which he believed could best be achieved by rigorous scholarship of the highest standard, a quality that he himself exemplified. In the course of a long involvement with the nomenclatural functions of the International Botanical Congresses, he was concerned with many initiatives aimed at the clarification of the Code and the promotion of stability. In the context of the British flora, he is best known for his *List of British vascular plants* (1958), which provided a unique basis for the nomenclature of our native flora.

Since its publication, he had maintained detailed files in which the nomenclatural pedigree of all the species is set out; copies of these are preserved in our Department and at the Botany School, University of Cambridge. Some further glimpses of the man at work may be of interest: as a young botanist I was continually amazed by his extraordinary facility in the use of the library, and there is no doubt that his close familiarity with the older literature was one of the factors that contributed to his great nomenclatural expertise. Seeing him at work, I was more than once reminded of a master organist at the console of his instrument. This may seem fanciful, but there was more than a passing resemblance as he effortlessly brought successive volumes into play while reaching a scholarly conclusion. At other times, as after a convivial lunch with some old botanical friend, he seemed more like a trapeze artist, performing amazing feats of mental gymnastics, yet always landing on his feet with a firm grasp on the elusive name that he was seeking.

Latterly he devoted much time and effort to the nomenclatural problems that arose from *Flora Europaea*, and the principal editors of this most significant enterprise have been among the first to pay tribute to him for the important contribution that his nomenclatural editing provided. A quotation from the *Tea Phytologist* (the Cambridge ephemeral, satirical botanical review) of Spring 1964 illustrates the unique veneration in which his nomenclatural skills were held by his contemporaries: 'We learn that Manuals are shortly to be exchanged for STD or Species Telephonic Dialling. The system is simple: just look up the Plant Number in the Gould Index and dial. You will then hear the recorded voice of J. E. Dandy giving the correct name, followed by the authority, reference to the original publication and a description. Initially there will be a choice of Latin or English. . . .'

The great standard oak of the British nomenclatural forest has fallen; those of us who were privileged to know him well will remember him with gratitude and affection. It remains to be seen if any of the junior saplings, who for so long have been sheltered by his expertise, can now grow so as to fill worthily the great gap in the canopy of British botanical scholarship.

J. F. M. Cannon

## ALAN JAMES SOUTER
(1916–1976)

Alan Souter died on 22nd June, 1976, while 'mapping' by himself near Portsoy, Banffshire, with his notebook in one hand and his pencil in the other.

Born at Gourock, Renfrewshire, on 9th June, 1916, he graduated from Glasgow University with honours and became a teacher of mathematics. During the Second World War he served in the meteorological division of the R.A.F. and afterwards moved north to Buckie, where he taught mathematics at Buckie High School. There he became Senior Mathematics Master and Assistant Rector and was latterly in charge of the curriculum, a very exacting appointment.

Having been interested in plants from an early age, Alan Souter became one of the best field botanists in Scotland. Most observant in the field, he added many new records to the lists for Moray, Nairn and Easterness, refound *Saxifraga hirculus* in Aberdeenshire (after much searching) and was the first to find *Crassula tillaea* in Westerness. At the time of his death he was making detailed distribution maps for Banff, v.c. 94. He and his wife, Marion, accompanied me on many outings. He will be sadly missed, especially by those concerned with the plants of north-eastern Scotland.

M. McC. Webster

## WILFRED ERNEST WARREN
(1896–1976)

Wilf Warren died suddenly on 6th May, 1976, shortly before his 80th birthday. By profession he was an electrical engineer but since childhood he had had a great interest in natural history, botany in particular. His first notebook was written up at the age of 7, and in adult life (in addition to meticulous botanical records) he kept a naturalist's diary which makes most interesting reading. His last task was to bring this up to date.

He became a life member of the B.S.B.I. at the age of 21 and supported the Society by leading field meetings, recording for the Map Scheme and participating in plant surveys. His herbarium was left to the Haslemere Museum. Wilf was a committee member of the Surrey Flora Committee and one of the major contributors to the new Flora. He continued to help the Surrey botanists to the end, participating in their further work of site-recording and conservation. In addition he encouraged interested beginners by holding botany classes at his home.

In later years he took up bryology and, to a lesser degree, lichenology—this despite the fact that he had completely lost the use of his right arm and had the added disadvantage of being colour blind.

Born in Farnham, Wilf lived all his life in north-west Surrey and had an unrivalled knowledge of that region. The loss of such a person whose botanical knowledge and recollections stretch back over 70 years is irreplacable, and his many friends miss not only this expertise but also a cheerful companion who was always ready to give of his time and his knowledge.

J. E. Smith

## Botanical Society of the British Isles
## Conference Reports

1. BRITISH FLOWERING PLANTS AND MODERN SYSTEMATIC METHODS
   Ed. A. J. Wilmott. Pp. 104, 18 plates, wrappers. 1948.
2. THE STUDY OF THE DISTRIBUTION OF BRITISH PLANTS
   Ed. J. E. Lousley. Pp. 128, illustr., wrappers. 1951.
3. THE CHANGING FLORA OF BRITAIN
   Ed. J. E. Lousley. Pp. 204, 6 plates. 1953.
4. SPECIES STUDIES IN THE BRITISH FLORA
   Ed. J. E. Lousley. Pp. 189, 2 plates. 1955.
5. PROGRESS IN THE STUDY OF THE BRITISH FLORA
   Ed. J. E. Lousley. Pp. 128, 4 plates. 1957.
6. A DARWIN CENTENARY
   Ed. P. J. Wanstall. Pp. 140, 7 plates. 1961.
7. LOCAL FLORAS
   Ed. P. J. Wanstall. Pp. 120, 2 plates. 1963
8. THE CONSERVATION OF THE BRITISH FLORA
   Ed. E. Milne-Redhead. Pp. 90. 1963.
9. REPRODUCTIVE BIOLOGY AND TAXONOMY OF VASCULAR PLANTS
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10. MODERN METHODS IN PLANT TAXONOMY
    Ed. V. H. Heywood. Pp. 312, illustr. 1968.
11. FLORA OF A CHANGING BRITAIN
    Ed. F. H. Perring. Pp. 158, illustr. 1970 (Paperback reprint: 1973).
12. TAXONOMY AND PHYTOGEOGRAPHY OF HIGHER PLANTS IN RELATION TO EVOLUTION
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13. PLANTS WILD AND CULTIVATED
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14. THE OAK: ITS HISTORY AND NATURAL HISTORY
    Ed. M. G. Morris and F. H. Perring. Pp. 376, 8 plates. 1974.
15. EUROPEAN FLORISTIC AND TAXONOMIC STUDIES
    Ed. S. M. Walters, with the assistance of C. J. King. Pp. 144, 4 plates. 1975.

Obtainable from: DR F. H. PERRING,
OUNDLE LODGE,
OUNDLE,
PETERBOROUGH,
PE8 5TN

# Reports

## ANNUAL GENERAL MEETING, MAY 22nd, 1976

At the Annual General Meeting of the Society held on May 22nd, 1976 at the Royal Botanic Gardens, Kew, three papers were read under the general title 'Native plants for naturalizing from horticultural sources'. The following is an abstract of one of them.

### THE DEMAND FOR AND AVAILABILITY OF WILD FLOWERS IN LAND DEVELOPMENT

Creative botanical conservation, or ecological engineering, can be divided into three parts: that concerned with the improvement or creation of habitats for wildlife; the cultivation of rare and interesting species, as is being done in university botanic gardens and some private gardens; and the use of plants to achieve some objective that is only secondarily of wildlife value, for example bank protection in recreational lakes, creation of flight ponds, land reclamation, etc.

Conservation has been traditionally associated with the acquisition and management of nature reserves and the survival of rare species. In more recent times some people have become aware of the contribution that new habitats, notably motorway verges, can make to the survival of wildlife in Britain, but the wildlife value of these areas has arisen by *default* rather than by positive design.

However, the opportunities for ecological engineering are not confined to road verges. They include the reclamation of derelict land in urban and rural areas; the restoration of mineral extraction sites, for example worked-out gravel pits, clay pits, quarries of various types and their attendant spoil heaps; major pipeline installations; the rehabilitation of poor or degraded habitats; and New Towns (of which there are 40). These areas contain a very wide range of habitats (including woodland, grassland, wetlands, heathland, etc.).

The development of habitats containing a native flora can be achieved in one or any combination of three ways:

a) By natural colonization (an option that is neither universally applicable nor acceptable);

b) In the case of some terrestrial habitats, either by grassing down with a standard seed mixture and applying a management regime that is sympathetic to colonization by desirable species and the suppression of undesirable ones, or by planting trees and shrubs in established or new sites;

c) By applying horticultural and forestry techniques and deliberately planting the seed, turf or rhizomes of native species.

#### DEMAND

The B.S.B.I., myself and others are continually receiving requests for information about the use and availability of native plants, mainly herbs. This demand can be exemplified as follows:

a) *Woodlands*. It is hoped to establish a woodland fieldlayer in some of the areas of Milton Keynes, Bucks., v.c. 24, that are being extensively planted with trees and shrubs. This will involve planting a nucleus of woodland herbs, e.g. *Arum maculatum*, *Anemone nemorosa*, *Primula vulgaris*, *Mercurialis perennis*, etc. As far as I know none of these (or many other woodland species) is available in large quantities from commercial sources, but we are in the fortunate position that at least *some* can be obtained locally from areas being destroyed by development. The B.S.B.I. has recently received a request for a source of woodland herbs for the rehabilitation of an established woodland in Cambridgeshire.

b) *Scrub*. Although some shrub and dwarf shrub material is available commercially there are some notable omissions. For example, Landscape Design, **114** (May 1976) contained a letter complaining about the unavailability of *Rhamnus catharticus*. It was similarly found to be difficult to obtain *wild* brambles (*Rubus fruticosus*) for a landscape scheme in Milton Keynes. Like the woodland herbs, some were obtained locally by children, but another 2,000 are required for the

1976/77 planting season. Apart from *Clematis vitalba*, climbers appear to be difficult to obtain commercially. As well as their use in creating woodland and hedgerow habitats, etc., climbers and dwarf shrubs are useful for screening some street furniture and other visually unacceptable roadside structures.

c) *Grassland.* I see no reason why the urban lawn should be so dull. Why not include some of the low growing herbs, e.g. species of *Veronica*, *Poterium sanguisorba*, the small *Geranium* species, *Thymus*, etc.? The rich turf of the urban parks in the centre of The Hague is surely preferable to that commonly found in English urban lawns. Wookey Hole Caves Ltd. recently sought help from the B.S.B.I. about the availability and use of wild flowers in a sheltered limestone valley of Somerset.

d) *Lakes.* Large numbers of lakes are being created throughout Britain by the extraction of gravel, sand and clay and by the construction of balancing lakes (i.e. lakes whose primary purpose is to impound storm water or water run-off) and the rehabilitation of ponds. Many farmers and landowners are creating lakes for coarse and game-fishing, or for wildfowling, as a subsidiary activity to their farming. The species of marginal and aquatic plants that can be used depend, amongst other things, upon the use of the water surface and the adjoining land. For example, in a lake to be used for fishing, one needs to create fish-spawning grounds, areas for fish to shelter, etc. In a water-skiing lake, one may wish to protect the edges from erosion. Emergent plants can be used to control eutrophication in balancing lakes. For wildlife conservation, one may need a much larger number of species. Milton Keynes Development Corporation has used several tons of aquatic material and will require much more in the future. It is not easy to get hold of emergent and aquatic plants in large quantity and at trade prices this would be phenomenally expensive. So far, however, enough material has been obtained locally by extracting it from sites that are to be destroyed or from places that are overgrown.

e) *Education.* The creation of habitats in and around school grounds provides easily accessible field-study facilities, for example ponds, new hedges, copses, and 'wilderness' areas. In order to do this, schools will have to either buy the plants or, if unavailable, grow them themselves from hand-collected seed.

f) *Reclamation Schemes.* There are opportunities for using a wide range of suitable woody and herbaceous species in the landscaping and rehabilitation of disused or partly disused quarries, for the restoration of pipelines and severely eroded footpaths, and for the upgrading of poor or degraded habitats, e.g. ecologically poor woodlands, neglected ponds, derelict land in urban areas, etc.

### AVAILABILITY

The availability of plants from commercial sources is clearly inadequate.

a) *Trees and Shrubs.* As far as trees and *some* shrubs are concerned, many commercial and local government nurseries grow and supply large quantities of plants in a range of sizes. For example, Hampshire County Council has set up a nursery to provide local trees and shrubs, and Cambridge City Council are about to do the same. Most Development Corporations have nurseries which deal with both native and non-native species. However, there are some notable omissions, e.g. *Sorbus torminalis*, *Populus nigra* var. *betulifolia.*

b) *Herbs.* Some seed-merchants have realized the potential demand and are beginning to make available the seed of a wider range of native material, but it is still in relatively small quantity and generally highly priced. Roots of a small range of herbs are available from nurseries or garden centres in very limited quantities, for example *Campanula glomerata*, *Alopecurus pratensis*, *Origanum vulgare* and variegated *Dactylis glomerata.*

c) *Aquatics.* A restricted range of species is available in a limited quantity. As with grassland and shrub species, the catalogues give no guidance on the native/non-native status or natural associations of the species they supply.

### UTILIZATION

The use of native plants has its problems. It is important to give guidance on the correct use of native plants, i.e. explaining the importance of using plants within their natural geographical range and in their natural ecological conditions, and of not using them in a formal design scheme or where they will be otherwise out of place.

There are contractual problems of putting hand-picked seed of wild herbs into standard grass-seed mixtures or sowing them individually after the standard mixture. Landscape contractors are responsible for the maintenance of a site for the first one to three years and are very likely to eradicate (either mechanically or chemically) the 'weeds'. With some, mainly clonal species, e.g. *Rubus fruticosus*, *Sorbus aria* agg., *Narcissus pseudonarcissus* and *Nymphaea alba*, one cannot always be sure that one will get what has been specified. This may not become evident until the material flowers, by which time it is often too late to do anything about it. Substitutes may be made when there is a shortfall of the specified species by the use of a similar species, hybrid, variety or cultivar. The survival and success of seed of a wide range of species sown into an established sward appears to be a problem, as is the survival of turf planted in established grassland.

THE SOLUTION

So far as the use of the native plants is concerned, there are two options: to do nothing and hope for the best—the easy way out; or to provide simple information on the cultivation, use, ecology and management of selected native species.

The demand for native plants is growing rapidly and the trade is already unable to meet it. This could result in the uncontrolled plundering of the countryside by people who want wild plants but cannot get them from *reputable* nurseries. If landscape architects or others wish to use a species or a group of species they may do so even though the necessary information about them is not available, which could result in the establishment of some very strange species and communities.

Something positive needs to be done to give guidance to those likely to want to use and manage native plants. The B.S.B.I. has, therefore, set up a Working Party to consider the need for supplying information about the cultivation of native British plants and to explore the sources of supply of plant material for conservation purposes. It is pursuing two issues:

a) The production of a pamphlet, which will be regularly revised, giving details of the nurseries from which native plants can be obtained.

b) The production of a publication for use by landscape managers, the nursery trade, local authorities, landscape consultants, Naturalists' Trusts and others, giving information about the cultivation of selected native shrubs, climbers and aquatics. The contents will include: a description of the plant and its distribution, response to a variety of factors, associated fauna, effect of frost and drought, germination, pollination details, seed production and dispersal, and phenology. Guidance will be given on the use of plants within their natural geographical range, propagation and use of local clones, source of material and the protection of the countryside (including a summary of the *Conservation of Wild Creatures and Plants Act* 1975). This publication is seen as fulfilling an immediate and urgent need; the long-term objective must be for more information to be obtained about the cultivation, use and management of the British flora for the specialist and non-specialist.

J. G. KELCEY

## EXHIBITION MEETING, 1976

The Annual Exhibition Meeting was held in the Department of Botany, British Museum (Natural History), London, on Saturday, 27th November, 1976 from 12.00 to 17.30 hours.

### A LINK BETWEEN GOODYER AND GILBERT WHITE

In the course of hunting down details of an overlooked Hampshire botanist, Thomas Yalden (1750–77),a co-worker of Lightfoot, it has come to light that both Gilbert White of Selborne and the famous early-seventeenth-century Petersfield botanist, John Goodyer (of *Goodyera*), also had relations named Yalden. The fact that all three were Hampshire men promptly suggested that they might be connected. After an extensive investigation this has indeed been proved to be the case, and the exhibit documented the relevant discoveries.

The connection is through Goodyer's sister Rose, who married a well-to-do land agent, William Yalden. Her great-great-granddaughter in the direct male line married Gilbert's brother Benjamin, the publisher of *The natural history of Selborne*.

In between, several members of the family seem to have had botanical inclinations. We owe to Gilbert White himself the information that Goodyer's nephew, the Rev. Edmond Yalden, turned to the practice of physic when ejected during the Commonwealth from his living at Compton, near Guildford. This evidently explains why Goodyer left him all his botanical notes and books. A 'Mrs Yalding', credited with some Guildford records by How, is presumably his wife. A nephew, son of the Rev. Edmond Yalden's sister—and so great-nephew to Goodyer—turns out to have been the pioneer gardening writer John Worlidge of Petersfield. Benjamin White's brother-in-law (and Gilbert's special friend and neighbour), the Rev. Richard Yalden, also has a record in the *Flora of Hampshire* standing to his name. The out-and-out botanist Thomas Yalden, however, the original cause of this investigation, proves to have been only a distant cousin.

Gilbert White's Yalden links were especially strong and close. Friends from childhood of the children of the vicar of the next-door parish, the Rev. Edmund Yalden, two of his brothers intermarried with them, while his eldest sister wed one of their cousins. Quite a number of the minor figures who feature in Gilbert White's letters prove in fact to be Yalden relations. It may even be that he owed to the Yaldens—and so, ultimately, to Goodyer—his original enthusiasm for natural history.

D. E. Allen

### WALL FERNS IN BUCKS., V.C. 24

Maps of nine species of pteridophytes, which in Bucks, v.c. 24, are confined mainly to walls, were exhibited, together with photographs of the plants *in situ*. The maps displayed the distribution as recorded during the years 1972–76 on a tetrad basis, together with the records contained in Druce's *The flora of Buckinghamshire* (1926), so that a visual comparison with known past and present distribution could be made. *Adiantum capillus-veneris* and *Cystopteris fragilis* appear to be recent colonists not previously known from the vice-county. *Polypodium*, by contrast, has a population that is either static or in retreat as old walls are destroyed. *P. vulgare* is recorded from two woodland localities and *P. interjectum* from old walls in much the same number of localities as Druce recorded the aggregate plant. *Asplenium adiantum-nigrum*, *A. trichomanes*, *A. ruta-muraria*, *Phyllitis scolopendrium* and *Ceterach officinarum* all show an increase in their range within the vice-county. This increase is largely due to the provision of suitable brickwork by the railway companies throughout the entire area. Railway walls provide 48% of all sites for *Ceterach* and between 30% and 40% of all sites for the other four species.

J. Bevan & E. Byrne

### LOOKING FOR 'ENDEMISMOS'

The exhibit was particularly concerned with the tours to southern Spain and the progress thereby made in the compilation of the six volumes of the Distribution Atlas. Expeditions to Jérez, Antequera and Lanjarón were advertised for 1977.

The drawings on display, and the flower portraits by Dorothy Carr, particularly featured 'endemismos' ('endemismo' being a convenient Spanish word meaning a species endemic to Spain) and other Andalucian species of limited range.

A display was mounted to show how the sightings on the recording boards were transferred to the pages of the Atlas and thence to the maps in the 'Opus Iconum'; the latter now shows at least a partial distribution of the species illustrated.

The UTM maps of part of Spain were available on the scale of 1:200,000 and 1:50,000 with keys to find the 10 km square under consideration and the sheet-lines of the required map.

J. W. Carr

### THE SPREAD OF *ELODEA NUTTALLII* IN BRITAIN

The exhibit showed the present distribution of this species in Great Britain. New sites discovered in 1976 and last year's (1975) records were indicated. The rapid spread of this species is being compared with that of *E. canadensis*. *Elodea nuttallii* is now known from v.c. 6, 11, 12, 13, 15, 16, 17, 18, 20, 21, 22, 23, 29, 31, 32, 33, 40, 53, 56, 57, 60, 63, 66 and 69.

Water Authorities have been asked to keep a watchful eye open and reports have already been received from Kent and the London area.

J. H. CHANDLER & F. H. PERRING

### *EUPATORIUM ADENOPHORUM* SPRENGEL (*E. AGERATOIDES* AUCT.) IN SOUTHERN SPAIN

The alien N. American composite recorded as *Eupatorium ageratoides* by M. Willkomm in *Supplementum Prodromi Florae Hispanicae*, p. 74 (1893) and C. M. Stocken in *Andalucian flowers and countryside*, p. 87 (1969) was investigated during J. W. Carr's May–June 1976 expedition to Torre del Mar, southern Spain.

Twenty-five 10-kilometre squares on the borders of the provinces of Málaga and Granada were explored, but this plant was found only in the UTM 10-km square VF26 (Nerja), colonizing water channels on cultivated land and also amongst natural ravine vegetation.

Reverchon's 1890 specimen (the basis of Willkomm's record) in **BM** is clearly *E. adenophorum* Sprengel (*E. glandulosum* Kunth) and not *E. rugosum* Houtt. (*E. ageratoides* L.f.), as were our own 1976 gatherings (**BM**). This is in accordance with the treatment in *Flora Europaea*, **4**: 109 (1976).

E. J. CLEMENT

### ALIEN POLYGONUMS

Maps were exhibited illustrating stages in the spread in the British Isles of the four alien species: *Reynoutria japonica* (*Polygonum cuspidatum*), *R. sachalinensis* (*P. sachalinense*), *Polygonum polystachyum* and *P. campanulatum*. All are of garden origin, the first two introduced from Japan in 1825 and the 1860s respectively, the latter two of Himalayan origin. All occur in dense stands spreading vegetatively, either overrunning abandoned gardens or so well established in parks or estates as to look 'wild'; on occasion thrusting beyond garden boundaries to escape and invade adjacent hedgebanks and even semi-natural habitats. In other cases jettisoned garden material or dumpings of earth have given rise to colonies spreading over waste-ground and river banks and becoming naturalized. Maps for consecutive periods for each of the four species show individual rates and pattern of spread: only *R. japonica* is at present extensively naturalized, at first mainly in the west; *P. polystachyum* is commonest in the west and south-west; *R. sachalinensis* has an increasing concentration of sites in and around Surrey; and *P. campanulatum* still has only a scatter of remote isolated sites.

Herbarium specimens illustrated male and female plants of the functionally dioecious *R. japonica* (and of its var. *compacta*); a 'polygamous' example of *R. sachalinensis*; the hairy-stemmed variant of *P. polystachyum*; and cultivated examples of the allied *P. molle* D. Don, with a specimen from the only naturalized colony (in Scotland).

A. P. CONOLLY

### FERNS NATURE-PRINTED

Four examples of books of nature-printed ferns were exhibited (block-makers in capitals):

H. C. BAILDON, *Nature-printed ferns*. London (1869).

F. M. Bailey, *Lithograms* (by COSTIN) *of the ferns of Queensland*. Brisbane (1892).

A. M. Jones, *Nature-printed* (by SMITH) *impressions of varieties of the British species of ferns*. Clifton, Bristol (1876–1880).

T. Moore (ed. J. Lindley, nature-printed by BRADBURY), *The ferns of Great Britain and Ireland*. London (1855).

J. A. CRABBE & J. W. DYCE

### THE DISTRIBUTION OF *CAREX MONTANA* IN BRITAIN

For a report on the subject of this exhibit see Short Notes, pp. 377–378.

R. W. David

### SOME ADDITIONAL WOOL ALIENS IN BEDFORDSHIRE

Wool is used extensively on the sandy soils in the market-gardening area of Bedfordshire. Much of the wool is the waste of the cleaning and combing mills of Yorkshire and contains many seeds and fruits of alien plants.

Wool aliens were first found in the county in 1946, but wool had been used on the fields for many years previously. Over 300 alien species have been recorded and new species are becoming difficult to find. Five alien species found in 1976 were exhibited—*Anoda cristata* (L.) Schlecht., *Coronilla scorpioides* (L.) Koch, *Ibicella lutea* (Lindl.) Van Eselt., *Iva xanthifolia* Nutt. and *Sida spinosa* L.

J. G. & C. M. Dony

### NATURE-PRINTING

Stages in the development of nature-printing, including prints made from plant, animal, fossil, rock and fabric subjects, were exhibited.

P. I. Edwards

### PAPER FROM UNUSUAL PLANT SOURCES

Examples of paper made from *Brassica*, *Gossypium*, *Juncus*, *Linum*, *Crocosmia*, *Morus*, *Pteridium* and *Urtica* by Maureen Richardson of Sevenoaks, Kent, and used for collages by Hilda Robinson of Tewkesbury, Gloucestershire, were on display.

P. I. Edwards

### ENDANGERED BRITISH PLANTS

In 1976, vice-county Recorders were asked for post-1960 records of 38 species for which the Biological Centre had received few recent records.

The Exhibit displayed 36 of these maps and another showing the excellent cover of the returns received. It is clear that at least 12 of the species now have very small populations, and may have to be included in the Red Data Book. Both species of *Caucalis* are now apparently extinct whilst *Bupleurum rotundifolium*, *Gastridium ventricosum* and *Lactuca saligna* are endangered. Other species which have declined rapidly are *Agrostemma githago*, *Alopecurus bulbosus*, *Filago apiculata*, *F. spathulata*, *Galium tricornutum*, *Mentha pulegium* and *Valerianella rimosa*.

L. Farrell & F. H. Perring

### WEST LANCASHIRE FLORA: A CONSERVATION ASSESSMENT

A botanical conservation assessment of W. Lancs., v.c. 60, was shown in map form using records collected on a tetrad basis between 1964 and 1974. In compiling the assessment, points were given for species diversity, the occurrence of rarities and habitat diversity.

The conservation assessment highlighted areas of known interest but also indicated other areas of botanical interest, sometimes in industrial zones. In addition the assessment showed areas of above average value, reflecting those parts of the vice-county with a variety of habitats.

B. D. & E. F. Greenwood

### WILD FLOWERS THROUGH THE CAMERA'S EYE

Wild flower photography poses several problems that must be overcome if the finished result is to be of an acceptable quality. Sufficient depth of field and a fast shutter-speed to stop subject movement are of prime importance.

For the exhibition prints, a Canon single-lens reflex camera with an f.1·8 aperture lens and high speed Vericolor negative film gave sufficient quality to enable the prints to be enlarged to an $8'' \times 10''$ format. Where possible, with hand-held shots, a shutter speed of 1/125 sec. and an aperture of f. 8 or f. 11 were used. On many occasions speeds of $\frac{1}{4}$ sec. and lower were used. A tripod was then employed to maintain a steady image. Only as a last resort was a flashgun used as, although this provides a crisp, bright photograph, the contrast between light and shade and any modelling effect is lost.

T. Hinitt

### A CAMBRIDGE MISCELLANY

The exhibit included herbarium sheets of the following hybrids: *Cirsium* × *celakovskianum*, *Senecio* × *albescens*, *Juncus* × *diffusus* and *Epilobium adenocaulon* × *E. parviflorum*. All but the last are new to Cambs., v.c. 29. Two new Cambridgeshire aliens, *Sesamum indicum* and *Solanum luteum* subsp. *luteum*, were exhibited and living plants of *Solanum luteum* and *S. nigrum* were provided for comparison.

In addition a collection of living plants of the $F_2$ generation from the artificially created hybrid *Senecio rodriguezii* × *S. squalidus* demonstrated considerable segregation of parental characters, especially flower-colour and leaf-shape.

A. C. Leslie

### THE GUERNSEY FLORA IN 1976

Thanks to the interest spread by the botanical section of La Societé Guernesiaise, led by Mrs Ryan, many more good finds were made in 1976.

Those new to the island included *Mimulus guttatus*, *Carthamnus tinctorius* and *Juncus inflexus*, while others were seen for the first time for from 70 to 185 years—*Scutellaria minor*, *Galium debile*, *Centaurea nigra* var. *pallens* and *Lolium temulentum*. *Senecio cineraria* was new to Alderney, where *Arum italicum* 'Pictum' was very fine and plentiful. *Conyza sumatrensis* (which for sure is its right name and not *C. albida* or *C. floribunda*) is spreading fast in Guernsey and Jersey and was first collected in Sark in 1976.

Further new and good records were made during the field meeting to be reported later. One of the heartening aspects of this fine achievement is that it was made by so many different local amateurs, a good sign for more good work. Interest will be specially given to Sark in the next year or so, and visitors there will be particularly welcome.

D. McClintock

### A 19TH CENTURY DECORATED VASCULUM

On display was a vasculum found among the effects of an aunt of the exhibitor after her death in 1975. It is suspected that it may have been given to her during one of her numerous visits to France or the Low Countries during the early years of this century. The metalwork and particularly the fastenings suggest an origin in the 19th century; and the pictures seem to be French, or perhaps German or Swiss.

K. G. Messenger

### SOME RECENT DISCOVERIES IN SHETLAND

*Atriplex praecox* Hülphers, a widespread Scandinavian species recently detected at Ullapool by P. M. Taschereau, was found in Shetland in 1976 along the shores of Brindister Voe, near Clousta. Herbarium material was exhibited, as well as of the following species: *Dryopteris assimilis* S. Walker, apparently seen over a century ago in Bressay, but recently only at Kergord, Weisdale, in one of Shetland's few plantations, presumably introduced; *Dryopteris oreades* Fom. (*D. abbreviata* auct.), found new to Shetland in serpentine scree at Hoo Field, Cunningsburgh; and a puzzling hybrid *Potamogeton* from Loch of Cliff, Unst, perhaps a form of *P.* × *sparganifolius* Laest. ex Fr., but presenting some curious features.

R. C. Palmer

### *OPHRYS APIFERA* × *O. INSECTIFERA* (*O.* × *PIETZSCHII* KÜMPEL) IN BRITAIN

*Ophrys apifera* × *O. insectifera* was first found in Britain in 1968 by Dr Flower, Dr Stevens and Prof. Whiting in the Avon Gorge (A. J. Willis, *Proc. Bristol Nat. Soc.*, **31**: 489 (1969)). Hybrid origin was suspected at the time, but has not been confirmed until recently. The hybrid was described by Kümpel in 1971, based on the results of artificial cross-pollination in the wild in E. Germany, so the British plant is perhaps the first natural hybrid of this combination to be found. Photographs of the plant *in situ* and illustrations from a book were displayed.

R. J. Pankhurst

### *OPHRYS BERTOLONII* MORETTI IN BRITAIN

A single plant of the Mediterranean orchid, *Ophrys bertolonii* Moretti, was found by Mr R. E. Webster in April, 1976, growing in calcareous grassland in Dorset. No further specimens have been found after careful searching. The plant disappeared in May, due perhaps to being grazed or picked, and is not believed to have set seed. The identity of the plant has been confirmed at Kew. Illustrations of the plant in various books were exhibited.

The nearest native locality for this orchid is in southern France. It is distributed in the northern Mediterranean region, as was shown on an accompanying map, and evidence has since come to light that some years ago seeds of various Mediterranean species of orchid were scattered in this area of Dorset.

R. J. Pankhurst & G. A. Matthews

### COMMON SPECIES IN THE BRITISH ISLES

In the autumn of 1975 vice-county Recorders were sent maps of 50 common species from the *Atlas of the British flora*, updated as far as possible with records received in the 13 years since publication and with Irish Records on the Irish Grid. Recorders were asked to send any additions for their vice-counties. From these returns new maps have been prepared. Three were exhibited, illustrating three kinds of common species:

*Bellis perennis*. The distribution in the *Atlas* was almost complete and it is clear that any gaps in that map were not real. The few gaps now remaining, almost entirely in Ireland, arose during the grid conversion where a few 'new squares' had to be created.

*Capsella bursa-pastoris*. The distribution in the *Atlas* was incomplete, and even with all the additions it is clear this is not a ubiquitous species. It is absent from large areas of the Scottish Highlands and western Ireland.

*Leontodon autumnalis*. The distribution in the *Atlas* was incomplete because this species was under-recorded by those who visited squares only early in the year or disliked yellow composites. Any remaining gaps are very scattered and this species could well be in every 10-km square.

F. H. Perring & D. Scott

### DWARF *JASIONE MONTANA*

Dwarf plants of *Jasione montana* collected on a raised beach at Ballyteige, Wexford, in August, 1976, were shown. The few-flowered inflorescence was held at ground level by the coiling of the peduncle and the plants also differed from typical specimens in some details of flower morphology. According to B. Jonsell of Uppsala this is not the var. *littoralis* Fried. The dwarfness was considered not to be due to the drought of 1976.

M. J. P. SCANNELL

### *RUMEX ANGIOCARPUS* MURB., A FORGOTTEN SPECIES

Dutch botanists working on the western coast of Ireland report *Rumex angiocarpus* as frequent in maritime pastures in W. Galway. Specimens collected at Carna in September 1976 were submitted to J. E. Lousley, who replied (*in litt.* 4 January, 1976): '. . . ripe seed and I am almost convinced.' *R. angiocarpus* is not reported in any recent local Flora in Great Britain.

M. J. P. SCANNELL

### *FRAXINUS EXCELSIOR* WITH NARROW LEAFLETS

Specimens of a variant of *Fraxinus excelsior* with narrow leaflets collected from a stand of trees at Selsham on the shore of Lough Neagh, Antrim, in July 1976 were exhibited. The narrow leaflets are not matched in the Augustine Henry Tree Herbarium at Glasnevin. The leaflets were held stiffly, not drooping, and presented a pectinate silhouette against the sky.

M. J. P. SCANNELL

### GALLED *ONONIS REPENS*

An extensive patch of *Ononis repens* on the sand-dunes at Ballyteige, Wexford, was found bearing galls in 1976. This species had not been seen in a galled state previously, and is not reported in recent publications on galls. Professor G. O. Evans of Albert College, Glasnevin, identified the mite forming the gall as *Aceria ononidis* (Can.), which appears to be new to the British Isles.

M. J. P. SCANNELL

### HYBRIDS IN THE GENUS *ATRIPLEX*

Herbarium specimens of the following plants were exhibited:

*Atriplex longipes* Drej., *A. prostrata* DC. and *A. longipes* × *A. prostrata* collected in 1976 from various sites in northern W. Norfolk.

An *Atriplex* hybrid, one parent of which is presumed to be *A. littoralis*, but the other unknown, collected in 1976 in stands of *A. littoralis* and *A. prostrata* at Burnham Deepdale and at Wolferton, W. Norfolk.

*Atriplex littoralis* female × *A. patula* male, artificially synthesized 1975–76 at Manchester.

Plants of the *A. prostrata* group showing introgressed *A. longipes* characters are commonly encountered in Britain, but this is the first record of undoubted *A. longipes* × *A. prostrata* hybrids in the British Isles. The hybrid of unknown parentage, though morphologically similar to the sterile *A. littoralis* × *A. patula*, which occurs in Scandinavia, has up to 70% of the bracteoles with full seed. A similar plant from this part of England has been reported by E. M. Jones as the putative hybrid *A. glabriuscula* × *A. littoralis*.

P. M. TASCHEREAU

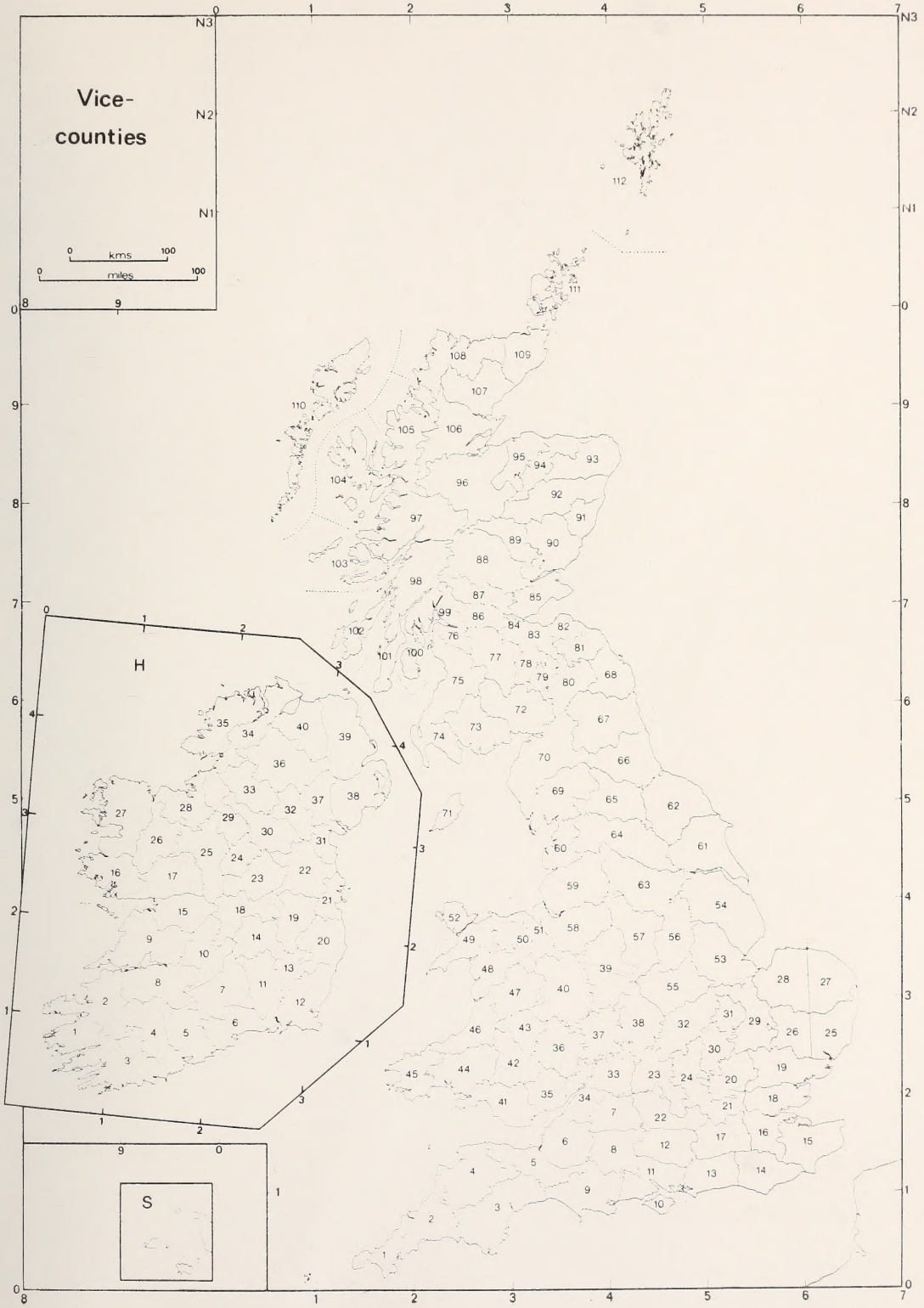
The following also exhibited:
E. J. Clement. (a) Adventive News 4 & 5.
(b) A *Setaria* triplet.
U. K. Duncan. *Cytisus striatus* (Hill) Rothm., an established alien in Easterness.
G. M. S. Easy. Some alien plant drawings.
G. Ellis. Some recent additions to the Welsh flora.
B. Everard. Threatened plants of Malaysia.
J. H. Fremlin. Stereophotographs of some Bedfordshire flowers.
A. N. Gibby. Postage stamps of botanical interest.
R. M. Hamilton & S. R. J. Woodell. The present state of *Viola persicifolia* Schreber in Britain.
A. MacDougall. Hybridization in thistles: *Cirsium* × *wankelii* Reichardt.
A. Rutherford. A new ivy from the south of Spain.
A. J. Silverside. *Mimulus cupreus* × *M. luteus* in Scotland.
O. M. Stewart. Drawings of shoddy plants and other aliens.
I. Tittley & J. H. Price. The seaweeds of Kent.

In the lecture hall the following members gave short talks illustrated by colour-slides:
F. J. Adnams. Plants and young people.
H. J. B. Birks. British pteridophytes.
W. R. Cubbon. Plants of the Balkan Peninsula with somewhat limited distribution.
H. H. Fowkes. Andalusian plants 1976.
J. Jones. Plant life in Central America.

## COMMITTEE FOR THE STUDY OF THE SCOTTISH FLORA
## EXHIBITION MEETING, 1976

An Exhibition Meeting was held at the Department of Botany, University of Glasgow, on Saturday, 6th November, 1976 at 14.00 hours. The following exhibits were shown.

J. Bowden. Lightfoot and *Flora Scotica.*
R. W. M. Corner. Plant records from v.c.s 79 and 80.
A. C. Crundwell. A Scottish moss new to science.
J. H. Dickson. (a) Ancient pine stumps in central Scotland.
(b) *Cuscuta campestris* from Kilmarnock.
U. K. Duncan. *Cytisus striatus* (Hill) Rothm. in Easterness.
L. Farrell. Colour transparencies of Shetland and the Monach Isles.
G. Halliday. Plants from Prudhoe Bay, Alaska.
A. Kenneth. *Cirsium dissectum* and *Lathyrus palustris* in Knapdale, v.c. 101.
J. B. Kenworthy. *John Anthony's Flora of Sutherland.*
Macaulay Institute for Soil Research. Soil survey of Scotland, Nairn–Cawdor area.
G. Messenger. A decorated 19th century vasculum.
J. Millar. Biorec in Renfrewshire.
A. Newton. *Rubus* maps by computer.
F. H. Perring. Rapidly declining British plants.
A. Rutherford. (a) A new ivy.
(b) *Hedera* research.
(c) The Dunbartonshire recording scheme.
A. J. Silverside. *Mimulus cupreus* × *M. luteus* in Scotland.
G. N. & L. M. Stallard. *Wild flowers of British Columbia.*
O. M. Stewart. Drawings of wild flowers and records from v.c. 73.
A. M. Stirling. Some items from the British Herbarium of the Botany Department of the University of Glasgow.
E. C. Wallace. Plants from Alaska.
M. McC. Webster. Scottish plant records.


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August 1977 Volume eleven Part four

## Contents

DONY, J. G. J. Edward Lousley (1907–1976) ... ... ... 282–286

MCCLINTOCK, D. J. E. Lousley and plants alien in the British Isles 287–290

CONOLLY, A. P. The distribution and history in the British Isles of some alien species of *Polygonum* and *Reynoutria* ... ... 291–311

JURY, S. L. The herbarium of J. E. Lousley ... ... ... 312

KENT, D. H. **Rumex × lousleyi hybr. nov.** (*R. cristatus* DC. × *R. obtusifolius* L.) ... ... ... ... ... ... ... 313–314

KENT, D. H. J. Edward Lousley's published works ... ... 315–325

ÖNDER, A. and JONG, K. The occurrence of B chromosomes in *Festuca ovina* L. *sensu lato* from Scotland ... ... ... 327–330

PRINCE, S. D. and CARTER, R. N. Prickly Lettuce (*Lactuca serriola* L.) in Britain ... ... ... ... ... ... ... 331–338

WILLMOT, A. *Sorbus torminalis* (L.) Crantz in Derbyshire ... ... 339–344

DAVIS, B. N. K. The *Hieracium* flora of chalk and limestone quarries in England ... ... ... ... ... ... ... ... 345–351

COLES, S. M. *Ranunculus repens* L. in Europe ... ... ... 353–366

RYVES T. B. Notes on wool-alien species of *Lepidium* in the British Isles ... ... ... ... ... ... ... ... ... 367–372

SHORT NOTES ... ... ... ... ... ... ... ... 373–389

PLANT RECORDS ... ... ... ... ... ... ... 391–404

BOOK REVIEWS ... ... ... ... ... ... ... ... 405–417

OBITUARIES ... ... ... ... ... ... ... ... 419–421

REPORTS

Annual General Meeting, May 22nd, 1976 ... ... ... 423–425

Exhibition Meeting, 1976 ... ... ... ... ... 425–432

Committee for the Study of the Scottish Flora Exhibition Meeting, 1976 ... ... ... ... ... ... ... 432

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