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Phenotypic plasticity of *Elodea nuttallii* (Planch.) H. St John and *Elodea canadensis* Michx in the British Isles

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ABSTRACT

Elodea nuttallii (Planch.) H. St John and *E. canadensis* Michx show a wide range of morphological variation, a feature which has caused many problems of identification. In the British Isles variation within the two species is entirely due to phenotypic plasticity. The features which most obviously demonstrate plasticity are leaf shape, leaf size, leaf posture, internode length and plant colour. Some of these have been incorrectly used in the past as diagnostic characters. The range of variation in these features is described. Field studies are reported which examine the variation of material in two different localities during the growing season, and cultivation experiments are described in which material from one genotype of each species was grown under a variety of environmental conditions. Possible factors influencing plasticity are discussed.

INTRODUCTION

Three species of the genus *Elodea* Michx occur in the British Isles, namely *E. canadensis* Michx, *E. nuttallii* (Planch.) H. St John and *E. callitrichoides* (Rich.) Casp. All are adventive in the British Isles and are native to the New World.

E. nuttallii and *E. canadensis* show a wide range of morphological variation, even though only a few genotypes of each species occur in the British Isles (Cook & Urmi-König 1985). This has caused many problems of identification, and such problems were particularly evident in Great Britain during the 1960s and 1970s, a period coinciding with the introduction and spread of *E. nuttallii*. This species, first reported from Oxford in 1966 (Simpson 1984), became widespread during the following ten years and its range of variation was great enough to suggest the possibility of two or even three new taxa being present. In addition some material could have been a hybrid between the two species. It was known that in America *E. canadensis* and *E. nuttallii* readily hybridize with each other (Ernst-Schwarzenbach 1945a, 1945b; Cook & Urmi-König 1985), a feature which probably accounts for some of the variation in American specimens (Cook & Urmi-König 1985), and could also have applied to British and Irish material. It was also suggested that material assigned to *E. nuttallii* was merely a phenotype of *E. canadensis* which had appeared as a response to changing environmental conditions, particularly the increasing eutrophication of water bodies (S. Haslam, pers. comm.; Harding 1979).

However, in my recent investigation of *Elodea* in the British Isles (Simpson 1983), it was concluded that *E. canadensis* and *E. nuttallii* are two distinct species, which cannot hybridize because only female plants are present. It was also shown that both species exhibit a wide range of phenotypic plasticity, which would explain the problems of identification. Aspects of phenotypic plasticity in Japanese material of *E. nuttallii* have been examined by Kunii (1982, 1984) who concentrated particularly on growth and phenology. In this paper I describe the range of phenotypic plasticity shown by British material of *E. nuttallii* and *E. canadensis*, with particular emphasis on features of taxonomic interest, such as leaf shape and size. I also report field and laboratory studies which were carried out (i) to demonstrate the range of phenotypic plasticity in the species in two localities over the growing season, (ii) to examine the effect of differing environmental conditions on their plasticity, and (iii) to determine whether the two species adopt a similar morphology under certain conditions. Possible factors which influence their plasticity are also discussed.

MATERIALS AND METHODS

INITIAL OBSERVATIONS

Before carrying out experimental work it was necessary to identify which parts of the plant were showing phenotypic variation. This was done by examining a range of living and herbarium material from a variety of different habitats. A full list of the latter is kept in **LANC** and a list of the herbaria consulted is given in Simpson (1986).

FIELD OBSERVATIONS

Field observations were made predominantly on *E. nuttallii*. The aim was to record the phenotypic plasticity of plants at four different depths on four dates during the growing season. Two contrasting sites were chosen, one in a shallow section of the R. Lune at Skerton, Lancaster, Lancs., v.c. 60, and the other in deeper water at Mitchell Wyke Bay, Windermere, Westmorland, v.c. 69. Whole plants were taken from 0·5–1 m depth in the R. Lune and 2–3 m depth in Mitchell Wyke Bay. Observations were made on the uppermost stems of these plants, which were gathered on 25 April, 15 June, 18 August and 23 September 1981. On 23 September, material of *E. canadensis* was collected for comparison. In this case the plants were taken from the Lancaster to Kendal canal at Burton-in-Kendal, Westmorland, v.c. 69, as well as from Mitchell Wyke Bay. Light intensity was measured at both sites in terms of quantum flux density. Measurements were made at the depths of the uppermost stems with a 'Lambda' quantum sensor adapted for underwater use. Light intensities received by the uppermost stems of the plants varied from nearly 100% of the surface intensity for plants at 0·5 m in the R. Lune and the Lancaster-Kendal Canal (i.e. the uppermost stems were at or near the surface), to only 8% for plants at 3 m depth in Windermere. In all cases ten plants from each depth were collected and pressed. Leaf shape, leaf posture and plant colour were noted. Measurements were made of leaf length, leaf width at the mid-point and internode length. Length and width of five cells in each leaf were also measured from plants at 0·5 m in the R. Lune, and at 2 and 3 m in Mitchell Wyke Bay. All leaf data were taken from the verticillate leaves only.

During the latter part of the fieldwork a simple transplant experiment was carried out, in which material was transferred from shallow to deep water. Ten stem apices each 10 cm long from one genotype of each species were planted in sand/gravel in plastic containers. One container of each species was then placed at 2, 3 and 4 m depths in Mitchell Wyke Bay and grown for 35 days between 18 August and 23 September 1981. The plants were obtained from c.0·5 m depth in the R. Lune (*E. nuttallii*) and the Lancaster-Kendal Canal, Burton-in-Kendal (*E. canadensis*). Plants growing at these localities were examined during the course of the experiment for comparison. The characters listed above were recorded from growth which had taken place during the 35 day period.

CULTIVATION EXPERIMENTS

Three simple laboratory experiments were carried out in which material representing one genotype of each species was subjected to a variety of environmental conditions. The apparatus for each experiment was similar, consisting of polypropylene bins filled with nutrient-poor sand/gravel or nutrient-rich river sediment and tap water. The experiments were as follows.

Plants of both species were grown for 35 days under low, medium or high light intensities (2, 35 and 250 μmol m^{-2} s^{-1}) in either sand/gravel or river sediment at c.19°C. Reduced light intensity was achieved by shading the bins with neutral density filters. Light intensities were chosen to reproduce, as near as possible, those in the two habitats during August and September.

E. nuttallii was grown for 30 days at high light intensity (250 μmol $m^{-2}s^{-1}$) in sand/gravel or river sediment at a raised water temperature of c.27°C.

Plants of both species were grown for 30 days in sand/gravel with different levels of water nutrient enrichment. This was achieved by adding 'Phostrogen' 10:10:27 N:P:K fertiliser in three different concentrations.

Ten stem apices 10 cm long were used in each treatment. These were obtained from the same source as material used in the transplant experiment. All observations were made on growth which had taken place during the course of the experiment. Again, material growing at the two sources was examined during the experiment for comparison. In the first two experiments observations

were made on the same characters as those examined in the field work. In the third experiment leaf shape, leaf apex shape, leaf width c.0·5 mm below the apex and plant colour were recorded. Leaf data were again taken from the verticillate leaves. Voucher material of all field and experimental work is in **LANC**.

RESULTS

RANGE OF PHENOTYPIC PLASTICITY IN *E. CANADENSIS* AND *E. NUTTALLII*

Phenotypic plasticity in both species is seen in the vegetative parts of the plant. The characters which most obviously demonstrate plasticity are: leaf shape, leaf size, leaf posture, internode length and plant colour.

Leaf shape has often been used as a diagnostic character for separating *Elodea* species, although in many cases it has been inadequately described (cf. St John 1965). It is most variable in *E. canadensis*, in which the leaves range from ovate to linear-oblong and occasionally linear-lanceolate. In *E. nuttallii* the leaves are either linear or linear-lanceolate. Of particular taxonomic importance is the shape of the leaf apex, which is broadly acute to obtuse in *E. canadensis* and narrowly acute to acuminate in *E. nuttallii*. This discontinuity is an important character for separating the two species.

Leaf length and mid-point width are highly variable in both species. The greatest variation of leaf length is seen in *E. nuttallii*, in which the leaves may be up to 35 mm long. However, mid-point width varies most in *E. canadensis* (Table 1). In many cases the leaves of *E. nuttallii* are longer and narrower than those of *E. canadensis*, although there is a wide range of overlap between them. Such overlap makes these characters of little use in separating the two species. However, leaf size does yield one taxonomically important feature, namely the width of the leaf measured at a point c.0·5 mm below the apex. This is usually greater in *E. canadensis* and reflects differences shown by the shape of the leaf apex. It is the most reliable character for separating this species from *E. nuttallii*.

Six types of leaf posture may be recognised in *Elodea*, ranging from patent to strongly recurved (Simpson 1986). *E. canadensis* has only three of the types, its leaves being patent, slightly recurved or spreading. *E. nuttallii* has six types, the most frequent being those seen in *E. canadensis*. However in *E. nuttallii* at least some leaves are strongly recurved, with their apices touching the stem. This type of leaf posture is diagnostic for *E. nuttallii*.

In both species the internodes become shorter towards the apex. However internode length at any given point along the stem is highly variable, and this appears to be closely associated with variation in leaf size. Thus plants with the longest, narrowest leaves also have the longest internodes and vice-versa. The greatest range of variation is seen in *E. nuttallii*, which can have internodes up to 20 mm long (Table 1).

Plant colour has often been used as a diagnostic character, with *E. canadensis* being described as dark green and *E. nuttallii* as light green or greenish brown. However, colour variation bears little relation to species differences and seems to be dependent on light intensity and/or nutrient status of the water or substrate.

FIELD OBSERVATIONS

The morphology of *E. nuttallii* in the R. Lune was similar at both depths on 25 April, the plants having short, broad, strongly recurved, linear-lanceolate, mid- to dark green leaves and short internodes. As the season progressed the leaves adopted a spreading posture, together with an

TABLE 1. RANGE OF LEAF SIZE AND INTERNODE LENGTH IN *ELODEA CANADENSIS* AND *ELODEA NUTTALLII*

Character	*E. canadensis*	*E. nuttallii*
Leaf length (mm)	4.5–17.0	5.5–35.0
Leaf mid-point width (mm)	1.4–5.6	0.8–3.0
Internode length (mm)	0.5–9.1	0.5–2.0

increase, followed later by a decrease, in leaf mid-point width (Figs 1 & 2). The internodes remained short.

In Windermere the seasonal pattern was different, particularly at 2 m. Plants from both 2 m and 3 m started off the season with a morphology similar to those in the R. Lune, but by 15 June there was an increase in leaf length and mid-point width. At 2 m there was a continued increase in leaf length, coupled with a decrease in mid-point width, so that by 18 August the plants had long, spreading, linear, light green leaves and long internodes. At the same time plants at 3 m adopted a morphology which was intermediate between that at the start of the season and the plants at 2 m as described above. The overall pattern was more or less the same on 23 September. None of the Windermere plants elongated sufficiently to reach the surface of the water.

The differences in external morphology were usually reflected by differences in leaf cell size (Table 2). The cells of plants from 0·5 and 1 m in the R. Lune were generally longer and broader than those of the 2 m plants from Windermere. In plants at 3 m there was no definite pattern in cell size, except that cell width was greater than in plants at 2 m.

E. canadensis showed a similar variation pattern to *E. nuttallii* on 23 September both in external morphology and cell size, although the range of variation was not as wide as in *E. nuttallii* (Fig. 2; Tables 2 & 3). The longest, narrowest leaved plants were again found at a depth of 2 m. Material from the canal was dark green, whilst that in Windermere was mid-green.

In the transplant experiment, the containers at 3 m were vandalised and no result was obtained. At 4 m none of the plants survived. This was probably due to their being below the lower depth limit for the growth of the two species. At 2 m a number of changes were noted (Fig. 3). At the start of the transplant experiment, material of *E. nuttallii* had short, broad, mostly recurved, mid-green leaves and short internodes. After 35 days the plants became similar to wild material at the same depth, having long, narrow, spreading, light green leaves. A similar transition to longer and somewhat narrower leaved material was also noted in *E. canadensis*, and again, the transplanted material became similar to wild material growing at the same depth. In *E. nuttallii* internode length showed little change, whereas in *E. canadensis* it was shorter on the new growth. It is likely that the experimental period was not long enough to allow the internodes to develop fully.

TABLE 2. CELL SIZE IN UPPER STEM LEAVES TAKEN FROM WHOLE PLANTS OF *ELODEA NUTTALLII* AND *ELODEA CANADENSIS* ON 23 SEPTEMBER 1981 (MEAN±S.E.)

Measurement (μm)	Depth of plant (m) 0.5	2.0	3.0
E. nuttallii			
Cell length	93.20±2.72	75.73±2.12	67.60±3.20
Cell width	36.80±0.80	26.40±0.56	35.20±0.50
E. canadensis			
Cell length	109.20±3.71	79.84±3.13	76.00±2.73
Cell width	46.88±0.76	15.10±0.45	38.80±1.47

TABLE 3. COMPARISON BETWEEN THREE MORPHOLOGICAL CHARACTERS OF *ELODEA CANADENSIS* ON 23 SEPTEMBER 1981 (MEAN±S.E.)

	Site and depth of plant (m)			
	Burton-in-Kendal		Windermere	
	0.5	1.0	2.0	3.0
Leaf length (mm)	7.8±0.1	8.0±0.1	14.1±0.4	6.8±0.1
Leaf mid-point width (mm)	2.9±0.03	2.0±0.03	2.0±0.06	3.3±0.1
Internode length (mm)	9.1±0.3	8.6±0.2	10.5±0.3	5.6±0.3

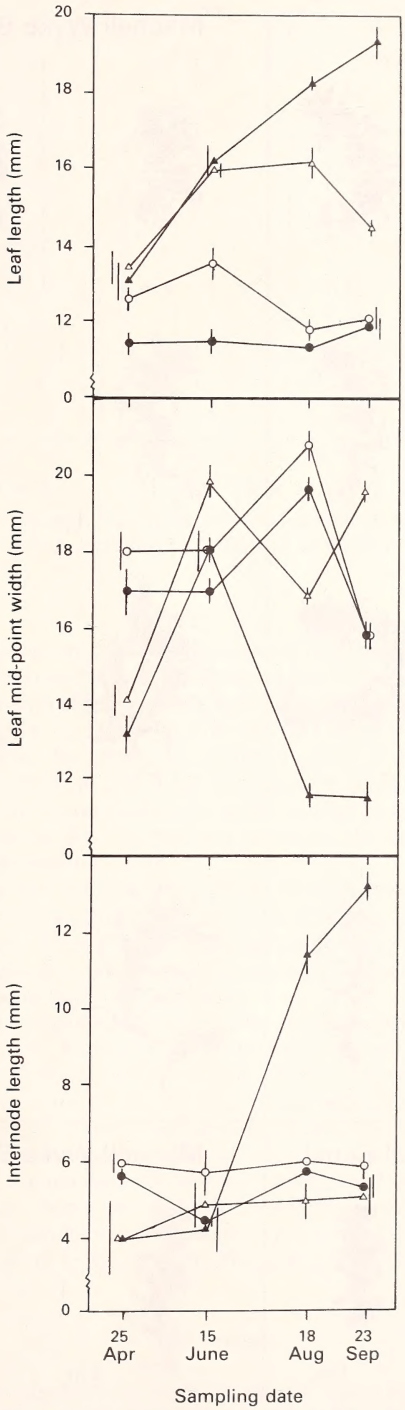

FIGURE 1. Variation in *E. nuttallii* of three morphological characters in relation to sampling date and depth. Points are means of 50 measurements. Bars indicate ± standard error. ● = 0·5 m R. Lune, ○ = 1 m R. Lune, ▲ = 2 m Mitchell Wyke Bay, △ = 3 m Mitchell Wyke Bay.

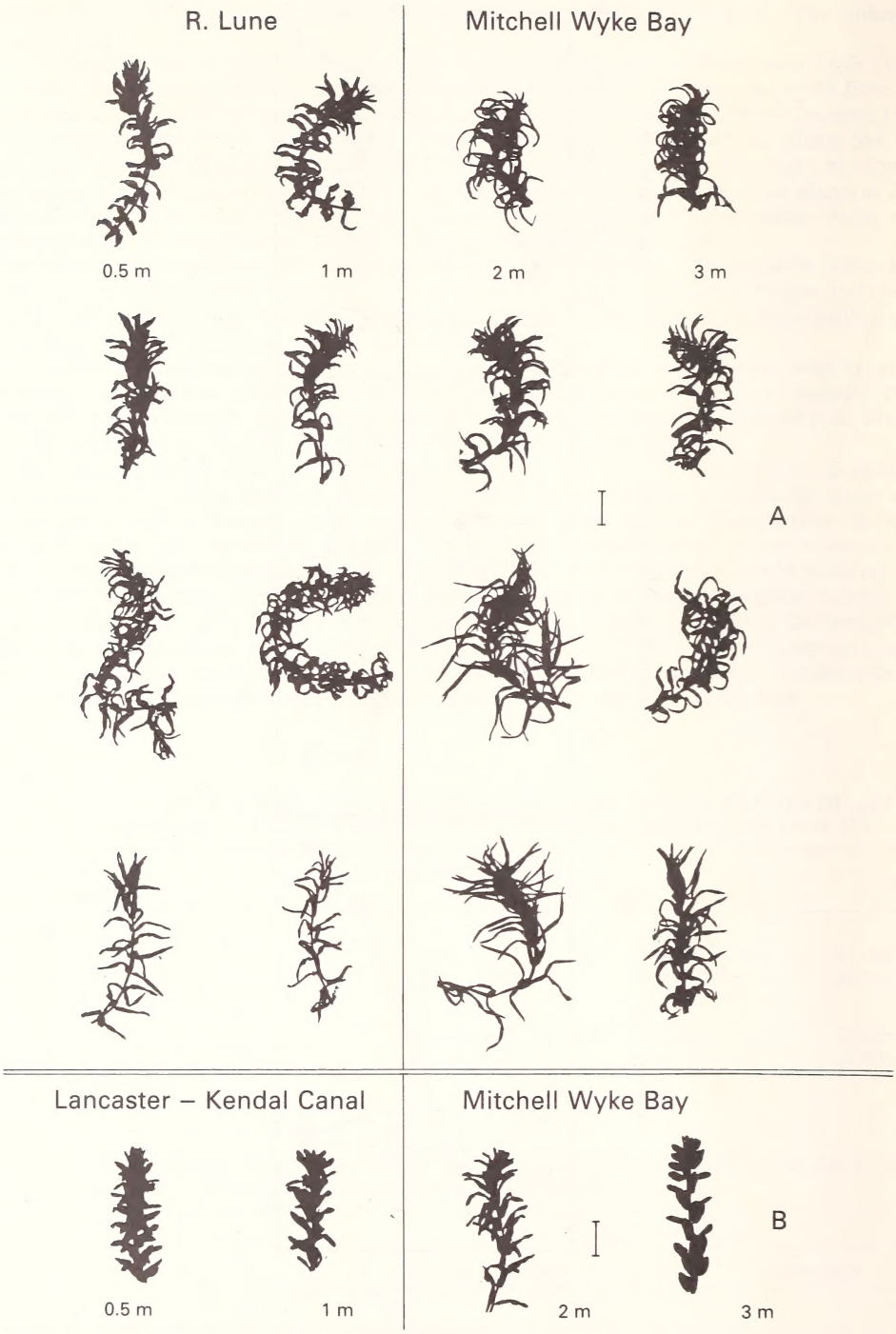

FIGURE 2. A: Silhouettes of upper stems from whole plants of *Elodea nuttallii* collected in relation to sampling date and depth; B: Silhouettes of upper stems from whole plants of *Elodea canadensis* collected on 23 September in relation to depth. Scale bar = 10 mm.

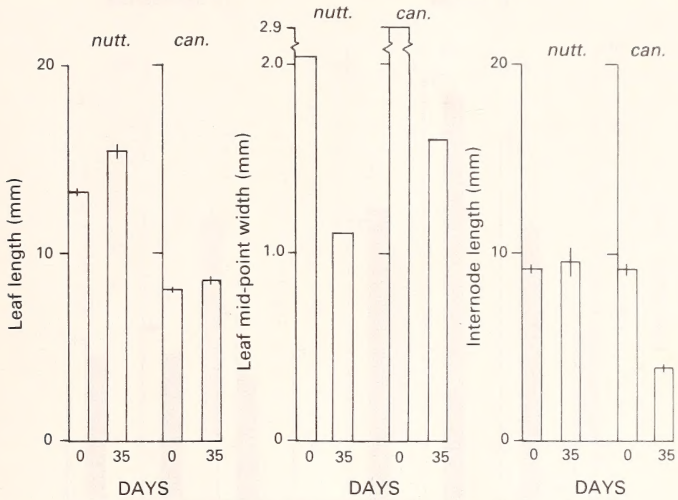

FIGURE 3. Changes in three morphological characters of *Elodea nuttallii* and *Elodea canadensis* 35 days after transplanting into Mitchell Wyke Bay. Columns are means of 20 measurements. Bars = ± standard error.

CULTIVATION EXPERIMENTS

At the start of all the cultivation experiments material of both species was identical in morphology to that at the beginning of the transplant experiment. After 35 days in nutrient-poor sand/gravel at 19°C, *E. nuttallii* showed an overall increase in leaf length, together with a decrease in mid-point width and internode length (Fig. 4). However, the overall variation pattern was similar to that seen in wild material on 18 August. In particular, material grown at the medium light intensity had similar characteristics to the plants at 2 m from Windermere, with long, narrow, spreading leaves. *E. canadensis* grown under the same conditions had a similar pattern of variation, with the most noticeable changes occurring at the middle light intensity. In this species the widest range of variation was noted in leaf mid-point width.

When grown in nutrient-rich river sediment, plants of both species under the low and medium light intensities showed a similar variation pattern to those grown in nutrient-poor sediment under equivalent lighting conditions. However, at high light intensity, light transmission below water level was reduced due to excessive phytoplankton growth. Plants grown under these conditions were similar to those at the medium light intensity.

Under conditions of raised water temperature, the responses shown by *E. nuttallii* varied with the type of substrate (Fig. 5). In both cases the plants developed linear, spreading leaves. However, plants in nutrient-poor substrate had shorter leaves and internodes. Incidental observations of *E. canadensis* under similar conditions indicated that it developed short and markedly narrow, linear-oblong or rarely linear-lanceolate leaves.

Plants grown in nutrient-poor sand/gravel at medium and high levels of water-nutrient enrichment showed some of the detrimental effects of such enrichment, including loss of leaves on the lower part of the stem. After 30 days the morphology of both species was similar to corresponding material grown under raised temperature and high light intensity conditions (Table 4). These forms developed at all levels of water-nutrient enrichment.

DISCUSSION

A wide range of phenotypic plasticity is characteristic of many aquatic taxa and this has caused numerous taxonomic difficulties within such groups. A notable example is that of *Ranunculus* L. subgen. *Batrachium* (DC.) A. Gray, in which Cook (1966) found a total of 302 possible names for the 17 species that he recognised. In *Elodea*, St John (1965) delimited 17 species of which ten were

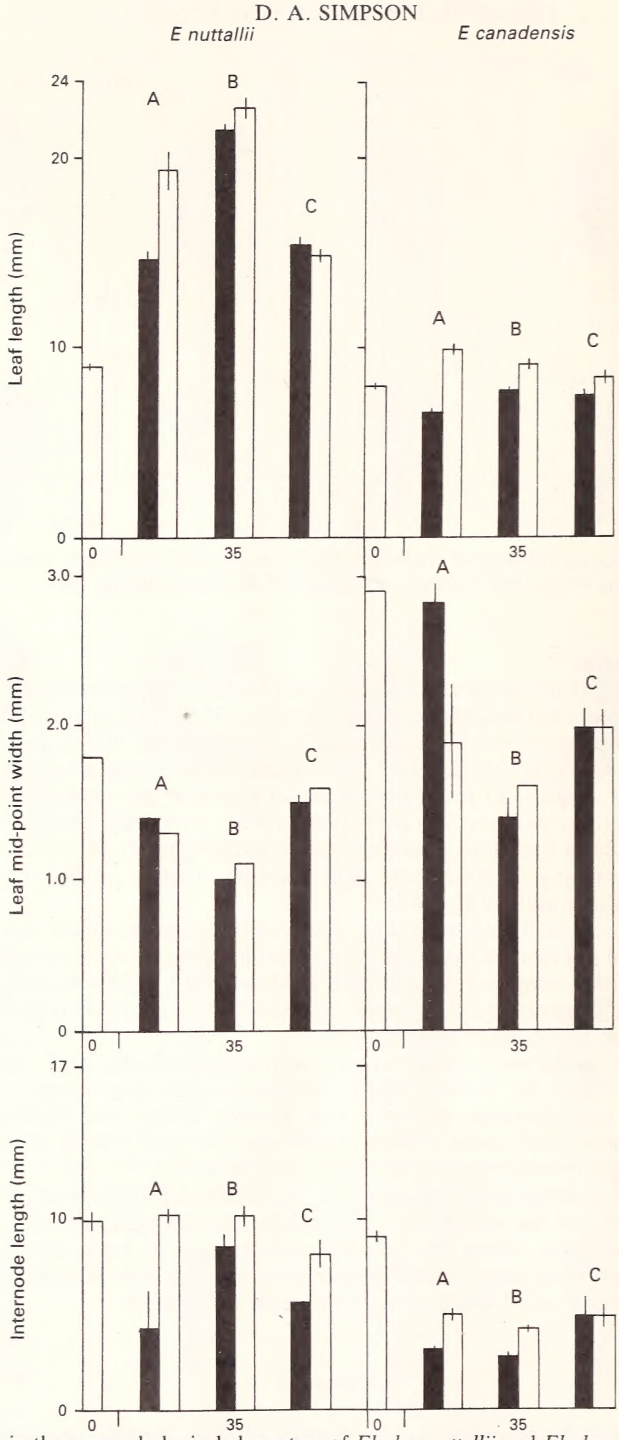

FIGURE 4. Changes in three morphological characters of *Elodea nuttallii* and *Elodea canadensis* after 0 and 35 days growth in differing light intensities in nutrient-poor and -rich substrates. A: high light intensity; B: medium light intensity; C: low light intensity. Shaded columns = nutrient-poor substrate, unshaded columns = nutrient-rich substrate. Columns are means of 20 measurements. Bars = ± standard error.

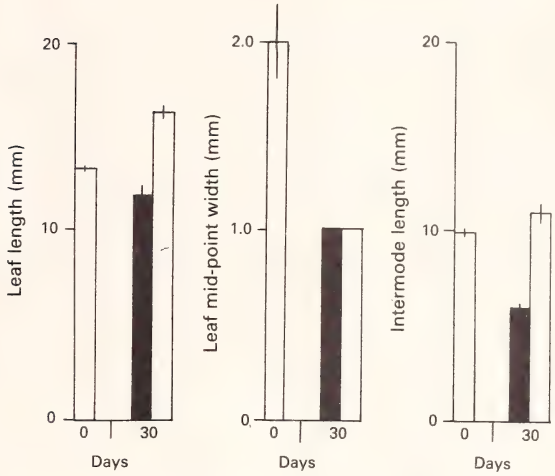

FIGURE 5. Changes in the morphology of *Elodea nuttallii* after 0 and 35 days growth at high light intensity at raised water temperature in nutrient-poor and -rich substrates. Shaded columns = nutrient-poor substrate, unshaded columns = nutrient-rich substrate. Columns are means of 20 measurements. Bars = ± standard error.

newly described. Unfortunately he based his work purely on herbarium material, which restricted his interpretation of the range of phenotypic plasticity. However, this is taken into account in the revision of Cook & Urmi-König (1985) who reduced the number of species to five.

From the present work it is apparent that *E. nuttallii* is the most variable of the species in the British Isles, particularly in leaf size and internode length. The variation is such that the two extremes of its morphological range have the appearance of distinct taxa, one with long, narrow, spreading leaves, the other with shorter, broader, strongly reflexed leaves. Narrow-leaved material, such as that seen in the Cumbrian lakes, is almost indistinguishable from *E. callitrichoides*, and microscopic characters, such as the length of the teeth on the leaf margins, are needed to separate them vegetatively. Furthermore, in the British Isles *E. nuttallii* has been confused with species in closely related genera, such as *Hydrilla verticillata* (L.f.) Royle and *Lagarosiphon major* (Ridley) Moss. Indeed for many years British and Irish material of the former was treated as being conspecific with *E. nuttallii* (Tutin 1962; Scannell & Webb 1976). However close observation shows that the two extremes of variation often occur on the same plant. These represent responses to environmental conditions which prevail during the growth of a given part of

TABLE 4. LEAF MORPHOLOGY OF *ELODEA NUTTALLII* AND *ELODEA CANADENSIS* AFTER 30 DAYS GROWTH AT THREE LEVELS OF WATER NUTRIENT ENRICHMENT (MEAN±S.E.)

		Concentration of added nutrient (mg/l)		
	Nutrient	Low	Medium	High
	N	0.025	0.05	0.10
	P	0.022	0.044	0.088
Character	K	0.055	0.11	0.22
E. nuttallii				
Leaf shape		linear	linear	linear
Leaf apex shape		acuminate	acuminate	acuminate
Leaf width 0.5 mm below apex (mm)		0.4±0.02	0.5±0.03	0.4±0.03
E. canadensis				
Leaf shape		linear-oblong	linear-oblong	linear-oblong
Leaf apex shape		broadly acute	broadly acute	broadly acute
Leaf width 0.5 mm below apex (mm)		1.1±0.03	1.0±0.04	1.0±0.03

the plant. Unfortunately such differences are rarely detected on herbarium specimens since only small sections of the plant are usually collected. This has undoubtedly emphasised the taxonomic difficulties associated with *E. nuttallii*, and indicates the need to have living material for identification wherever possible.

E. canadensis has a narrower range of variation than *E. nuttallii* except in leaf shape, and has not usually been confused with other species in related genera. Nevertheless, problems have sometimes arisen in distinguishing *E. nuttallii* from *E. canadensis*. In North America, where hybridization occurs, this would be expected. However in the British Isles, where hybridization cannot take place, such problems have come about because knowledge of the characters separating the two species was inadequate.

As indicated earlier, it has also been suggested that *E. nuttallii* is merely a phenotype of *E. canadensis*. In relation to this, three points should be made about the comparative variation of the two species and their distinctness under differing environments. Firstly, both species respond in a broadly similar manner to varying environmental conditions. This is exemplified by wild material from different depths late in the growing season. Thus in both species the leaves tend to be shorter and broader in shallow water, longer and narrower in deeper water and intermediate between these phenotypes at the deepest levels. The two species also show similar variation in leaf anatomy. Secondly, the wider range of plastic response shown by *E. nuttallii* is demonstrated in the field by the differences between this species and *E. canadensis* on 23 September, and experimentally by the variation they show in relation to light intensity. From this the third, and taxonomically important, point is that when the responses of the two species to each environmental factor are compared, both *E. canadensis* and *E. nuttallii* maintain distinct morphological facies. These facies are based on a combination of leaf shape, leaf apex shape and leaf width c.0·5 mm below the apex-tip (Table 5), and represent a clear morphological discontinuity between *E. canadensis* and *E. nuttallii*. There is, therefore, no justification for treating *E. nuttallii* as conspecific with *E. canadensis*.

Of the environmental factors influencing phenotypic plasticity of aquatic macrophytes, light is probably the most significant, particularly in terms of intensity. There is a sharp contrast in light intensity between shallow and deep water, and the underwater light climate is characteristically one of deep shade (Spence 1981, 1982). This has a marked effect on plasticity, and the adaptations of terrestrial plants to sun and shade conditions are well known. Similar adaptations are shown by aquatic macrophytes (Spence & Chrystal 1970a, b; Spence 1982). Temperature may also be important and, in common with light, varies according to the time of year and depth of water. It is also interactive with light, and responses to the two factors may be impossible to separate (Barko *et al.* 1982). Other factors which might have an influence include light quality, photoperiodism, nutrients and ontogenetic drift.

The limited amount of literature on factors influencing phenotypic plasticity in *Elodea* suggests that light, temperature, substrate and water nutrients are involved (Adams *et al.* 1971; Spence &

TABLE 5. COMPARISON OF LEAF WIDTHS 0.5 MM BELOW THE APEX OF *ELODEA NUTTALLII* AND *ELODEA CANADENSIS* UNDER VARYING ENVIRONMENTAL CONDITIONS (MEAN±S.E.)

	Mean width 0.5 mm below apex (mm)	
Environmental variable	*E. nuttallii*	*E. canadensis*
a. Depth (m) 23 September		
0.5	0.6±0.02	1.0±0.03
1.0	0.6±0.02	1.0±0.03
2.0	0.4±0.01	0.8±0.01
3.0	0.6±0.02	1.2±0.03
b. Differing light intensities, nutrient-poor substrate		
High	0.4±0.05	1.8±0.16
Medium	0.3±0.03	0.8±0.04
Low	0.5±0.03	0.9±0.02
c. Differing light intensities, nutrient-rich substrate		
High	0.3±0.04	1.0±0.03
Medium	0.2±0.02	0.8±0.01
Low	0.4±0.02	0.9±0.06

Dale 1978; Swann 1978; Barko *et al.* 1982). What might be deduced from previous and present work about their effect on plasticity in *E. nuttallii* and *E. canadensis*? Of the four factors, substrate probably has the least influence, although plants grown experimentally in nutrient-poor and nutrient-rich substrates do show slight variation. In the case of water nutrients, studies by Adams *et al.* (1971) of *E. canadensis* growing in a variety of habitats indicated that with increasing water nutrient enrichment, the species showed increases in leaf length and internode length, together with decreases in leaf mid-point width. Unfortunately no account was taken of variation in the light and temperature conditions of these habitats. In addition, the present work suggests that, when in cultivation under the same light and temperature regime, there is little response to water nutrient enrichment in either species. Although slight organic pollution of the water occurred at both sampling sites, comparison with equivalent pollution-free sites showed that a similar pattern of variation was taking place in both species during the growing season.

From both the literature and the present work it is clear that both species react markedly to varying light intensity and temperature. For example Spence & Dale (1978) noted a general increase in internode length of *E. canadensis* with increasing temperatures at low light intensities, whereas there is a decrease with increasing light intensities at all temperatures. Barko *et al.* (1982) indicated a similar relationship by showing that stem length increases with increasing temperature up to 28°C. Lawrence (1976) noted a decrease in leaf width in *E. canadensis* maintained at a mean temperature of 25·6°C, while Swann (1978) observed that *E. canadensis* plants in a static water tank growing in temperatures fluctuating between 22 and 30°C showed a 25% decrease in leaf length. Barko *et al.* (1982) concluded that *E. canadensis* is most responsive to differences in light when at optimum temperature levels and vice versa. In the present work, *E. nuttallii* and *E. canadensis* grown in the same substrate under differing light intensities at 19°C showed variation somewhat similar to that of wild plants in August and September, particularly in leaf shape and size. The light and temperature regimes in these experiments were designed, within the limits of the equipment available, to reproduce conditions equivalent to that of the sampling sites in late August or September. Therefore it is likely that the phenotypic plasticity shown by the two species is in response to variation in light and temperature.

The effects of these two factors might be as follows: except at the lowest light intensity, an interaction between the two factors produces longer, narrower leaves and longer internodes. At the highest light intensity, a high temperature (c.27°C and above) is required to produce the longer, narrower-leaved form, but as the light intensity decreases the optimum temperature similarly decreases. Such high temperatures are rarely experienced by plants in the British Isles. Therefore material receiving the highest light intensity will usually have short, broad, mid- or dark green leaves and short internodes. Where light intensity is reduced, ideal conditions will occur for the production of long, narrow, light green leaves and longer internodes. Thus the shorter, broader-leaved phenotype typically occurs when the plants are close to the water surface, whereas the long, narrow-leaved phenotype occurs in deeper water. The latter may also be present near the surface when light intensity is reduced due to shading or turbidity of the water.

The phenotypes described above demonstrate obvious adaptations to sun and shade conditions. However, a problem arises in relation to material growing at the lowest light intensities in deep water, such as that found at 3 m in Windermere. It appears that at the lowest light intensity, plants show characters which are intermediate between the short, broad-leaved and long, narrow-leaved phenotypes. This suggests that another environmental factor, not previously considered, might be involved. One such factor is pressure. It has been argued that pressure may limit the depth distribution of aquatic macrophytes (Gessner 1952), although this has been disputed (Bodkin *et al.* 1980; Spence 1982). However it is possible that morphological and anatomical adaptations might occur which combine extra rigidity with the need to maintain leaves capable of utilising low light intensity in an efficient manner. This may be worthy of further investigation.

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Alchemilla gracilis Opiz, a species new to the British flora

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ABSTRACT

Alchemilla gracilis Opiz, a widespread species in northern and Central Europe not previously known with certainty in the British Isles, was found in 1976 in Northumberland. The diagnostic characters of the species are described, and its status in Britain is discussed in the light of the distribution of related *Alchemilla* species.

INTRODUCTION

In May 1976 G.A.S. was informed by Mr M. Braithwaite, a local botanist, of an interesting site near Cockplay, north-west of Hexham, Northumberland, v.c. 67, where the sheep-grazed turf of an old lime quarry contained some local plant species. He visited the locality on 13th June 1976 and made a detailed species list, which included *Alchemilla filicaulis* subsp. *vestita* (earlier identified by Mr Braithwaite) and a second, quite distinct *Alchemilla* which G.A.S. was unable to identify. He therefore collected a small quantity of flowering material and sent the pressed specimens at the end of the season to S.M.W. for determination. These were, unfortunately, not examined by S.M.W. until December 1977, but when they were finally dealt with, they turned out to be the European *Alchemilla* species, *A. gracilis* Opiz, never previously certainly reported in Britain. On 16th June 1978, S.M.W., together with G.A.S. and some botanical colleagues, visited the site and studied the population in detail; they also saw two other nearby sites where the species had been discovered by Mr Braithwaite since the confirmation of the plant at the original locality.

(S.M.W. apologises for the inordinate delay in publishing details of this remarkable discovery, and wishes to make clear that he has been solely responsible for that delay.)

ALCHEMILLA GRACILIS AND ITS DISTINCTION FROM OTHER SPECIES OF *ALCHEMILLA*

Alchemilla gracilis (*A. micans* Buser) belongs to a group of microspecies of the *Alchemilla vulgaris* aggregate which are reasonably well characterised on morphological, distributional and ecological grounds. They are in the subseries *Hirsutae* H. Lindb., species 41–53 in the treatment in *Flora Europaea* (Walters 1968; see also Lippert & Merxmüller 1975). Three of them constitute a remarkable group of continental *Alchemilla* species centred on Upper Teesdale in Britain: these are *A. monticola* Opiz, *A. subcrenata* Buser and *A. acutiloba* Opiz, all medium to large plants with spreading hairs present on stems and petioles and (at least to some extent) on both surfaces of the leaves. In many parts of Central and northern Europe these three species are frequently found growing together, in hay-meadows, on roadsides, etc., and are often accompanied by the fourth member of the group, *A. gracilis*. In sub-alpine regions of Central Europe, and in parts of Scandinavia, the common '*vulgaris*' Alchemillas belong to this group, *A. monticola* being in general the commonest of all.

PLATE 1. Herbarium specimen of *Alchemilla gracilis* collected in Teesdale in 1924. (Photograph by P. F. Yeo).

In view of this general pattern of correlated distribution in Europe, the possibility that *A. gracilis* was also a member of the Upper Teesdale flora has long been in the minds of British botanists studying *Alchemilla*; thus Walters (1949, 1952) wrote "*A. gracilis* Opiz . . . should be looked for in Teesdale, particularly in view of the fact that there is a single inadequate specimen (Druce in Herb. Mus. Brit.) which is doubtfully referable to this species." This specimen, annotated by A. J. Wilmott as doubtfully attributable to *A. gracilis* by S.M.W. in 1947, and seen again and annotated by S.M.W. in 1953, lay neglected in the British Herbarium at **BM** until G.A.S. re-found it after his discovery of the living plant in Northumberland. The reason for this neglect was two-fold. S.M.W. was in any case cautious in identifying the plant from a single gathering, and the very detailed study conducted during the 1950s by Dr Margaret Bradshaw failed to discover any *A. gracilis* in the Upper Teesdale area. (See Bradshaw (1962, 1985) for comments on this.)

The sheet in question is, however, undoubtedly referable to *A. gracilis*. It was collected (as '*A. pastoralis*', i.e. *A. monticola*) by Francis Druce at Langdon Beck in Upper Teesdale on 12th August 1924. The material is quite adequate for critical determination, although much of the ripe fruit has already been shed from the inflorescences. It is probably 'second-growth' material from a rather disturbed, perhaps road-side, habitat. Such plants growing with *A. monticola* and *A. acutiloba* are not easy to detect. This sheet remains the sole evidence that *A. gracilis* grows (or once grew) in Teesdale (Plate 1).

The unequivocal identification of *Alchemilla* microspecies depends on the availability of well-grown summer flowering specimens complete with some basal leaves. Grazed plants, even if flowering, and second growth late in the season may be unidentifiable. On the other hand, the characters of importance in *Alchemilla* taxonomy, especially the hairiness and leaf-shape, are retained very satisfactorily in well-prepared pressed specimens, so that detailed study is entirely practicable in the herbarium. It is further true that some *Alchemilla* species have very characteristic appearances in the living state so that, with experience, field identification of technically inadequate material may be entirely reliable. This is the case with *A. gracilis*, and it is interesting that G.A.S., who had never seen the plant before, saw that even in its grazed state it was quite distinct from *A. filicaulis* subsp. *vestita* with which it was growing.

The characters shared by the group of four widespread European *Alchemilla* species related to *A. monticola* can be listed as follows:

1. Petioles and (at least) lower part of stems with erecto-patent or patent hairs (i.e. spreading at approx. 45° or 90°). This separates *A. glabra*, a common species in Northern England and Scotland, which has sparse, appressed hairs on petioles and the lower part of stems.
2. Upper surface of mature summer leaves hairy at least in the folds. This separates the other common northern British *Alchemilla*, *A. xanthochlora*, which has glabrous upper leaf surfaces.
3. At least the pedicels of the flowers glabrous. This separates *A. filicaulis* subsp. *vestita*, the most widely-distributed British species, which has some hairs even on the pedicels, and also the (very local) *A. glaucescens*, a relatively small plant with dense indumentum throughout all parts of the plant.

Plants possessing leaves with hairs on the upper surface are therefore worth careful inspection: if the pedicels (and especially if the inflorescence in general) are glabrous, then the species is likely to be a rare or local one in Britain.

Within this group of species related to *A. monticola*, discrimination of *A. gracilis* is easy, because the hair covering, especially on the petioles, is erecto-patent (45° angle), *not* more or less patent (90°). This quality in the indumentum is shown also on the leaf-surfaces and particularly on the veins beneath the leaf, and gives the live plant a characteristic silky sheen (referred to in the name *A. micans* given to the species by Buser). Indeed, the indumentum sometimes approaches that of the arctic-alpine species *A. glomerulans*, though leaf-shape and particularly hypanthium-shape easily distinguish the two species. Growing in grazed turf mixed with *A. filicaulis*, *A. gracilis* can readily be picked out by the silky erecto-patent hair covering: as G.A.S. demonstrated in the field in 1978, individual leaves could also be distinguished in that they were usually 9-lobed, whereas the *A. filicaulis* leaves were 7-lobed.

Two other diagnostic features are shown by *A. gracilis*. The first, which seems to be very reliable even in grazed material which may have only poorly-developed inflorescences, is the shape of the hypanthium in flower. Uniquely in *A. gracilis* this is narrow with a base cuneate in outline (see Fig. 1). If the inflorescence is reasonably well-grown, the other diagnostic feature becomes evident: the

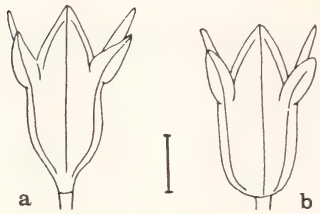

FIGURE 1. Diagram of hypanthium shape in (a) *Alchemilla gracilis*, (b) other British species of the subseries *Hirsutae*. (Adapted from Lippert & Merxmüller 1975.) Scale bar = 1 cm.

branching of the inflorescence is rather sparse, and the whole inflorescence is narrow and relatively few-flowered. Combined with the erecto-patent or even sub-appressed indumentum, this gives the inflorescence a very characteristic appearance (Plate 1). Leaf-shape, as in most *Alchemilla* species, is too variable to be a very reliable diagnostic character, but a well-grown summer leaf of *A. gracilis* is reniform to reniform-orbicular in outline, with a narrow but open sinus (that is, the lobes do not overlap to cover the junction of the blade and the petiole). In this respect the leaf is rather intermediate in shape between the reniform leaf of *A. filicaulis*, which usually has quite a wide sinus, and the more or less orbicular leaf of *A. monticola* in which the basal lobes usually overlap. (The coloured illustrations of leaves of *Alchemilla* in Garrard & Streeter (1983) include *A. gracilis*, and are recommended for their accuracy.)

The early flowering of *A. gracilis* seems to differentiate it from most other *Alchemilla* species with which it might be confused. Thus, G.A.S. recorded it in full flower at the Cockplay locality on 16th May 1984, at least one week in advance of *A. filicaulis* subsp. *vestita* growing with it. Plants which S.M.W. has cultivated (from one of the Coldwell localities) since 1978 also come into flower early every year. If this phenological difference is consistent, it may explain why the species remained undetected for so long in mixed populations, for the inflorescences in cultivation are shedding ripe seed and becoming relatively inconspicuous by late June or early July, and the whole plant could become covered by competing vegetation in the wild.

DESCRIPTION OF THE LOCALITIES

In the locality near Cockplay, where G.A.S. first detected the plant, the population in June 1978 was estimated to contain in the main site some 100 separate plants (or small clumps) mostly concentrated in an area of some 30 × 10 m of heavily-grazed, more or less closed, grassland turf.[1] Nearby, in the same field, a smaller population in more broken turf on a small limestone outcrop contained an estimated 30 or 40 plants. In the main site, there was some admixture with *A. filicaulis* subsp. *vestita*, and in the subsidiary site the two species of *Alchemilla* seemed about equally common. The history of the site is not known, but is presumed to have been worked for lime; it is on the junction of limestone and the Whin Sill rock, and the surface limestone explains the exceptionally species-rich grassland turf. Associated species listed on 13th June 1978 were: *Agrostis capillaris*, *Anthoxanthum odoratum*, **Avenula pratensis*, *Bellis perennis*, *Briza media*, *Cerastium fontanum*, *Cynosurus cristatus*, *Deschampsia cespitosa*, *Festuca ovina*, *F. rubra*, **Galium verum*, *Holcus lanatus*, **Koeleria macrantha*, *Lotus corniculatus*, *Plantago lanceolata*, **Plantago media*, *Potentilla erecta*, *Ranunculus bulbosus*, *Sanguisorba minor*, *Taraxacum cf. brachyglossum*, *Thymus drucei*, *Trifolium pratense*, *T. repens*, *Viola riviniana*. (*Species indicating relatively calcareous soil.)

The two other localities discovered in 1978 are near Coldwell, about 1 km from the original one. Both sites were visited on 13th June 1978 and in one of these there was a small population of

[1] This estimate was, apparently, too small: Dr A. J. Richards surveyed the population on 8th May 1984 and estimated the *flowering* plants of *A. gracilis* to number 800 ± 100.

A. gracilis in a damp corner of a roughly-grazed pasture. At the other locality nearby, there were a few clumps of separate individual plants with lax, somewhat etiolated inflorescences up to 50 cm tall growing in lush ungrazed meadow with competition from tall coarse grasses, especially *Dactylis glomerata*. Associated spp. here were: *Alopecurus pratensis*, *Bellis perennis*, *Cerastium fontanum*, *Cirsium arvense*, *Cynosurus cristatus*, *Festuca rubra*, *Lolium perenne*, *Plantago lanceolata*, *Plantago major*, *Poa annua*, *Poa trivialis*, *Ranunculus acris*, *Rumex acetosa*, *Rumex obtusifolius*, *Taraxacum* sp., *Veronica chamaedrys*, *Veronica serpyllifolia*.

Neither locality showed any unusually rare or local species, and indeed seemed quite unremarkable. In the ungrazed meadow, the lack of grazing was possibly a recent factor: some species (including the *Alchemilla* itself) seemed rather etiolated and not well adapted to the vigorous competition by the grasses.

After 1978, G.A.S. kept a sharp look-out during extensive botanical study of Northumberland for new localities for *A. gracilis*, but it was not until 1985 that he was successful. The new locality near Sharpley is in the general area of the 1976 discoveries, and consists of grassland on a roadside verge, where *A. gracilis* was found growing with *A. filicaulis* subsp. *vestita*. The adjacent field had relatively species-rich calcareous grassland with much *Poterium sanguisorba* and other calcicoles such as *Plantago media*, but G.A.S. could not find *A. gracilis* in the field.

STATUS AND DISTRIBUTIONAL SIGNIFICANCE

A. gracilis, as we have explained, has a wide distribution in Central and northern Europe essentially similar to that of the other three related species *A. monticola*, *A. subcrenata* and *A. acutiloba*; such distributions are characterised as Northern-Montane (Matthews 1955) and are shown by several other British species, including e.g. *Primula farinosa*. Its discovery in the north of England is therefore not unexpected. On the other hand, the three other species are centred in the Upper Teesdale area (if we neglect two apparently casual and non-persistent records for *A. monticola* elsewhere), where the flora already has a remarkable assemblage of rare and local species, including two other *Alchemilla* species, *A. glomerulans* and *A. wichurae*, with montane distributions in Britain.

Bradshaw (1962) discusses the status of the Northern-Montane group of *Alchemilla* species in the Teesdale area, and concludes that a hypothesis of survival and secondary expansion from a wider Late-Glacial distribution, which might reasonably be applied to the Arctic or Arctic-alpine species *A. wichurae* and *A. glomerulans*, has little to support it for the Northern-Montane group, though clearly it cannot be ruled out. She points to the almost complete absence for these three species of any natural habitats. They are strongly synanthropic, both in Teesdale and also in Scandinavia where much information is available (see especially Sjörs (1954) and Samuelsson (1943)). She considers the possibility of accidental introduction as hay-meadow 'weeds', or even intentional introduction as medicinal '*Alchemilla vulgaris*' in historic time, and concludes that the question of their origin remains an entirely open one.

Samuelsson (1943) gives a detailed discussion of the Scandinavian distribution of *A. gracilis*, and shows that it is not significantly different from that of *A. monticola* and *A. acutiloba* – except that there is a curious, unexplained absence from Western Finland, a feature not shown by the other two species. Even more so than *A. monticola*, *A. gracilis* is a ruderal plant in Scandinavia, being particularly common in artificial park grassland and on roadsides, but readily colonizing from such sites into hay meadows and pastures. The spread of the species in recent historic time is reasonably well documented in particular localities both in Norway and Sweden where the *Alchemilla* flora has been critically surveyed over a sufficiently long period to record such a spread. Thus Samuelsson himself was certain that the species spread in his own life-time in the vicinity of his birthplace (the town of Strängnäs in Södermanland) from an initial record in 1910. This assessment accords well with the fact that Sjörs (1954) does not record *A. gracilis* from the (relatively old) synanthropic hay meadow communities of Dalarna (Sweden) where he made a special study. Indeed, it seems that throughout Fennoscandia *A. gracilis* occurs rarely in even semi-natural habitats until one reaches the Finnish-Russian frontier region, where it is recorded in open deciduous woodland and assessed as a truly native species (Fagerström 1939–40; cited in Samuelsson 1943, p. 35). In European Russia, the species is common in a variety of habitats; for

example, Tikhomirov (1969) states that in the Moscow region: "it often grows in abundance" and "possesses perhaps the broadest ecological range among our [species of *Alchemilla*], being often found in dry meadows, on hillsides, in shady forests, etc." The species extends into W. Siberia, outside the boundary of Europe as adopted for *Flora Europaea* (see Juzepczuk, 1941, p. 348).

The nearest Continental localities to Britain are in the Low Countries; here there seems to be some evidence that *A. gracilis* is still extending its range, though the belated recognition of the species in the flora of a particular country cannot, obviously, by itself be taken as evidence of its recent introduction. For a discussion of the status of the species in Belgium see Sougnez & Lawalrée (1956, 1959), and in Luxembourg see Reichling (1969).

What light does this throw on the newly-discovered British occurrences of *A. gracilis*? Firstly, we can say that, since they are all within a small area, a relatively recent introduction and spread from a Continental source seems quite probable. On the other hand the Cockplay locality – grazed limestone turf – is emphatically *not* a crudely artificial new habitat, and the population there certainly gives the impression of relative age. Secondly, we have to admit that there is a great deal of northern England for which systematic and careful *Alchemilla* recording, such as Bradshaw (1962) undertook for Teesdale and Weardale, has not been done, so that we have no idea whether the newly-discovered *Alchemilla* is really so rare and local. If we have to conclude with Bradshaw that the case for the native status of the Northern-Montane Teesdale Alchemillas is wholly uncertain, the same doubt must remain over the Northumberland records of *A. gracilis*. It is a challenge to sharp-eyed northern botanists to extend the known range of this interesting addition to the British flora.

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The coastal ecodeme of *Parnassia palustris* L.

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ABSTRACT

Cultivation and breeding experiments have shown that *Parnassia palustris* L. var. *condensata* Travis & Wheldon (Parnassiaceae), a coastal ecodeme, retains its characteristic, dwarf, clumped habit and larger ratio of flower diameter to stem height in cultivation, and breeds true from seed. Its taxonomic rank of variety is therefore upheld, and its name is lectotypified by a specimen collected by J. A. Wheldon from W. Lancs., v.c. 60. It has two cytodemes, with 2n = 18 and 36.

MORPHOLOGICAL VARIATION

The existence of a distinctive, coastal ecodeme of *Parnassia palustris* L. in the British Isles had been known for some time (Hall 1839; Wheldon & Wilson 1907; Druce 1911) before it was given taxonomic rank as var. *condensata* (Travis & Wheldon 1912). It was described from "the sand-dunes on the coasts of Lancashire and Cheshire", and was distinguished from var. *palustris* by the following characters: shorter stature; branched rhizome producing more (4–20) and thicker (1·5–1·6 mm in diameter) stems; more tufted basal leaves, the laminae of which are usually as long as or longer than the petioles (rather than shorter); a cauline leaf immersed amongst, or only slightly protruding above the basal leaves (rather than elevated); larger flowers (25–37 mm or more in diameter); and a larger capsule (12–16 mm long). In order to examine these differences, measurements were made of British and Irish specimens of *P. palustris* at **BM**, **CGE**, **DBN**, **E**, **LIV**, **LTR**, **NMW**, **RNG** and **TCD** for the characters listed by Travis & Wheldon (1912). It became clear that these authors underestimated or, in some cases, misjudged the amount of variation to be found within each variety, such that the actual differences between the characters are less clear-cut than they claimed (Table 1), and a distinction between the varieties must be made on the characters considered in combination. For example, variation in stem height and especially in flower diameter is such that any distinction based on these characters individually is either impossible or at best very difficult. However, when the two characters are considered together, the pattern of variation in each variety is different. In var. *palustris* short specimens usually have proportionally smaller flowers, whereas in the dwarf var. *condensata*, the reduction in flower size is much less marked. Thus, when flower diameter is considered as a ratio of stem height, the two varieties can be distinguished much more reliably, and indeed this ratio is probably the best discriminant for use in the field (Table 1).

CULTIVATION AND BREEDING EXPERIMENTS

Cultivation and breeding experiments were conducted to discover whether the coastal ecodeme is merely an environmentally-induced variant (Melvill 1912; Marshall 1913), or whether its features are due directly to genetic factors (Wheldon & Travis 1913). Previous attempts at cultivation have produced different results, partly perhaps because, by general agreement, the species is difficult to grow and maintain in cultivation. Wheldon & Travis (1913) reported that samples of var. *condensata* from S. Lancs., grown by Prof. K. Graebner in Berlin, retained their characteristic features. In contrast, a later but similarly undocumented report stated that var. *condensata* reverted to "average size and habit" after two years in cultivation, becoming indistinguishable from var. *palustris* (Salisbury 1952: 271, 278).

TABLE 1. CHARACTERS USED TO DISTINGUISH VAR. *CONDENSATA* FROM VAR. *PALUSTRIS*
Measurements of wild plants are from herbarium specimens. Measurements of cultivated plants are quoted as means and standard deviations; the statistical tests were applied to these data only.

	Wild		Cultivated[a]	
Character	*palustris*	*condensata*	*palustris*	*condensata*
Stem height, mm	100–330(–512)	30–150(–230)	186±60	102±66*
Height of cauline leaf above ground, mm	(10–)20–170	5–40	37.5±21.4	30.2±18.0
Basal leaf petiole length: lamina length ratio	(1–)2–6	0.4–3(4)	1.7±0.4	1.9±0.6
Rhizome branched	usually sparingly	usually extensively	usually sparingly	usually extensively
Number of basal leaves[b]	—	—	14±6	28±10*
Number of stems	1–6(–32)	(1–)4–15(–34)	2.0±1.0	3.9±3.2
Stem diameter, mm	0.5–1.5	0.5–2.0	1.3±0.4	1.5±0.5
Flower diameter, mm	15–35	15–35	22.8±4.2	25.0±6.0
Flower diameter: stem height ratio	0.04–0.23	0.15–0.76	0.14±0.04	0.40±0.32**
Capsule length, mm	(6–)9–13	8–15(–20)	9.2±2.3	10.1±1.7

[a] Mann-Whitney U-test on cultivated plants:– **significant difference, $P \leq 0.01$; *significant difference, $P \leq 0.05$; all other characters not significantly different. Origins of ramets, sample sizes in parentheses:– Var. *condensata*: Ainsdale, S. Lancs., v.c. 59 (5); Tentsmuir, Fife, v.c. 85 (3); Loch Spiggie, Shetland, v.c. 112 (2). Var. *palustris*: Monks Dale, Derbys., v.c. 57 (3); Malham Tarn, Mid-W. Yorks., v.c. 64 (4); Lochranza, Clyde Is., v.c. 100 (3).
[b] Character not used by Travis & Wheldon (1912).

In view of these conflicting reports, I undertook a small cultivation experiment in which transplanted material of both var. *condensata* and var. *palustris* was grown side by side in a glasshouse (Table 1). Ramets taken from plants in the wild were planted in a mixture of 3:1 compost and sand in 7·5 cm plastic pots, and grown in a mist unit; I found this to be the most satisfactory method of maintaining plants in a healthy condition. The duration of cultivation varied, but was usually about 12 months (up to three years in some cases), and the period always included the development of the flowering phenotype from the dormant rhizome.

Three features of var. *condensata* remained distinctive in cultivation: its shorter stems; its larger flower size relative to stem height; and its greater degree of rhizome branching, a character reflected also in the larger number of basal leaves (Table 1). The other differences seen in the field, particularly the position of the cauline leaf and the relative lengths of the petiole and lamina of the basal leaves, tend to disappear in cultivation, with var. *condensata* becoming like var. *palustris*.

Most plants were cultivated for about a year, after which they were pressed, but it is worth noting that the individuals of var. *palustris* from Malham Tarn and of var. *condensata* from Tentsmuir, which were grown for three years, retained their different morphologies as outlined above.

Confirmation that the flower, stem and rhizome differences are under genetic and not environmental control came from a breeding experiment. Self-pollination of cultivated plants of var. *condensata*, collected from Ainsdale, produced full capsules of seeds, showing the plants to be self-compatible. Twelve S_1 seedlings were randomly selected to be raised to maturity. Five of them flowered in their first year, five succumbed to attack by vine weevil and two have remained in a vegetative state. The five flowering plants were all very similar and showed the characteristically large flowers and short stature. The only important difference between the S_1 generation and the parental plants was in the number of stems produced. All S_1 plants had but a single stem, although examination of the rhizomes revealed them to have branched into three or four shoots; these may eventually each produce a flowering stem of their own, thereby generating the clumped appearance typical of var. *condensata*. Seed collected from a wild population of var. *condensata* in Orkney produced similar plants. In contrast, plants of var. *palustris* grown from seed collected in

FIGURE 1. Silhouettes of representative specimens of *Parnassia palustris* grown from selfed seed; (a) var. *palustris*, from an Argyll parent; (b) var. *condensata*, from an Ainsdale parent.

Argyll were taller, had smaller flowers relative to stem height, and rhizomes that were less branched (1 (−4) flowering shoots). Representative specimens of both varieties grown from seed are illustrated in Fig. 1.

CONCLUSIONS

The conclusions to be drawn from the herbarium studies and the cultivation and breeding experiments are: i) that *P. palustris* var. *condensata* is a coastal genoecodeme, which constitutes the characteristic variant of the species in machair-type habitats, usually dune-slacks, or in the short turf on the tops of sea-cliffs; and ii) that it is appropriate to award it taxonomic recognition at the rank of variety, because it is a local rather than a consistently regional variant (Du Rietz 1930).

Some comment should be made here on the contrary results obtained by Salisbury (1952) mentioned earlier. It is possible that more than one coastal variant exists, and that Salisbury's material represented an environmentally induced, phenotypic copy of var. *condensata*. Such plastoecodemes sometimes occur in coastal populations with an otherwise genetically fixed phenotype (Akeroyd, in press), but how frequent such plants may be in populations of var. *condensata* is unknown.

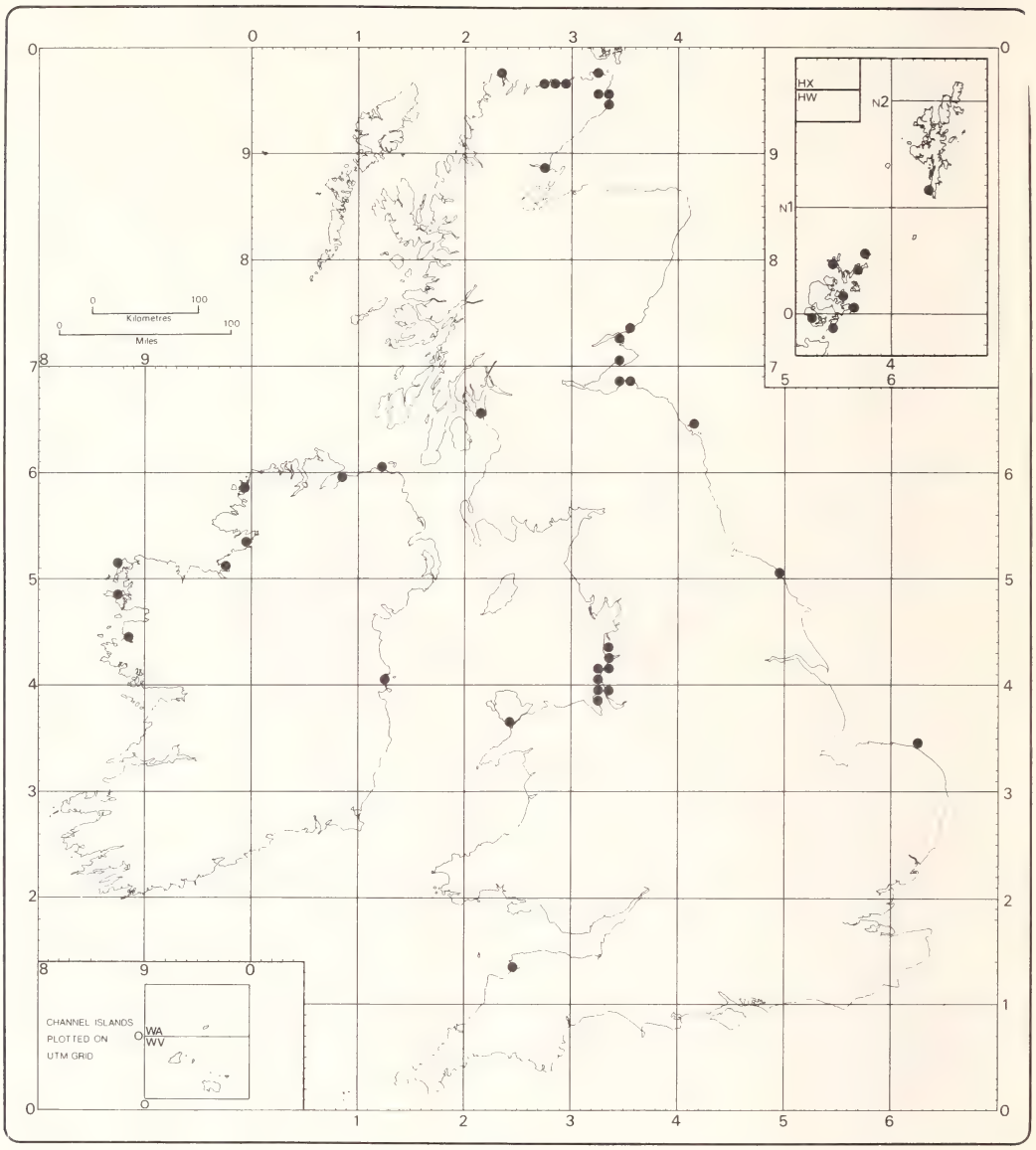

FIGURE 2. Distribution of *Parnassia palustris* var. *condensata* in the British Isles (all records).

TAXONOMIC ACCOUNT

The following description is based entirely on specimens from Great Britain and Ireland.

PARNASSIA PALUSTRIS L. var. *CONDENSATA* Travis & Wheldon in *J. Bot., Lond.*, 50:256 (1912). TYPE: N. of St Annes, [W. Lancs., v.c. 60], Sep. 1900, *J. A. Wheldon* (Lectotype: **NMW**, designated here).

Rhizome usually much-branched. Stems (1–)4–15(–34), usually less than 15(–23) cm tall, diameter 0·5–2 mm. Basal leaf lamina 8–25 × 7–20 mm, petiole 7–30(–40) mm, usually less than 1·5 times as long as the lamina. Cauline leaf cordate or amplexicaul, rarely deltoid, 5–25(–30) × 3–25 mm,

positioned 5–40 mm from base of stem, the apex of the leaf often level with or below the point to which the apices of the basal leaves reach when positioned alongside the stem. Flowers 15–35 mm in diameter, usually 1/5 or more of stem height; sepals 4–10 × (1–)2–4 mm; petals 6–16 × 5–12 mm, with 7–11 veins; staminode lamina 2–3 mm, longer than broad, narrowed abruptly or tapering to a claw, bearing 7–14 filiform divisions, 2–4 mm long; filaments 3–6 mm; anthers 2–3 mm. Capsule ovoid to globose, obtuse or rounded at the apex, 8–15 (–20) × 9–16 (–21) mm. Chromosome number, 2n = 18, 36 (Gornall unpublished, based on native material).

There are no Travis or Wheldon specimens predating the protologue in W. G. Travis's herbarium at **LIV**. Therefore, I have designated the Wheldon specimen from the latter's herbarium at **NMW** as the lectotype because it is the only one which obviously pre-dates the protologue and is fairly characteristic of the variety. Far better material, collected from Freshfield, S. Lancs., v.c. 59, was widely distributed by Wheldon (1913) as part of a Botanical Exchange Club distribution, but I have been unable to discover whether it was collected before the protologue was published (both are dated August 1912).

DISTRIBUTION

The distribution of var. *condensata* in the British Isles, based on herbarium specimens, is shown in Fig. 2. Records are from the following vice-counties: 4, 27, 52, 58–60, 62, 67, 68, 82, 85, 90, 100, 107–09, 111, 112, H21, H27, H28, H34, H35, H39 and H40. Some populations of *P. palustris* from cliff-tops on the coast of Co. Durham, v.c. 66, are referable to var. *palustris* and grow in a wet meadow habitat, rather than in short turf. Some plants of var. *palustris* from exposed, inland populations (often at high elevations) may resemble var. *condensata* in their dwarf, compact habit, although they usually do not have the characteristically large ratio of flower diameter to stem height. Whether this dwarfness is genetically fixed or not is unknown.

In Europe, var. *condensata* has been collected from dune-slacks in north-western France (Brittany), the Netherlands and Denmark, and, like many coastal ecotypic variants (Akeroyd in press), it appears to be restricted in its occurrence to north-western Europe; southwards and eastwards it grades into var. *palustris*.

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Conyza sumatrensis (Retz.) E. Walker established in England

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ABSTRACT

Conyza sumatrensis (Retz.) E. Walker has achieved a coherent distribution pattern through the Thames estuary to eastern London. The implications are examined, together with a résumé of its earlier colonization of France and the Channel Islands. The habitat requirements of *C. sumatrensis*, *C. bonariensis* (L.) Cronq. and *C. canadensis* (L.) Cronq. are compared, and a key is given for their identification.

DISCOVERY IN LONDON

On 26th September 1984, I first observed *Conyza sumatrensis* (Retz.) E. Walker on the English mainland, well established by the River Lea towpath from Old Ford to Bromley-by-Bow, in the London Borough of Newham. Previously, the British literature had reported this robust fleabane only from Guernsey (Jee 1962) as *C. bonariensis* (L.) Cronq., and from Jersey (McClintock 1975) and Sark (Ryan 1977) under the present name. In 1980, I noted its widespread occurrence in the first two of these islands, and, as it self-sowed annually in my garden since then, it was still possible to compare fresh Sarnian material with the new Lea-side plant. D. McClintock (pers. comm.) also confirmed that they belonged to the same species.

PRESENT DISTRIBUTION IN EASTERN AND CENTRAL LONDON

Between October 1984 and October 1986, I found *C. sumatrensis* occupying over 40 urban sites, sometimes abundantly, and often close to the River Thames and/or its associated waterways. My current records for each London borough are summarized as follows.

Newham, v.c. 21: from Old Ford (GR 51/378.832) to Bromley-by-Bow (GR 51/382.823), plentiful along c. 2 km of River Lea towpath, in ancient concrete fissures and wall crevices, with much *Chenopodium ambrosioides* and *Hirschfeldia incana*.

Tower Hamlets, v.c. 21: a) Carpenter's Road (GR 51/374.845). One large plant in factory forecourt. It had more deeply sinuately-cut lower leaves, rather *Coronopus*-like, and smaller, less pubescent capitula, appearing somewhat intermediate to *C. canadensis* (L.) Cronq., but too sturdy, stout and fertile for an F_1 hybrid. I have seen similar plants of Spanish origin in **BM**. b) Regent's Canal from Victoria Park (GR 51/348.835) south-eastwards to Limehouse (GR 51/364.812), scattered individuals on and below the towpath wall. c) Limehouse Basin (GR 51/364.811), abundant and very vigorous on quayside, mostly at foot of south-facing brick wall. d) from Ratcliff (GR 51/360.810) to Shadwell (GR 51/354.808), frequent by pavements and on concrete dump. e) Shadwell Basin (GR 51/352.807), frequent on stony waste ground. f) Wapping (GR 51/345.801), two plants on roadside. g) Wapping (GR 51/343.804), several plants on gravelly waste ground. h) Stepney (GR 51/353.817), pavement weed with *Sorghum halepense*.

Hackney, v.c. 21: a) Upper Clapton (GR 51/355.867), one casual plant on concrete path by Middlesex Wharf. b) Stamford Hill (GR 51/337.878), one casual plant on pavement by school wall. c) Stoke Newington (GR 51/332.870), stony waste ground behind Abney Park Cemetery, five large plants amid a mixed colony of *Atriplex prostrata* and *A. prostrata* × *longipes*. d) Shacklewell (GR 51/341.858), two plants on sheltered footpath. e) Graham Road (GR 51/

344.847), three plants as garden weeds in warm, sheltered hollow. f) London Fields (GR 51/345.845), pavement and shrubbery weed, several plants surprisingly mixed with *Rumex palustris* and *Atriplex littoralis*. g) Regent's Canal, from Victoria Park (GR 51/348.835), north-westwards to De Beauvoir Road (GR 51/328.838), small scattered colonies frequent along brick walls. h) Homerton (GR 51/355.845), widespread street weed.

Islington, v.c. 21: Regent's Canal, from De Beauvoir Road (GR 51/328.838), south-westwards to Danbury Street (GR 51/318.835), several small colonies on brick walls.

Haringey, v.c. 21: by Finsbury Park (GR 51/313.874), one plant atypically and casually on rough grassy verge of Parkland Walk, the most north-westerly of all European records to date.

Lambeth, v.c. 17: by Westminster Bridge, opposite County Hall (GR 51/306.796), two small plants at the foot of a concrete wall.

Southwark, v.c. 16: Peckham Rye Park (GR 51/345.754), one plant on a roadside.

Logically, one would now expect frequent occurrences close to the Thames in the Bermondsey, Rotherhithe, Deptford, Greenwich, Isle of Dogs, Poplar and Canning Town areas; further investigations are needed. It should also be more frequent in central London than the above records indicate, but it has not yet been found naturalized anywhere west of London.

OTHER THAMES-SIDE RECORDS

Palmer (1983) not only reported *C. bonariensis* (now redetermined as *C. sumatrensis*) from stony waste ground near Blackfriars, in the City of London, but also referred to a strong colony established at least since 1977 at Chalkwell, S. Essex, v.c. 18. The latter was first found in 1974 by R. M. Payne (Rand 1975), and E. J. Clement (pers. comm.) further states that R. M. Payne had identified two colonies at Westcliff-on-Sea. Additionally, R. B. Hastings (Burton 1985) detected a large stand of the species on Rainham Marsh in 1984, and G. D. Kitchener (pers. comm.) discovered a plant at Swanscombe, N. Kent, v.c. 16, in 1985.

True *C. bonariensis*, which is closely related, has, to the best of my knowledge, only occurred in Great Britain as an ephemeral shoddy alien.

FRENCH RECORDS

C. bonariensis, presumably sensu stricto, has long been known as an established alien in the south of France, either by the name *Erigeron crispus* Pourret (Bonnier & Layens 1909) or as *Conyza ambigua* DC. (Le Maout & Decaisne 1855). Rouy (1927) also noted its occurrence in Corsica. More significantly, De Langhe *et al.* (1973) mention "*Erigeron crispus* Pourret" as an adventive in Belgium, Luxembourg and northern France, but there is no description given and thus no way of ascertaining which *Conyza* species is intended; at such temperate latitudes, *C. bonariensis* s.s. would indeed be adventive, but one would, by that date, expect *C. sumatrensis* to have naturalized itself locally in the region. Fournier (1961) had already made a clear distinction between the two; the latter, as *Erigeron naudinii* (Bonnet) G. Bonnier, is described as very rarely naturalized in Var, Aude, Pyrénées Orientales, etc., and of unknown origin. An interesting footnote claims that "les vrais *Conyza* ont les styles plus longs que les corolles; ce qui n'est pas le cas ici."

Neither Mérat (1812) nor Cosson & Germain (1845) nor even Jeanpert (1977) mention any *Conyza* species other than *C. canadensis* occurring in the Parisian region. However, in October 1984, personal observations of *C. sumatrensis* growing plentifully on gravelly roadsides in the Aulnay-sous-Bois, Bondy and Blanc-Mesnil suburbs (about 15km north of Paris) revealed that its recent northward progress had extended on a broader west-to-east front than is indicated in Jovet & Vilmorin (1975). This suggests that De Langhe *et al.* (1973) may either have overlooked or misnamed it in the countries listed above. It also supports the hypothesis that our present Thames estuarine and metropolitan populations arose from wind-blown seed originating in north-eastern France rather than the Channel Islands. Clearly, further records from northern Europe generally would now be very helpful in placing our London colonies into a wider context.

It is also relevant to recall that the decade 1974–1984 enjoyed exceptionally frequent hot summers, with prolonged spells of dry, south-easterly winds. These conditions favoured not only the establishment of *C. sumatrensis* here, but also encouraged other highly drought-resistant Continental species such as *Picris hieracioides* and *Hirschfeldia incana* to extend their British range and abundance quite dramatically. Nowadays, they often grow together in London, an association unheard of ten years ago.

AUTECOLOGIES OF THE THREE *CONYZA* SPECIES

From my own research carried out near Los Angeles, California, in June 1984, it became apparent that naturalized *C. bonariensis* would seek the extra warmth of narrow pavement cracks and tight wall crevices, even given a climate more tropical than that prevailing in the Mediterranean. *C. sumatrensis*, also a marked thermophile, again favours arid, sun-baked niches, but to a lesser degree, and this has enabled it to spread as far northwards as London. *C. canadensis*, the least demanding of the trio, profusely colonizes cold, bare, loose soil and gravel in rural and urban areas alike, but still remains adaptable enough to produce stunted, rather woody (sometimes biennial?) plants in the same stone and concrete heat-traps which are actually sought by the other two. As a result, I have found it almost always accompanying *C. sumatrensis*, both in London and in Paris, the relative vigour of each species doubtlessly influenced by the relative heat-retentiveness of each substrate.

A marked degree of moisture intolerance in *C. canadensis* is implied by the *Atlas* (Perring & Walters 1962) whose numerous distribution dots cluster most closely in the driest south-eastern and East Anglian regions; the species is not recorded from Scotland or Ireland at all. For a similar reason, London may now represent the north-western limit of the Eurasian distribution of *C. sumatrensis*, its recent extension of range aided by a number of particularly rainless, warm, continental summers. Having arrived, it may slowly retreat again, faced with the return of a normal Atlantic climate. Or it may evolve morphologically indistinguishable variants more tolerant of dampness, so as to hold its own or even move a little further northward and westward. After all, *Conyza* species do vary considerably in response to environmental conditions, and *C. sumatrensis* is sometimes seen to produce casual examples in unusual habitats such as shady gardens, exposed spoil heaps, and windswept grassy banks. This tendency is more noticeable towards the outer edge of its present urban distribution, and therein could lie evolutionary potential.

Be that as it may, *C. sumatrensis* has, so far, shown no capacity for using British Rail's rolling stock as a seed distribution vector. Unlike *C. canadensis*, *Senecio squalidus* and *Epilobium ciliatum*, which have exploited this facility to a spectacular degree in southern England, it still finds loose trackside ballast uncolonizable; the limited ability of that medium to hold heat at night could well explain why. Bearing in mind also the small likelihood of favourable long-term habitats existing in cooler, damper, country areas, I would, at the present time, anticipate only a remote chance that this tall subtropical species might permanently invade a major part of the United Kingdom.

KEY TO *CONYZA* SPECIES IN ENGLAND

1. Inflorescence ± columnar. Mature capitula 3–5 mm broad, ± bell-shaped. Involucral bracts yellowish-green, glabrous or subglabrous. Tubular florets short, yellow, four-lobed. Leaf-blades relatively thin, their borders sparsely but usually conspicuously hispid-ciliate throughout ..... *C. canadensis*

1. Inflorescence ± pyramidal. Mature capitula 5–10 mm broad, ± straight-sided. Involucral bracts pale grey-green, shortly and evenly pubescent. Tubular florets longer, yellow below, whitish above, five-lobed. Leaf-blades relatively thick, their borders densely appressed-pubescent, sometimes with a few soft longer cilia towards the base only 2

2. Plant often robust (10–) 30–200 cm. Inflorescence finely grey-pubescent throughout, not glandular, widely and profusely branched, the lateral branches not overtopping the main axis. Mature capitula 5–7 mm broad, pappus pale grey. Shortly ligulate florets present. Widely naturalized in London, preferring hot, stony substrates ..... *C. sumatrensis*

2. Plant seldom exceeding 60 cm. Inflorescence glandular, sticky, often becoming purplish, the branches less numerous, with laterals often overtopping the main axis. Mature capitula 6–10 mm broad, pappus dull grey-brown. True ligulate florets absent. Naturalized in the Mediterranean region, occurring in England only as a temporary shoddy alien ..... *C. bonariensis*

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The reintroduction of *Cirsium tuberosum* (L.) All. in Cambridgeshire

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ABSTRACT

The Tuberous Thistle (*Cirsium tuberosum* (L.) All.) became extinct at its only locality in Cambridgeshire in 1974. A plant from the population was transferred to the University Botanic Garden at Cambridge in 1954 and has been used to provide plants which, in 1987, were planted in grassland dominated by *Arrhenatherum elatius* and *Festuca rubra* close to the original locality.

INTRODUCTION

The Tuberous Thistle (*Cirsium tuberosum* (L.) All.) is a sub-Atlantic species with its main area of distribution at altitudes below 1450 m in southern and south-western Germany, northern Switzerland and eastern and central France (Hegi 1928; map in Schönfelder 1970). There are a few localities in adjacent parts of Austria and northern Italy, and scattered localities in northern France and northern Belgium to latitude 50°20′N (van Rompaey & Delvosalle 1972). The localities in Glamorgan and Wiltshire are now the northern limit of the species, but the most northerly locality was that in Cambridgeshire at latitude 52°09′N.

THE LOCALITY IN CAMBRIDGESHIRE

Cirsium tuberosum was discovered in Cambridgeshire by Dr W. H. Mills in July 1919. In their report of the discovery Mills & Evans (1922) refer to the possibility that the species had been found much earlier, but confused with *C. pratense* Hudson (= *C. dissectum* (L.) Hill). At that time these two species were not distinguished. The record in Professor C. C. Babington's manuscript, to which they refer, though from the "Wimpole District" was, in fact, from Hayley Wood and it seems unlikely that this could be the same locality.

In 1919 there were many plants of the thistle growing on an ancient grassy trackway and on the grassy headland of an adjacent field, but already by 1922 some of the plants in the field had been destroyed by ploughing (Mills & Evans 1922). The precise position of the original locality was for many years kept a closely-guarded secret; it was, in fact, on the Mare Way above Little Eversden, and in the adjacent field on the northern side at GR 52/363.519. The Mare Way is an ancient ridge-way, forming the boundaries between parishes (mere, a boundary), and this with the upper edge of the field were regarded by Mills & Evans (1922) as original downland that had escaped being ploughed after enclosure at the beginning of the nineteenth century, when so much pasture was lost to "the rapacity of modern agriculturists" (Babington 1860, pp. xiv–xv). In 1925 two other populations of the thistle were found on the southern slope of the hill about 750 m from the original locality, probably at GR 52/356.520 on the edge of a small plantation (Sharp Hill Plantation) and on the boundary between the fields north of this plantation (unpublished records of Dr W. H. Mills).

During the second World War and in the years immediately after, the Mare Way became choked by scrub and brambles spreading in from the two hedges, and ploughing encroached further on the headland of the adjacent field. By the 1950s the thistle had disappeared from the trackway and was greatly reduced in the field, and, by the 1960s, only two patches of the plant remained. These were

almost in the base of the broad hedge of *Crataegus monogyna* and *Prunus spinosa* in a grassland composed of the following species: *Arrhenatherum elatius*, *Dactylis glomerata*, *Deschampsia cespitosa*, *Festuca rubra*, *Lolium perenne* and *Trisetum flavescens*. It also contained scattered plants of: *Agrimonia eupatorium*, *Cirsium arvense*, *C. vulgare*, *Galium verum*, *Knautia arvensis*, *Picris echioides*, *Primula veris*, *Senecio erucifolius* and *Sison amomum*. This represents a well-defined regional variant, containing such species as *Picris* and *Sison*, of the *Festuca rubra* subcommunity of the *Arrhenatherum elatius* community recognised by the National Vegetation Classification. The soil at the site was a heavy clay containing small pebbles of erratic rocks over broken chalk.

The two remaining plants were seen year after year until 1973 when, in spite of strenuous efforts to conserve the site, the whole area was ploughed and even the hedge on the north side of the Mare Way was destroyed. The leaves reappeared in 1974, but thereafter no plants were seen and now so little suitable land remains, even though the trackway has been reinstated, that it seems certain the original population is lost.

No information about the thistle at the localities discovered in 1925 has been recorded, but a search in 1987 revealed neither the plant, nor any suitable grassland in or beside the plantation. The field boundary to the north has disappeared and crops entirely cover it. At the western end of Sharp Hill Plantation a narrow bank of suitable grassland remains between two arable fields. This is dominated by *Arrhenatherum elatius* and *Festuca rubra* and contains such species as *Primula veris*, *Viola hirta*, *Blackstonia perfoliata* and *Clinopodium vulgare*, but a search failed to discover any sign of *C. tuberosum*.

In 1954 a small lateral shoot of one of the plants was taken to the University Botanic Garden in Cambridge by Dr S. M. Walters and has been propagated vegetatively. This plant is hermaphrodite and, in 1986, capitula were bagged and selfed by V. Morgan and produced a few fertile achenes from which two plants were successfully raised.

The gift of the Wimpole Estate to the National Trust in 1976 made it feasible to consider re-establishing the Tuberous Thistle close to the original sites on land in ownership favourable to conservation. Most of the Park is grazed by sheep or cattle and, although the thistle might survive in a stunted vegetative state, it would be unlikely to flower in these conditions. The *Arrhenatherum elatius* community in which it originally grew is characteristically a lightly grazed or mown grassland. A search of the estate disclosed a few small areas of grassland which are not grazed by stock. One such area carried a community similar to that at the original site. In 1986, after detailed discussions, the National Trust agreed to the thistle being planted on this site.

The site selected is a low bank facing west on the gentle south-facing slope. The grassland is composed of the species shown in Table 1 and belongs to the same subcommunity as did the original site; there are scattered bushes of *Acer campestre* and suckers of elm.

By midsummer the sward has an average height of 20–35 cm with an ill-defined mosaic of slightly shorter patches. Although there is a risk of the site being affected by drift of herbicides or fertilisers, the present composition of the grassland suggests that the area has until now escaped significant damage.

The soil is Brown Calcareous Soil with a variable depth (20–35 cm) of ochre-coloured, heavy clay, overlying a horizon containing fragments of chalk, flints and small erratic rocks derived from the Great Chalky Boulder Clay. In summer the upper horizon cracks vertically into columns; part of the area is kept moist by seepage of water. Although in Britain *C. tuberosum* normally grows on free-draining soils, in Germany it is also characteristic of seasonally wet soils which support vegetation containing *Molinia caerulea* (Oberdorfer 1981).

METHOD OF REINTRODUCTION

Six plants of *C. tuberosum*, four of the original stock and two grown from achenes produced by selfing, were washed clean and repotted in 1986 in soil obtained from the site at Wimpole. On 7 May 1987, these plants and the soil were planted into holes cut in the turf and their exact positions recorded on a plan. The plants were heavily watered at planting and ten days later; they showed no sign of wilting in a short drought in July and thereafter the summer of 1987 was exceptionally wet. By June two of the plants had been damaged by slugs and some of the developing inflorescences

TABLE 1. SPECIES COMPOSITION AND PERCENTAGE COVER-ABUNDANCE OF THE SITE OF REINTRODUCTION OF *CIRSIUM TUBEROSUM*

Arrhenatherum elatius	50	*Galium verum*	3
Brachypodium sylvaticum	5	*Glechoma hederacea*	5
Bromus erectus	1	*Heracleum sphondylium*	3
B. sterilis	5	*Knautia arvensis*	1
Carex flacca	3	*Mercurialis perennis*	5
Dactylis glomerata	10	*Picris echioides*	1
Festuca rubra	30	*Rumex conglomeratus*	1
Holcus lanatus	2	*Taraxacum officinale*	3
Phleum nodosum	1	*Veronica chamaedrys*	3
Poa pratensis	5	*Viola hirta*	3
Trisetum flavescens	2		
		Brachythecium cf. *rutabulum*	10
Cirsium arvense	3	*Eurhynchium swartzii*	10
C. vulgare	1	*Fissidens cristatus*	1
C. eriophorum	2	*Pseudoscleropodium purum*	1
		Weissia cf. *microstoma*	1

were bitten off, probably by hares (*Lepus capensis* L.). By August four plants were vigorous and well established, one was weak and one had been lost after being undermined by a run of field vole (*Microtus agrestis* L.). This plant will be replaced.

DISCUSSION

In general, plants should not be introduced into sites where they appear to be native because it may confuse knowledge of their natural distribution, of their natural genetic variability and of their ecology. There may also be unforeseen and undesirable consequences. The decision to attempt to return *C. tuberosum* to the wild was not taken lightly and was felt to be justified on the following grounds:

1) The species is very rare in Britain and the original localities in Cambridgeshire were isolated and far removed from the nearest localities in Wiltshire.
2) The population was probably long-established and apparently not hybridised with other species, particularly *C. acaule*, as is the case in some populations in Wiltshire and the population at Nash Point, Glamorganshire.
3) The destruction of the population and its habitat was witnessed and now so little suitable ground remains that it is almost certain that the plant is extinct.
4) As the population was reduced and increasingly threatened, an off-shoot was transferred to the University Botanic Garden where it has been propagated vegetatively, so that there has been no possibility of hybridisation. An individual from the original population was thus available.
5) Even with a plant grown as easily as *C. tuberosum* there is a risk in a large collection that it could be lost, or its origin confused. Maintenance of pure stocks in gardens requires constant care, is labour-intensive and therefore expensive.
6) In a garden a plant is isolated from its natural environment and not subject to selection imposed by that environment. *C. tuberosum* is gynodioecious, but the particular plant is hermaphrodite and self-fertile. Allowing it to reproduce by seed in a garden may lead to selection for garden conditions and, for this reason, fruiting heads have normally been cut off before maturity.
7) It has been possible to find a site which closely resembles the original as judged by the plant community and soil, and which is under sympathetic ownership and treatment.
8) Establishment of a population from one individual is no different from natural establishment from a single fruit.
9) If successfully established the species becomes a member of a community of plants and animals including its natural pollinators and predators. Not least, the plant of local origin is preserved and may be seen and enjoyed in as near as possible its natural habitat.

Introductions must be adequately recorded. The exact locality is not given in this report to allow the plants to become established without disturbance. Those who chance upon the plants are asked to avoid disturbing them. The progress in establishment will be recorded and, when appropriate, the precise locality published.

ACKNOWLEDGMENTS

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[Editors' note: the B.S.B.I. Panel for Introductions should be consulted before similar projects are undertaken; contact the Conservation Committee in the first instance.]

Two subspecies of *Molinia caerulea* (L.) Moench in the British Isles

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ABSTRACT

Two subspecies of *Molinia caerulea* (L.) Moench are recognised in the British Isles, the history of their discovery set out, their characters given and their nomenclature explained. Known localities for subsp. *altissima* (Link) Domin are listed in vice-county order.

INTRODUCTION

Many infraspecific taxa of *Molinia caerulea* (L.) Moench have been described, but in *Flora Europaea* (Tutin 1980) only two subspecies are recognized. Subsp. *caerulea* is found on heaths, moorland and mountain grassland, as well as in depressions on river banks, in peat fens, on stony shores of lochs and on mountain cliff ledges up to 1220 m. The plants are often found in isolation in open situations and not in competition with other vegetation; but in bog conditions, plants of subsp. *caerulea* are often crowded.

Subsp. *altissima* (Link) Domin (subsp. *arundinacea* (Schrank) H. Paul) is a much larger plant in all its parts, and is more specific in its habitat. It is a plant of open fens and fen river valleys and occasionally in fen scrub reversion. The texture of the soil on which it grows is a light peat or coarse sand over peat with a fluctuating water level which is high in winter. Its associated species are tall, strong plants which create dense ground cover and competition and include *Angelica sylvestris*, *Cladium mariscus*, *Eupatorium cannabinum*, *Filipendula ulmaria*, *Galeopsis tetrahit*, *Juncus effusus*, *J. subnodulosus* and *Phragmites australis*. It is sometimes shaded by *Betula* and *Salix*. The tall stem of subsp. *altissima* has the ability to push its way into the above mentioned vegetation and the long, lax panicle is often hidden from the casual observer.

HISTORY

Subsp. *altissima* was first described as *Melica caerulea* var. *major* by Roth in April 1789 and as a species, *M. arundinacea* Schrank, later in the same year. Var. *major* was taken up by Babington (1856) and Syme (1872) and has been used in some County Floras. The earliest reference to it in British Floras which we can trace, however, is as *Monilia caerulea* var. *sylvatica* by S. F. Gray (1 November 1821) which is presumably based on *Enodium sylvaticum* Link (ante 30 June 1821). Conert (1961) has discussed the morphology and taxonomy of the plant at some length.

The current distribution of this subspecies is imperfectly known. A search in herbaria under *M. caerulea* var. *major*, var. *robusta*, var. *arundinacea* and *M. litoralis* has produced 58 sheets of subsp. *altissima* from 47 sites: 42 from England & Wales, three from Scotland and two from Ireland. Of these records, only six refer to finds prior to 1900. From 1900 to 1955, only 31 sites

were found and only ten new sites have been reported between 1955 and 1985. For this record there are two possible reasons. First the general lack of interest in infraspecific taxa may mean that it has been ignored, but secondly, and more likely, its specific habitat (needing a fluctuating water level) has had interference or has been destroyed by drainage and more ruthless maintenance of ditches since the Second World War.

NOMENCLATURE

The first problem concerns the generic name. *Aira caerulea* L. (i.e. *Molinia caerulea*) (1753) was selected as the lectotype of *Aira* L. (1753, 1754) by Britton & Brown (1913) and is accepted by *Index Nominum Genericorum* (1979). This typification is undesirable in that it does not allow *Aira* to be used in the sense in which it is most commonly accepted. It can be rejected on the grounds that it was made on a largely mechanical basis (Art. 8). Hitchcock (1920) selects *Aira caespitosa* L. (=*Deschampsia caespitosa*). This also is contrary to common usage. The author says he selected it arbitrarily, but considering Linnaeus' description of the genus it does appear to be logical. Hitchcock & Green (1929), Philips (1951) and Clayton & Renvoize (1986) all choose *A. praecox* L. as the lectotype of *Aira*. This is clearly the most sensible attitude, but *A. praecox* surely needs conserving as the lectotype to make sure neither *A. caerulea* or *A. caespitosa* can be used. The lectotype of *Molinia* Schrank is *M. varia* Schrank which is a superfluous nomen illegitimum of *M. caerulea* (L.) Moench.

Aira caerulea was described by Linnaeus on page 63 of *Species Plantarum* in 1753. The diagnosis 'Aira foliis planis, panicula coarctata, floribus pedunculatis muticis convoluto subulatis' is taken verbatim from his *Flora Suecica*. It is thus a species he knew in his native Sweden and which he would himself have collected. In the Linnaean herbarium is a sheet (*Savage Cat.* 85/1) labelled "caerulea 3". It fits the original diagnosis and is an excellent specimen of what is regarded as the most common form of *Molinia caerulea*. We designate it as the lectotype of *Aira caerulea* L. This establishes the application of the nominate subspecies.

The second subspecies was first recognized as *Melica caerulea* var. *major* Roth in 1789. Between then and 1829 it received no fewer than six specific names. H. Paul (1937) gave it the rank of subspecies, basing it on *M. litoralis* Host (1827). In the following year he changed his mind and made a new combination based on *M. arundinacea* Schrank (1789). Although Schrank's name was earlier it also was at the rank of species so that *M. caerulea* subsp. *litoralis* (Host) H. Paul was in fact earlier.

Tutin (1980) used the name *M. caerulea* subsp. *arundinacea*. However, there is an even earlier subspecific name, *M. caerulea* subsp. *altissima* (Link) Domin (1935), which was in fact given as a synonym in *Flora Europaea*. The types of these names have not been examined, but from their original descriptions and general usage there seems to be little doubt that they refer to the large variant of *Molinia caerulea*.

MOLINIA Schrank, *Baier. Fl.* 334 (1789) (Lectotype: *M. varia* Schrank nom. illegit. = *Aira caerulea* L., i.e. *Molinia caerulea* (L.) Moench, vide Hitchcock, *U.S. Dept. Agric. Bull.*, **772**: 50 (1920)).

Enodium Pers. ex Gaudin, *Agrost. Helv.*, **1**: 145 (1811) (Holotype: *E. caeruleum* (L.) Gaudin); superfl. nom. illegit. pro *Molinia* Schrank ab lectotyp.

Monilia S. F. Gray, *Nat. Arrang. Brit. Pl.*, **2**: 110 (1821) (Holotype: *M. caerulea* (L.) S. F. Gray); superfl. nom. illegit. pro *Molinia* Schrank ab lectotyp.

M. CAERULEA (L.) Moench, *Meth.* 183 (1794).

a) subsp. *CAERULEA*

Aira caerulea L., *Sp. Pl.* 63 (1753) (Lectotype: Savage Cat. 85/1 (**LINN**), designated here).

Melica caerulea (L.) L., *Mantissa Alt.* 325 (1771).

Molinia varia Schrank, *Baier. Fl.* 334 (1789), superfl. nom. illegit. pro *Aira caerulea* L.

Molinia variabilis Wibel, *Prim. Fl. Werth.* 115 (1799).

Festuca caerulea (L.) DC. in Lam. & DC., *Fl. Fr.*, 3rd ed., **3**: 46 (1805).

Enodium caeruleum (L.) Gaudin, *Agrost. Helv.*, **1**: 145 (1811).

Arundo agrostis sensu Lapey., *Hist. Abr. Pl. Pyr.* 52 (1813).
Hydrochloa caerulea (L.) Hartm., *Genera Gram.* 8 (1819).
Monilia caerulea (L.) S. F. Gray, *Nat. Arrang. Brit. Pl.*, **2**: 110 (1821).
Molinia depauperata Lindley, *Syn. Brit. Fl.* 307 (1829) (Holotype: Clova Mountains, Forfar, v.c. 90, *D. Munro* (**CGE**)).
Molinia minor Holandre, *Fl. Moselle* 813 (1829).
Molinia obtusa Peterm. in *Flora (Regensb.)*, **27**: 235 (1844).

A densely tufted, strong-rooted perennial forming clumps, which consist of a number of single culmed plants. Culms 8–65 cm, erect, strong. Sheaths smooth and ribbed, the basal internode clothed with short sheaths 4–10 cm and scales of 1–2 cm. Leaves 10–50 (−63) cm × (1.5)3–6 (−8) mm, long-pointed, flat, with very short hairs only, or some hairs of 2–3 mm scattered on the upper surface, rough on the margins, deciduous in winter. Ligule 0, but mouth of sheath ciliate, the cilia 0.5–2.0 mm. Panicles 1–30 cm, dense to widely interrupted. Spikelets 3.0–5.5 mm, dark mauve to light green, lanceolate, up to 4-flowered but mainly 1–2. Glumes persistent, unequal to equal, lanceolate to ovate; lower 1.5–3.0 mm, upper 2.2–3.5 mm. Lemma 3–4 mm, lanceolate.

(Hubbard's (1968) description of this taxon is not comparable as his measurements make it clear that those of subsp. *altissima* are included.) The height of plants and the length of panicles are influenced by sheep grazing.

b) subsp. *ALTISSIMA* (Link) Domin in *Preslia*, **13–15**: 39 (1935).
Melica caerulea var. *major* Roth, *Tent. Fl. Germ.*, **2**(1): 103 (April 1789).
Molinia arundinacea Schrank, *Baier. Fl.*, **1**: 336 (June-Dec. 1789).
Aira atrovirens Thuill., *Fl. Par.*, 2nd ed., **1**: 37 (1800).
Enodium sylvaticum Link, *Enum. Pl. Hort. Berol. Alt.*, **1**: 80 (ante 30 June 1821).
Monilia caerulea var. *sylvatica* (Link) S. F. Gray, *Nat. Arr. Brit. Pl.*, **2**: 110 (1 Nov. 1821).
Enodium atrovirens Dumort., *Obs. Gramin. Belg.* 108 (1824).
Molinia litoralis Host, *Fl. Austriac.* 118 (1827).
Molinia altissima Link, *Hort. Berol.*, **1**: 197 (1827).
Molinia sylvatica (Link) Link, *Hort. Berol.*, **1**: 197 (1827).
Enodium litorale (Host) Kunth, *Enum. Pl.*, **1**: 380 (1833) nom. in syn.
Molinia caerulea var. *arundinacea* (Schrank) Ascherson, *Fl. Brand.* 837 (1864).
Molinia caerulea var. *robusta* Prahl, *Krit. Fl. Schl. Holst.*, **2**: 257 (1890).
Molinia caerulea b. *arundinacea* (Schrank) Richter, *Pl. Eur.*, **1**: 72 (1890).
Molinia caerulea subsp. *litoralis* (Host) H. Paul in *Ber. Bayer. Bot. Ges.*, **22**: 18 (1937).
Molinia caerulea subsp. *arundinacea* (Schrank) H. Paul in *Ber. Bayer. Bot. Ges.*, **23**: 154 (1938).

A densely tufted and extensive, strong-rooted perennial, building a tussock of 20 cm high. Culms very variable and variation presumably related to moisture supply. Culms (63–) 75–124 (–162) cm, erect. Sheath smooth and ribbed, the basal internode clothed with short sheaths and scales slightly longer than in subsp. *caerulea*. Leaves (28–) 40–62 (–78) cm × 4.0–8.5 mm, long-pointed, flat, tapering from near the base, with short hairs scattered on the upper surface or glabrous, margins smooth, deciduous in winter. Panicle (23–) 35–53 (–65) cm, generally widely interrupted with many unequally long branches 4–15 cm, patent to erecto-patent, dark green to light mauve. Spikelets variable in length, (3–) 4–7.5 mm; glumes unequal to equal, lanceolate, pointed; the lower 1.6–3.2 mm, upper 2.3–4 mm. Lemma (3.2–) 3.5–5.4 (–5.7) mm, lanceolate.

DISTRIBUTION OF SUBSP. *ALTISSIMA*

v.c. 1, W. Cornwall, Pengerswick Castle, 1873, *J. Cunnack* (**K**); Trelawney Mill, 1919, *E. Thurston* (**K**).
v.c. 2, E. Cornwall, Boscastle, 1915, *E. Thurston* (**K**); Pencarrow Wood, Bodmin, 1957, *C. C. Townsend* (**CGE**, **K**).
v.c. 4, N. Devon, Banks of R. Lyn, Watersmeet near Lynmouth, 1902, *S. H. Bickham* (**CGE**, **NMW**).

v.c. 5, S. Somerset, Shapwick, 1936, *F. K. Makins* (**K**).
v.c. 6, N. Somerset, Walton in Gordano, 1908, *C. Bucknall* (**RNG**); Wood at Penselwood, 1916, *W. Herridge* (**EXR**); Beacon Hills, Shepton Mallet, 1942, *J. P. M. Brenan* (**K**); S. of Ashcott Railway station, 1944, *J. P. M. Brenan* (**K**).
v.c. 9, Dorset, Arne Heath, Wareham, 1899, *L. V. Lester Garland* (**K**).
v.c. 10, Wight, St Helen's, 1857, *A. G. More* (**CGE**).
v.c. 11, S. Hants., Near Milton, 1913, *J. Comber* (**BM**, **K**, **NMW**).
v.c. 17, Surrey, Near Woking, 1900, *H. J. Riddelsdell* (**BM**); Wimbledon Common, 1894, *J. Fraser* (**K**); Esher Common, 1928, *C. E. Hubbard & V. S. Summerhayes* (**K**); Richmond Park, 1929, *V. S. Summerhayes & H. M. Montford* (**K**); Brookwood bank of Basingstoke Canal, 41/952.572, 1985, *P. J. O. Trist* (**CGE**, **Herb. P.J.O.T.**).
v.c. 19, N. Essex, Middlewick, S. of Colchester, 1924, *G. C. Brown* (**CGE**, **K**, **NMW**).
v.c. 22, Berks., Parson's Moor, near Cothill, 1943, *C. E. Hubbard* (**K**); Cothill Fen, near Oxford, 1955, *F. White* (**EXR**).
v.c. 23, Oxon, North Leigh Heath, 1944, *C. E. Hubbard* (**K**).
v.c. 24, Bucks., Wilstone, near Thame, 1913, *G. C. Druce* (**NMW**); East Burnham Common, 1928, *V. S. Summerhayes & E. Nelmes* (**K**).
v.c. 26, W. Suffolk, Palmers Heath, near Brandon, 52/742.847, 1972, *P. J. O. Trist* (**Herb. P.J.O.T.**); Lt. Eriswell Hall, Lakenheath, 52/721.708, 1976, *P. J. O. Trist* (**Herb. P.J.O.T.**); Pashford Poors Fen, Lakenheath 52/736.836, 1974, 1976, 1986, *P. J. O. Trist* (**CGE**, **Herb. P.J.O.T.**).
v.c. 28, W. Norfolk, Dersingham Common, 1928, *C. E. Hubbard* (**K**); Rockland marshes, 1935, *F. Ballard & C. E. Hubbard* (**K**); Cranberry Fen, Wolferton, 1921, *A. R. Horwood* (**NMW**); Breckles Heath, Stow Bedon, 1971, *C. E. Hubbard* (**K**); Little and Middle Fens, South Lopham, 52/042.795 and 52/052.798, 1985, *P. J. O. Trist* (**Herb. P.J.O.T.**, **CGE**); Gooseberry Lane, Castle Rising, 1975, *E. L. Swann* (**K**).
v.c. 29, Cambs., Great Heath Wood, Gamlingay, 1910, *R. S. Adamson* (**BM**).
v.c. 33, E. Gloucs., Driffield, 1942, *H. K. Airy Shaw* (**K**).
v.c. 35, Mons., South-west of Bassaleg, 1934, *A. E. Wade* (**NMW**).
v.c. 36, Herefs., Bucknall's Wood, Madley, 1905, *H. J. Riddelsdell* (**NMW**).
v.c. 43, Rads., Llandrindod Wells, 1916, *W. C. Barton* (**K**).
v.c. 46, Cards., Esgair Elan, east of Devil's Bridge, 1984, *A.G. de R. Channer* (**RNG**).
v.c. 54, N. Lincs., Epworth, 1945, *J. M. Taylor* (**K**).
v.c. 55, Leics., Bradgate Park, 1944, *R. M. Payne* (**K**).
v.c. 59, S. Lancs., Simonswood Moss, 1897, 1898, *J. A. Wheldon* (**NMW**); Risley Moss, 1907, *J. A. Wheldon* (**NMW**).
v.c. 63, S. W. Yorks., Thorne Waste, near Doncaster, 1942, *S. P. Rowlands* (**K**).
v.c. 80, Roxburghs., Newcastleton State Forest, S. of Tweedenhead, 1934, *D. H. S. Davis* (**K**).
v.c. 100, Clyde Is., West of Brennan Head, Arran, 1934, *R. Mackechnie* (**RNG**).
v.c. 104, N. Ebudes, Loch Ainort, Skye, 1934, *H. M. Montford* (**K**).
v.c. H1, S. Kerry, Between O'Sullivan's Cascade and Shehy Mountains, 1935, *S. Ross-Craig, B. L. Burtt & J. R. Sealy* (**K**).
v.c. H11, Co. Kilkenny, Kilcoron House, Kilkenny, 1937, *N. L. Bor* (**K**).

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Notes on *Avenula pratensis* (L.) Dumort. in Britain

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ABSTRACT

It is suggested in the literature that *Avenula pratensis* (L.) Dumort. from the mountains of Scotland and northern England might represent a taxon, described as *Avena alpina* Sm., distinct from that of lowland Britain. Morphological observations made on *A. pratensis* from sites throughout Britain do not support this suggestion, nor do specimens from Scotland and northern England agree with the published description of alpine *Avena alpina*.

INTRODUCTION

A rider to the entry for *Avenula pratensis* (L.) Dumort. in *Flora Europaea* (Holub 1980) states that "Plants from the mountains of Scotland and N. England, with larger more strongly coloured spikelets, described as *Avena alpina* Sm., may represent a distinct taxon".

In Britain, *A. pratensis* is found to 366 m in Derbyshire, to 457 m in Yorkshire and to 838 m in Scotland (Wilson 1956). Smith (1811) described his specimens, collected from the summits (307 to 945 m) of the Clova mountains, Angus, as forming compact tufts with the roots "not inclined to creep" (cf. *Avenula pubescens*). The leaves resembled those of *A. pratensis*, being non-hairy and having serrated edges, but differed from the latter in their rough and greatly elongated sheaths. The flowers differed from *A. pratensis* "not only in their much greater size" (no figures given), "but in their partial stalk, or rachis (rachilla?), the hairiness of which I observe to be crowded up into a very dense tuft, towards the base of each floret, not dispersed over the whole rachis". Smith made no mention of the colour of the spikelets.

Hegi (1967) described *Avena alpina* as having sheaths not, or only slightly, rough and with the culm rough only in the panicle, whereas the culms of *A. pratensis* are upwardly rough. *A. alpina* usually has two basal branches to its panicle, as opposed to one, seldom two, in *A. pratensis*. Like Smith, he specified that the spikelets of *A. alpina* are larger than those of *A. pratensis* (but again no figures are given), with 6 to 8 florets. He states that the glumes are overlaid with violet, and that the lemmas bear an awn which is "up to a little over 1.5 cm long", compared with *A. pratensis*, whose awns are "up to almost 2.0 cm long".

MORPHOLOGICAL OBSERVATIONS

Numerous specimens of *A. pratensis* from the British Isles have been examined (site details are given in Table 1) and the following observations made:–

1. Culms of specimens examined were mostly smooth in the lower part – occasionally small protuberances were noticed. When examined microscopically these were found to occur at right angles to the culm until the panicle was almost reached, when they resolved into minute upward pointing teeth. The rachis of all specimens had upwardly pointing teeth, variable in size and quantity; all pedicels were minutely toothed.
2. None of the specimens examined had noticeably rough or elongated sheaths.
3. Spikelet measurements from 55 different sites indicated that there is indeed a significant difference (at $p < 0.05$) in mean spikelet length between Scotland plus the north of England (defined as Yorkshire and Lancashire northwards), and the Midlands, Wales and the south of England. Mean spikelet lengths are given in Fig. 1. However, all the British material examined

TABLE 1. SITES FROM WHICH *AVENULA PRATENSIS* WAS EXAMINED

Location	Grid Reference	Vice-County	Approximate altitude (m)
Scotland			
Aberfeldy, Perthshire	27/855.473	89	335
Beinn Laoigh, Argyllshire	27/262.274	98	838
Ben Lui, Perthshire	27/266.266	98	800
Braid, Edinburgh	36/255.698	83	152
Cockburnspath, Berwickshire	36/790.712	81	60
Craig Dorney, Aberdeenshire	38/403.352	93	380
Creag an Lochan, Perthshire	26/596.392	88	500
Forres, Morayshire	38/020.592	95	10
Glen Clova, Forfarshire	37/320.745	90	500
Glen Doll, Forfarshire	37/243.775	92	700
Glen Lyon, Perthshire	27/654.505	88	800
Golspie, Sutherland	28/823.957	107	8
Loch Lyon, Perthshire	27/450.424	88	533
Loch Pattack, Invernesshire	27/545.789	97	442
Relugas, Morayshire	38/995.487	93	183
Tomintoul, Banffshire	38/170.190	94	344
North of England			
Arnside Knott, Cumbria	34/453.777	69	91
Aysgarth Falls, N. Yorkshire	44/016.890	69	152
Giggleswick, N. Yorkshire	34/810.648	64	229
Gilsland, Northumberland	35/634.668	67	137
Gordale Scar, N. Yorkshire	34/915.638	64	335
Helmsley, N. Yorkshire	44/585.840	62	167
Malham Tarn, N. Yorkshire	34/885.694	64	411
Overdale, N. Yorkshire	44/840.715	61	427
Scout Scar, Cumbria	34/488.921	69	213
Shap, Cumbria	35/560.173	69	293
Skirethorn, N. Yorkshire	34/963.648	64	366
Sproxton, N. Yorkshire	44/601.819	62	137
Sutton Bank, N. Yorkshire	44/515.826	62	219
Teesdale, Durham	35/902.280	66	351
Wilson Scar, Cumbria	35/548.182	69	304
Midlands, Wales and the South of England			
Bakewell, Derbyshire	43/184.670	57	305
Ballard Down, Dorset	40/030.815	9	76
Boxhill, Surrey	51/178.516	17	172
Collyweston, Northamptonshire	53/010.002	32	76
Coombe Hill, Buckinghamshire	42/848.066	24	257
Corfe Castle, Dorset	30/964.823	9	76
Cosgrove, Northamptonshire	42/792.426	32	76
Devil's Ditch, Cambridgeshire	52/581.645	29	30
Dover, Kent	61/300.398	15	137
Epsom Downs, Surrey	51/217.584	17	137
Firle Beacon, Sussex	51/485.060	14	152
Kithurst Hill, Sussex	51/082.127	13	198
Little Ormes Head, Gwynedd	23/812.823	49	91
Litton, Derbyshire	43/156.748	57	244
Littonfields, Derbyshire	43/175.759	57	266
Llysfaen, Clwyd	23/888.774	50	208
Monksdale, Derbyshire	43/135.738	57	244
Monyash, Derbyshire	43/158.663	57	259
Newport, Gwent	31/354.906	35	76
Portland, Dorset	30/690.697	9	15
Risby Heath, Suffolk	52/790.683	26	40
Saffron Walden, Essex	52/570.405	19	115
Salisbury Plain, Wiltshire	41/055.451	8	107
Winter Hill, Berkshire	41/873.863	24	76

FIGURE 1. Variation in spikelet length of *Avenula pratensis* in the British Isles. Figures are mean values (mm) of spikelets taken from the middle of the panicle. Sample size varied between 5 and 30 inflorescences per population. Maximum standard error for any sample was ± 1.1 mm.

falls within the range given for *A. pratensis* in *Flora Europaea*, namely 12–23(–28) mm. In only nine out of 90 spikelets measured from Scottish sites were the lengths greater than 23 mm, and 23 out of 420 spikelets measured from England and Wales had lengths greater than 23 mm. Eleven of these, interestingly, came from one site in Derbyshire. On the other hand, spikelets of 14.0 mm were recorded from Scotland, and one depauperate specimen from East Anglia had spikelets of only 10.0 mm. Thus, spikelets encompassing more or less the entire range enumerated in *Flora Europaea* for *A. pratensis* have been found throughout Britain.

4. None of the specimens examined had an unusually hairy rachis, and no noticeable differences were apparent in the quality or quantity of rachilla hairs.

5. The maximum number of florets per spikelet found was six, including rudimentary florets.

6. No distinct north/south variation in spikelet colour has been observed, and deeply coloured specimens were found at several sites throughout Britain.

7. Awns varied from 12 to 27 mm in length with the longer awns generally matching the larger spikelets of Scotland and the north of England, but again with almost the full range throughout Britain.

8. Many specimens had two basal branches to their panicles. This character seems to depend on soil depth/fertility. Specimens collected from cliffs, screes and poor shallow soils tend to have few paired branches, whilst specimens from deeper 'richer' soils had more. From the 25 sites examined, the populations having the maximum number of paired basal branches came from Salisbury Plain and a population cultivated in the author's garden, where all 20 panicles collected from each site had paired basal branches. The minimum number came from a scree population at Gordale Scar, North Yorkshire, and a population growing on a thin rendzina above Malham Tarn, North Yorkshire where the 20 panicles collected from each site had no paired basal branches.

Comparing the above observations with the descriptions given for *Avena alpina* by Smith (1811) and Hegi (1967) shows there to be no good correspondence, nor do any of the characters examined fall outside the definitive limits given in *Flora Europaea* for *Avenula pratensis*. It is therefore suggested that although *A. pratensis* occurring in Scotland and the north of England has on average larger spikelets and longer awns, these features are not sufficient to refer them to a different taxon.

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Short Notes

PUTATIVE *REYNOUTRIA JAPONICA* HOUTT. × *FALLOPIA BALDSCHUANICA* (REGEL) HOLUB HYBRIDS DISCOVERED IN BRITAIN

Reports that seed taken from naturalized plants of *Reynoutria japonica* Houtt. in Britain is frequently the result of hybridization with the commonly grown garden plant *Fallopia baldschuanica* (Regel) Holub (Russian Vine) have been the subject of two B.S.B.I. exhibition meeting displays (Bailey & Conolly 1984; Bailey 1987). These exhibits were accompanied by pleas to those interested to try to find such plants growing in the wild. Experience at Leicester had shown that although hybrid seed was capable of surviving the winter and germinating in the spring, such seedlings would be unlikely to survive a British winter, and so the best chance would be to look for seedlings under *R. japonica* plants in spring. These requests have, I am happy to report, borne fruit, and have resulted in B.S.B.I. member D. Bevan, who had seen our exhibits, finding the first *R. japonica* × *F. baldschuanica* growing in the wild; furthermore, the discovery was not just of a seedling, but of a clump of some considerable size, at Railway Fields, Haringey, Middlesex, v.c. 21 (GR 51/317.882) in 1987. This has prompted me to give a fuller account of the discovery, incidence and morphology of this new addition to the British flora.

Bailey & Conolly (1985) reported that the most commonly found variant of *R. japonica* in Britain was octoploid (2n=88) and female. Persistent reports that such plants were capable of setting some seed in the absence of male-fertile *Reynoutria* plants led to comparative examination of the chromosome complements of the octoploids with their seedling offspring from eleven localities in Britain (Table 1).

TABLE 1. LOCALITIES OF OCTOPLOID FEMALE *R. JAPONICA* PLANTS FROM WHICH SEED WAS COLLECTED AND GROWN, AND THE NO. OF SUCH SEEDLINGS THAT HAD 54 CHROMOSOMES

Location			No seedlings with 2n = 54	No seedlings grown
V.c. 11, S. Hants.	Petersfield	GR 41/744.234	5	5
V.c. 12, N. Hants.	Itchen Abbas	GR 41/541.329	5	5
V.c. 40, Salop	Ironbridge	GR 33/671.033	3	4
V.c. 48, Merioneth	Boston Lodge	GR 23/589.382	4	5
V.c. 48, Merioneth	Tyn Coed	GR 23/67.18	2	2
V.c. 48, Merioneth	Ynys	GR 23/597.353	2	2
V.c. 49, Caerns.	Criccieth	GR 23/492.381	4	4
V.c. 49, Caerns.	Pentre'r-felin	GR 23/526.396	3	3
V.c. 49, Caerns.	Pwllheli	GR 23/374.350	5	6
V.c. 55, Leics.	Sileby	GR 43/602.153	4	4
V.c. 55, Leics.	Stoughton	GR 43/644.026	3	3[a]

[a] artificial hybridization with *F. baldschuanica*

Since the female parent, *R. japonica*, had in all the above localities 88 chromosomes, it was something of a surprise that all seedlings counted had 54 chromosomes. Furthermore, whatever was going on was a very regular and widespread phenomenon, occurring as it did in widely separated parts of the country. Cytologically the seedling karyotype was rather distinctive in that ten large chromosomes could be readily distinguished from 44 smaller and more uniform chromosomes typical of *Reynoutria*. Working on the assumption that these seeds were the result of a fertilization event (rather than some bizarre meiotic aberration) one would be looking for a pollen parent with 20 chromosomes. The cytological data in combination with the leaf shape and the semi-twining habit of the seedlings pointed to the involvement of the diploid climber *F. baldschuanica* (2n=20) as a putative pollen donor.

Artificial hybridization between a female *R. japonica* from Stoughton and *F. baldschuanica* gave rise to several seeds; three seedlings were subsequently grown on and found to have the same chromosome number and karyotype as well as being virtually identical morphologically with the plants grown from wild-collected seed. A further indication of the ubiquity of this phenomenon came later, when I contacted Richard Scott of I.T.E., Merlewood, who had been conducting research into the suitability of *Reynoutria* taxa as biomass producers. During the course of this work he had collected seeds from female *R. japonica* growing next to a plant of *R. sachalinensis*, thinking not unnaturally that they would grow into the interspecific hybrid. However, when I examined these plants it quickly became apparent that they were hybrids between *R. japonica* and *F. baldschuanica*.

Plants grown outdoors at Leicester for three years are becoming more vigorous but are extremely reluctant to flower; some flower-buds were initiated on one plant this year (1987) but were aborted before they reached maturity. In contrast, the plant at Haringey is extremely vigorous, covering over 10 m^2, and is strongly rhizomatous and with several densely flowered inflorescences. Judging from its size, it must have been established for some time, since it is many times larger than the three-year-old Leicester plants.

DESCRIPTION OF *R. JAPONICA* × *F. BALDSCHUANICA*

Superficially similar to *R. japonica*, but with stems much thinner and with smaller leaves. Stems herbaceous, up to 2 m long, slender with red blotches, bending over almost to touch the ground, reducing the height of the plant to c. 1.5 m. Leaves acuminate, ovate to narrowly ovate-oblong, to 13 × 6.5 cm; petioles slender, 2–2.5 cm long. Inflorescence of axillary and terminal panicles. Flowers hermaphrodite (?), resembling *R. japonica* more than *F. baldschuanica*; the three outer perianth segments more broadly keeled than in *Reynoutria*; anthers 0.6–0.7 mm long; style trifid, with fimbriate, club-shaped stigmas (intermediate between the fimbriate and capitate stigmas of its respective parents). Younger plants without rhizomes, or only weakly rhizomatous; established clumps may have tough, woody rhizomes up to 2 cm in diameter. Flowering occurs very late in the season (late September to early October); there are no reports of any seed set in this hybrid.

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THE VASCULAR PLANT HERBARIUM OF E. C. WALLACE

The herbarium of the late Edward Charles (Ted) Wallace (1909–1986) was massive and exceptionally well curated. His bryophyte collections were bequeathed to **NMW** and his lichens to the British Lichen Society. The vascular plants were presented to **RNG** by Mr Alan Crundwell to whom they had been bequeathed (Jury 1987).

The vascular plant herbarium was kept in an upstairs bedroom of his semi-detached house in Surrey in four purpose-built cupboards with a total of 137 shelves! Even so this was not enough and the specimens of *Carex* were housed separately in 15 boxes. The collection was arranged according to Dandy (1958) with the sheets of each species in strict vice-county order. No trace of any insect damage was found, except in some unmounted duplicate material which was destroyed.

Although still avidly collecting specimens to near his departing, no backlog of material awaiting processing or incorporating was found: Ted was too organized. A recent obituary (Richards 1987) gives details of his life, travels and great dedication to botany. Examination of his specimens also shows just how great his botanical passion was.

The job of incorporating the herbarium has now been completed and a substantial number of duplicates removed and exchanged. This was a large task, for **RNG** is fortunate in also having the herbarium of the late J. E. Lousley, who had exchanged many specimens with Wallace, and a good deal of material was duplicated. Both men had been members of the Botanical Exchange Club and the Watson Botanical Exchange Club and had acquired specimens from these sources. (Incidentally, it is very interesting to note that a very large number of specimens collected by Lousley which had not been kept by Lousley himself were found in Wallace's herbarium.)

All sheets were stamped on incorporation into **RNG**: "Herbarium E.C. Wallace (1909–1986). Presented to Herbarium **RNG** 1986" so they will be identifiable in the future. (Specimens from Lousley's own herbarium have also been similarly annotated.)

While examining and checking each specimen some simple statistics were recorded (Table 1). Kent & Allen (1984) record that his herbarium contained 25,000 gatherings and had significant holdings from Surrey, v.c. 17, and Scotland. Wallace's vascular plant herbarium in fact contained 26,190 gatherings, of which 1,458 were foreign.

The Lousley herbarium contained 3,570 (14.6%) specimens from Surrey (Jury 1977), and with the addition of another herbarium also known to be rich in Surrey specimens a note was kept of these. In fact of the total 22,855 British gatherings incorporated, no less than 4,692 (20.5%) were from Surrey. Botanists working on the flora of v.c. 17 are therefore advised that they are likely to find it worthwhile consulting **RNG.** A total of 5,951 gatherings (24.5%) from Scotland were incorporated.

The foreign material is almost all from his recent travels (listed by Richards 1987), e.g. *Carex illegitima* Cesati from Rodhos collected in April 1987 (see photograph in Briggs 1986).

Table 1 shows what genera were especially well represented in his collection. The comparable figures for Lousley's herbarium are also given. It is interesting to note how both shunned the apomictic genera *Rubus* and *Taraxacum*, though Lousley had a fine collection of *Hieracium* specimens. In many cases the two herbaria have proved to be complementary.

Only two single specimens of *Agrostis* have been found, both only recently collected and unnamed by Wallace. Also missing were specimens of the genera × *Agropogon*, *Aira*, *Alopecurus*, × *Ammocalamagrostis*, *Ammophila*, *Anthoxanthum*, *Apera*, *Corynephorus*, *Cynodon*, *Digitaria*, *Echinochloa*, *Eragrostis*, *Gastridium*, *Hierochloë*, × *Hordelymus*, *Lagurus*, *Mibora*, *Milium*, *Nardus*, *Parapholis*, *Phalaris*, *Phleum*, *Polypogon*, *Setaria* and *Spartina*. Were these loaned by Wallace to someone? Information on their whereabouts would be gratefully received.

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TABLE 1. PARTIAL BREAKDOWN OF THE WALLACE VASCULAR PLANT HERBARIUM

	Number of gatherings						Number of gatherings in J. E. Lousley's herbarium where known
	Surrey v.c. 17	Scotland	Rest of the British Isles	Rest of Europe	Rest of the World	Total number	
Pteridophyta	144	429	681	72	58	1384	
Gymnospermae	19	63	19	6	9	116	
Monocotyledons							
Cyperaceae							
Carex	204	863	1162	205	67	2501	949
Scirpus	34	33	95	13	7	182	118
Juncaceae							
Juncus	70	194	186	42	11	503	301
Luzula	31	69	65	9	3	177	71
Liliaceae							
Allium	7	7	43	4		61	68
Orchidaceae							
Dactylorhiza	2	11	24			37	116
Orchis	9	2	28			39	41
Poaceae							
Agrostis			2			2	156
Bromus	55	22	147	19	2	245	271
Festuca	33	69	104	16		222	99
Poa	34	165	88	40	4	331	219
Vulpia	15	3	48	5		72	104
Potamogetonaceae							
Potamogeton	69	121	316	3	4	513	242
Others	346	558	1127	120	40	2190	
Total monocotyledons	909	2117	3435	476	238	7075	
Dicotyledons							
Asteraceae							
Centaurea	14	2	54	6		76	108
Hieracium	69	17	76	8	1	171	644
Senecio	32	18	100	6		156	105
Taraxacum	3	16	21	1		41	35
Boraginaceae							
Myosotis	35	32	80	3		150	96
Brassicaceae							
Lepidium	18	9	47	3		77	120
Caryophyllaceae							
Arenaria	18	77	137	8	8	248	56
Sagina	21	123	116	1		261	151
Silene	27	65	213	10	2	317	114
Chenopodiaceae							
Atriplex	11	24	73	2		110	112
Chenopodium	42	5	123	8		178	308
Euphorbiaceae							
Euphorbia	38	6	78	12	1	135	114
Fabaceae							
Medicago	18	8	81	9	1	117	218
Trifolium	47	25	156	17		245	387
Vicia	34	39	122	2	2	199	179

Table 1. continued

	Number of gatherings						Number of gatherings in J. E. Lousley's herbarium where known
	Surrey v.c. 17	Scotland	Rest of the British Isles	Rest of Europe	Rest of the World	Total number	
Fumariaceae							
Fumaria	23	12	85	2		122	115
Gentianaceae							
Gentianella	16	36	45	6	2	105	83
Geraniaceae							
Erodium	1	5	27			33	152
Geranium	30	24	116	1		171	132
Hypericaceae							
Hypericum	49	31	77	3		160	89
Lamiaceae							
Mentha	210	73	335	5		623	176
Onagraceae							
Epilobium	94	80	140	3	2	319	145
Polygonaceae							
Polygonum	153	65	155	7	2	382	326
Rumex	41	50	129	8		228	1126
Ranunculaceae							
Ranunculus	49	35	182	7	2	275	246
Rosaceae							
Alchemilla	3	27	47	1		78	64
Potentilla	37	54	65	13	3	172	92
Rosa	24	1	10			35	66
Rubus	8	23	12			43	3
Rubiaceae							
Galium	52	58	104	11	4	229	138
Salicaceae							
Salix	90	309	188	12	1	600	181
Scrophulariaceae							
Euphrasia	30	107	119	5		261	298
Veronica	83	101	135	11		330	208
Verbascum	10	1	26			37	95
Solanaceae							
Solanum	3	3	24			30	105
Violaceae							
Viola	156	155	422	10	2	745	204
Others	3429	2726	7365	500	101	14121	
Total dicotyledons	4007	3786	9125	581	118	17617	
Total in herbarium	5079	6395	13260	1135	323	26192	24465
Duplicates extracted	387	444	1046	10	1	1888	
Total specimens added to **RNG**	4692	5951	12212	1125	322	24304	

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TRIFOLIUM OCCIDENTALE D. E. COOMBE, NEW TO WALES

On 15 May 1987 a single, profusely-flowering patch of *Trifolium occidentale* was found in cliff-top turf near Tears Point in the Gower Peninsula, Glamorgan (v.c. 41, GR 21/407.872) by Jo Dunn. Subsequent searches by Rosemary John, E. M. Kay and Q. O. N. Kay of suitable habitats on the coast of south-western Gower between Port-eynon Point and Rhosili showed that *T. occidentale* grew both on Tears Point and on similar south-facing limestone cliff-tops between Fall Bay and Mewslade Bay (GR 21/413.872 to 21/421.873); none was found elsewhere.

On Tears Point (the headland on the south-western side of Fall Bay near Rhosili) it is apparently confined to one minor headland, where several (c. 12) small scattered plants of varied size grow within an area of about 20 m^2 in dense, closely sheep-grazed and species-rich *Festuca rubra* turf on the level cliff-top, about 3–7 m from the edge of the cliff. The sloping limestone cliffs are about 45 m high here. Two more small patches were found about 25 m west of the first site on Tears Point (Table 1).

On the other side of Fall Bay, *T. occidentale* was found to be locally more abundant between Lewis Castle (the headland to the east of Fall Bay) and Mewslade. Here it grows in floristically similar but less intensively grazed grassland near limestone outcrops on exposed cliff-tops, and also on the upper cliff-slopes facing the sea. The total population in this area was estimated to be 350–500 plants. On Lewis Castle, for example, at least 50 patches of *T. occidentale* were seen in about 60 m^2 of *Festuca rubra* turf (Table 1) at the seaward end of the headland, about 50 m above sea-level. Most plants were more vigorous than those on Tears Point and many were flowering strongly; on 7 June 1987 some flower-heads were still open but others had formed mature seed, so had probably started flowering in late April. Here and at Tears Point scattered patches of *T. repens*, not yet in flower on 7 June, grew locally intermingled with *T. occidentale*, mainly on the less exposed landward side of the site.

The Gower plants closely resembled plants of *T. occidentale* from Cornwall and the Isles of Scilly both morphologically and in their overall isoenzyme profiles, although the latter showed some distinctive local features (N. A. Ab-Shukor, unpublished). Chromosome numbers of 2n=16 were determined for three plants from Mewslade and Tears Point, in agreement with those reported from other populations of this diploid species.

When it was first described, *T. occidentale*, which closely resembles the tetraploid species *T. repens* and had previously been confused with it, was known in Britain only from western Cornwall and the Isles of Scilly (Coombe 1961). Its occurrence in the Channel Islands and north-eastern Spain suggested that it should be widespread on the western coast of France, and it was subsequently found both there and on the northern coast of Portugal (Coombe & Morisset 1967; Géhu 1972). Its discovery in 1979–81 on the eastern coast of Ireland as far north as Skerries in northern Co. Dublin (Akeroyd 1983) and in 1983 in a small population at Welcombe Mouth in Devon (Milton 1984a), about 70 km north-east of its nearest Cornish site, though only just in Devon, suggested that it should occur further north on the coast of England and Wales. Milton (1984b) drew attention to this in a widely-circulated paper in which he described and illustrated *T. occidentale*, but the present report appears to be the first discovery since then of *T. occidentale* in a

TABLE 1. SPECIES ASSOCIATED WITH *TRIFOLIUM OCCIDENTALE* AT SITES IN THE GOWER PENINSULA (DOMIN COVER-ABUNDANCE SCORES)

Species that were recorded with *T. occidentale* in Cornwall and the Channel Islands by Coombe (1961) are marked +++ if they occurred in at least three of Coombe's four noda, ++ if they occurred in two and + if they occurred in one with a constancy of 2 or more.

Species	Site		
	Tears Point E. (21/407.872)	Tears Point W. (21/407.872)	Lewis Castle (21/413.873)
Trifolium occidentale	3–4	2–3	4–5
Armeria maritima+++	2	—	3–4
Bellis perennis+++	2	1	2
Bromus hordeaceus subsp. *ferronii*+++	3–4	2	2
Cerastium diffusum+++	3	1	2
Cerastium fontanum++	2	—	2
Cynosurus cristatus+++	4	4	3–4
Dactylis glomerata+++	2	2	3
Festuca ovina+++	3	4	2
Festuca rubra+++	4–5	4	4
Helianthemum nummularium	—	4	2
Hieracium pilosella	3–4	2	2
Koeleria macrantha+++	2	3–4	3–4
Leontodon taraxacoides+++	2	4	2
Lotus corniculatus+++	2	3	3–4
Luzula campestris++	2	1	—
Plantago coronopus+++	3	4	2
Plantago lanceolata+++	3	—	2
Poa pratensis++	2	—	3
Ranunculus bulbosus+++	2–3	3	3–4
Sanguisorba minor	4	4	3–4
Scilla verna++	3	3–4	2
Taraxacum erythrospermum	2	1	2
Thymus praecox+++	—	2–3	2
Trifolium dubium++	3–4	—	1
Trifolium repens+	2	3–4	2
Trifolium striatum+	2–3	—	2

Additional species found at only one site: Tears Point E., *Centaurium erythraea*++ 1, *Cirsium vulgare*++ 1, *Poa annua* 3–4; Tears Point W., *Polygala vulgaris*++ 1, *Stachys officinalis*++ 1; Lewis Castle, *Aira caryophyllea*+++ 3, *Carex caryophyllea*++ 1, *Galium verum*++ 1, *Lolium perenne*+++ 3, *Sherardia arvensis* 1, *Trifolium scabrum*++ 1–2.

locality to the north of its known range in Great Britain. The Gower sites are the first to be found in Wales and are about 70 km north-north-east of Welcombe Mouth, separated from it by the Bristol Channel.

The maritime *Festuca rubra* turf of the Gower sites differs from that of the sites in Cornwall and Guernsey described by Coombe (1961) chiefly in the presence of a few calcicoles (e.g. *Sanguisorba minor*) and the absence of some calcifuges (e.g. *Jasione montana* and *Sedum anglicum*); otherwise they are very similar in floristic composition, with *Armeria maritima* as the chief halophytic species in both cases.

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REDISCOVERY OF *HALIMIONE PEDUNCULATA* (L.) AELLEN IN BRITAIN

In northern Europe *Halimione pedunculata* (L.) Aellen is a rare annual of saltmarshes and tidally inundated dune-slacks. It appears to have undergone considerable decline during the present century, and is now listed as an 'endangered' species in Europe (Council of Europe 1983). *H. pedunculata* was believed to have become extinct in Britain in the 1930s. There are old records of the plant from at least 16 localities on the eastern coast between Kent and Lincolnshire (Perring & Walters 1962; Perring & Farrell 1983), but this century it has been observed at only three of these: at Pegwell Bay, Kent (many records, last seen about 1924); on the Wash at Freiston, Lincolnshire (1932, specimen at **NOT**); and at Walberswick, Suffolk (last seen 1938 (J. E. Lousley, note at **RNG**)).

On 29th September 1987 a colony of *H. pedunculata* was discovered in S. Essex, v.c. 18, GR 51/9.8, by S. J. L. and S. A. Wolfe-Murphy in the course of a Nature Conservancy Council survey of grazing marshes in Suffolk and Essex. The species occurs here on a narrow strip of relict saltmarsh about 100m back from the sea-wall, where it is associated with *Puccinellia maritima*, *Aster tripolium*, *Spergularia media*, *Suaeda maritima* and *Triglochin maritima* (Table 1). In phytosociological terms this vegetation clearly belongs to the *Puccinellietum maritimae*, and is similar to stands containing *H. pedunculata* described from elsewhere in Europe (Géhu & Meslin 1968; Géhu 1969; Westhoff & Den Held 1969). The presence of *Parapholis strigosa* is of particular interest, since on the Continent this species helps to typify the subassociation of the *Puccinellietum* in which *H. pedunculata* characteristically occurs (Beeftink 1977).

TABLE 1. PLANT SPECIES GROWING IN ASSOCIATION WITH *HALIMIONE PEDUNCULATA*
Cover-abundance is listed on the Domin scale.

	Quadrat No. (1×1 m)					
Species	1	2	3	4	5	6
Puccinellia maritima	8	8	8	7	7	7
Aster tripolium	7	6	7	7	7	7
Spergularia media	3	4	4	3	4	3
Halimione pedunculata	5	5	2	3	3	4
Suaeda maritima	3	1	3	2	1	3
Salicornia ?ramosissima	1					
Triglochin maritima	1			5	6	3
Parapholis strigosa		5			2	3
Atriplex prostrata		1				
Juncus gerardii						4
Bare ground (%)	5	1		5	2	5
Vegetation height (cm)	12	8	15	13	9	12

On 2nd October J. P. Doody, L. Farrell and S. J. L. revisited the site to carry out a population count of *H. pedunculata* and to map its distribution. A total of 1,714 plants were found within an area of 95m^2. They were distributed very unevenly, with large numbers in areas of more open vegetation and around the edges of slight depressions where seed had collected, possibly as a result of flooding. Most of the plants were in full fruit, with pedicel lengths frequently exceeding the 'up to 12mm' given in the Floras (e.g. Tutin 1987): a sample of 33 pedicels had an average length of

13mm, and a maximum of 25mm. Plant height was also very variable, with a sample of 41 fruiting plants having an average height of 14.2 cm and a range of 1.7–32.5 cm.

It is tempting to speculate on the possible origins of *H. pedunculata* at this site. Has it always been here or is it a recent arrival? The plant's centre of distribution in Europe is on the Danish coast (Jalas & Suominen 1980) and this also happens to be the major 'refuelling' area for Brent Geese on their autumn migration to south-eastern England (Owen *et al.* 1986). Huge flocks of these birds pass through Denmark in late September – just as the seeds of *H. pedunculata* are ripening – and arrive on the Essex coast in early October. Is it possible that *H. pedunculata* could have made the journey across the North Sea in the belly of a Brent Goose?

On the other hand, if it is indeed a site of long standing, how is it that the plant has remained undetected for so long? *H. pedunculata* is a notoriously unreliable species in that its numbers can vary dramatically from year to year (Bennett 1905; Géhu 1969), and this is bound to make finding the plant more a matter of luck than judgement. In addition, it only becomes visually obvious in late September or early October after the pedicels have lengthened. Most botanists are in the field earlier in the year when *H. pedunculata* could easily be overlooked.

This is the first record of *H. pedunculata* in Britain for 50 years, and the first ever record for Essex. Yet the vegetation in which it occurs is otherwise quite unremarkable, and there are certainly large areas of suitable looking habitat in other parts of Essex, and in Kent, Norfolk and Suffolk. It is likely that – if searched for late enough in the season – *H. pedunculata* could be found elsewhere in south-eastern England.

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ON *CONYZA SUMATRENSIS* (RETZ.) E. WALKER AND CERTAIN HYBRIDS IN THE GENUS

The first object of this note is to establish that the correct name for a *Conyza* now well naturalized in the Channel Islands (Marshall & McClintock 1972; McClintock 1975) and now in and near London (Badmin 1986; Wurzell 1988) is *C. sumatrensis* (Retz.) E. Walker (Marshall 1974).

This epithet was first published by Retzius in 1789 for such a plant in Sumatra – which may seem unexpected for one said to be native of Peru. It is, however, now at least, a common weed in Malaysia (Kalkmann & Van Steenis, in litt., 12 Sept. 1976) and may well have started spreading across the globe before the late 18th century. There are objections, however, to the use of this epithet:

a) Burtt (1948) considered Retzius' description did not give sufficient detail to enable certain identification to be made. But his alternative, *C. bonariensis* (L.) Cronq., is a separate species which has never been known in that part of the world (Kalkman & Van Steenis, in litt., 12 Sept. 1976).

b) Retzius described the stems as red, whereas in northern Europe they are usually green. Guédès (1984) dismissed the epithet *sumatrensis* solely because of this, even though in other places, including Sumatra, plants with red stems also occur – the latter presumably due to the Sumatran sun.

c) There is no type or other specimen of Retzius' to check the application of the name (Guédès, in litt., 17 Jan. 1985). This is of course true of many published names and we here designate a neotype:

Conyza sumatrensis (Retz.) E. Walker in *J. Jap. Bot.*, **46**: 72 (1971).
TYPE: Sumatra, Berastagi, February 1921, *H. N. Ridley* (Neotype: **K**, designated here).

Later epithets which have been used for this species include the following:

a) *C. floribunda* Kunth. This is rejected by Guédès & Jovet (1975) on the ground that it should be considered a distinct species, having smaller, glabrescent, finally chestnut-brown capitula and glabrescent or glabrous leaf-surfaces with setiferous margins. Marshall (1973) called this taxon *C. floribunda* var. *subleiotheca* (Cuatr.) J. B. Marshall, using much the same characters, but he now considers it within the range of *C. sumatrensis* which, with its wide distribution, not surprisingly, is variable.

b) *C. albida* Willd. ex Sprengel. This was favoured by Guédès & Jovet (1975) and by Jovet & Vilmorin (1975), but in neither of these publications is *sumatrensis* considered.

c) *C. erigeroides* DC. (see Guédès & Jovet 1975).

Other synonyms are listed by Marshall (1973, 1974).

HYBRIDS

The boundaries of *Conyza* species are not always clear, the plants becoming modified according to the conditions in which they grow. McClintock (1985) mentioned the opinion of Cronquist (1976) to whom *C. bonariensis* and *C. floribunda* (*sumatrensis*) are conspecific. Furthermore, hybrids have been claimed to occur in south-western France and north-eastern Spain, notably under names published (but not all validly so) by Sennen (1904, 1908, 1912, 1916, 1929). We have studied numerous specimens from **BM**, **BOG**, **BRI**, **E**, **GH**, **K**, **LP**, **RB** and **US** with such names and most of them seem to us to fit under *C. sumatrensis* (see synonymy in Marshall (1974)). Two taxa do, however, appear to be distinguishable:

a) *C.* × *daveauiana* Sennen (said to be *C. naudinii* Bonnet (*sumatrensis*) × *ambigua* DC. (*bonariensis*)); all the samples come from the neighbourhood of Barcelona, but it is not clear how his later *C.* × *barcinonense* (with the same postulated parentage) differs from it. All eight specimens we have seen look distinct; indeed Sennen (1912) himself wrote "peut-être la plante n'est pas hybride". We do not know how fertile it is, nor indeed if any of the claimed hybrids are. None have been made experimentally.

b) Another alleged hybrid of note is *C.* × *mixta* Foucaud & Neyraut (= *C. ambigua* (*bonariensis*) × *canadensis* (L.) Cronq.); we know of no specimen so named but the drawing the authors gave of it from near Bordeaux (Foucaud & Neyraut 1902) suggests the postulated parentage may be correct.

CONCLUSION

We have found that we can place any plants we have seen from the British Isles, and most of those from the Continent, under one of three species: *C. canadensis*, *C. bonariensis* or *C. sumatrensis* (cf. Hansen 1972). Nevertheless, members may still like to look out for possible hybrids.

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A NEW BRAMBLE FROM SKYE AND THE OUTER HEBRIDES

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

R. grato similis, sed proprie differt:– Turiones acutiores, profundius sulcati; aculei validiores, curvati e basi lata (vice recti declinati e base angustata); foliola terminalia elliptica vel elliptico-rotundata, apice paulatim acuminata, petioli aculeolis validis curvatis armati; inflorescentia saepe uno vel nonnullis foliis simplicibus ± rotundatis supra ornata; rachis aculeis validis curvatis declinatis armata.

Flores erubescentes 2.5 cm diam. vice rosei 3.5 cm; petala corrugata antherae epilosae. Habitat praecipue in insulis Skyense et Ebudibus extremis.

Similar to *R. gratus* particularly in panicle structure, but differing as follows:– Stems more sharply angled and more deeply grooved; stem prickles stouter, curved rather than straight, declining from broad rather than narrow bases; terminal leaflets elliptic or elliptic-rotund, gradually acuminate rather than obovate; petioles with several strongly curved prickles.

Panicle often with one or more roundish simple leaves above the 3-nate leaves, the rachis armed with several stout-based curved declining prickles. Flowers pinkish and 2.5 cm diam. rather than pink and 3.5 cm, petals crumpled, anthers glabrous. Found in Skye and the Outer Hebrides; not noted as yet on the mainland.

HOLOTYPE: Side of B884 near Colbost above Loch Dunvegan, Skye, v.c. 104, GR 18/212.492, 18/8/1966, *B. A. Miles 66/250* (**Herb. A. Newton**).

Specimens of this species have previously been named as *R. gratus* or given the manuscript name of 'false gratus'. I have also seen the following material:
S. Uist, N. Glendale, GR 08/791.177, 8/1980, *R. Pankhurst & A. Chater 377* (**BM**).
Benbecula, 8/1940, *J. W. Heslop-Harrison* (**BM**).
S. Harris, Leverburgh, GR 18/020.855, 8/1980, *R. Pankhurst & A. Chater 351* (**BM**); Ardvey, GR 18/125.928, 8/1980, *R. Pankhurst & A. Chater 347* (**BM**); Obbe, 7/1894, W. A. Schoolbred (as *R. gratus*, det. W. M. Rogers) (**BM**).
Lewis, Eishken, GR 19/327.120, 8/1980, *R. Pankhurst & A. Chater 354* (**BM**).
Skye, near Loch Treaslane, GR 18/3.5, 8/1966, *B. A. Miles* (**CGE**).

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RORIPPA × *HUNGARICA* BORBÁS (*R. AMPHIBIA* × *R. AUSTRIACA*) (CRUCIFERAE) NEW TO THE BRITISH ISLES

In June 1987, while investigating *Rorippa* populations along the River Roding, Chigwell, Essex (v.c. 18), we found a single plant intermediate between *R. amphibia* (L.) Besser and *R. austriaca* (Crantz) Besser. Further morphological analysis indicated that it was probably a hybrid between the two species and material was therefore sent to Professor B. Jonsell, who confirmed the identification (pers. comm. 1987). This hybrid has been reported rarely from Europe (Javůrková-Kratochvílová & Tomšovic 1972; Jonsell 1975) and this is the first record from the British Isles. Voucher specimens have been placed in **BM**, **LTR**, **herb. T.C.G.R.** and **herb. B. W.**

We have accepted the name *R.* × *hungarica* as the binomial for *R. amphibia* × *R. austriaca* (Borbás 1879) but have not seen the material from which it was described.

TABLE 1. CHARACTERS OF *RORIPPA AMPHIBIA*, *R. AUSTRIACA* AND *R.* × *HUNGARICA* BASED ON MATERIAL FROM CHIGWELL
Measurements are ranges made on fresh material

Character	*R. amphibia*	*R.* × *hungarica*	*R. austriaca*
habit	clumps with ascending stems	± clump-forming	patch-forming with erect stems
stem T.S. below inflorescence	hollow with thin, supple, dark green cells	loosely packed with thick, firm whitish-green cells	solid with dense, hard foamy white cells
middle stem leaves			
auricles	small, but clasping stem	obvious and nearly projecting	prominent, projecting well behind stem
teeth	deep, outwards-pointing	medium, generally forward-pointing	shallow, forward-pointing
sepal length (mm)	(3.3) 3.4–4.3	3.2–3.6	2.7–3.0
petal length (mm)	(4.3) 4.8–6.2	4.8–5.7	3.7–5.0
shape at base	clawed	± unclawed	unclawed
pedicels	spreading to deflexed	spreading to deflexed	ascending, angle c. 40°
immature ovaries			
stipe (mm)	0.4–0.5	c. 0.3	sessile
shape	oblong	elliptic	± round
length (mm)	2.0–3.0	1.3–1.5	1.2–1.5
width (mm)	0·8–1.2	0.9–1.2	1.1–1.4
fruit set	setting good fruit	not maturing, racemes elongating markedly	setting good fruit

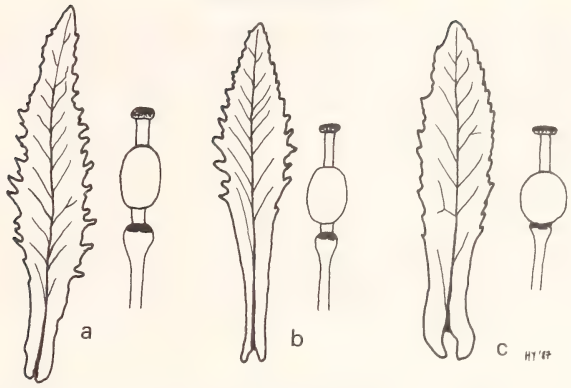

FIGURE 1. Leaves and immature ovaries of (a) *R. amphibia*, (b) *R.* × *hungarica* and (c) *R. austriaca*.

The plant was found growing amongst tall vegetation on the steep bank of the river within 20 m of both parents. *Rorippa amphibia* was frequent along the river bank and one patch of *R. austriaca* was found in dry grassland; this appears to be a new site for the latter although there are three other colonies known nearby in the Roding Valley. Other *Rorippa* taxa present along the river here are *R. palustris*, *R. sylvestris* and *R. amphibia* × *sylvestris* (the latter also confirmed by Jonsell).

Characters of *R.* × *hungarica* and its parents from Chigwell are given in Table 1. Drawings of leaves and immature ovaries are given in Fig. 1, and a plot of fresh sepal length against fresh petal length for individual flowers of all the taxa is given in Fig. 2. These illustrate the general intermediate nature of the hybrid, though any one character may vary towards either parent. In addition, Professor Jonsell examined pollen under a microscope and states (pers. comm.) "the *R.*

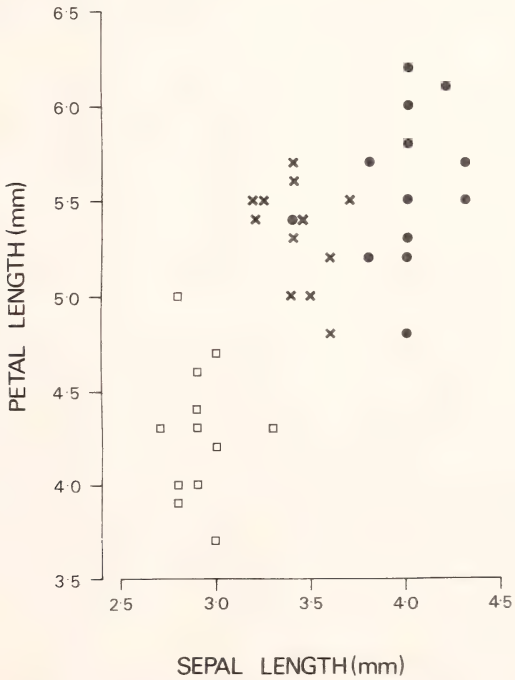

FIGURE 2. Fresh sepal length plotted against fresh petal length for individual flowers of (●) *R. amphibia*, (□) *R. austriaca* and (×) *R.* × *hungarica*, all from Chigwell.

amphibia × *austriaca* hybrid seems to produce only inviable pollen . . . in the parent species pollen quality is, as is very often the case, far from excellent, but there are at least a number of well developed presumably functioning grains".

ACKNOWLEDGMENTS

Our thanks to Ken Adams who suggested we should investigate this section of river in the first place, to Professor B. Jonsell for examining the material, and to Mike Mullin for help in checking nomenclature.

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CEPHALANTHERA RUBRA (L.) RICH. IN HAMPSHIRE

On 20th July 1986 the flower-spike of a *Cephalanthera* was found in bud, in a beech-yew wood on the chalk in N. Hants., v.c. 12. When the first flower opened a few days later, it was clear that this was a plant of *Cephalanthera rubra* (L.) Rich. of which no satisfactory records exist for Hampshire. Druce (1927) reported that it was "recorded from near Selborne, Hants., but in error, the specimen being a Helleborine (i.e. *Epipactis*)". It is not mentioned in the *Flora of Hampshire* (Townsend 1904), but in a supplement (Rayner 1929, p. 99) *C. rubra* is recorded as having been found in 1926 in District VI(1) (Upper Test Catchment) on the authority of Miss E. Williams. Nothing further is known of this report. We have received oral information that Anne Pratt, the Victorian botanist, reported *C. rubra* from the Hampshire Chalk Hangers in the 1880s, but we cannot trace this record in print.

The present-day locality for *C. rubra* in Hampshire is under rather deep shade, on a north-west-facing slope. The single plant that flowered in 1986 was a fine one, with a total of 13 flower-buds, but some of these aborted. Several, however, opened widely enough to produce flowers in which the narrow labellum and pubescent ovary were well displayed. Careful search of the site revealed that at least nine leafy, but non-flowering, shoots of this species were present over some 50m of the bank. Botanists have visited this area over some years previously, in general botanical surveys, but *C. rubra* has not been reported before. It is however known that a few trees were felled higher up the bank a few years ago; this may well have allowed enough (almost horizontal) morning sunlight to penetrate the site and to stimulate one plant to produce a flower-spike.

In early August this flower-spike unfortunately was found to have been broken off. Efforts at pollinating the flowers having met with no success, the spike was preserved, using the sulphur dioxide method, by F. R.

The site has little ground flora apart from sparse ivy; conservation work has been undertaken, with the cooperation of the owners, to thin out the tree canopy, particularly the yews and smaller scrubby beeches, to let in more light. In its localities in France and Germany, *C. rubra* only flowers well in situations where it gets some hours of sunlight on each sunny day, e.g. in glades or on the

northern sides of minor roads or trackways. Similar management has been carried out in other British sites, with considerable success in stimulating several plants to flower. It is known that in some continental sites there are large numbers of rhizomes present that do not even produce leafy shoots, but in later years have inflorescences if light is let in.

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THE IRISH VICE-COUNTY MAP IN *WATSONIA*: A CORRECTION

I wish to draw attention to the map of vice-counties of Ireland which has been published in most issues of *Watsonia* from 1976 onwards. In this map the boundary line limiting West Cork, v.c. H3, to the east and Mid Cork, v.c. H4, to the west is incorrect and not in accord with the reference vice-county map for Ireland published by Praeger (1901). This map is reproduced in both editions of *Census Catalogue of the flora of Ireland* (Scannell & Synnott 1972, 1987).

Webb (1980) set out very clearly the historical background to the vice-counties. In this paper a number of ambiguities and errors are discussed and attention is drawn to the changes in the administrative county boundaries in 1898–1900, and the effects of those on the biological scheme. Webb reaffirms the principle adopted by the Praeger Committee of the Royal Irish Academy – that the biological vice-counties should be defined in accordance with the frontispiece map of *Irish Topographical Botany* (Praeger 1901). Webb delineates in words and by line-drawing the boundaries of the vice-counties and in particular those lines drawn to subdivide the larger counties. In the case of West Cork, v.c. H3, and Mid Cork, v.c. H4, the dividing line runs from the median part of the Bandon estuary, along the Bandon River to the bridge at Bandon, from thence by a straight line to the centre of Macroom, from there by a straight line to Millstreet and then along the Mallow-Killarney railway line to the Kerry border. This is not the line presented in the map published in *Watsonia*.

Where then did the H3/H4 line in the *Watsonia* map come from? In 1949 the Ordnance Survey of Ireland published a large-scale map (10 miles to one inch) setting out the biological divisions. Colonel Niall MacNeill, an authority on dragonflies, then in charge of Ordnance Survey, supervised the work. In this map the H3/H4 line is based on barony boundaries and appears as an undulating line from the sea to the Kerry border. This is the line presented in the *Watsonia* map. Webb (1980), however, has discussed this map and has given reasons for its rejection; he also points out that MacNeill's boundary between West Cork and Mid Cork deviates from Praeger's by as much as 8 km in two places. The boundary line is also incorrect in the overlay issued with *Atlas of ferns of the British Isles* (Jermy *et al.* 1978).

The map in Druce (1932) is correct as regards the boundary line and the letter-press on the back of Druce's map describes the geographic points on the line. Dandy's work on the vice-counties (Dandy 1969) refers to Great Britain only.

It is recommended that the correct map be published and that attention be drawn to Webb (1980) on the Irish vice-counties.

ACKNOWLEDGMENT

I wish to thank Professor David Webb for his comments on an earlier draft of this note.

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POLYGONUM HYDROPIPER L. VAR. *DENSIFLORUM* A. BRAUN

While walking along the edge of the Ouse Washes near Welches Dam, Manea, Cambridgeshire, v.c. 29, on 13th November 1986, P.D.S. saw in some quantity two completely different looking Polygonums growing with *Urtica dioica* subsp. *glabrescens*, *Bidens tripartita*, *Atriplex prostrata*, *Erysimum cheiranthoides*, *Senecio aquaticus* and *Rumex* spp. In some places they formed separate patches, in others they were close together, but not intermingled. There were no intermediates.

One of them (*Sell 86/229*, colour slide 423/16 in **CGE**) had narrow, wavy leaves and very lax inflorescences, and was recognizable at a glance as *Polygonum hydropiper* L.; the peppery taste of the leaves confirmed the identification. The other plant (*Sell 86/228*, colour slide 423/15 in **CGE**) had broader, non-wavy leaves and much denser inflorescences, many of which came from the axils of the leaves. The plant was on the whole much larger, taller and more branched and straggly. On first tasting this plant P.D.S. got no reaction, but later did obtain some reaction, as did others who tried it. An examination of the plant in detail indicated that it must be included in *P. hydropiper*, but it is a distinct variant of that species.

Consultation of the literature showed that C. E. Britton (1926, 1933) had recorded such a plant from Brox in Surrey, v.c. 17, under the name *P. hydropiper* var. *densiflorum* A. Braun, *Flora (Regensb.)*, **7**: 352 (1824), and that this determination was upheld by Salmon (1931). Grose (1957) recorded it from a cultivated field near Dewey's Water and a damp field near Garsdon, both in Wiltshire. Timson (1966), in his *Biological Flora* account, included only these records and gave no indication that he had seen the plant himself. This variant is also mentioned in Lousley & Kent (1981).

During the autumn of 1986, J.R.A. independently received material of *Polygonum* for determination, from Mrs M. E. R. Martin (v.c. 72) and L. J. Margetts (v.c. 3), that appeared to be *P. hydropiper* var. *densiflorum*. Mrs Martin had annotated the specimen: "More elegant plant. Brown glands not so numerous. Biting taste less obvious. Not drooping tips." Mr Margetts noted (in litt. to J.R.A.) that "the inflorescences were not drooping." P.D.S. later confirmed this identification.

In the Cambridge University herbarium (**CGE**) there is a specimen collected by the Rev. E. S. Marshall, no. 2487 from the head of Loch Long, Dunbarton in 1900, which was associated with normal *P. hydropiper* and *P. persicaria* L. It is annotated: "I do not think that this is a hybrid, but I believe it may be *P. hydropiper* L. var. *densiflorum* Braun in *Bot. Zeit.* 1824; but I have not access to his paper, but take it from Bosch's *Flora Batavica*. Ar. Bennett in litt. 31/12/1900." E. F. Linton has annotated the specimen: "Too strongly fertile in my opinion for a hybrid *Polygonum*. Reminds me of forms of Hydropiper which simulate *P. mite*. I do not know the varietal name. I have one nearly as dense-flowered (from Nayland, Suffolk), but never a specimen with such broad-round-basal leaves! I consider I have *P. mite* × *hydropiper* from Sway, not entirely barren, but fruits rather intermediate. The fruit and perianth of your plant are out and out Hydropiper, not a trace of *P. persicaria*." A duplicate of Marshall's gathering (**BM**) bears the annotation "Taste insipid", which fits the observations of P.D.S. and Mrs Martin noted above. We consider both Marshall's Dunbarton plant and Linton's Suffolk plant to be var. *densiflorum*.

Although more difficult to recognize when pressed, a number of specimens in **CGE** and elsewhere seem to be referable to *P. hydropiper* var. *densiflorum*. These are listed below. The Nayland plant is presumably that to which Linton referred. P.D.S. did not comment on the Flitwick plant, which is typical of the variety, when he collected it, other than that it had an acrid taste: it may be this variety that Saunders (1883) called *P. minus* Hudson and which Dony (1953) later corrected to *P. hydropiper*. Both collections were from a ditch (stream) at Flitwick Moor.

v.c.3. S. Devon. Starcross, side of small stream, 22.9.1900, *S. H. Bickham*, **CGE**; near Exeter, Columbjohn, by River Culm (GR 20/95.99), 30.9.1986, *L. J. Margetts*, **RNG**.
v.c.13. W. Sussex. Near Lyminster, farmyard, 23.9.1928, *E. C. Wallace*, **RNG**.
v.c.17. Surrey. Brox, 2.10.1926, *C. E. Britton 2988*, **BM**, **RNG**; between Kew and Richmond, by River Thames, 10.9.1932, *J. E. Lousley*, **RNG**; Frensham Great Pond, dried bed of lake, 12.9.1941, *E. C. Wallace*, **RNG**.
v.c.23. Oxon. Oxford, Port Meadow, 1891, J. Baker, **OXF**; Lechlade, 9.1894, *G. C. Druce*, **OXF**.
v.c.25. E. Suffolk. Stoke-by-Nayland, lower park gate, roadside, 9.1889, *J. D. Gray*, **CGE**; Nayland, *ibid.*, 12.9.1889, *E. F. Linton*, **BM**.
v.c.27. E. Norfolk. Near Cromer, Felbrigg Woods, 8.1896, *A. Wallis*, **CGE**.
v.c.29. Cambs. Manea, near Welches Dam, edge of Ouse Washes, 13.11.1986, (GR 52/472.860) *P. D. Sell 86/228*, **CGE**.
v.c.30. Beds. Flitwick Moor, side of stream, 12.9.1962, *P. D. Sell 62/805*, **CGE**.
v.c.37. Worcs. Bransford, ditch, 1.10.1910, *R. F. Towndrow*, **CGE**.
v.c.41. Glam. Near Cardiff, Llanedyrne Road, ditches, 5.10.1935, *A. E. Wade*, **CGE**.
v.c.71. Man. Rushen, marsh by Croak Mooar, 16.9.1952, *D. E. Allen*, **CGE**.
v.c.72. Dumfries. Near Dumfries, riverside sandy gravel (GR 25/97.76),13.9.1986, *M. E. R. Martin*, **RNG**.
v.c.79. Dunbarton. Head of Loch Long, Arrochar, 28.8.1900, *E. S. Marshall 2487*, **BM**, **CGE**.
v.c.83. Midlothian, Crookster, 1849, *J. B. Syme*, **BM**.

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LECTOTYPIFICATION OF FIVE NAMES IN *RANUNCULUS* L. SUBGENUS *BATRACHIUM* (DC.) A. GRAY

This group is bedevilled with names difficult to apply, many of which need to be lectotypified, and progress is necessarily piecemeal. Five of these names are dealt with below.

R. hederaceus L., *Sp. pl.* 556 (1753)
The diagnosis given by Linnaeus is, in fact, taken verbatim from the *Hortus Cliffortianus* of 1738, and the type should, if possible, be selected from material available to him at that time. There is unfortunately no specimen in the *Hortus Cliffortianus* in **BM**. It is therefore necessary to consider the synonyms and any specimens in his herbarium (**LINN**) up to 1753. Benson (1954) designated

the sheet of the Savage *Catalogue* 715/74 (**LINN**) as the lectotype. Cook (1966) says he has seen this specimen and has no reason to doubt Benson's designation. P.D.S. has labelled the specimen as the lectotype.

R. hederaceus forma *natans* Moss, *Camb. Br. Fl.*, **3**: 139, pl. 144 (1920)
No type was designated, but judging from the distribution given, there were obviously a great many syntypes. The original drawing made by E. W. Hunnybun for pl. 144 is in the Botany School, University of Cambridge. It is labelled "Hemingford Common [Huntingdonshire], May, 1900", but there is no specimen to go with it in **CGE**. P.D.S. has therefore selected as lectotype a specimen in **CGE** which is cited with the original description. It is labelled "Rheinfläche bei Kruft, 15 Aug. 1861, Dr Wirtgen *Herb. Pl. Crit.* Fasc. 10, no. 546", on which Moss has written, "*R. hederaceus* L., floating form. Not *R. homiophyllus* Ten." Cook (1966) considers that forma *natans* has no genotypic basis.

R. hederaceus var. *grandiflorus* Babington, *Man. Br. Bot.* 5 (1843)
There are two syntype gatherings in Babington's herbarium in **CGE** made before 1843 and labelled by him as var. *grandiflorus*.
1) Floating on the water in a small pit near the Monastery, Charnwood Forest, Leicestershire, 20 June 1837, *C. C. Babington*.
2) Needwood Forest, Staffordshire, 15 June 1837, *C. C. Babington*.

Both are *R. omiophyllus* Ten. P.D.S. has selected the first as the lectotype. The second becomes a paralectotype.

R. floribundus Babington in *Ann. Mag. nat. Hist.*, ser. 2, **16**: 397 (1855)
All the material on which Babington based his description is in his herbarium in **CGE** and is so labelled in his own handwriting. There are six syntypes:
1) In a pond by the road on the common at Denver, Norfolk, 2 June 1853, *C. C. Babington*.
2) In a pit on the common at Denver, Norfolk, 2 June 1853, *C. C. Babington*.
3) On the mud by the pond on the common at Denver, Norfolk, 2 June 1853, *C. C. Babington*.
4) In a pond near Legge's Farm near Hatfield, Herts., 12 June 1855, *C. C. Babington*.
5) Hedon, near Hull, 7 Sept. 1853, *W. W. Newbould*.
6) In stagnis Siciliae, *Prof. Gasparinii*.

In selecting a lectotype, uncertain specimens and those not fulfilling the required characters should be rejected first. Number 6 can be rejected as Babington himself says it only "appears to be *floribundus*". Number 3 has no floating leaves and therefore shows only some of the characters. The remaining four sheets are excellent specimens. A careful comparison of these specimens with the original description enables 4 and 5 to be rejected on one or more grounds and for the Denver plants to be regarded as those that best fit the description. Both are good specimens, but number 2 shows the rooting at the lower nodes and good sepals. It thus fits the description exactly and is designated as the lectotype. It is *R. peltatus* Schrank and *R. floribundus* must be reduced to a synonym of that species. Sheets 1 and 4 are also *R. peltatus*. Sheet 5 and possibly 3 are *R. baudotii* Godron. Sheet 6 is *R. aquatilis* L.

R. peltatus var. (vel forma) *lacerus* Druce in *Rep. botl Soc. Exch. Club Br. Isl.*, **5**: 272 (1919)
Druce stated that this plant "differs from the type in the floating leaves being irregularly cut into acute, wedge-shaped segments, sometimes with the apices prolonged into long, comb-like parts." There are three syntypes in Druce's herbarium in **OXF** collected from the River Don, Alford, N. Aberdeen by Druce in 1918 and labelled by him as "*R. peltatus* var. (vel forma) *lacerus*", all of which are *R. peltatus* Schrank. One of these can be rejected because the laminar leaves are not prolonged into capillary appendages. Both of the remaining sheets are good specimens and S.D.W. has designated one of them as the lectotype. This specimen has the longer capillary appendages of the two and thus best fits the description. This sheet is marked "Don" in Druce's handwriting.

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Plant Records

Records for publication must be submitted to the appropriate vice-county Recorder (see *Vice-county Recorders* (1985)), and *not* the Editors. The records must normally be of species, hybrids or subspecies of native or naturalized alien plants belonging to one or more of the following categories: 1st or 2nd v.c. record, 1st post-1930 v.c. record; only extant v.c. locality, or 2nd such locality; a record of an extension of range by more than 100 km. Such records will also be accepted for the major islands in v.cc. 102–104 and 110. Only 1st records can be accepted for *Rubus*, *Hieracium* and hybrids. Records for subdivisions of vice-counties will not be treated separately; they must therefore be records for the vice-county as a whole. Records of *Taraxacum* are now being dealt with separately, by Dr A. J. Richards, and will be published at a later date. New records for Irish vice-counties are published elsewhere, usually in the *Irish Naturalists' Journal*.

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)). All records are field records unless otherwise stated. With the exception of collectors' initials, herbarium abbreviations are those used in *British and Irish herbaria* by D. H. Kent & D. E. Allen (1984).

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.: Warren Heath, GR 41/76.59. Bank of pond. C. R. Hall, 1985, **herb. A. Brewis**. Only extant record.

4/1. Equisetum hyemale L. *__12__, N. Hants.: Westlands Copse, GR 41/80.45. Stream-bank. R. B. Gibbons, 1985, **herb. A. Brewis**, det. F. Rose.

4/7. Equisetum sylvaticum L. *__52__, Anglesey: Bryn Mwcog, GR 23/46.83. Damp grassland. L. J. Colley, M. R. Davies & R. H. Roberts, 1987, **NMW**.

4/7 × 10. Equisetum sylvaticum L. × E. telmateia Ehrh. *__11__, S. Hants.: Minstead, GR 41/29.10. Roadbanks. R. P. Bowman, 1986, **E**, det. C. N. Page. 1st ever record of this hybrid.

4/8. Equisetum pratense Ehrh. **99**, Dunbarton: Lang Craigs, GR 26/43.76. Grassy rock ledge on basalt crags. A.McG. Stirling, 1987, **E**. 2nd record.

4/10. Equisetum telmateia Ehrh. *__79__, Selkirks.: Newhouse Bank, Ettrick, GR 36/37.22. Flushed woodland and roadside verge. R. W. M. Corner, 1987, **herb. R.W.M.C.**

7/1. Hymenophyllum tunbrigense (L.) Sm. *__67__, S. Northumb.: Bull Crag, GR 35/66.86. M.O. Hill, 1987, **herb. G.A. Swan**.

†17/1. Matteucia struthiopteris (L.) Tod. *__79__, Selkirks.: R. Ettrick at Thirlestane, GR 36/28.15. Shaded river-bank. *__80__, Roxburghs.: Linthill, GR 36/54.26. Woodland by burn. Both C.O. Badenoch, 1987, **herb. R.W.M. Corner**.

21/6 × 7. Dryopteris carthusiana (Vill.) H. P. Fuchs × D. dilatata (Hoffm.) A. Gray *__70__, Cumberland: Culgaith, GR 35/60.31. Cleared woodland. R. W. M. Corner, 1983, det. C. R. Fraser-Jenkins.

21/8. Dryopteris aemula (Aiton) O. Kuntze *__8__, S. Wilts.: Langley Wood, GR 41/22.20. Streamside. F. Rose & R. J. Hornby, 1985. *__11__, S. Hants.: Wilverley Inclosure, GR 41/24.01. Drainage ditch in *Pseudotsuga* plantation. Mrs A. Bolton, 1987, **herb. R. P. Bowman**, det. R.P.B.

25/1 × int. Polypodium vulgare L. × P. interjectum Shivas *__6__, N. Somerset: Nye Drove, Winscombe, GR 31/40.60. E. M. McDonnell & Lady R. FitzGerald, 1985, det. R. H.

Roberts. *75, Ayrs.: Ailsa Craig, GR 25/02.99. Rock crevice. A.McG. Stirling, 1987, **herb. A.McG.S.**

†32/kae. LARIX KAEMPFERI (Lamb.) Carrière *99, Dunbarton: Near Rosneath Point, GR 26/26.80. Forest trackside. A.McG. Stirling & A. Rutherford, 1984. Regenerating.

40/1. ACONITUM NAPELLUS L. †*73, Kirkcudbrights.: Below Carsluith Castle, GR 25/49.54. Wood. O. M. Stewart, 1987.

46/12 × 13. RANUNCULUS FLAMMULA L. × R. REPTANS L. *98, Main Argyll: Loch Awe opposite Kilchurn Castle, GR 27/13.27. Damp loch shore. A.McG. Stirling, 1977, **LTR**, det. R. J. Gornall.

46/22c. RANUNCULUS PENICILLATUS (Dumort.) Bab. subsp. PSEUDOFLUITANS (Syme) S. Webster var. PSEUDOFLUITANS (Syme) S. Webster *46, Cards.: Afon Teifi above Henllan, GR 22/37.40. River. A. O. Chater, 1986, **NMW**, det. S. D. Webster.

50/2. THALICTRUM ALPINUM L. *64, Mid-W. Yorks.: Giggleswick Scar, Richardsons Scar & Gordale, GR 34/8.6. N. J. Winch, annotated Flora in **LINN**. Rocks above Settle, GR 34/8.6. J. Tatham, 1841, **BM**, det. J. M. Mullin. 1st and 2nd records. See *BSBI News*, **47**: 20–21 (1987).

62/1. CHELIDONIUM MAJUS L. †*103, Mid Ebudes: Dervaig, Mull, GR 17/43.52. B. Rae, 1987, det. J. W. Clark & A. Slack.

†63/1. ESCHSCHOLZIA CALIFORNICA Cham. *12, N. Hants.: Stoke, GR 41/40.50. G. D. Field, 1984.

†65/1. CORYDALIS SOLIDA (L.) Sw. *39, Staffs.: Colwich, GR 43/02.20. Roadside spinney. M. B. Jennings, 1968, still there in 1986.

66/7. FUMARIA DENSIFLORA DC. 73, Kirkcudbrights.: Castle Douglas, GR 25/75.62. Waste ground. P. Stanley, 1987. 1st post-1930 record.

†68/1. ERUCASTRUM GALLICUM (Willd.) O. E. Schultz *69, Westmorland: M6 road west of Bendrigg, GR 34/58.90. Waste ground. C. E. Wild, 1987, **LANC**, det. T. C. G. Rich.

†71/1. HIRSCHFELDIA INCANA (L.) Lagr.-Foss. 39, Staffs.: Pensnett, GR 32/91.88. Spoil heap. C. B. Westall, 1987. 1st post-1930 record.

75/1. CRAMBE MARITIMA L. 59, S. Lancs.: Between Hall Road and Hightown, GR 34/29.02. Rubble above high-tide mark. V. Gordon, 1987. 1st post-1930 record.

†76/2. RAPISTRUM RUGOSUM (L.) All. 69, Westmorland: Heversham, GR 34/49.82. Copse. M. Baecker, 1986, **LANC**, det. T. C. G. Rich. 2nd record.

†79/den. LEPIDIUM DENSIFLORUM Schrader 17, Surrey: Sutton, GR 51/25.64. Churchyard. M. J. Dyke, 1987. 1st record since 1920.

†81/2. CARDARIA CHALEPENSIS (L.) Hand.-Mazz. *25, E. Suffolk: Felixstowe, GR 62/3.3. Roadside. Herb. A. H. Maude, 1919, **BM**, det. T.C.G. Rich.

88/5. COCHLEARIA DANICA L. †*12, N. Hants.: Aldershot, GR 41/86.52. Central reservation of A325 road. T. Dove, 1985.

94/4. DRABA MURALIS L. †98, Main Argyll: Ormaig House, Loch Craignish, GR 17/82.03. Garden wall. B. H. Thompson, 1987. 2nd record.

†97/7. CARDAMINE RAPHANIFOLIA Pourret *99, Dunbarton: Loch Lomond, near Balloch, GR 26/38.82. Marshy ground. J. H. Penson, 1966. Upper Helensburgh, GR 26/30.83. Wet streambank. A. McG. Stirling & A. Rutherford, 1972. 1st and 2nd records.

†98/3. BARBAREA INTERMEDIA Bor. *98, Main Argyll: Bishop's Glen, Dunoon, GR 26/16.76. Disturbed ground. B. H. Thompson, 1987, **herb. B.H.T.**, det. T.C.G. Rich.

102/1 × 2. NASTURTIUM OFFICINALE R.Br. × N. MICROPHYLLUM (Boenn.) Reichenb. *46, Cards.: Mwnt, GR 22/17.51. Stream. A. O. Chater, 1987.

102/2. NASTURTIUM MICROPHYLLUM (Boenn.) Reichenb. *77, Lanarks.: South of Strathaven, GR 26/7.4. Burn. P. Macpherson, 1987, **herb. P.M.**, det. T.C.G. Rich.

†102/6. RORIPPA AUSTRIACA (Crantz) Bess. **33**, E. Gloucs.: Teddington Hands Roundabout, Tewkesbury, GR 32/96.33. Roadside verge. R. J. Cooper, 1987. Only extant locality.

112/1. RESEDA LUTEOLA L. **98**, Main Argyll: Bishop's Glen, Dunoon, GR 26/16.76. Disturbed ground. B. H. Thompson, 1987. 2nd record.

113/1. VIOLA ODORATA L. ***93**, N. Aberdeen: Insch, GR 38/63.28. Deciduous woodland. D. Welch, 1987, **ABD**.

113/1 × 2. VIOLA ODORATA L. × V. HIRTA L. ***80**, Roxburghs.: West of Carham Station, GR 36/78.36. Limestone railway cutting. R. W. M. Corner, 1987, **herb. R.W.M.C.**, det. D. M. Moore.

113/5. VIOLA REICHENBACHIANA Jord. ex Bor. ***67**, S. Northumb.: Devil's Water near Ordley, GR 35/94.59. Steep grassy bank. G. A. Swan, 1987. Gunnerton Crag, GR 35/91.75. Limestone scrub. A. J. Richards, 1987. Both **herb. G.A.S.**, det. D. M. Moore. 1st confirmed and 2nd record.

113/12 × 13. VIOLA TRICOLOR L. × V. ARVENSIS Murr. ***80**, Roxburghs.: Smailholm Craigs, St Boswells, GR 36/63.34. Shallow soil over rock. M. Little, 1985, **herb. R.W.M.Corner**, det. D. R. McKean.

115/5 × 6a. HYPERICUM PERFORATUM L. × H. MACULATUM Crantz subsp. MACULATUM ***77**, Lanarks.: Bothwell Castle, GR 26/68.59. Grassy area. J. H. Dickson, 1984, **GL**, det. N. K. B. Robson.

123/14. SILENE ALBA (Mill.) E. H. L. Krause ***103**, Mid Ebudes: Near Bishop's House, Iona, GR 17/28.24. Waste ground. J. W. Clark, 1987. 1st confirmed Mull record.

†124/cor. LYCHNIS CORONARIA (L.) Desr. ***70**, Cumberland: Rockcliffe, Carlisle, GR 35/35.61. Scrub on sandstone river cliff. R. E. Groom, 1979, still present in 1987, **LANC**.

127/1. DIANTHUS ARMERIA L. **11**, S. Hants.: Avon Forest Park, St Leonards, GR 41/12.01. Sandy acid grassland. Mrs F. Woodhead, 1986. Only extant locality.

127/4. DIANTHUS PLUMARIUS L. ***73**, Kirkcudbrights.: Below Port Mary House, GR 25/75.45. Shingle on shore. C. D. Preston & O. M. Stewart, 1986, **E.**

127/8. DIANTHUS DELTOIDES L. †**11**, S. Hants.: Avon Forest Park, St Leonards, GR 41/12.01. Sandy grass heath. R. P. Bowman, 1986, **herb. R.P.B.**, det. S. Hooper. Only extant locality.

129/1. SAPONARIA OFFICINALIS L. †**77**, Lanarks.: Bellahouston, GR 26/56.63. Grassy waste ground. P. Macpherson, 1987, **herb. P.M.** 2nd record. †**99**, Dunbarton: Near Dog's Loan, Dunbarton, GR 26/40.74. Sandy shore. E. Brock, 1981. 2nd record.

131/10. CERASTIUM DIFFUSUM Pers. †***64**, Mid-W. Yorks.: Adel, Leeds, GR 44/27.39. Garden weed. K. Bradbury, 1987, det. P. P. Abbott. Embsay Station, GR 44/00.53. Platform and trackside. E. Crackles & J. Duncan, 1987. 1st and 2nd records. †***79**, Selkirks.: Galashiels, GR 36/47.37. Old railway track. J. A. Murray, 1986, det. D. R. McKean. †**80**, Roxburghs.: Galashiels, GR 36/47.37. Old railway track. J. A. Murray, 1986, det. D. R. McKean. 2nd record.

131/12. CERASTIUM SEMIDECANDRUM L. ***79**, Selkirks.: Old Redhead, GR 36/44.37. Rocky roadside bank. R. W. M. Corner, 1987, **herb. R.W.M.C.**

132/1. MYOSOTON AQUATICUM (L.) Moench **59**, S. Lancs.: Lostock, GR 34/66.08. Wet ground. V. Gordon, 1987. Only extant locality.

141/2. ARENARIA LEPTOCLADOS (Reichb.) Guss. **77**, Lanarks.: Eastfield, Glasgow, GR 26 63.61. Bare ground. P. Macpherson, 1987. 2nd record.

†141/6. ARENARIA BALEARICA L. ***99**, Dunbarton: Helensburgh, GR 26/29.83. Garden wall. A.McG. Stirling & A. Rutherford, 1985. Present since 1950.

147/1. ILLECEBRUM VERTICILLATUM L. †**59**, S. Lancs.: Fazakerley, GR 33/38.97. Old railway lines. B. K. Byrne, 1987. 2nd record.

148/1. SCLERANTHUS ANNUUS L. **7**, N. Wilts.: Near The Column, Savernake Forest, GR 41/23.64. Cornfield. D. Green & J. Newton, 1985. Only extant locality.

149/1a. MONTIA FONTANA L. subsp. FONTANA *__52__, Anglesey: Twyn-y-Parc, Bodorgan, GR 23/36.64. Coastal turf near gullery. C. D. Preston, 1986, **NMW**, det. S. M. Walters.

149/1b. MONTIA FONTANA L. subsp. CHONDROSPERMA (Fenzl) Walters *__80__, Roxburghs.: Near Crailing Hall, Oxnam, GR 36/70.21. Sandy soil over basalt. South end of Broadlee Loch, GR 36/40.09. Peaty flush. Both R.W.M. Corner, 1986, **herb. R.W.M.C.**, det. S. M. Walters. 1st and 2nd records.

149/1c. MONTIA FONTANA L. subsp. AMPORITANA Sennen **38**, Warks.: Sutton Park, GR 42/09.96. Marshy ground. J. C. Bowra, 1986, **WAR**, det. S. M. Walters. 1st record since 1875.

149/1d. MONTIA FONTANA L. subsp. VARIABILIS Walters **52**, Anglesey: Llyn Coron, GR 23/37.69. Close-grazed lakeside turf. C. D. Preston, 1986, **NMW**, det. S. M. Walters. 2nd localized record. *__81__, Berwicks.: Fans, GR 36/61.41. Sandy bank. M. E. Braithwaite & M. Mutch, 1987, **herb. M.E.B.**, det. S. M. Walters.

†DISPHYMA CRASSIFOLIUM (L.) L. Bolus *__52__, Anglesey: North of Bwa Du, Rhoscolyn, GR 23/26.76. Coastal cliff. C. D. Preston, 1986, photographs in **CGE**. Originally planted, first seen 1976, now thoroughly naturalized. 1st Welsh record.

†153/4. AMARANTHUS LIVIDUS L. **38**, Warks.: Guy's Cliffe, Warwick, GR 42/28.66. Waste ground. J. C. Bowra, 1985, **WAR**, det. T. B. Ryves. Still present in 1987. 1st record since 1874.

154/3. CHENOPODIUM VULVARIA L. **70**, Cumberland: Eden Bridge, Lazonby, GR 35/55.40. Landscaped picnic area. R. E. Groom, 1984, **LANC**, det. J. M. Mullin. 1st record this century.

154/11. CHENOPODIUM MURALE L. **70**, Cumberland: Great Salkeld, GR 35/55.36. Garden. R. W. M. Corner, 1982, **LANC**, det. J. M. Mullin. 1st record this century.

†154/16. CHENOPODIUM GLAUCUM L. *__70__, Cumberland: Eden Bridge, Lazonby, GR 35/55.40. Landscaped picnic area. R. E. Groom, 1984, **LANC**, det. J. M. Mullin.

[156/1 × 2. ATRIPLEX LITTORALIS L. × A. PATULA L. **95**, Moray: Delete record published in *Watsonia*, **12**: 350 (1979), specimen at **E** redetermined as *A. littoralis* L. × *A. prostrata* Boucher ex DC. by P. M. Taschereau.]

156/4. ATRIPLEX GLABRIUSCULA Edmondst. **59**, S. Lancs.: Hightown, GR 34/29.02. High-tide mark. V. Gordon, 1987. Only extant locality.

156/5. ATRIPLEX LACINIATA L. **59**, S. Lancs.: Hightown, GR 34/29.02. High-tide mark. V. Gordon, 1987. Only extant locality.

156/lon. ATRIPLEX LONGIPES Drejer *__68__, Cheviot: Near Beal Point, GR 46/08.42. Under *Scirpus maritimus* in salt-marsh. G. A. Swan, 1983, **herb. G.A.S.**, det. P. M. Taschereau.

†KOCHIA SCOPARIA (L.) Schrader *__70__, Cumberland: Eden Bridge, Lazonby, GR 35/55.40. Landscaped picnic area. R. E. Groom, 1984, **LANC**, det. J. M. Mullin.

†168/8. GERANIUM MACRORRHIZUM L. *__99__, Dunbarton: Craigrownie, GR 26/22.81. Pathside. A.McG. Stirling & A. Rutherford, 1985.

168/14. GERANIUM PUSILLUM L. *__75__, Ayrs.: Maidenhead Bay, GR 26/21.08. Sandy waste ground near shore. A.McG. Stirling, 1986, **E**.

†170/4. OXALIS EUROPAEA Jordan **52**, Anglesey: Henblas, GR 23/42.72. Garden weed. BSBI meeting, 1987, **NMW**, det. C. D. Preston & R. H. Roberts. 2nd record. *__99__, Dunbarton: South King Street, Helensburgh, GR 26/30.82. Garden path. A. Rutherford, 1983.

†170/exi. OXALIS EXILIS A. Cunn. *__80__, Roxburghs.: Kelso Abbey, GR 36/72.33. Lawn.

Greycrook, St Boswells, GR 36/60.30. Garden weed. Both M. E. Braithwaite, 1987. 1st and 2nd records. ***81**, Berwicks.: Rhymers Tower, Earlston, GR 36/57.38. Lawn. M. E. Braithwaite & R. W. M. Corner, 1987, **herb. M.E.B.**

192/1. TRIFOLIUM ORNITHOPODIOIDES L. ***26**, W. Suffolk: Red Lodge, Freckenham, GR 52/69.70. Sandy waste ground. D. Dupree, 1953 & P. H. Oswald, 1987, **CGE**.

192/10. TRIFOLIUM STRIATUM L. †**59**, S. Lancs.: Near Lydiate, GR 34/34.04. Laneside. V. Gordon & G. Sloman, 1987. Only extant locality.

192/occ. TRIFOLIUM OCCIDENTALE D. E. Coombe ***41**, Glam.: Tear's Point & Mewslade, GR 21/41.87. Cliff-top turf. J. Dunn, 1987, conf. D. E. Coombe. 1st Welsh record.

†192/pan. TRIFOLIUM PANNONICUM Jacq. **59**, S. Lancs.: Melling, GR 34/37.00. Railway embankment. V. Gordon, 1987. 2nd record.

†193/1 car. ANTHYLLIS VULNERARIA L. subsp. CARPATICA (Pant.) Nyman var. PSEUDOVULNERARIA (Sag.) Cullen ***73**, Kirkcudbrights.: East of Castle Douglas, GR 25/78.62. Rough ground. O. M. Stewart, 1986, **E**, det. J. R. Akeroyd.

200/3. ASTRAGALUS GLYCYPHYLLOS L. ***70**, Cumberland: West of Culgaith, GR 35/59.29. Basic bank. R. W. M. Corner, 1987, **LANC**.

206/12. VICIA LUTEA L. †**38**, Warks.: Near Brandon Marsh N.R., GR 42/38.75. Raised grassy bank. J. C. Bowra, 1987, **WAR**, det. P. J. Copson. 2nd record.

†207/6. LATHYRUS SYLVESTRIS L. **39**, Staffs.: Burton-on-Trent, GR 43/23.24. Grassy bank. B. R. Fowler, 1976. 1st post-1930 record.

†207/gra. LATHYRUS GRANDIFLORUS Sibth. & Sm. ***39**, Staffs.: Pennant Road, Rowley Regis, GR 32/96.87. Rubble. M. Doulton, 1987, **herb. B.R. Fowler**.

†209/1 × 2. SPIRAEA SALICIFOLIA L. × S. DOUGLASII Hook. ***59**, S. Lancs.: Trawden, GR 34/91.39. Hedge. V. Gordon, 1987, det. A. J. Silverside. ***70**, Cumberland: Lees Hill, Kirkcambeck, GR 35/55.67. E. Rhone & M. R. Smith, 1983, **LANC**, det. A. J. Silverside.

†209/1 × alb. SPIRAEA SALICIFOLIA L. × S. ALBA Duroi ***99**, Dunbarton: Near Rosneath Castle, GR 26/25.82. Rough marshy ground. A.McG. Stirling & A. Rutherford, 1979, det. A. J. Silverside. Vast, long-established colony.

†209/2. SPIRAEA DOUGLASII Hook. **59**, S. Lancs.: Between Chew Moor and Lostock Junction, GR 34/67.08. Waste ground. V. Gordon, 1987, det. A. J. Silverside. 2nd record.

†209/2 × alb. SPIRAEA DOUGLASII Hook. × S. ALBA Duroi ***59**, S. Lancs.: Chadwicks Farm Lane, Abram, GR 34/61.00. Hedge. V. Gordon, 1987, det. A. J. Silverside.

†209/alb. SPIRAEA ALBA Duroi **73**, Kirkcudbrights.: Maxwelltown, GR 25/97.75. Waste ground. O. M. Stewart, 1986, **E**, det. A. J. Silverside. 2nd record.

†ARUNCUS DIOICUS (Walter) Fernald ***99**, Dunbarton: Near Ardencaple Farm, Helensburgh, GR 26/28.83. Waste ground. A. Rutherford, 1977.

211/9 × 11/129. RUBUS CAESIUS L. × R. ULMIFOLIUS Schott ***38**, Warks.: Newbold Pacey, GR 42/29.57. Churchyard hedgerow. J. W. Partridge, 1987, det. A. Newton.

211/11/22. RUBUS WARRENII Sudre ***70**, Cumberland: West of Fletchertown, GR 35/20.42. Hedge. G. Halliday & A. Newton, 1986, **LANC.**

211/11/226. RUBUS SUBTERCANENS W. C. R. Wats. ***99**, Dunbarton: Shore of R. Clyde, Dalmuir, GR 26/47.71. Waste ground. A.McG. Stirling & A. Newton, 1980, **herb A.McG.S.**, det A. N. 1st Scottish record.

211/11/arm. RUBUS ARMIPOTENS Barton ex A. Newton †***75**, Ayrs.: Skelmorlie, GR 26/19.67. Roadside. A. Newton & A.McG. Stirling, 1987, **E**, det. A. N. 1st Scottish record.

211/11/blo. RUBUS BLOXAMII Edees *7, N. Wilts.: Near Grand Avenue, Savernake, GR 41/23.65. Glade. A. Newton & D. Allen, 1986, **herb. R. D. Randall**.

211/11/lan. RUBUS LANATICAULIS Edees & A. Newton *75, Ayrs.: West of Dalquarran Castle, Dailly, GR 26/26.02. Wood border. A. Newton & A.McG. Stirling, 1987, **E**, det. A.N. 1st Scottish record.

211/11/nor. RUBUS NORVICENSIS A. L. Bull & Edees *7, N. Wilts.: Near Grand Avenue, Savernake, GR 41/23.65. Glade. A. L. Bull, 1986, **herb. R.D. Randall**, det. A. Newton.

212/13 × 15. POTENTILLA × MIXTA Nolte ex Reichb. *103, Mid Ebudes: Craigdarroch House, Arinagour, Coll, GR 17/22.57. Grass by wall. J. W. Clark, 1986, **E**, det. D. R. McKean.

218/2. AGRIMONIA PROCERA Wallr. **25**, E. Suffolk: Nacton, GR 62/20.40. Woodside track, on sandy soil. Suffolk Trust for Nature Conservation Recording Team, 1986. 2nd record.

220/2. ALCHEMILLA CONJUNCTA Bab. †*39, Staffs.: Coseley, GR 32/94.93. Limestone slope. B. R. Fowler, 1987, **CGE**, det. S. M. Walters. †*77, Lanarks.: Busby, GR 26/57.56. Waste ground. P. Macpherson, 1987, **herb. P. M.**

220/3/3. ALCHEMILLA FILICAULIS Buser subsp. FILICAULIS **68**, Cheviot: Hobberlaw, GR 46/17.11. Old limestone quarry. G. A. & M. Shaw, 1987, **herb. G.A.S.**, det. S. M. Walters. 2nd record.

†220/3/12. ALCHEMILLA MOLLIS (Buser) Rothm. *11, S. Hants.: Plain Heath, Holmsley, GR 40/22.99. Short turf. R. P. Bowman, 1985, **herb. R. P. B.**, det. S. M. Walters. *99, Dunbarton: Near Rhu Station, GR 26/27.84. Rough ground by roadside. A. McG. Stirling & A. Rutherford, 1976.

†223/2. SANGUISORBA MINOR Scop. subsp. MURICATA Briq. **83**, Midlothian: Arthur's Seat, GR 36/27.72. Roadside. N. F. Stewart, 1983. 1st record since 1906.

†226/3. PRUNUS CERASIFERA Ehrh. *77, Lanarks.: Between Glasgow and Renfrew, GR 26/51.67. Edge of woodland. P. Macpherson & E. Teasdale, 1986, **herb. P. M.**, det. R. D. Meikle.

†227/2. COTONEASTER SIMONSII Baker *39, Staffs.: Brocton, GR 33/96.18. Woodland margin. B. R. Fowler, 1987.

†229/pru. CRATAEGUS PRUNIFOLIA (Lam.) Pers. *39, Staffs.: Broadhurst Green, GR 33/98.15. Roadside verge. B. R. Fowler, 1974.

232/1 × 5/1. SORBUS AUCUPARIA L. × S. ARIA (L.) Crantz *39, Staffs.: Newborough, GR 43/12.22. Roadside woodland. M. B. Jennings, 1987, **herb. B.R. Fowler**.

†232/6/lat. SORBUS LATIFOLIA (L.) Crantz *sensu stricto* *39, Staffs.: Brown's Coppice E. of Hanbury, GR 43/18.28. Deciduous woodland. B. R. Fowler, 1987, det. P. J. M. Nethercott.

232/7. SORBUS TORMINALIS (L.) Crantz **64**, Mid-W. Yorks.: Studley Royal, GR 44/28.69. Magnesian limestone cliff. P. P. Abbott, 1987. 2nd record.

†237/hel. CRASSULA HELMSII (T. Kirk) Cockayne *33, E. Gloucs.: Arle Court, Cheltenham, GR 32/91.21. Muddy edge of lake. S. C. Holland & D. S. Dudley-Smith, 1987, conf. F. H. Dawson. *39, Staffs.: Brocton, GR 33/97.19. Flooded disused gravel pit. B. R. Fowler, 1987, **herb. B.R.F.** Known here for 10 years. *46, Cards.: Ynys-las, GR 22/69.93. Pool in dune slack. M. Wainwright, 1986.

†239/4. SAXIFRAGA CF. UMBROSA L. *99, Dunbarton: Clachan Woods, Rosneath, GR 26/25.83. Semi-natural woodland. A.McG. Stirling & A. Rutherford, 1983, det. C. D. Brickell.

†239/4 × 5. SAXIFRAGA UMBROSA L. × S. SPATHULARIS Brot. *99, Dunbarton: Bank of Gielston Burn, GR 26/34.77. Steep, wet rocks. A.McG. Stirling & A. Rutherford, 1985, det. C. D. Brickell.

†239/7. SAXIFRAGA CYMBALARIA L. *69, Westmorland: Winderwath, Culgaith, GR 35/59.29. Garden weed for many years. A. Wilson, 1986, **LANC.**

†240/1. TELLIMA GRANDIFLORA (Pursh) Douglas ex Lindley *99, Dunbarton: Rhu, GR 26/26.84. Marshy ground near stream. A. Rutherford, 1984. Known here since 1940s.

†PELTIPHYLLUM PELTATUM (Torr. ex Benth.) Engler *99, Dunbarton: Duhill, Helensburgh, GR 26/29.83. Rough ground near seepage. A. Rutherford, 1978, still present in 1984.

†RODGERSIA PODOPHYLLA A. Gray *99, Dunbarton: Bank of R. Leven near Dumbarton Golf Course, GR 26/39.76. Well established under willows. B. McNeil, 1986, det. C. D. Brickell.

†244/1. PHILADELPHUS CORONARIUS L. *69, Westmorland: South of Barbon, GR 34/62.81. Edge of plantation. C. E. Wild, 1987, **LANC.**

249/2. LYTHRUM HYSSOPIFOLIA L. **13**, W. Sussex: Thorney Island, GR 41/74.03. Depression in arable field. D. J. P. Miller, 1987, **BM**. 1st record since 1853. *34, W. Gloucs.: Swan Lake, Slimbridge, GR 32/72.04. Marshy edge of lake. B. Stewart & N. Woodward, 1987.

252/1. HIPPOPHAE RHAMNOIDES L. †93, N. Aberdeen: Cruden Bay, GR 48/09.36. Sand. D. Welch, 1987. 1st post-1930 record; probably a relic of introduced plants reported by Trail in 1904.

254/1 × 3. EPILOBIUM HIRSUTUM L. × E. MONTANUM L. *70, Cumberland: West of Boltonfellend, GR 35/47.68. Roadside ditch. G. Halliday, 1986, **LANC**.

254/4. EPILOBIUM LANCEOLATUM Seb. & Mauri **7**, N. Wilts.: Old Totterdown, GR 41/13.71. Scrub. K. Payne, 1986, **herb. D. Green**. 2nd record.

254/5. EPILOBIUM ROSEUM Schreber *69, Westmorland: Brathay Hall, Ambleside, GR 34/36.03. G. Halliday, 1986, **LANC**. 1st seen here by A. J. Richards in late 1970s.

254/7. EPILOBIUM TETRAGONUM L. *59, S. Lancs.: Victoria Park, St Helens, GR 33/50.96. D. Jolly, 1987. 1st localized record.

254/12. EPILOBIUM ALSINIFOLIUM Vill. *93, N. Aberdeen: Creag an Sgor, GR 38/37.21. Flushed shaly earth. D.Welch, 1987, **ABD**.

†256/2. OENOTHERA ERYTHROSEPALA Borbás *75, Ayrs.: Troon, GR 26/33.29. Sandy waste ground by railway. A.McG. Stirling, 1987.

†256/3. OENOTHERA STRICTA Ledeb. ex Link *29, Cambs.: Dernford Fen, GR 52/47.50. Sedge fen. G. M. S. Easy, 1987, **herb.G.M.S.E.**

†256/cam. OENOTHERA CAMBRICA Rostański **4**, N. Devon: East-the-Water, Bideford, GR 21/45.26. Disused railway. W. H. Tucker, 1986. 2nd record.

262/2. CALLITRICHE PLATYCARPA Kütz. **73**, Kirkcudbrights.: Carton Bridge, GR 25/83.66. Slow, deep burn. O. M. Stewart, 1986, **E**. 1st post-1930 record.

264/1. THESIUM HUMIFUSUM DC. **26**, W. Suffolk: Bury Hill, Moulton, GR 52/66.64. Chalk grassland. E. M. Hyde, 1987. 2nd extant locality.

†268/hib. HEDERA HIBERNICA (Kirchner) Bean 'Hibernica' *99, Dunbarton: Torwood Road, Rhu, GR 26/27.83. Verge. A.McG. Stirling & A. Rutherford, 1971.

†268/col. HEDERA COLCHICA (C. Koch) C. Koch *99, Dunbarton: Greenfield, Garelochhead, GR 26/24.90. Wooded shore. A. Rutherford, 1970.

†271/1. ASTRANTIA MAJOR L. **39**, Staffs.: Fradswell, GR 33/99.31. Shady churchyard. E. S. Edees, 1976. 1st post-1930 record.

285/4. APIUM INUNDATUM (L.) Reichb. f. **7**, N. Wilts.: Durley, Savernake Forest, GR 41/23.64. Pond. A. Summers, 1986, **herb. D. Green**. Only extant locality.

288/1. CICUTA VIROSA L. *81, Berwicks.: Everett Moss, GR 36/60.43. Fen. M. E. & P. F. Braithwaite, 1987, **herb. M.E.B.** Previously reported site (Yetholm Loch) is in v.c. 80.

300/7. OENANTHE FLUVIATILIS (Bab.) Coleman **7**, N. Wilts.: R. Churn, Cricklade North Meadow N.N.R., GR 41/09.94. K. Payne, 1986. Only extant site.

311/1 × †2. HERACLEUM SPHONDYLIUM L. × H. MANTEGAZZIANUM Somm. & Levier *71, Man: Kionlough, Bride, GR 24/45.99. Wet hollow with willow scrub. M. Devereau & L. S. Garrad, 1987.

319/2. EUPHORBIA LATHYRIS L. †*73, Kirkcudbrights.: Carsethorn, GR 25/99.59. Shore. O. M. Stewart, 1987.

319/7. EUPHORBIA PLATYPHYLLOS L. *39, Staffs.: Terrace Street, Blackheath, GR 32/96.86. Rubble. L. Goodby, 1987, **herb. B. R. Fowler**.

†319/16. EUPHORBIA CYPARISSIAS L. 70, Cumberland: Beck Farm, Wheyrigg, GR 35/19.48. Rough trackside. M. Porter, 1987, **LANC**. 1st post-1930 record.

320/1/4 POLYGONUM ARENASTRUM Boreau *77, Lanarks.: Cathkin, Glasgow, GR 26/62.57. Side of reservoir. A.McG. Stirling & P. Macpherson, 1983, **herb. P.M.** Shieldhall, Glasgow, GR 26/53.65. Waste ground. P. Macpherson & E. Teasdale, 1986. 1st and 2nd records.

320/2. POLYGONUM OXYSPERMUM C. A. Meyer & Bunge ex Ledeb. subsp. RAII (Bab.) D. A. Webb & Chater 25, E. Suffolk: Felixstowe, GR 62/29.33. Shingle beach. J. Heath, 1987, **IPS**. 1st post-1930 record.

320/13. POLYGONUM MITE Schrank 12, N. Hants.: Bramshill Common, GR 41/74.62. Lakeshore. C. R. Hall, 1986. Only extant locality. 25, E. Suffolk: Iken Wood, GR 62/39.56. Ditch. I. M. Vaughan, 1985, **herb. E. M. & M. A. Hyde**, det. J. R. Akeroyd. 2nd extant locality.

[320/16. POLYGONUM DUMETORUM L. 38, Warks.: Delete records published in *Watsonia*, **13**: 335 (1981), specimens have been redetermined as *P. aubertii* Louis Henry by J. R. Akeroyd.]

†320/20. POLYGONUM SACHALINENSE F. Schmidt *77, Lanarks.: Castlemilk, GR 26/60.59. Wooded river valley. P. Macpherson, 1986, **herb. P. M.**

†320/22. POLYGONUM CAMPANULATUM Hooker fil. *99, Dunbarton: Cardross, GR 26/34.77. Streamside. A.McG. Stirling, 1972, still present in 1985.

325/1/3. RUMEX TENUIFOLIUS (Wallr.) Löve 79, Selkirks.: E. side of Haze Law, Craik Forest, GR 36/30.11. Forestry track. R. W. M. Corner, 1987, **herb. R.W.M.C.** 2nd record.

325/11 × 12. RUMEX CRISPUS L. × R. OBTUSIFOLIUS L. *25, E. Suffolk: Landguard Common, Felixstowe, GR 62/28.32. Soil bank. A. Copping, 1981.

325/12 × 14. RUMEX OBTUSIFOLIUS L. × R. SANGUINEUS L. *64, Mid-W. Yorks.: Bishop Wood near Selby, GR 44/55.34. P. P. Abbott, 1987, **herb. P.P.A.**, det. W. A. Sledge.

325/15. RUMEX CONGLOMERATUS Murray 83, Midlothian: Duddingston Loch, GR 36/28.72. Marshy loch edge. J. Sinclair, 1946, **E**, det. D. R. McKean. 1st post-1930 record.

†327/1. SOLEIROLIA SOLEIROLII (Req.) Dandy *99, Dunbarton: East Montrose Street, Helensburgh, GR 26/30.32. Garden wall. A. Rutherford, 1980.

343/5. SALIX TRIANDRA L. *77, Lanarks.: "Cunningar Loop", Rutherglen, GR 26/62.62. River-bank. A. J. Silverside & A. McG. Stirling, 1981.

343/5 × 9. SALIX TRIANDRA L. × S. VIMINALIS L. *69, Westmorland: Temple Sowerby Moss, GR 35/61.27. R. W. M. Corner, 1985, **LANC**, det. R. D.Meikle. *77, Lanarks.: "Cunningar Loop", Rutherglen, GR 26/62.62. River-bank. A. McG. Stirling & A. J. Silverside, 1981, **herb. A.McG.S.**, det. R. D. Meikle as *S.* × *mollissima* Hoffm. ex Elwert var. *undulata* (Ehrh.) Wimm.

343/9 × 11. SALIX VIMINALIS L. × S. CAPREA L. *77, Lanarks.: Kinning Park, Glasgow, GR 26/56.63. Old railway line. P. Macpherson, 1987, **herb. P.M.**, det. R. D. Meikle. *99, Dunbarton: Loch Lomond, Balloch Park, GR 26/38.72. Shingle shore. A.McG. Stirling, 1986, **herb. A.McG.S.**, det. R. D. Meikle.

343/9 × 13. SALIX VIMINALIS L. × S. AURITA L. *99, Dunbarton: R. Leven, Dunbarton, GR 26/39.76. Swampy river-bank. A.McG. Stirling, 1984, **herb. A.McG.S.**, det. R. D. Meikle.

343/12 × 14. SALIX CINEREA L. × S. MYRSINIFOLIA Salisb. *77, Lanarks.: Gorbals, Glasgow, GR 26/58.64. Roadside. P. Macpherson, 1987, **herb. P.M.**, det. R. D. Meikle.

343/12 × 15. SALIX CINEREA L. × S. PHYLICIFOLIA L. *99, Dunbarton: St Germans Loch, Bearsden, GR 26/54.71. Loch margin. A.McG. Stirling, 1984, **herb. A.McG.S.**, det. R. D. Meikle.

†343/ude. SALIX UDENENSIS Trautv. & Mey. *70, Cumberland: Viol Moor, GR 35/59.40. R. W. M. Corner, 1985, **LANC**, det. R. D. Meikle.

351/1. GAULTHERIA SHALLON Pursh *80, Roxburghs.: Kaim Burn, Edgerston, GR 36/68.12. Woodland. R. W. M. Corner, 1986, **herb. R.W.M.C.**

358/4. VACCINIUM OXYCOCCOS L. **2**, E. Cornwall: N.W. of Garrow Downs, GR 20/13.79. *Sphagnum* bog. K. Bryson, T. J. Dingle & R. J. Murphy, 1987. 2nd record.

370/2. LYSIMACHIA NUMMULARIA L. *93, N. Aberdeen: Insch, GR 38/63.28. Moist deciduous woodland. D. Welch, 1987, **ABD**.

371/1. TRIENTALIS EUROPAEA L. **103**, Mid Ebudes: Near Loch Spelve, Mull, GR 17/66.24. Area of bracken and heather. A. Gardner, 1987, photograph lodged with J. W. Clark. 2nd record.

372/1. ANAGALLIS TENELLA (L.) L. **7**, N. Wilts.: Pike Corner, Ashton Keynes, GR 41/03.93. Meadow ditch. D. Hornby, 1985, det. D. Green. 2nd post-1930 record.

388/1. POLEMONIUM CAERULEUM L. **68**, Cheviot: S. bank of Ridlees Burn, GR 36/84.06. Steep N.W.-facing andesite crag. G. A. & M. Swan, 1987. 2nd native locality.

†392/3. SYMPHYTUM ORIENTALE L. *99, Dunbarton: Luss churchyard, GR 26/35.92. Old wall. A.McG. Stirling & A. Rutherford, 1978.

392/6. SYMPHYTUM TUBEROSUM L. †*7, N. Wilts.: Allington, GR 31/89.75. Roadside. J. Presland, 1986, **herb. D. Green**. †*29, Cambs.: Harston, GR 52/43.50. Wooded ride. G.M.S. Easy, 1987, **herb G.M.S.E.**

†392/ibe. SYMPHYTUM IBIRICUM Steven *99, Dunbarton: Below Cannisburn Hospital, GR 26/54.70. Deciduous wood. A.McG. Stirling, 1985.

†BRUNNERA MACROPHYLLA (Adams) I. M. Johnston *69, Westmorland: Gossrig Hall, Cliburn, GR 35/60.24. Well naturalized in grounds. R. W. M. Corner, 1984, **LANC**. *73, Kirkcudbrights.: Knockbrex, GR 25/58.49. Ditch-bank. O. M. Stewart, 1986.

†393/1. BORAGO OFFICINALIS L. *73, Kirkcudbrights.: Carsethorn, GR 25/99.59. Sand on shore. O. M. Stewart, 1987. **103**, Mid Ebudes: Iona, GR 17/28.24. Waste ground. J. W. Clark, 1987. 1st Mull record.

400/1 × 4. MYOSOTIS SCORPIOIDES L. × M. CAESPITOSA K. F. Schultz *70, Cumberland: Parkside, Frizington, GR 35/02.15. Marshy field. C. C. Haworth, 1986, **LANC**, det. P. M. Benoit.

†AMSINCKIA INTERMEDIA Fischer & C. A. Meyer **38**, Warks.: Bradnock's Marsh, Barston, GR 42/22.78. Waste ground. P. Noakes, 1984, det. P. J. Copson. 2nd record.

†PLAGIOBOTHRYS SCOULERI (Hooker & Arnott) I. M. Johnston *11, S. Hants.: Setley, GR 40/30.99. Locally abundant on silt and fine gravel in shallow flood hollows in levelled tip areas. A. Hale, 1982, **herb. Lady A. Brewis**. Beaulieu Airfield, GR 41/35.00. Bare mud and gravel in shallow flood hollow. R. P. Bowman, 1987, **BM**. 1st and 2nd records, both det. A. O. Chater.

†413/4. SOLANUM SARRACHOIDES Sendtn. **38**, Warks.: Wasperton, GR 42/27.58. Waste ground. J. W. Partridge, 1987, **WAR**, det. J. C. Bowra. 2nd record.

†414/1. SALPICHROA ORIGANIFOLIA (Lam.) Baill. **25**, E. Suffolk: Ipswich, GR 62/17.45. Waste ground. M. N. Sandford, 1987. 2nd record.

†416/3. VERBASCUM PHLOMOIDES L. *26, W. Suffolk: West Stow, GR 52/82.70. Roadside verge. P. G. Lawson, 1986.

424/3. SCROPHULARIA UMBROSA Dumort. **38**, Warks.: Moreton Morrell, GR 42/32.56. Ditch-side. J. W. Partridge, 1987, **WAR**, det. P. J. Copson. 1st record since 1903.

†424/5. SCROPHULARIA VERNALIS L. *39, Staffs.: Terrace Street, Blackheath, GR 32/96.86. Rubble. L. Goodby, 1987, **herb. B. R. Fowler.**

†425/1 × cup. MIMULUS GUTTATUS DC. × M. CUPREUS Dombrain *99, Dunbarton: Drumfad Farm House, Glen Fruin, GR 26/31.84. Wet, peaty area. A.McG. Stirling & A. Rutherford, 1985, det. A. J. Silverside.

†425/3. MIMULUS MOSCHATUS Dougl. ex Lindl. **79**, Selkirks.: Lewenshope Burn, Yarrow, GR 36/37.31. Bog by burn. D. J. Methven, 1987, **herb. R. W. M. Corner**. 1st record since 1917.

426/1. LIMOSELLA AQUATICA L. **32**, Northants.: Pitsford Reservoir, GR 42/78.70. Muddy reservoir margin. B. Adams, 1987. 1st post-1930 record.

†430/14. VERONICA PEREGRINA L. **77**, Lanarks.: Bellahouston, Glasgow, GR 26/55.63. Nursery weed. P. Macpherson, 1987, **herb. P. M.** 2nd record.

431/ × ama. HEBE × AMABILIS (Cheesem.) Cockayne & Allan *99, Dunbarton: Lennox Drive, Helensburgh, GR 26/29.83. Dry waste ground. A.McG. Stirling & A. Rutherford, 1983. Regenerating.

435/1/16. EUPHRASIA PSEUDOKERNERI Pugsl. **26**, W. Suffolk: Bury Hill, Moulton, GR 52/65.64. D. E. Coombe, 1986, det. P. F. Yeo. 2nd post-1930 record.

435/1/18. EUPHRASIA ARCTICA Lange ex Rostrup subsp. BOREALIS (Towns.) P. F. Yeo **11**, S. Hants.: Hookheath Farm, Lye Heath, Southwick, GR 41/64.08. Fen meadow. R. P. Bowman, 1985, **herb. R.P.B.**, det. A. J. Silverside. Only extant locality.

440/8. OROBANCHE MINOR Sm. *75, Ayrs.: Ardrossan, GR 26/23.42. Disused railway track. G. Mitchell, 1987, **E**.

462/1. LAMIUM AMPLEXICAULE L. **103**, Mid Ebudes: Arnabost, GR 17/20.60. Sandpit rubbish dump. J. W. Clark, 1987, **E**. 1st Coll record.

466/1. NEPETA CATARIA L. *7, N. Wilts.: Long Dean, GR 31/84.75. Hedgebank. D. Green, 1983. Little Cote Estate, GR 41/29.70. B. Phillips, 1985. Only extant localities.

469/2. SCUTELLARIA MINOR Hudson **67**, S. Northumb.: Near Black Cleugh, GR 36/90.03. Damp stream-bank. G. A. & M. Swan, 1987. Only extant locality.

†470/1. TEUCRIUM CHAMAEDRYS L. *77, Lanarks.: Busby, GR 26/58.56. Roadside wall. P. Macpherson, 1986, **herb. P.M.**, det. R. M. Harley.

472/1 int. PLANTAGO MAJOR L. subsp. INTERMEDIA (DC.) Arcangeli *73, Kirkcudbrights.: Port Mary House, GR 25/75.45. *Phragmites* marsh on shore. O. M. Stewart, 1986, **E**.

†475/5. CAMPANULA PERSICIFOLIA L. *39, Staffs.: Gibbet Lane, Kinver, GR 32/86.83. Roadside verge. C. B. Westall, 1985, still present in 1987. **70**, Cumberland: By R. Caldew, Buckabank, GR 35/37.48. Woodland. R. E. Groom, 1985, **LANC.** 1st post-1930 record.

†475/pos. CAMPANULA POSCHARSKYANA Degen *46, Cards.: 1.5 km west of Sarnau, GR 22/30.50. Roadside hedgebank. A. O. Chater, 1984.

†PRATIA ANGULATA Hooker fil. *80, Roxburghs.: Wilton Lodge Park, Hawick, GR 36/49.14. Lawn. M. E. Braithwaite, 1972, **herb. R. W. M. Corner**. Still present in 1987.

485/6. GALIUM PUMILUM Murray **8**, S. Wilts.: Slay Down, Larkhill Artillery Ranges, GR 41/09.49. Chalk grassland. R. D. Porley, 1986, det. M. J. Wiggington. 2nd record. *12, N. Hants.: Ladle Hill, GR 41/47.56. F. Rose, 1987, **herb. Lady A. Brewis**.

†492/1. LEYCESTERIA FORMOSA Wallich *99, Dunbarton: Rhu Point, GR 26/26.83. Roadside verge. A. Rutherford, 1966.

494/2. VALERIANELLA CARINATA Lois. *77, Lanarks.: Bellahouston, Glasgow, GR 26/55.63. Abundant nursery weed. P. Macpherson, 1987, **herb. P. M.**

494/5. VALERIANELLA DENTATA (L.) Poll. **64**, Mid-W. Yorks.: Newthorpe, GR 44/45.32.

Edge of pea field. Leeds Naturalists Club Excursion, 1987, det. P. P. Abbott, 2nd localized post-1930 record.

†503/1. Galinsoga parviflora Cav. **4**, N. Devon: Braunton, GR 21/46.35. Arable field. W. H. Tucker, 1987. 2nd record.

†507/2. Doronicum plantagineum L. **80**, Roxburghs.: Abbotsford, GR 36/50.33. Wooded river-banks. M. E. Braithwaite, 1987, **herb. M.E.B.** 1st record since 1873. Doorpool Loch, GR 36/61.10. Woodland edge. R. W. M. Corner, 1987, **herb. R.W.M.C.** 2nd extant locality.

†509/2. Petasites albus (L.) Gaertner *__67__, S. Northumb.: Swin Burn near Swinburne Castle, GR 35/93.75. Wooded stream-bank. G. A. Swan, 1985, **herb. G.A.S.** Extensively naturalized.

†512/1. Inula helenium L. **77**, Lanarks.: Barncluith, GR 26/73.54. Waste ground. A.McG. Stirling & A. Rutherford, 1986. 2nd record.

517/1. Antennaria dioica (L.) Gaertner **33**, E. Gloucs.: Cleeve Hill, GR 32/99.26. One patch in short turf. D. S. Dudley-Smith & S. C. Holland, 1987. Only extant locality.

†519/8. Aster lanceolatus Willd. *__67__, S. Northumb.: R. Wansbeck W. of Morpeth, GR 45/18.86. River-bank. G. A. Swan, 1984, **herb. G.A.S.** *__70__, Cumberland: R. Duddon, Duddon Bridge, GR 34/19.88. River-bank. G. Halliday, 1975, **LANC**. *__99__, Dunbarton: Near Helensburgh Upper Station, GR 26/29.83. Embankment. A. McG. Stirling & A. Rutherford, 1985. All records det. P. F. Yeo.

†522/1. Conyza canadensis (L.) Cronq. **70**, Cumberland: Denton Holme Industrial Estate, Carlisle, GR 35/39.55. Old railway sidings. R. E. Groom, 1987, **LANC**. 2nd record.

†526/1. Anthemis tinctoria L. *__73__, Kirkcudbrights.: Castle Douglas, GR 25/75.62. Waste ground. O. M. Stewart, 1987, **E**.

†533/4. Tanacetum parthenium (L.) Schultz Bip. **103**, Mid Ebudes: The Lodge, Arinagour, GR 17/21.57. Garden weed. J. W. Clark, 1987. 1st Coll record.

†536/1. Echinops sphaerocephalus L. *__69__, Westmorland: Far Arnside, GR 34/45.76. Roadside. C. E. Wild, 1986, **LANC.** *__70__, Cumberland: Longwath, Moorhouse, GR 35/32.56. Roadside grassland. R. E. Groom, 1986, **LANC**.

540/3 × 4. Cirsium palustre (L.) Scop. × C. arvense (L.) Scop. *__77__, Lanarks.: Dalton, GR 26/67.58. Partly overgrown track. J. H. Dickson, 1987, **GL**.

554/1. Lactuca serriola L. *__46__, Cards.: Cardigan, GR 22/17.45. Roadside. A. O. Chater. A. P. Fowles & C. D. Preston, 1987.

554/2. Lactuca virosa L. **81**, Berwicks.: Blount Bank, New Ladykirk, GR 36/90.47. Wooded bank. M. E. Braithwaite, 1987, **herb. M.E.B.** 2nd extant locality.

558/1/4. Hieracium alpinum L. *__105__, W. Ross: An Teallach, GR 29/07.85. Rocky slopes and detritus. A. G. Kenneth, 1984, **herb. D. J. Tennant.** *__107__, E. Sutherland: Ben Hee, GR 29/42.33. Detritus near summit. A. G. Kenneth, 1986, **herb. D. J. Tennant**.

558/1/28. Hieracium centripetale F. J. Hanb. *__73__, Kirkcudbrights.: Meikle Millyea, GR 25/51.83. Rocks in gully. D. J. McCosh, 1986, **E**.

558/1/32. Hieracium dasythrix (E. F. Linton) Pugsl. *__73__, Kirkcudbrights.: Cairnbaber, GR 25/48.76. Rocks. D. J. McCosh, 1986, **herb. D. J. McC.**, det. P. D. Sell.

558/1/38. Hieracium ampliatum (W. R. Linton) A. Ley *__73__, Kirkcudbrights.: Cairnbaber, GR 25/48.76. D. J. McCosh, 1986, **herb. D. J. McC.**, det. P. D. Sell.

558/1/40. Hieracium langwellense F. J. Hanb. *__73__, Kirkcudbrights.: Cairnbaber, GR 25/48.76. Rocks by burn. D. J. McCosh, 1986, **herb. D.J.McC.**, det. P. D. Sell.

558/1/46. Hieracium stenopholidium (Dahlst.) Omang *__69__, Westmorland: Longsleddale above Sadgill, GR 35/48.07. Dry rocks by beck. G. Halliday, 1986, **LANC**, det. P. D. Sell.

558/1/56. HIERACIUM SUBRUDE (Arv.-Touv.) Arv.-Touv. *103, Mid Ebudes: Totamore, Coll, GR 17/17.56. Rock cleft. K. A. Cassels, 1986, **E**, det. A.McG. Stirling.

558/1/67. HIERACIUM SUBPLANIFOLIUM Pugsl. *69, Westmorland: Meathop quarry, GR 34/43.79. Limestone cliff. J. M. Mullin, 1987, **BM**, det. P. D. Sell.

588/1/92. HIERACIUM SCOTOSTICTUM Hyl. *70, Cumberland: R. Eden, E. of Low House Farm, Holmwrangle, GR 35/51.48. By wooded path. G. Halliday, 1985, **LANC**, det. P. D. Sell.

588/1/94. HIERACIUM DURICEPS F. J. Hanb. *77, Lanarks.: Hillshie Burn, Camps Reservoir, GR 36/03.21. Rocks by waterfall. D. J. McCosh, 1987, **E**.

558/1/99. HIERACIUM GRANDIDENS Dahlst. *77, Lanarks.: Craigend Muir, Glasgow, GR 26/65.68. Old wall. A. McG. Stirling & J. Mitchell, 1966, **herb. A.McG.S.** Gartloch, GR 26/67.67. Old coal bing. A.McG. Stirling & J. H. Dickson, 1985. 1st and 2nd records.

558/1/210. HIERACIUM STRICTIFORME (Zahn) Roffey *69, Westmorland: Stock Gill, Ambleside, GR 35/3.0. S. H. Haslam, 1843, **KDL**, det. P. D. Sell.

558/1/atr. HIERACIUM ATRATICEPS (Pugsl.) P. D. Sell & C. West *88, Mid Perth: N. E. Coire, Ben More, GR 27/44.24. Rock ledge. D. J. Tennant, 1978, **herb. D.J.T.**, conf. P. D. Sell.

558/1/lar. HIERACIUM LARIGENSE (Pugsl.) P. D. Sell & C. West *92, S. Aberdeen: An Garbh Choire, Cairn Toul, GR 27/95.98. Rocky slope. D. J. Tennant, 1973, **herb. D.J.T.**, conf. P. D. Sell.

558/1/not. HIERACIUM NOTABILE P. D. Sell & C. West *97, Westerness: Coire Ardair, Creag Meagaidh, Loch Laggan, GR 27/43.88. Rock ledges. D. J. Tennant, 1979, **herb. D.J.T.**, conf. P. D. Sell.

558/2/1 mic. PILOSELLA OFFICINARUM F. W. Schultz & Schultz Bip. subsp. MICRADENIA (Naegeli & Peter) P. D. Sell & C. West **103**, Mid Ebudes: Near Arnabost, GR 17/20.60. Grassy outcrops. J. W. Clark, 1987, det. A.McG. Stirling. 1st Coll record.

†558/2/10 PILOSELLA PRAEALTUM (Vill. ex Gochnat) F. W. Schultz & Schultz Bip. subsp. ARVORUM (Naegeli & Peter) P. D. Sell & C. West *8, S. Wilts.: Trowbridge, GR 31/85.58. Disused railway siding. J. Presland, 1982, **herb. D. Green**, det. P. D. Sell.

†559/2. CREPIS VESICARIA L. subsp. HAENSELERI (Boiss. ex DC.) P. D. Sell *99, Dunbarton: Forth & Clyde Canal, Kelvindale, GR 26/55.69. Canal tow-path. A.McG. Stirling, 1986, **GL**.

†570/3. ELODEA NUTTALLII (Planch.) St. John *83, Midlothian: Auchendinny, GR 36/25.61. Pond. D. R. McKean & A. G. Miller, 1987, **E**, det. D. R. McK. *99, Dunbarton: Forth & Clyde Canal between Bowling and Old Kilpatrick, GR 26/46.72. Abundant in canal. BSBI Meeting, 1987, **E**, det. C. D. Preston, N. F. Stewart & A.McG. Stirling.

577/13. POTAMOGETON PUSILLUS L. **99**, Dunbarton: Net Bay, Loch Lomond N.N.R., GR 26/43.88. Pool near loch shore. A.McG. Stirling & J. Mitchell, 1987. 2nd record.

581/1. NAJAS FLEXILIS (Willd.) Rostk. & Schmidt **103**, Mid Ebudes: Loch Ballyhaugh, Coll, GR 17/17.58. Mesotrophic loch. A. Walker & H. J. Noltie, 1987, **E**. 2nd record.

589/2. POLYGONATUM ODORATUM (Miller) Druce †*98, Main Argyll: Achafour, by bridge across Ardyne Burn, GR 26/10.70. Woodland edge. B. H. Thompson, 1987.

600/1 × †2. HYACINTHOIDES NON-SCRIPTA (L.) Chouard ex Rothm. × H. HISPANICA (Miller) Rothm. *99, Dunbarton: Daligan, GR 26/32.84. Roadside wood. A.McG. Stirling & A. Rutherford, 1979.

†600/2. HYACINTHOIDES HISPANICA (Miller) Rothm. *77, Lanarks.: Braehead, GR 26/51.67. Woodland. P. Macpherson & E. Teasdale, 1986, **herb. P. M.**

†601/arm. MUSCARI ARMENIACUM Leichtlin ex Baker *77, Lanarks.: Between Glasgow and Renfrew, GR 26/51.67. Trackside bank. P. Macpherson, 1987, **herb. P.M.**, det. E. J. Clement.

605/4. JUNCUS COMPRESSUS Jacq. **11**, S. Hants.: Ham Common, Sopley, GR 40/14.98. Short

grassland on flood plain near river. C. Chatters, 1986, conf. R. P. Bowman, 1987. Only extant locality.

605/fol. JUNCUS FOLIOSUS Desf. *12, N. Hants.: Fleet Pond, GR 41/82.54. Sandy ground at water's edge. A. R. G. Mundell, 1981, **herb. A. Brewis**, det. T. A. Cope. **14**, E. Sussex: Cooden Beach Golf Club, Bexhill, GR 51/70.06. Spring running into ditch. Lady R. FitzGerald & L. B. Burt, 1987, **herb. R. F.**, det. T. A. Cope. 1st post-1930 record. *46, Cards.: Nant-llwyd, Soar y Mynydd, GR 22/78.52. Marshy track. A. O. Chater & D. Davies, 1987, **NMW**, det. C. A. Stace.

†607/11. ALLIUM PARADOXUM (Bieb.) G. Don *39, Staffs.: Abbots Bromley, GR 43/08.24. Roadside verge. I. J. Hopkins, 1983. **70**, Cumberland: Near Blennerhasset, GR 35/16.40. Roadside. C. C. Haworth, 1986, **LANC**. 2nd record.

†607/uni. ALLIUM UNIFOLIUM Kellogg *99, Dunbarton: Behind Cardross Park, GR 26/34.77. Damp, basic soil in deciduous wood. A.McG. Stirling & A. Rutherford, 1985, det. C. D. Brickell.

†616/sib. IRIS SIBIRICA L. *77, Lanarks.: Ibrox, GR 26/55.64. P. Macpherson, 1986, **herb. P. M.**, det A. C. Leslie.

†618/2. CROCUS PURPUREUS Weston *77, Lanarks.: Craigton, GR 26/53.64. Old graveyard. P. Macpherson, 1985, **herb. P. M.**, det. A. C. Leslie.

†618/5. CROCUS FLAVUS Weston *70, Cumberland: Deanscales, GR 35/09.26. Roadside verge. N. Botham, 1987, **LANC**.

†CURTONUS PANICULATUS (Klatt) N. E. Brown *99, Dunbarton: Ardencaple Castle, GR 26/28.83. A. Rutherford, 1975.

624/3. CEPHALANTHERA RUBRA (L.) Rich. *12, N. Hants.: K. Turner, 1986, **herb. Hampshire County Museum Service**.

625/4. EPIPACTIS LEPTOCHILA (Godfery) Godfery **11**, S. Hants.: Hedgemoor Copse, W. Tytherley, GR 41/26.31. Under beech near edge of wood. V. A. Williams, 1987, conf. R. P. Bowman, photograph in **herb. R.P.B.** Only extant locality.

636/1 × 643/1. GYMNADENIA CONOPSEA (L.) R.Br. × DACTYLORHIZA FUCHSII (Druce) Soó *14, E. Sussex: Coburn Bottom near Lewes, GR 51/43.09. N.-facing chalk downland. D. C. Lang, 1987. *39, Staffs.: Ecton, GR 43/09.58. N.-facing roadside bank on limestone. B. R. Fowler, 1987, det. R. H. Roberts.

†648/1. LYSICHITON AMERICANUM Hultén & St John *98, Main Argyll: R. Add at Kilmichael Glen, GR 16/8.9. Riverside. A. G. Kenneth, 1986. Has spread downstream 6 km from origin at Kirnan gardens.

†649/2. ARUM ITALICUM Mill. subsp. ITALICUM **46**, Cards.: Croeslan, Llandysul, GR 22/38.44. Roadside hedgebank. G. Harrison, 1986. 2nd record.

†650/min. LEMNA MINUSCULA Herter *11, S. Hants.: The Hatches, Moortown, GR 41/14.03. Mill stream. G. Halliday, 1984, **LANC**. R. Test, Horsebridge, GR 41/34.30. Stream. J. A. Moore, 1984. 1st and 2nd records, both det. A. C. Leslie.

654/1. ERIOPHORUM ANGUSTIFOLIUM Honck. **8**, S. Wilts.: Pains Bridge, Pewsey, GR 41/16.60. Water meadows. D. Green & R. Randall, 1983. 2nd extant locality.

654/2. ERIOPHORUM GRACILE Roth **11**, S. Hants.: Widden Bottom, Sway, GR 40/28.99. Valley bog. R. P. Bowman, 1987. 2nd extant locality.

654/4. ERIOPHORUM VAGINATUM L. *29, Cambs.: Ninewells, Thriplow, GR 52/4.4. N. Maynard, 1842, **CIECRO**, det. D. E. Coombe. Chippenham Fen, GR 52/6.6. A. Shrubbs, undated but probably c. 1890, **CGE**. 1st and 2nd records.

655/9. SCIRPUS LACUSTRIS L. subsp. TABERNAEMONTANI (C. C. Gmelin) Syme **7**, N. Wilts.: Cotswold Water Park, Ashton Keynes, GR 41/01.93. Gravel pit. D. Green, 1986, **herb. D.G.** Only extant locality.

656/3. Eleocharis quinqueflora (F. X. Hartmann) Schwarz **7**, N. Wilts.: Pike Corner, Ashton Keynes, GR 41/03.93. Ditch in damp meadow. D. Hornby & D. Wells, 1986, **herb. D. Green**. 1st record since 1885. ***55b**, Rutland: Shacklewell Hollow, GR 43/97.07. Marsh. D. Drewett, 1987. 1st v.c. 55 record since 1922.

656/6. Eleocharis uniglumis (Link) Schult. ***8**, S. Wilts.: Seend Head, GR 31/92.59. Water meadow. F. Rush, 1985, det. D. Green.

657/1. Blysmus compressus (L.) Panz. ex Link **81**, Berwicks.: Fangrist Burn, GR 36/69.49. Burn-side. M. E. & P. F. Braithwaite, 1987, **herb. M.E.B.** 2nd extant locality.

658/1. Cyperus longus L. †***7**, N. Wilts.: Kemble, GR 31/99.97. Streamside marsh. M. A. R. & C. Kitchen, 1985. Holt, GR 31/86.61. Path. E. Curtis, 1986. 1st and 2nd records.

661/1. Cladium mariscus (L.) Pohl †***7**, N. Wilts.: Cotswold Water Park, Somerford Keynes, GR 41/01.94. Edge of gravel pit. D. Green & S. C. Holland, 1986. **11**, S. Hants.: Gilkicker Point, Gosport, GR 40/60.97. Hollow in shingle behind beach. R. P. Bowman, 1986, **herb. R.P.B.** 2nd extant record. ***46**, Cards.: Near Ciliau Aeron, GR 22/4.5. Fen. A. P. Fowles, 1987, **NMW**.

663/4. Carex hostiana DC. **7**, N. Wilts.: Pike Corner, Ashton Keynes, GR 41/03.93. Damp meadow. D. Green & D. Hornby, 1986. 2nd extant locality.

663/15. Carex pseudocyperus L. ***46**, Cards.: Near Ciliau Aeron, GR 22/4.5. Fen. A. O. Chater & A. P. Fowles, 1987.

663/16. Carex rostrata Stokes **8**, S. Wilts.: Jones' Mill, Pewsey, GR 41/16.61. Water meadow. D. Green, 1984, **DZS**. Only extant locality.

663/17 × 21. Carex vesicaria L. × C. acutiformis Ehrh. ***11**, S. Hants.: Ebblake, Ringwood Forest, GR 41/10.06. Acidic, wet carr. R. P. Bowman, 1986, **BM**, det. A. O. Chater & R. W. David. 1st British record.

663/18. Carex × grahamii Boott ***97**, Westerness: Beinn na Socaich, Glen Spean, GR 27/23.74. Wet flush. D. J. Tennant, 1980, **BM**, det. A. C. Jermy.

663/20. Carex riparia Curtis †***79**, Selkirks: Howlands plantation, Yair Forest, GR 36/45.32. Dominant in two old ponds. C. O. Badenoch, 1986, **herb. R.W.M. Corner**.

663/20 × 33. Carex riparia Curtis × C. lasiocarpa Ehrh. ***29**, Cambs.: Grunty Fen, GR 52/4.7. Herb. C. M. Lemann, 1833, **CGE**, det. E. Nelmes, conf. R. W. David.

663/40. Carex ornithopoda Willd. ***70**, Cumberland: By R. Eden S. of Armathwaite, GR 35/50.44. R. W. M. Corner, 1986, **LANC**.

663/46. Carex elata All. ***33**, E. Gloucs.: Cerney Wick, GR 41/07.94. Fen. S. C. Holland & R. W. David, 1987, **herb. S.C.H.**, det R.W.D.

663/47. Carex acuta L. **79**, Selkirks.: R. Ettrick, Thirlestane, GR 36/28.15. Fen. C. O. Badenoch, 1987, **herb. R.W.M. Corner**. 2nd record.

663/54. Carex paniculata L. **103**, Mid Ebudes: Arnabost, GR 17/20.60. Marsh. J. W. Clark, 1987, **E**. 1st Coll record.

663/54 × 56. Carex paniculata L. × C. diandra Schrank ***98**, Main Argyll: Loch Baile a'Ghobhainn, Lismore, GR 17/86.43. A. McG. Stirling & J. Mitchell, 1984, **E**, det. A. O. Chater & R. W. David. 2nd Scottish record.

663/54 × 71. Carex paniculata L. × C. remota L. ***39**, Staffs.: Sher Brook Valley, GR 33/98.18. Streamside. D. J. Tinston, 1987, **BM**, det. A. O. Chater.

663/55. Carex appropinquata Schumach. **79**, Selkirks.: Back Loch, Alemoor, GR 36/35.15. Mire. R. W. M. Corner, 1986, **herb. R.W.M.C.** 2nd record.

663/67. Carex spicata Hudson **77**, Lanarks.: Craigton, GR 26/54.64. Grassy area. P. Macpherson, 1986, det. A. O. Chater. 2nd record.

663/68. Carex muricata L. subsp. lamprocarpa Čelak. **79**, Selkirks.: A7 road by Big Wood, S. of Selkirk, GR 36/47.25. Foot of roadside cutting. P. F. Braithwaite, 1987. 2nd extant record.

663/69. Carex elongata L. **25**, E. Suffolk: Reydon, GR 62/4.7. Woodland. F. W. Simpson, 1987, det. A. O. Chater. Only extant locality.

669/4. Glyceria maxima (Hartm.) Holmberg **81**, Berwicks.: Banks of R. Tweed, Fishwick, GR 36/91.49. M. E. Braithwaite & M. Mutch, 1987, **herb. M.E.B.** Only extant locality.

†670/dif. Festuca diffusa Dumort. **77**, Lanarks.: Shieldhall, GR 26/53.65. Waste ground. P. Macpherson, 1986, **herb. P. M.**, det. P. J. O. Trist. 2nd record.

670/1 × 671/1. Festuca pratensis Hudson × Lolium perenne L. ***79**, Selkirks.: East Buccleuch Farm, Ettrick, GR 36/32.14. Track verge. R. W. M. Corner, 1987, **herb. R.W.M.C**.

†676/15. Poa chaixii Vill. **38**, Warks.: Leamington Spa, GR 42/31.65. Canal bank. J. C. Bowra, 1987, **herb. J.C.B.**, det. P. J. O. Trist. 2nd record. ***103**, Mid Ebudes: Torosay Castle, Mull, GR 17/72.35. Edge of pond. J. W. Clark, 1987, **E**, det. H. J. Noltie.

677/1. Catabrosa aquatica (L.) Beauv. **81**, Berwicks.: Everett Moss, GR 36/60.43. Muddy pool. M. E. & P. F. Braithwaite, 1987, **herb. M.E.B.** 2nd extant locality. **99**, Dunbarton: Hunter's Burn near Loch Bowie, GR 26/41.75. Muddy stream bank. A.McG. Stirling & Rutherford, 1987, **E**. 1st record since 1892.

†683/4. Bromus inermis Leyss. **77**, Lanarks.: Kelvindale, GR 26/55.69. Roadside. A. J. Silverside, 1977, still present 1987, **herb. P. Macpherson**. 1st record since 1920.

683/5. Bromus sterilis L. **93**, N. Aberdeen: Fingask, GR 38/77.26. Old railway. D. Welch, 1987, **ABD**. 1st post-1930 record.

†683/7. Bromus diandrus Roth ***46**, Cards.: Penyrangor, Aberystwyth, GR 22/58.80. Rocky slope. A. O. Chater, 1982, **NMW**, det. P. J. O. Trist.

†683/9. Bromus tectorum L. **11**, S. Hants.: Dibden Bay, GR 41/41.09. Sparse turf on reclaimed land. R. P. Bowman, 1987, **herb. R.P.B.**, det. P. J. O. Trist as var. *hirsutus* Regel. 1st post-1930 record.

683/10 × 13. Bromus hordeaceus L. × B. lepidus Holmberg ***7**, N. Wilts.: Pewsey Down N.N.R., GR 31/90.64. Downland. K. Payne, 1984, det. P. J. O. Trist.

683/11. Bromus ferronii Mabille ***93**, N. Aberdeen: Aberdour, GR 38/89.65. Sea cliff. D. Welch, 1987, **ABD**, det. P. J. O. Trist.

†683/18. Bromus secalinus L. **26**, W. Suffolk: Hermitage Farm, Clare, GR 52/77.46. Wheat field. F. Edmonds, 1987, det. P. J. O. Trist. 2nd post-1930 record.

†683/20. Bromus carinatus Hooker & Arnott ***39**, Staffs.: Wom Brook near Common Lane, Wombourne, GR 32/87.92. Bank of brook. C. B. Westall, 1987, **herb. B.R. Fowler**.

685/3 × 4. Elymus repens (L.) Gould × E. pycnanthus (Godron) Melderis ***11**, S. Hants.: Eling, GR 41/36.12. Edge of creek. A. C. Leslie, 1986, **herb. A.C.L.**

686/1. Leymus arenarius (L.) Hochst. †***38**, Warks.: Winson Green, GR 42/04.88. Sandy waste ground by canal. J. W. Partridge, 1987, **WAR**, det. P. J. O. Trist.

689/1. Koeleria macrantha (Ledeb.) Schultes **99**, Dunbarton: Kilpatrick Braes, GR 26/46.73. Dry turf near basalt rock outcrops. A.McG. Stirling, 1987, **E**. 1st record since 1891.

698/1. Corynephorus canescens (L.) Beauv. †***39**, Staffs.: 1 mile S.W. of Kinver, GR 32/83.82. Loose sand on S.E.-facing heathy slope. B. R. Fowler, 1977, **BM**, det. E. J. Clement. Still present in 1986.

700/2. Calamagrostis canescens (Weber) Roth ***72**, Dumfriess.: Old course of Kinnel Water, Lochmaben, GR 35/09.83. Winter-flooded silty sand. E. Kungu & M. E. R. Martin, 1987, **K**, det. T. A. Cope.

702/1. Apera spica-venti (L.) Beauv. **11**, S. Hants.: Fryern Court, Fordingbridge, GR 41/14.16. Border between fields. J. Ounsted, 1987. Only extant locality.

702/2. Apera interrupta (L.) Beauv. *__39__, Staffs.: Bilston, GR 32/94.96. Disused railway track. B. R. Fowler, 1976, **herb. B.R.F.**, det. J. P. M. Brenan. Pensnett, GR 32/91.88. Spoilheap. I. C. Trueman, 1986. 1st and 2nd records.

703/1. Polypogon monspeliensis (L.) Desf. †**25**, E. Suffolk: Beccles, GR 62/42.91. Field entrance. T. Abrehart, 1987, det. E. Beaumont, G. W. Maybury & P. J. O. Trist, 2nd record.

†713/aqu. Phalaris aquatica L. *__7__, N. Wilts.: Manor Farm, Rockley, GR 41/72.15. Arable headland. M. Ponting, 1986, **DZS**, det. R. Payne.

Book Reviews

Jupiter Botanicus. Robert Brown of the British Museum. D. J. Mabberley. Pp. 500, with 24 colour plates and 64 text figures. J. Cramer, Braunschweig. 1985. Price £43.00 (ISBN 3–7682–1408–7).

It may seem strange to be reviewing a book three years after its emergence from the press – and five even after the date of its preface. The reason for doing so in this case is that publication was attended by a quite exceptional piece of misfortune, as a result of which scarcely any copies were sent out at the time for review. That was not a fair measure of the volume's value and importance, and belatedly steps have been taken to repair the omission.

At the same time it is an open secret that the manuscript was a long time finding a publisher in the first place. And one can see why that was: to judge from the finished text and from hints dropped in the acknowledgements, it bore all too much resemblance to too many doctoral theses, in that so much effort was expended on the research that seemingly little was left over for producing a narrative that was easy, let alone enticing, to read. Biography is a particularly well-established genre, and it was surely courting danger not to make more attempt to meet the expectations that the public (or at any rate publishers) have of titles in that category.

Which is a pity, because Robert Brown is certainly a figure of the first rank in botanical history (whether or not one accepts the author's claim that he was "Britain's greatest botanist"); a full-scale study of his life and work has long been needed, and Dr Mabberley has fulfilled the scholarly side of his task with exemplary care and thoroughness. The problem seems to have been that he fell in love with his material and could not bring himself to discard enough of it to produce an account of the necessary selectiveness. Just about everything one could possibly want to know about Brown and his times is consequently to be found in his pages. It is indeed, as he terms it himself, a "source-book", and one that will be consulted, and with confidence, by generations of historians and taxonomists to come.

Much of the volume is necessarily devoted to Brown's work on the Australian flora and his pioneering researches in a variety of botanical fields apart from taxonomy. There is necessarily much, too, on his years successively in the employ of the Linnean Society (1805–22), Sir Joseph Banks (1810–27) and the British Museum, where he was responsible for heading a new botanical department from 1827 till his death in 1858 in his 85th year. B.S.B.I. members, however, are likely to find the two opening chapters of more particular interest, for in these Brown's little-known contributions to field botany in these islands are described.

It was while at Edinburgh University, as a 17-year-old medical student, that Brown apparently embarked upon botany seriously, starting a herbarium and exploring his native county of Angus in the company of the more experienced George Don. In 1791 their partnership was speedily rewarded with a singular piece of beginner's luck: the addition of *Scirpus hudsonianus* to the British flora in its only-ever-known station, the Moss of Restenneth. Three years after that, Brown on his own found a new grass, on which Smith was to bestow the name *Alopecurus alpinus* (though at first he mistakenly gave the credit for its discovery to Don). As an ensign in the Fifeshire Fencibles Brown then found himself posted to Ulster. There he was the first to recognise *Sagina maritima* as a distinct species and to collect several mosses that are now known to have been new to science. This work on bryophytes brought him into touch with James Dickson, the fellow Scot and Covent Garden nurseryman then compiling the fourth of his cryptogamic *Fasciculi*, and to that Brown became a major, if unacknowledged, contributor.

A special word of praise must be reserved for the series of superb watercolours by the Bauers reproduced in a special section at the end of the book. Over half of these, mainly of Australian plants and animals, are enjoying here their public début, after years of lying hidden away in the magnificent iconographical collections of the British Museum (Natural History).

D. E. Allen

The National Trust book of wild flower gardening. John Stevens. Pp. 192. Profusely illustrated with colour photographs, additional colour drawings and b. & w. marginal thumb-nail sketches. Dorling Kindersley Publishers Ltd., London, in association with the National Trust. 1987. Price £14.95 (ISBN 0–86318–219–4).

The concept of growing wild flowers in gardens has dramatically increased in popularity in the last decade, with a corresponding public awareness of the loss of wild flowers from native habitats. This book aims at encouraging the creation of a piece of countryside in urban and garden settings, as part compensation for the fast-disappearing countryside in the wild.

The attractively produced book has good colour photographs of more than 100 growing plants featured in the "Creating wild flower gardens" section. These are arranged for six types of garden: sunny, shady, semi-shady, water, rock and seaside, each species with photograph, description and cultivation instructions. The grouping is supplemented by eleven double spreads of wildflower snippets photographed on a parchment-coloured background.

A 30-page section entitled "Technique of wildflower gardening" includes notes on seed dispersal, collection and sowing of the seeds, general planning, cultivation and looking after the wildflower garden. A further 30-page section, entitled "Wildflower catalogue and useful information", lists plants for gardens of different aspects with cultivation notes for 156 of these. A section on useful addresses (B.S.B.I. not included) and an 8-page index complete the book. 36 National Trust Wildflower Gardens are listed, actively promoted by the Trust as part of its conservation role. John Sales, Chief Gardens Adviser, states in his foreword that the wildflower areas also enhance the overall design of these gardens.

This book should entice even tidy gardeners to consider wildflower cultivation. John Stevens was a pioneer in growing wild flowers for seed to meet the current need to supply this "quiet revolution taking place in our gardens", and he offers valuable practical suggestions on their cultivation from his experience. Growing plants increases our knowledge, and it is the author's hope that to grow wild flowers will also increase the gardener's appreciation of these in the wild.

M. Briggs

A check-list of mycorrhiza in the British flora. J. L. & E. L. Harley. *New Phytologist* supplement **105** (2). Pp. 102. Available from the Executive Editor, *The New Phytologist*, Department of Botany, The University, Sheffield S10 2TN. Price £5.00.

Contrary to the assumptions of most botanists (and many mycologists), mycorrhizal associations between plants and fungi are very widespread. In the British flora, there are few species which have not been reported to have some sort of association with fungi, apart from annual plants which presumably have too short a life cycle for the association to be feasible.

The work includes an introduction which details the various types of mycorrhizal association, and in very basic terms the sorts of fungi that are involved, the check-list itself, with some notes on its organization, and no less than 723 references.

The list is arranged according to the *Excursion Flora of the British Isles* (3rd ed., 1981). Information on the type of mycorrhizal association, references to literature, and to the *Biological Flora of the British Isles* (*Journal of Ecology* (1941), et seq.), and a section of miscellaneous notes, are included. A distinction is made between studies on British material, and European studies on species occurring in Britain.

As the compiler of another large check-list, I am well aware that the amount of effort expended on such a project is out of all proportion to the number of printed pages produced. The authors should be congratulated on producing such an extensive and informative list. However, I have a few minor criticisms, which should not be allowed to detract from the favourable impression gained of the work as a whole.

The list would have been more compact if a tabular format had not been chosen. Plants whose associations have not been investigated are tabulated to no real advantage, though the blank columns may encourage other workers to investigate these species. References to the *Biological*

Flora could usefully have been incorporated into the general reference column. More detail might have been given of the fungal component of the mycorrhiza, though I am aware that in many cases it is difficult to be sure of the identity of the symbiotic partner.

This check-list should be of interest to botanists and mycologists alike, and will be as useful to workers in other parts of northern and western Europe as to those from Britain. At the very modest price quoted, it can be warmly recommended.

P. F. Cannon

Checklist of European pteridophytes. L. N. Derrick, A. C. Jermy & A. M. Paul. *Sommerfeltia*, **6**: i–xx, 1–94 (1987). Botanical Garden and Museum, University of Oslo, Trondheimsveien 23B, N–0562 Oslo 5, Norway. Price NOK 70.00 (ISBN 82–74–002–0; ISSN 0800–6865). Obtainable from J. W. Dyce, Hilltop, 46 Sedley Rise, Loughton, Essex IG10 1LT.

This list is the first major updated output to be produced directly from the database of the European Science Foundation's Taxonomic, Floristic and Biosystematic Documentation System. It is essentially an updating, amplification and correction of the relevant data from *Flora Europaea*, Vol. 1 (T. G. Tutin *et al.*, 1964). Whereas the latter contained 244 accepted pteridophyte taxa, the present list contains 329, the increase being to a considerable extent due to the inclusion of more hybrids. The synonymy is vastly more extensive than that in *Flora Europaea*, and a total of 1259 synonyms are listed, all with their places of publication. Country by country distributions are given for all taxa at and below the rank of species, as well as a brief indication of world distribution. The arrangement of families, genera, species, subspecies (although the typical one comes first) and hybrids is alphabetical, and the system of Lellinger is followed for the circumscription of families. Only one variety (*Athyrium distentifolium* var. *flexile*) is recognised, but two new varietal combinations made in the introduction are surprisingly not included in the list. There seems to be a high degree of accuracy in the citations, and the nomenclature has clearly been very thoroughly checked. In a rare misprint, *Asplenium scolopendrium* subsp. *anti-jovis* is given for Britain instead of Bulgaria. So far as British and Irish taxa are concerned, apart from hybrids, the main changes from the last authoritative account, C. N. Page, *The Ferns of Britain and Ireland* (1982), are that *Ceterach* and *Phyllitis* are again sunk into *Asplenium*, the plant we have been calling *Dryopteris affinis* subsp. *stilluppensis* has become subsp. *cambrensis* Fraser-Jenkins (and subsp. *robusta* is sunk into subsp. *borreri*), and *Polypodium australe* Fée has again become *P. cambricum* L. There are six pages of valuable taxonomic and nomenclatural notes in the introduction.

The list is printed from camera-ready copy taken directly from the database. This has resulted in a layout and typography that are confusing and difficult to follow. Apologies are made for the lack of any diacritical signs (which of course makes the list difficult to quote from unless one is in a position to check from source what accents are required). Equally unfortunate, though, is the lack of any variation in type-face except for upper and lower case, and differentiation between accepted names and synonyms has to rely entirely on a rather poor system of indentation. The plant names are written to include the authors not only of the names but of the books in which they were published (if different), e.g. CRYPTOGRAMMA CRISPA (L.) R.BR. IN HOOKER – Gen. Fil. t. 115 B (1842). It is much to be hoped that future publications of this sort will not continue to offset the advantages of quick and easy updating by using such unhelpful and inaccurate typography. The synonymy is also not as user-friendly as it might be; and although some synonyms are explained away, others, for example *Aspidium distans* Viv. (1825), under *Dryopteris affinis* (Lowe) Fraser-Jenkins, based on *Nephrodium affine* Lowe (1838), are not, and the reader would have to repeat the work which the authors of the list have presumably already done to discover why the earliest epithet, *distans* Viv., is not the one to be adopted.

This list will immediately become the standard checklist for Europe and will be of great interest even for those only interested in the 110 or so British and Irish taxa that it covers. With its detailed synonymy and thorough checking it should also help to stabilise the notoriously unstable nomenclature of this group of plants.

A. O. Chater

Iconographia palynologica Pteridophytorum Italiae. E. Ferrarini, J, Ciampolini, R. E. G. Pichi Sermolli & D. Marchetti. Extracted from *Webbia* **40** (1). Pp. 202, with 71 b. & w. plates. Firenze. 1986. Price not stated (ISSN 0083–7792).

This large and useful volume contains much valuable information. All Italian taxa are included, with their spores depicted as 550 micrographs. The description of the spores is greatly aided by the provision of a very useful illustrated and cross-referenced glossary of the terms used within. Chromosome numbers, genomic formula, notes on reproduction and the total geographic range (with distribution maps cited) are given. Note that the spore sizes given are derived from spores observed in air, and also that the photographs, although generally good, are like my own SEMs – sometimes a little less than sharp.

A key is given to the genera, species and subspecies of all Italian Pteridophytes, based on their spore characters. This will prove valuable to many, including palaeobotanists.

This collaborative work by four authors has been competently co-ordinated by Pichi Sermolli in his usual thorough-going manner. The work is a precursor to his book on Italian ferns, which is in preparation now.

P. J. Edwards

The Brightest Jewel. A history of the National Botanical Gardens, Glasnevin, Dublin. E. C. Nelson & E. M. McCracken with original watercolours by Wendy F. Walsh. Pp. 275, with 1 colour photograph, 15 colour plates and 150 b. & w. illustrations. Boethius Press, Kilkenny, Ireland. 1987. Price £26.00 (ISBN 0–86314–083–1).

The National Botanic Gardens at Glasnevin have a distinguished record in the history of horticulture world wide. Established in 1795 they were at one time the second largest botanic garden in the British Empire. This volume traces the Gardens from their formation through the peak of their international fame in the 19th century up to the present day.

From 1838 David Moore and later his son Frederick, who retired in 1922, established contacts at home and abroad and built up rich and extensive collections of plants. One of their particular enthusiasms was tropical orchids, but Glasnevin is also famous for raising many new cultivars of *Nerine*, *Lachenalia* and a host of other plants.

The work not only represents the definitive history of Glasnevin but also provides considerable insight into the history of botanic gardens, plant collecting and horticulture of the 19th and 20th century. A particularly noteworthy feature is the pairing of early illustrations and photographs with recent counterparts. How little the Yew Walk has changed in 80 years is remarkable.

The planning and construction of the Curvilinear Range, contemporary with the Palm House at Kew, shows that the Victorian period suffered its share of problems and frustrations.

The work is admirably researched and written in a most readable and enjoyable style.

I. K. Ferguson

The Euphorbiales. Chemistry, taxonomy & economic botany. Edited by S. L. Jury, T. Reynolds, D. F. Cutler & F. J. Evans. Pp. iv + 326, with black & white illustrations. Academic Press, London. 1987. Price £15 (ISBN 0–12–392484) softback.

This volume is the published proceedings of a joint symposium organised by the Linnean Society of London and the Phytochemical Society of Europe and has been reprinted from *Bot. J. Linn. Soc.*, **94**: 1–326 (1987). Of the 17 papers, ten are on various aspects of chemistry, six are taxonomic in some way and one deals with ethnobotany. Of the taxonomic papers, B.S.B.I. members will probably be most interested in the review of the classification and relationships of the Euphorbiales by G. L. Webster, and the discussion by A. Radcliffe-Smith of families segregated from the

Euphorbiaceae. Surprisingly for a symposium of this nature, there is only one paper which applies chemical evidence directly to the solution of a taxonomic problem – and this deals with *Euphorbia esula* and its relatives in North America. Many of the other chemical papers discuss aspects of the carcinogenic properties of diterpene esters and their derivatives, compounds widespread in the Euphorbiaceae. Accepting the pronounced chemical bias to the symposium, this volume is well-written and well-presented. I doubt, however, whether it contains sufficient of interest to B.S.B.I. members to make it a good buy for them.

R. J. Gornall

Coevolution and systematics. Edited by A. R. Stone & D. L. Hawksworth. The Systematics Association Special Volume No. 32. Pp. xii + 147, with 30 text figures. Oxford University Press, Oxford. 1986. Price £22.50 (ISBN 0–19–857703–6).

All evolution is coevolution to some extent, there being a continuous spectrum from the most tenuous to the most intimate of coevolutionary interactions. It is with the extreme of the latter, the relationship between parasite and host, characterized by reciprocal evolutionary change in interacting species involving partial coordination of non-mixing gene pools, that this volume is concerned. The papers are largely addressed to the question of the extent to which 'Fahrenholtz's rule' and its corollaries, which essentially state that parasites and hosts have congruent phylogenies, really do apply in practice. The problem is considered both generally and in relation to special groups of hosts, such as *Nothofagus* and Australian marsupials, and parasites, such as aphids and lice.

The overall conclusion is that Fahrenholtz's and similar rules are invalid as generalities and may produce erroneous hypotheses of relationship; groups of parasites associated with a holophyletic group of hosts may or may not be holophyletic, as the case may be. The conclusions reached are pertinent to the consideration of other intimate and biologically significant coevolutionary phenomena, such as endosymbiosis, mycorrhiza, lichenization and gut biota. Hypotheses of pattern should always be developed independently of those of process.

C. Jeffrey

The flowering plants and ferns of North Lancashire. L. A. & P. D. Livermore. Pp. iv+148, with 735 distribution maps. L. A. & P. D. Livermore, 8 Durham Avenue, Lancaster, LA1 4ED. 1987. Price £4.95 + £1.00 postage & packing (ISBN 0–9512644–0–0).

This publication covers the northern part of Watsonian vice-county 60, West Lancashire, specifically the administrative area of Lancaster District Council. To the best of my knowledge no account of the flora of this area, or of the vice-county as a whole, has been published since Wheldon & Wilson's *The flora of West Lancashire* appeared in 1907 (reprinted 1978). The recent publication is a praiseworthy attempt to fill the gap and may arguably be considered a model for other district floras.

The survey area covers 220 square miles (c.570 km^2), involving some 180 tetrads, with fieldwork in the main carried out during the last six years. The area of the botanical survey is considered in terms of Wheldon & Wilson's Flora, but no attempt is made to give a detailed account of the geography and geology (on cost grounds); rather the reader is referred to the earlier work.

A short account compares the changes in flora since 1907, and the mapping system by the standard tetrad method is described. There follows a brief synopsis of the area's habitat types with their associated flora. This is a very rich district ranging from the Lancashire coast to the Pennine moorland, and from acidic mosslands to the Morecambe Bay limestone.

The main list of the flora includes hybrids as well as plants of garden or similar origin and is followed by 732 distribution maps. Critical groups are well covered with the exception of *Hieracia*, though, given the difficulty in obtaining identifications of this genus, this is hardly a criticism of the authors. However, although the referees for the more critical groups are acknowledged, no

reference is made to which of the records they identified. Neither is there any mention of where the voucher specimens are housed. Inevitably in any work such as this there are odd omissions, *Eriophorum latifolium* for one; and is *Epilobium tetragonum* quite so common?

Yet, one can only praise this publication and the hard work that has so obviously gone into its production. It provides a valuable account of the area's flora and will undoubtedly become a standard datum from which to assess the floristic changes in future years. It is a must for field botanists in that part of England or anyone intending to spend any time in this rewarding part of the country. The authors' attempt to keep the price so low is commendable, but I for one would prefer to pay more and have something a little more robustly bound.

P. Jepson

Biosystematics in the Nordic Flora. Edited by Bengt & Lena Jonsell. *Acta Universitatis Upsaliensis/Symbolae Botanicae Upsaliensis* **27** (2). Pp. 256. Distributor: Almqvist & Wiksell International, Stockholm – New York [1986]. 1987. Price SEK 160 (ISBN 91–554–1941–0).

This is an account of the Proceedings of a symposium held at the Royal Swedish Academy of Sciences on the occasion of the centenary of the Bergius Botanic Garden, Stockholm University, Sweden, on August 27th–29th, 1985. The symposium brought together a large gathering of botanists, many of whom were active in biosystematic studies in the Nordic flora, and the 25 papers presented cover a wide range of topics, including much to interest British and Irish botanists. There are excellent accounts by two prominent English taxonomists, Professor Clive Stace on "Hybridization and plant taxonomy" and Dr Max Walters on "*Alchemilla*: a challenge to the biosystematists", while critical groups are well represented with studies on the *Campanula rotundifolia* complex, the *Carex flava* group, *Cochlearia* and *Euphrasia*. Research on the Gramineae is covered by papers on the genera *Anthoxanthum, Deschampsia* and *Festuca*. "Man's influence on the establishment and composition of the national flora" by M. Ryberg provides an account of the role of man as a dispersal agent in the Swedish flora and of the effect of human influence on natural and semi-natural plant communities; it contains much data relevant to these islands. A further paper by R. Svensson & M. Wigren, entitled "A changing flora – a matter of human concern", describes the decline of many cornfield weeds and the changing pattern of village ruderals due to modern grain-cleaning methods, improved manure management and better husbandry. This is a useful publication, similar in many ways to some of the B.S.B.I. Conference Reports. It should be acquired by all those with an interest in the flora of northern Europe.

D. H. Kent

Planting a Bible garden. F. N. Hepper. Pp. vii + 160, with 73 line drawings and 41 colour photos. Her Majesty's Stationery Office, London. 1987. £6.95 paper-back. (ISBN 0–11–250011–0).

Nigel Hepper has a close interest in this subject – he is the author of HMSO's *Bible plants at Kew* and has himself laid out Bible gardens. The result is, for those inclined that way, all that could be wished for – discussions on the frequent extreme uncertainties of just what plant is intended by the various references and translations, and how to grow them or substitutes. For many are impossible out of doors outside the Holy Land, and some even there.

Personally, I would find such an odd assortment of plants unsatisfactory, above all when the best that can be done is quite often to have a similar, or not so similar, species – ideas towards this are listed under each sort described, e.g. the 1867 yellow British hybrid *Cytisus* × *praecox* for the white *Retama*, or *Iris pseudacorus* for *Acorus*. Mr Hepper makes the best of these difficulties, and one wonders why (so far as I know) only two churchyards include any of these as such, as many are easy enough to grow. The book is a *tour de force* by him, all the drawings, all the photos and all the text being his.

D. McClintock

The complete book of British berries. D. C. Lang. Pp. 223, with 108 colour photographs and 103 line drawings. Threshold Books, London. 1987. Price £19.95 (ISBN 0–901366–34–X).

In this book, David Lang confines his attention to those fruits which can loosely be called berries. The author's claim to deal with all the true fleshy fruits found as natives or widespread introductions in Britain is fully justified, with 96 species covered, including some, such as *Fuchsia magellanica*, of which fruit illustrations are rare.

The introductory text has chapters explaining about the different kinds of fleshy fruits and where to find them, plant poisons and how to treat them, a species list entitled "Can we eat them", and a second list of the species covered in the book with known or potentially poisonous ones marked. There are a number of minor but alarming discrepancies here. Depending on which list is consulted, Rowan for example, is either good to eat or potentially poisonous, a distinction of some importance to the eater. Nor is the text any more reassuring, concluding with the statement that "the process of boiling involved in making jelly or jam could well destroy these (poisonous) properties". Only "could well"? I think I will stick to strawberry jam!

At the end of the book are a rather serendipitous glossary, an extensive bibliography and a usefully cross-referenced index. The middle of the book is devoted to descriptions of the species, arranged in the taxonomic order used in *Flora Europaea* (not the one most familiar to British botanists). In addition to the text, which describes leaves and flowers as well as fruits, and includes notes on ecology and distribution, each entry is accompanied by a colour photograph of the fruit and a line drawing, usually of a flowering stem, flower or fruit. The photographs are excellent, sharply focused, and with true colours, and are the best feature of the book. The line drawings are rather crude, adding little to the book. For comments on the history and uses of the various fruits the author relies heavily on those oft-quoted herbalists, Culpeper and Gerard. I found Mr Lang's own comments on the toxicology, symptoms and treatment of the poisonous species of more interest.

This particular book falls into an odd category, more than a coffee table glossy, less than a field guide. The author conceived his book as an aid for those with "minimal botanical knowledge to identify plants in fruit". The lack of any kind of key to the species is a major drawback, and I fear Mr Lang's intended readers may find using his book for this purpose a frustrating exercise.

J. R. Press

The plant-book. A portable dictionary of the higher plants. D. J. Mabberley. Pp. xii+706. Cambridge University Press, Cambridge. 1987. Price £20.00 (ISBN 0–521–34060–8).

When Willis's *Dictionary of the flowering plants and ferns* was revised and enlarged by H. K. Airy Shaw for the 7th edition (1966), he confined the entries to generic and family names and those of higher ranks, omitting much that had been treated by Willis himself in the earlier editions (1896–1931). The missing parts (common names, uses, etc.) were subsequently included by F. N. Howes in *A dictionary of useful and everyday plants* (1974), whilst Shaw's 8th edition of the *Dictionary* proper (1973) was in the same format as the 7th. Many botanists, however, while appreciating the increased and more up-to-date coverage of the works of Shaw and Howes, lamented the absence of a single-volume comprehensive small-size dictionary; and it is this lacuna that David Mabberley has attempted to fill.

Mabberley's book is certainly small (23 × 12.5 × 4 cm); and it is more comprehensive than Shaw's in that it contains a large number of common names from many regions of the world and a considerable amount of economic information in addition to the purely taxonomic and distributional data. It is not – nor could it be – completely comprehensive. The less usual botanical synonyms, for example, have been omitted; and I failed to find one or two modern common names, e.g. Gallant Soldiers (*Galinsoga parviflora*). On the whole, however, I should regard the use of the word 'comprehensive' as well justified; and the wide coverage of literature has made it reasonably up-to-date. Shaw's volumes include summaries of the classifications of both Bentham & Hooker and Engler & Prantl; but the text is full of his own ideas of family and generic

relationships, only some of which have gained acceptance. Mabberley has "tried not to innovate" and has adopted Cronquist's system (1981) as standard; and it is that system that is summarized at the end of this volume. His own views, therefore, are seldom revealed; but they do sometimes appear, e.g. when he uses the sign '~' ("sometimes included in, has recently been included in, should be included in or is very close to") before a generic name. The references to recent or standard monographs or revisions, however, are a very welcome innovation and do compensate, to some extent, for the absence of the subfamilial and tribal positions of the genera that have been a feature of '*Willis*'. Was it necessary, though, to include a *nom. nov.* (p. 371) for a genus of orchids in such a work?

The format, in general, is acceptable and helpful. Would that it were always possible, however, to distinguish which author's names are abbreviated. This can be done only for those of generic synonyms, not for those whose generic names are accepted. All in all, however, this really is a book that should be on the bookshelf of every botanist, not to mention other biologists who are concerned with vascular plants.

N. K. B. Robson

The origins of angiosperms and their biological consequences. E. M. Friis, W. G. Chaloner & P. R. Crane. Pp. x+358, with 44 text figures and 15 tables. Cambridge University Press, Cambridge. 1987. Price £27.50 (ISBN 0–521–32357–6).

The contents of this fascinating and informative book were mostly presented as papers at the Third International Congress of Systematic and Evolutionary Biology at the University of Sussex in August 1985. They provide, overall, a clear and reasonably comprehensive picture of the current 'orthodox' view of the origin(s) of the angiosperms, although references are made by some contributors to the divergent opinions of e.g. Meeuse, Axelrod and Burger (but not to those of Melville).

An 'Introduction to angiosperms' by the editors provides a very useful summary of the facts and opinions about their nature and evolutionary history, after which Doyle & Donoghue summarise previous ideas about their relationships and give a detailed account of a cladistic analysis of the groups concerned. From this it would appear that the angiosperms are the sister-group of the Bennettitales + Pentoxylales + Gnetales, and that all these taxa form the sister-group of the Caytoniales, which in turn links them to the Glossopteridales (a group of seed ferns). Parrish's discussion of Late Cretaceous and Early Tertiary geography and climate provides a helpful framework into which the data of the other authors can be placed and indicates that large areas of the earth were semi-arid (with steppe, taiga or Mediterranean climates) when the angiosperms were apparently undergoing their major evolutionary divergence.

Of the other contributions, the chapter by Friis & Crepet on 'Time of appearance of floral features' will be of great interest to many *Watsonia* readers, whilst Collinson & Hooker's description of the 'Early Tertiary of southern England' reveals a very different vegetation from that encountered now on B.S.B.I. excursions, e.g. reedswamp with palms.

In general, I can thoroughly recommend this book for those who want to know the current orthodox state of knowledge and opinion on the angiosperms, i.e. that they are monophyletic, arose in or soon before the Early Cretaceous, were probably Magnolioid in form, had pinnate venation in leaves and 'carpels', etc. Apart from Doyle & Donoghue's preliminary discussion, you will not find much about the views of those who disagree with this picture, although it is clear that the simple flower of e.g. Chloranthaceae appeared very early in the evolutionary history of the angiosperms. Would that palaeontologists took seriously Melville's data on dichotomous venation and gonophylls in the angiosperms and their relatives.

N. K. B. Robson

Pasture-woodlands in lowland Britain. P. T. Harding & F. Rose. Pp. 89, with 8 colour plates. Institute of Terrestrial Ecology, Monks Wood, Huntingdon. 1986. Price £5.00 plus £1.10 p. & p. from Publications Section, I.T.E., Merlewood Research Station, Grange over Sands, Cumbria LA11 6JU (ISBN 0–904282–91–0).

This attractively produced book is sub-titled "A review of their importance for wildlife conservation". Many botanists will no doubt be familiar with Francis Rose's work on the lichen epiphytes of old trees, but the importance of ancient trees with dying and dead wood for saproxylic invertebrates (particularly beetles) is perhaps less well-known.

The authors indicate that pasture-woodlands are better represented in lowland Britain than in most of north-western Europe, with the New Forest being the most important of all. Recommendations for their conservation and future research are given.

The numbers of lichens and insects associated with each tree are given. Oak is the best for both groups (326 lichens, 423 insects and mites). It is of interest that sycamore is high up the list with 194 lichens – not far behind ash, beech and elms in this respect.

An important feature of the book is the tabulated schedule of all pasture woodlands with an assessment of the conservation importance of each. There is also an extensive list of references.

R. C. Stern

 Watsonia, **17**, 208-216 (1988)

Obituaries

DOROTHY ADLINGTON CADBURY
(1892—1987)

Dorothy Cadbury was born on 14th October, 1892 and died on 21st August, 1987 at the age of 94. Through much of her life she worked in Cadbury Bros. at Bournville and was a director for many years, retiring from the firm in 1952. She was a Quaker and throughout her life maintained a strong commitment to the Society of Friends.

Dorothy always said that her botanical interests started at an early age. As a child she had helped her mother to find about 1,000 flowers, which were carefully coloured in her *Illustrations* to the Bentham & Hooker *Flora of the British Isles*. This activity was continued into her old age, and nothing gave her more pleasure than finding another species which she could 'paint into' her book of *Illustrations*.

She joined the Wild Flower Society in 1937, and each year sent in records beginning in the first week in March or sometimes even earlier. She was Warwickshire Recorder for that Society for a time and continued to send in records up to 1986. In 1939 she joined a group carrying out a botanical survey of the Isle of Mull. Dorothy joined the B.S.B.I. in 1936 and remained a member for the rest of her life. She took a lively interest in the Society's meetings, particularly in the November Conversazione.

From quite early in her career Dorothy Cadbury began to take a special interest in water plants, though it was apparently by accident that she became a 'Potamogetonist'. Apparently, she had sent some pond weeds to a Wild Flower Society friend for name checking, and the friend had taken them to the British Museum to be identified. The identifiers were Dandy and Taylor (later, Sir George Taylor, who became the Director of the Royal Botanic Gardens, Kew). Sir George had a great admiration for Dorothy's *Potamogeton* work, and she was most gratified to be asked to collect pondweeds officially for the British Museum.

During field excursions in Warwickshire, and indeed everywhere she went, we all knew that the merest hint of an interesting pondweed would send her rushing into pond, canal or river fully clothed and shod, without any hesitation, to collect her specimens.

One of the interesting outcomes of this work was the discovery of two rare hybrids, the first named in her honour *Potamogeton* × *cadburyae* by Dandy and Taylor and collected in Seeswood Pool, Nuneaton. According to these authors the hybrid is "a most surprising cross, but there is no doubt about the parentage, as examination of the material will quickly show . . . Subsequent visits to the Warwickshire locality have failed to reveal more of the plants" (see Cadbury *et al.*, *A computer-mapped Flora, a study of the county of Warwickshire*: 218, 1971). The second hybrid was named *P.* × *pseudofriesii* Dandy & Taylor and was collected in v.c. 14, near Buckenham Ferry. She made some 400 *Potamogeton* collections for the British Museum, from many different parts of the British Isles, of which 192 were from Warwickshire. These records included most of the British species and natural hybrids.

Dorothy Cadbury did not neglect local natural history interests. She joined the Birmingham Natural History Society in 1950 and remained a member until her death. One of her tasks for the Society was to compile a complete list of the flowering plants of Edgbaston Park, a task which she tackled with her usual enthusiasm and energy. She was very active, both on field excursions and in giving talks during the winter sessions, particularly on her travels abroad, on wild flowers in general and certainly on pondweeds in particular. Her enthusiasm and excitement during excursions was infectious and was communicated to everyone within earshot. It was truly an enjoyable and an energetic experience to be with Dorothy in the field!

I was privileged to work with her on the Revision of the Flora of Warwickshire for a period of nearly 20 years. This was a joint project between the Birmingham Natural History Society (B.N.H.S.) and the Botany Department of the University, together with help from the Birmingham Museum and Art Gallery. The project was officially begun in January, 1950, the joint recorders being Mr R. C. Readett (B.N.H.S.) and Mr Peter Green (University), with Dorothy

Cadbury as a committee member. Peter Green left in 1951 and I came to Birmingham in 1952. After a number of changes to the Flora organization, Miss Cadbury, Mr Readett and I were appointed joint recorders and editors with the assistance of Mr M. C. Clark.

Collation and verification of records was undertaken every Tuesday, year in and year out, by Dorothy Cadbury together with various assistants, Elsa Pickvance taking part for most of the period. In the evenings of each Tuesday, Dorothy together with Robert Readett and myself, would identify 'critical' material sent in by collectors, make policy decisions from time to time and eat a delicious Cadbury tea. This went on continuously, week by week, from 1954 to about 1970 – some 16 years. Throughout all this period Dorothy worked with an enthusiasm and determination that was amazing. When the *Computer-mapped Flora* was published in 1971, Dorothy's work throughout the years was evident to all. This book stands as a tribute to her and to Robert Readett, both gifted amateurs, who were able to teach me, as a professional, many lessons in field botany and local flora work.

When I suggested to the Committee in 1964 that we ought to computerize our records and seek a way to have the distribution of each species computer-mapped, I was surprised that without the slightest hesitation Dorothy at once agreed to and enthusiastically supported this idea; I had imagined that, since she grew up before the computer age, I should have some difficulty in persuading her and Bob Readett to go along with this suggestion. On the contrary, they both took to it with great enthusiasm.

After the publication of the *Flora*, into which Dorothy had put an energetic 20 years of her life, I thought that she would wish to sit back and relax for a little while. I was completely mistaken; she forged ahead with local natural history excursions and pond-dipping practically to the end of her life.

Truly, here was a great personality whose friendship I greatly enjoyed. It was a privilege to have known and worked with her. Always modest, but with whole-hearted devotion to field botany, she is sadly missed by all who knew her.

J. G. Hawkes

JOHN HARRIS CHANDLER
(1909—1987)

B.S.B.I. members who knew him well will be sorry to learn of the death on 5th September 1987 of John Chandler, a member since 1956. Though born at Markyate, near Luton, he had an intimate knowledge of the countryside around Stamford, where he had lived since the early 1950s. He was a meticulous recorder who studied his own area in detail. During the Maps Scheme he took on a number of 10km squares, and the Stamford square was one of the best recorded in England. He was never afraid to tackle critical or difficult groups, particularly *Rosa*, *Salix* and *Ulmus*. His work on these groups, especially the first, and in recording generally was of great significance in the publication of three local Floras. Guy Messenger, author of the *Flora of Rutland*, writes that, without John Chandler, that work would never have been begun, let alone finished. He tried to persuade John to allow his name to appear on the title page, but, with his usual modesty and generosity, he refused.

John Chandler also gave considerable help to Terry Wells in fieldwork for the forthcoming *Flora of Huntingdonshire and the Soke of Peterborough*; his knowledge of the localities for many rare plants in the Soke was invaluable and he was forever on the lookout for newcomers. It was he who first noticed *Elodea nuttallii* in the Soke in 1974 and carefully traced its spread along the dykes and river systems. His detailed study of *Rosa*, which fortunately occurred before the period of widespread hedge removal, provides a historic record of the variety which existed around Stamford and Peterborough before the fields were enlarged and the hedges destroyed. This detailed approach is reflected in a letter he wrote to Joan Gibbons about the *Flora of Lincolnshire*: "I have collected about 50 specimens so far, particularly in the Uffington and Holywell areas. It seems better to work a small area in detail rather than odd bushes here and there. A small gravel pit at Uffington has about a dozen bushes and at least half of that number are different – several '*canina*'

forms, a couple of '*dumetorum*' varieties and '*obtusifolia sclerophylla*'." This was his forte – a mind and an eye for detail.

He was President of the Lincolnshire Naturalists' Union (1965–66), and his Presidential Address, which re-emphasised his love of his own locality, was 'Uffington Gravel Pits – an ecological study'. Uffington is c. 2 km east of Stamford.

In professional life John Chandler was a Customs and Excise Officer. This work stimulated his interest in Revenue stamps, and, during the last years of his life when ill-health made fieldwork more difficult, he was joint author of a book on *The newspaper and almanac stamps of Great Britain and Ireland*; published in 1981, this is the definitive work on the subject. It demonstrates his ability to compile and write; and, had he lived in the centre of a county instead of on the boundary of three, he would undoubtedly have joined the ranks of B.S.B.I. members who have written County Floras. Instead, three other authors have reason to be grateful for his unselfish assistance.

T. C. E. Wells & I. Weston

THOMAS GASKELL TUTIN, M.A., Sc.D., F.R.S.
(1908—1987)

Thomas Tutin, who died aged 79 on 7th October, 1987, was very widely renowned as an extraordinarily productive and persistent author and compiler of Floras. His name will remain familiar to plant taxonomists for centuries to come through his floristic achievements, two of which stand out in excellence and importance.

Flora of the British Isles was published in 1952, with A. R. Clapham and E. F. Warburg as co-authors, and, as 'CTW', quickly became the standard British reference work. The circumstances surrounding the commencement of this work, and the early roles played by H. Gilbert-Carter and A. G. Tansley, have been set in print by Clapham (1978), and for these and for many other anecdotes and early reminiscences of Tom Tutin the reader is referred to that work, the existence of which forbids too much repetition here. The impact of *Flora of the British Isles* cannot easily be exaggerated. As a 13-year-old, it was the first 'proper flora' I ever used, but its degree of detail, its level of authoritativeness, and its up-to-date nomenclature and classification were equally novel and came as just as much a shock to those who were already experts in the study of British plants. The reason for this is easy to see – it replaced, as the standard British Flora, C. C. Babington's *Manual of British botany* (1843), G. Bentham's *Handbook of the British flora* (1858) and J. D. Hooker's *The Students' Flora of the British Islands* (1870), all several times revised, but none very adequately and none after 1924. The changes and new data that had accumulated up to 1952 were predictably very numerous and very far-reaching. 'CTW' became the British botanists' 'bible' almost overnight, and its sequence and nomenclature were soon adopted by the B.S.B.I. as its basis for recording via J. E. Dandy's *List of British vascular plants*(1958), which used the sequence of 'CTW' "for obvious reasons of convenience".

The success of 'CTW' was largely the result of Tutin's devotion to the overall editing and to the incorporation of the efforts of his two co-authors, a devotion amply acknowledged by them on page xviii of the first edition. Authorship of the various families was divided approximately equally between the three (see pages 1507–1508 of the first edition). This position of pre-eminence of *Flora of the British Isles* has been maintained to the present day by the appearance of a second edition in 1962 and a third in 1987, Tutin's last work. Warburg having died in 1966, the families written by him in the first two editions were revised for the third by D. M. Moore. The second and third editions are, of course, improvements on the first, but, seen in relation to the amount and availability of contemporary data, they probably represent a lesser achievement; in my opinion the level of excellence of the first edition has not since been equalled in British Floras. The popularity of 'CTW' was further established, and its use widened, by the preparation of a shortened version, *Excursion Flora of the British Isles*, in 1959, with later editions in 1968 and 1981.

Much of the above concerns 'CTW' rather than Tom Tutin, but anyone who knew Tom soon realised that the two were inextricably entwined. Moreover, Tom was a quiet, self-effacing man

who rarely volunteered information, let alone that of a personal nature, and in some ways it was easier to understand the man via his work than directly.

The other major work with which Tom was involved was, of course, *Flora Europaea* (5 volumes, 1964–1980). The part Tom played as Chairman of the Editorial Committee, from its first formal meeting at Leicester in 1956 until his death, has been referred to by Clapham (1978) and Webb (1978), and an apt acknowledgement appears on page xv of Volume 5 (1980). A short history of *Flora Europaea* also appears on pages xvii–xx of Volume 5. During the 1960s and 1970s *Flora Europaea* gradually took over from *Flora of the British Isles* as Tom's main botanical interest. Indeed the influence of the former on the latter is made abundantly clear from a study of the progressive editions of 'CTW' and of the *Excursion Flora*. The sequence of families in *Flora Europaea* (taken from the twelfth edition of *Syllabus der Pflanzenfamilien* (1964)) was never adopted in 'CTW', but the later editions were altered to conform with the generic and specific sequences of the families, as was the classification in the majority of instances, and even the descriptive data of later editions were emended in the light of those in *Flora Europaea*. Webb (1978), in analysing the contents of *Flora Europaea*, pointed out that Tom wrote more accounts (1307 species) than any other author, and concluded that "For individual achievement Tutin, . . . , is in a class by himself; . . ."

Tutin's contribution to botanical literature will also be known to all B.S.B.I. members through two of our handbooks – *British Sedges*, produced in 1968 with A. C. Jermy (the second edition, renamed *Sedges of the British Isles*, appeared in 1982, but Tutin played no part in its preparation), and *Umbellifers of the British Isles*, produced in 1980. These books, the first two of the series, are indispensable to students of sedges and umbellifers, and the first has become the best seller of any of the Society's publications. He wrote no major separate works on his favourite family, the grasses, but he prepared the account of these for 'CTW' and was the general editor as well as a major author for the family in *Flora Europaea*.

Tom Tutin was born, appropriately, at Kew on 21st April, 1908, where from an early age he developed a keen interest in natural history, a devotion shared and fostered by his father, a biochemist. Outside plants his favourite group became the Lepidoptera, and he retained an interest in butterflies until his last years. His sighting of the season's first Brimstone, or his discovery on holiday of a good colony of Marsh Fritillaries, were to him items well worthy of remark at the first opportunity to anyone who he thought shared his delight in these creatures.

In 1920 his family moved to the Bristol area, and from 1927 to 1930 he read Natural Sciences at Cambridge University. There he met many people, both teachers and students, who were to shape his future career. Perhaps his foremost contemporaries were P. W. Richards and E. F. Warburg, but there were others just before and just after with whom he rubbed shoulders and who together generated an exciting atmosphere from which emerged a probably unparalleled number of distinguished botanists. In his second long vacation (1929) Tom and Warburg took part in an expedition to Madeira and the Azores.

After graduation Tom took a series of short-term posts that alternated with his participation in a number of foreign expeditions, notably to Spain and Morocco in 1931, British Guiana in 1933 and Lake Titicaca in 1937. All these trips, especially that to British Guiana, deeply influenced his view of plants and probably helped to determine the direction of his future career. Immediately after graduation he remained at Cambridge to work on Greenland fossils collected by A. C. Seward. In 1933 he joined the Marine Biological Station at Plymouth to investigate the wasting disease of *Zostera*, and after his return from Lake Titicaca he held posts at King's College, London, the University of Manchester, and, as part of the war effort, in the Geographical Section of the Naval Intelligence Division of the Admiralty.

In these early years he published papers on topics as diverse as Greenland fossils, rot-holes in trees, the *Zostera* parasite and fresh-water algae, as well as floristic and taxonomic notes on plants from the Azores, S. America and Britain. His interest in aquatic plants, apparently commencing with the *Zostera* work, flourished on his trip to Lake Titicaca, where he studied the larger algae and developed ideas on the concept of the hydrosere succession. While at Manchester he spent a good deal of time at Windermere, where he met Winifred Anne Pennington, whom he married in 1942. His wife, who answers variously to the names Winifred Pennington, Mrs T. G. Tutin, and Professor W. A. Tutin, F.R.S., is a world authority on lake sediments. They had one son and three daughters, one of whom, Caroline, has worked for the past 16 years on the threatened gorillas and

chimpanzees in tropical Africa. Her regular letters to Tom over this period were a great delight to him, and he often passed on from them tit-bits of general natural history interest.

Virtually all of Tom's papers that appeared after 1942 concerned the floristics and taxonomy of British and European flowering plants. In 1944 he was appointed Lecturer-in-charge of the embryonic Department of Botany at University College, Leicester. He was appointed Professor of Botany in 1947, holding this post through the granting of the charter to the University of Leicester in 1957 until the foundation of the School of Biological Sciences there in 1967. During this period he devoted much effort to the establishment of a thriving Department of Botany, especially through the formation of a University Botanic Garden and Herbarium at Leicester, and to the detailed study of the British Flora. The Botanic Garden was originally on the University campus, but in 1947 was moved to an ideal 16-acre site two miles away at Oadby, opposite Leicester Race-Course. The Herbarium was commenced in 1946 and now comprises about 120,000 specimens. At first it reflected Tutin's interest in the British flora, and contains his collections from most parts of the British Isles, including many of the well-known localities of rare species. Those early collections were augmented by duplicates from correspondents and friends such as J. E. Lousley and E. F. Warburg, and by the collections of his chief technician, E. K. Horwood (son of A. R. Horwood, co-author of *The flora of Leicestershire and Rutland* (1933)) and of one of his first appointees, Miss A. P. Conolly. Parts of Tutin's own herbarium (notably the grasses) were kept separate, but they were all finally incorporated in the mid-1970s. Later, increasingly so as *Flora Europaea* got underway, more Continental material was added (the names Horwood and Conolly remain prominent here), and the valuable collections of Mrs B. M. Allen, O. Polunin and B. E. Smythies were attracted by the determination service provided by Tom and A. O. Chater, who was *Flora Europaea* Research Assistant at Leicester between 1960 and 1977. Their joint identification sessions became a feature of the Leicester Herbarium for an hour or two after tea every afternoon, and one soon learned that that period was not an appropriate time to interrupt with queries or points relating to teaching or administrative matters.

In 1967 the Leicester scene was changed dramatically by the institution of the School of Biological Sciences, which embraced five Departments (now seven). The greatly increased administrative duties and inter-departmental liaison that this entailed were not to Tom's liking (principally, they ate into time that could be devoted to *Flora Europaea*), and Professor H. E. Street was appointed from Swansea as Professor of Botany and Chairman of the School. Tom became the first occupant of the newly created Chair of Plant Taxonomy. Upon his retirement from this in 1973 he was awarded the title of Emeritus Professor, and until early 1985, when the manuscript for the third edition of *Flora of the British Isles* was delivered to the press, he worked almost daily in the herbarium on his various floristic projects.

Tom Tutin's many floristic achievements were recognized by his award of a Gold Medal of the Linnean Society of London in 1977, an Honorary Doctorate by Trinity College, Dublin in 1979, and Fellowship of the Royal Society in 1982. He was President of the B.S.B.I. from 1957 to 1961, following his Vice-Presidency from 1952–1956. Despite his name being a household word with British botanists, I doubt whether he was well known personally by many of the present membership of the B.S.B.I. He stopped attending our Annual Exhibition Meeting about ten years ago because he felt he no longer knew many of the exhibitors and visitors. His own natural reticence and the awe in which his juniors held him probably mitigated against the forging of new friendships from casual personal meetings. However, once this initial difficulty was overcome, one found a most warm-hearted and friendly person, who would most readily help with any query or problem. He received many plants for identification; on the whole his replies were prompt, accurate and brief. I believe that he never kept copies of his replies (certainly not since 1973, when they were virtually all hand-written), and that he threw away the original letter of enquiry once it was answered. Tom never used two words where one was sufficient, and had a pathological distaste for confrontation or fruitless argument. He never in any way sought the limelight, and was always surprised when anyone attempted to bring him into it. To celebrate his seventieth birthday, H. E. Street had arranged for a book to be written by a number of his colleagues and former students (Street 1978). Tom did not learn of this until a relatively late date, by which time Street had unfortunately died of a heart attack. I was left to make the few remaining arrangements, and one sentence in a brief note that Tom wrote to me shortly before we were due to gather for a surprise celebratory dinner seems to me to sum up much of his character: "I find it incredible that anyone

PLATE 2. Thomas Gaskell Tutin, 1908–1987. Courtesy of Mrs T. G. Tutin. Taken early or mid 1960s.

should go to so much trouble over one so undeserving who, after all, has only done as far as possible what he most wanted to do."

His interests included observing plants and insects, listening to music and watching cricket. In his younger days he enjoyed plant-hunting, gardening and playing the flute.

Tom Tutin was one of a dwindling number of distinguished botanists coming from the pre-war Cambridge stable. In British plant taxonomy he started an era in 1952 with 'CTW', the many obvious errors and gaps that it exposed being investigated by a much wider-ranging new generation of research workers and amateurs. It generated a new interest in, and awareness of, the British flora that coincided with the post-war expansion and the flourishing phase in the history of the B.S.B.I. described by D. E. Allen (1986) as "Full Steam Ahead." His death equally marks the end of an era, but we are left with tangible evidence of his achievements not only in his Floras and Handbooks but also in the form of the enormous amount of diverse research and data-gathering that these in turn generated. I know of two plants named after him: *Atractylis tutinii* Franco, *Bot. J. Linn. Soc.*, **71**: 47 (1975) (endemic to Cabo de Gata, Spain); and *Mentha* × *tutinii* Pinto da Silva, *Cat. Pl. Vasc. Açores*, p. 103 (1966). The latter has no description but refers back to a description by J. Fraser in *J. Bot., Lond.*, **70**: 39 (1932), where the plant is described as *M. piperita* × *M. rotundifolia*.

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PUBLICATIONS OF T. G. TUTIN

This list is additional to that in Clapham (1978); it includes two omissions from the latter and all the post-1976 publications that I have traced. In addition there are a few minor errors in Clapham's list. The most important are the page-numbers of the fifth article cited, which should read *J. Bot., Lond.*, **72**: 306–314, 333–341; and that *Aquilegia* should be deleted from the entries for *Flora Europaea* Volume 1.

1. 1964 A vegetaçao dos Açores. *Açoreana*, **6**: 8–32.
2. 1975 *Apium*, *Bidens*, *Zostera* & *Poa*, in Stace, C. A. ed. *Hybridization and the flora of the British Isles*. London, New York & San Francisco.
3. 1978 (with C. A. Stace). A new species of *Gaudinia* from Spain. *Bot. J. Linn. Soc.*, **76**: 353–356.
4. 1978 Short notes, in Heywood, V. H., ed. Notulae Systematicae ad Floram Europaeam spectantes, 20. *Bot. J. Linn. Soc.*, **76**: 361, 363, 365, 369.
5. 1980 (edited with V. H. Heywood *et al.*). *Flora Europaea*, Vol. 5. Cambridge. Author of Zosteraceae and Gramineae *pro parte*.
6. 1980 *Umbellifers of the British Isles*. London.
7. 1981 (with A. R. Clapham [& E. F. Warburg]). *Excursion Flora of the British Isles*, 3rd ed. Cambridge.
8. 1987 (with A. R. Clapham & D. M. Moore). *Flora of the British Isles*, 3rd ed. Cambridge.

C. A. Stace

DAVID HENRIQUES VALENTINE
(1912—1987)

Professor D. H. Valentine died in Manchester on 10th April, 1987. He was born in Salford on 16th February, 1912, and was educated at Manchester Grammar School and St John's College, Cambridge. Initially involved with plant physiology, his research interests soon led him to consider the relationships and distribution of flowering plants, a move to plant taxonomy which he pursued for the rest of his life. In 1936 he was appointed Curator of the Herbarium at the University of Cambridge and, in 1938, gained a Fellowship at St John's College there. During World War II he was employed by the Ministry of Food to carry out research into methods for dehydrating vegetables. In 1945 he was appointed Head of the Department of Botany in the, then, Durham Colleges in the University of Durham, first as Reader and later, in 1950, as Professor. In 1966 he returned to his native Manchester (which, he always avowed, was *schön*), where he was Professor of Botany until his retirement in 1979.

Valentine was a vigorous member of the Editorial Committee of *Flora Europaea* (which of his colleagues can forget his insistent query at one meeting, "what the hell is NERC"?, as the vogue for such abbreviations moved towards the current unintelligibility), a member of the Council of the Linnean Society of London (1968–71, 1976–80), President of the International Organization of Plant Biosystematists (from 1974) and President of the Botanical Society of the British Isles from 1977 to 1979. In the late 1960s he was prominent in the group which undertook to assess the potential effects of the dam at Cow Green in Upper Teesdale and was instrumental in the related research programme.

His early studies on variation in *Viola riviniana*, during the 1940s, led Valentine into the then-developing field of genecology. He soon expanded into the broader field of what would come to be known as biosystematics, first by exploring the relationships between *Viola riviniana* and *V. reichenbachiana* (later extending this to considerations of the cytogenetical relationships between these and other violets) and then by his studies on *Primula*. He clarified the patterns and processes of hybridization between British primulas, both in the field and in the experimental garden, showing, amongst other things, the role of endosperm breakdown in accounting for the differential success of reciprocal hybrids. In the field and in the laboratory Valentine's interests extended to *Centaurea*, *Impatiens*, *Potentilla* and *Senecio*. His Presidential Address to The Botanical Society of the British Isles, in 1978 (*Watsonia* **12**: 201–207, 1979), not only outlined the scope of his own researches but also provided a most stimulating overview of the current British biosystematic scene, in which amateur and professional members of our Society were making, or could make, their mark.

Together with such contemporaries as Böcher, Gregor and Merxmüller, Valentine was prominent in the European group which counterbalanced the North American, largely Californian, school in the heyday of biosystematics during the 1950s and 1960s. His perceptive studies of, above all, *Viola* and *Primula*, his introduction of the concepts of abrupt and gradual speciation, and his continuing concern with the interrelationships between taxonomy and ecology, have ensured his distinguished place in European botany. In addition to his considerable contributions as editor and author for *Flora Europaea*, Valentine wrote over 30 scientific papers and edited the volume resulting from the valuable international meeting on 'Taxonomy, Phytogeography and Evolution', which he organized in Manchester in 1971.

Despite the research record outlined above, however, Valentine was, above all, a great teacher. In 1951 I entered his Department as a callow undergraduate. Quite properly, 'the Professor' was viewed with awe. It soon became evident that his kindly, though firm, guidance was leading to our absorbing some of his knowledge and love of the British flora. His well-organized lectures and field trips (always designed so that a glass of beer was at hand during the midday stop) were instrumental in cultivating our appreciation of plant taxonomy. During the final examinations, how we were helped to overcome our nervousness by the cherries and strawberries which he produced during the intervals of the practicals!

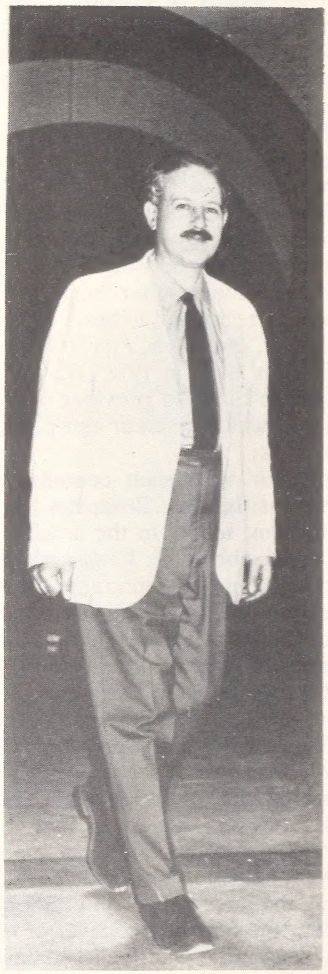
I was the fourth, I believe, of his numerous graduate students. Unstintingly, he supported us with ideas and the unpublished data from his work on *Viola* and *Primula*, with which to prosecute our Ph.D. programmes. We were allowed into the tea-time discussions during which Valentine and Dr Jack Crosby introduced us to the art of friendly, though gladiatorial, debate. Afternoon tea at

his home with Joan and their five children was always a delight and a welcome reminder of the family life often missed by those of us living in college or digs. Nor was the conversation confined to matters botanical – Valentine's appetite for detective novels was a pleasurable, and much discussed, revelation.

I am not sure how often a callow student becomes the friend and colleague of 'the Professor'. This was certainly the case between David Valentine and many of his students. His numerous distinctions never caused him to lose his empathy with people, especially the young– the 'common touch', as Kipling put it. We, his students, were privileged to have David Valentine as our mentor and friend; we are grateful for his life.

D. M. Moore

(a)



(b)

Plate 3. David Henriques Valentine (1912–1987). a) Probably taken in the early 1950s; courtesy of Mrs H. Parsons. b) Taken in 1967 at a *Flora Europaea* symposium in Seville; courtesy of D. M. Moore.

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