Short Notes

97. CARDAMINE—Pollen.

Observations have been made on the pollen of *Cardamine* spp. including *C. hirsuta*, *C. impatiens*, *C. matthiola*, *C. resedifolia* ($2n = 16$), *C. pratensis* ($2n = 30$), *C. flexuosa* ($2n = 32$), and *C. raphanifolia* ($2n = 46$). Measurements of pollen diameter showed that this character was not very useful in distinguishing the diploids from the polyploids. Light microscope observations of the pollen surface showed a reticulate pattern but no obvious distinguishing features.

Further investigations of the surface features were carried out using the Stereoscan electron microscope. Low ($\times 5000$) and high ($\times 15000$) power photomicrographs were exhibited at the 1968 Exhibition Meeting showing the extine pores and features of the germinal pores. In the region of the germinal pores the reticulate pattern broke down and, especially in *C. matthiola*, numerous papillae were seen. Measurements of the extine pore diameters were found to be significantly different in all the species examined. There were no significant correlations between extine pore size and breeding system (*C. matthiola*, *C. pratensis*, and *C. raphanifolia* are self-sterile while the other species are self-fertile) and between pore size and the ability to hybridise (*C. flexuosa* with *C. hirsuta*, *C. pratensis* with *C. raphanifolia*). In contrast, there is a strong correlation between extine pore size and chromosome number. The mean pore size varied from 0·15 μ m (*C. resedifolia*) to 0·21 μ m (*C. hirsuta*) in the diploids to 0·24 μ m in *C. pratensis*, 0·26 μ m in *C. flexuosa* and 0·42 μ m in *C. raphanifolia*.

Other species in the Cruciferae will be examined to determine if this correlation can be made over a number of genera and if pollen extine pore size is useful in distinguishing species.

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122/2. ELATINE HYDROPIPER L.—New to Scotland.

In the West of Scotland the summer of 1968 was unusually dry and Loch Lomond was reduced to prolonged low levels, exposing extensive areas of sand bars and mud flats around the River Endrick mouth and its low-lying marshy hinterland. Among several uncommon plants found on the freshly exposed surfaces was *Elatine hydropiper* L. During July and August this plant was recorded in two localities on the mainland part of the Loch Lomond National Nature Reserve, Dunbartonshire (Vice-county 99), and in the marshes south of Balmaha, Stirlingshire (Vice-county 86). In each case it was found in open communities on either undisturbed, bare sandy mud, or surrounding agricultural watering ponds on the mud churned up by cattle. Since 1965 The Nature Conservancy has maintained daily recordings of the levels of Loch Lomond from which it has been possible to determine the height and period of inundation/emersion of each colony of *E. hydropiper*. The annual rise and fall of the loch is between 5–7 feet with a summer average level of 24·5 ft O.D. The modal loch level, i.e. the level occupying the highest percentage of time throughout the year, is 25·5 ft O.D. By referring to the loch levels it was found that, with one exception which was not ascertainable, all colonies of *E. hydropiper* were growing at about 24·0 ft O.D., 1·5 ft below the modal loch level. Taking the average for the years 1958–1967, sites at this level would be exposed for 22 days per year. However in 1968 the number was 43, almost twice as long, providing highly favourable conditions for germination. It is worth noting that Mr D. McClintock recorded *Elatine hexandra* (Lapierre) DC. at Balmaha in July 1953 following a similar dry period and low loch level. This species was also noted by the

present authors in the Endrick mouth area in the summer of 1968.

Sir Edward Salisbury has pointed out that *E. hexandra* is intolerant of competition except with other small annual species. In general the same rule seems to apply to *E. hydropiper*. In both the English sites from which the plant has been reported since 1960, the recorders note that it was either the only plant colonising the mud or its nearest competitor was 1 metre away. At Loch Lomond, although the plant cover was more dense than this, it was still extremely sparse. The most commonly associated species were *Peplis portula* L., *Callitriche stagnalis* Scop. and *Eleocharis acicularis* (L.) Roem. & Schult., all notably slender or weak-growing species.

In Sweden, Lohammar (1965) has produced comparable lists of species colonising inundated muds on lake shores. At Lake Morjärvsträsket he records *Eleocharis acicularis*, *Subularia* sp., *Limosella* sp., *Crassula* sp., *Elatine hydropiper* and *Callitriche verna*; at Lake Jädersjön, on the dried-up lake floor, he notes *Limosella* sp., *Subularia* sp., *Elatine hydropiper* and *Callitriche verna*. Similarly Pekkari (1965) working on the aquatic vegetation of Swedish rivers found *Subularia aquatica*, *Callitriche verna* and *Elatine hydropiper* growing with other small annuals in the shallow muddy bottoms of broads, where there was less competition. The only perennials present were *Eleocharis acicularis*, *Isoetes echinospora* and *Ranunculus reptans*.

At Loch Lomond annual fluctuations in water level seem to be important in combining with wave action to maintain a strand of bare sand and mud, readily colonised by weak annual species. In Sweden, although water levels differ in the way they control the habitat, the effect in maintaining bare soil is much the same. Lohammar (1965) states 'The kind of substrate and annual rhythm in water level fluctuation are prerequisites for this peculiar vegetation. During the period of low water in winter frost penetrates down into these bottoms, and horizontal layers of ice cleave the bottom material and cause it to expand and heave. On such an unstable substrate *Phragmites* and other tall rhizomatose perennial plants never have the possibilities of forming closed communities leaving the space free for small or weak competitors'. When open conditions change, *E. hydropiper* would be expected to disappear in the face of competition from more vigorously growing species. Praeger (1934) suggested that even the irregular cleaning of the sides of the Newry Canal (Northern Ireland), was sufficient to maintain a suitable habitat for large colonies of the plant there.

The nearest sites to Loch Lomond, in which *E. hydropiper* has been seen since 1930, are in NE. Ireland, where it is recorded from eight 10 km squares covering four Vice-counties, Louth, Armagh, Down and Antrim (*Atlas of the British Flora*, 1962). Apart from NE. Ireland the only post-1930 records are from Surrey, Anglesey, W. Sussex and Worcester and only in the last two has the plant been seen since 1960. In both of these the habitat was either shallowly submerged sand or mud exposed by fluctuating water levels. It is probable that, in Britain, the rarity of the plant may be more apparent than real considering the difficulty of detection in seasons other than those which are unusually dry.

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168/s. GERANIUM SUBMOLLE Steud. (or *G. core-core* Steud.)—In the Channel Isles.

The precise name of this, probably South American, plant cannot be settled because the type specimens are still unobtainable. It is, however, most certainly not the New Zealand *G. retrorsum* L'Hérit. Its history in the Channel Isles is as follows:

1926. Paradis/Fort Doyle, Guernsey. T. J. Fogitt, (**BM**). Never seen there since.
1938. Railway crossing, Whitegates, Alderney. A. B. & A. K. Jackson & H. K. Airy Shaw, (**K**).
1957. Railway line between naval quarries and Platte Saline, Alderney. Discovered independently there by Dr H. J. M. Bowen, D. McClintock and Mrs B. H. S. Russell, and still plentiful.
1963. Essex House and Reuthe's Valley, Alderney. D. McClintock.
1966. Rue des Pres, Jersey. Mrs F. le Sueur.
1968. La Garenne, Guernsey (at the opposite end of L'Ancresse Common from Paradis). Dr H. J. M. Bowen.

I know of no records for this plant anywhere else in the British Isles. Specimens from the first and last localities were shown at the Exhibition Meeting in November 1968.

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506/4, 5 & 8. SENECIO SQUALIDUS L., S. VULGARIS L. and S. CAMBRENSIS ROSSER.

The status of the radiate varieties of *Senecio vulgaris* in Britain has recently been discussed by D. E. Allen, who suggests the separation of these varieties into var. *denticulatus* (O. F. Muell.) Hyland., a maritime plant, and var. *hibernicus* Syme, an inland plant that has spread considerably in recent times. However, reference to herbarium and other records establishes a pattern where *S. vulgaris* var. *hibernicus* tends to occur only after *S. squalidus* has been recorded in the same locality.

In 1966, a short-rayed plant closely resembling Rosser's *S. cambrensis* ($2n = 60$), the allohexaploid from *S. vulgaris* ($2n = 40$) × *S. squalidus* ($2n = 20$), was found in east London. Progeny from this plant segregated for characters of *S. vulgaris* and *S. squalidus*, and all proved to be more or less tetraploid ($2n = (36–) 40 (–44)$). The majority of these segregates resembled the parent plant in ray dimensions, and a small number showed either rays of full size, as in *S. squalidus*, or were nearly or completely rayless, as in *S. vulgaris*. Self-fertilised rayless plants produced rayless offspring. The morphology of these is within the range of variation shown by *S. vulgaris*, but they differ in their greater vigour, slightly larger seeds and pollen, a degree of seed and pollen sterility, and the formation of a few multivalents at pollen mother cell meiosis. Intermediate-rayed tetraploids have been crossed with *S. vulgaris*, and have produced segregate offspring, some of which, again, closely resemble *S. vulgaris*. It therefore appears probable that repeated back-crossing of these plants into *S. vulgaris* could result in plants containing genetically determined characters of *S. squalidus*, and that these characters (e.g. the ray character, and leaf shape) might be sufficiently "diluted" in the population to appear as single gene variants. There have been a number of reports of "short-rayed *S. squalidus* plants" and of "giant radiate groundsels" in the literature, and in herbarium records, but with no possibility of analysing these plants chromosomally, it would be presumptive to conclude that

these are plants of the type described above. We would, however, like to suggest that the spasmodic reports of these anomalous plants indicate that they are not part of stable populations, and hence might be indicators of transitory stages in the rapid introgression of *S. squalidus* genes into *S. vulgaris*.

There are several possibilities as to the origin of these segregating tetraploids. These will be reported on when we have more information, but observations made on the progeny of the triploid ($2n = 30$) *S.* × *londinensis* Lousley (*S. viscosus*, $2n = 40$ × *S. squalidus*, $2n = 20$) have indicated that plants with tetraploid or higher chromosome numbers can be produced. These have so far shown high sterility, in contrast to the naturally occuring tetraploid from *S. vulgaris* and *S. squalidus* reported above.

This investigation has also raised the rather intriguing question of what happens to the large-rayed tetraploid segregates. These bear a close resemblance to ordinary diploid *S. squalidus*, but because of their increased chromosome number will not form part of the same breeding population. They also differ in being self-compatible, which would allow isolated individuals to reproduce themselves. Also in this context, it is of interest to note that *S. cambrensis*, which appears from the herbarium records to have arisen in Wales at least 40 years ago, has segregated to the extent that pure breeding rayless forms can be seen there. Theoretically, self-maintaining populations of large-rayed *S. cambrensis* segregates could have also been produced. This is speculative, but could it be that tetraploid and hexaploid, as well as diploid races of "*S. squalidus*" occur, as yet undetected, in the British Isles? These races, as well as those of *S. cambrensis* resembling *S. vulgaris*, could easily have been mistaken for autopolyploids, with any slight morphological difference from the "parent species" being attributed to evolution in the reproductively isolated autopolyploid. Polyplotypes of other species have often been described as autopolyploids because of their close morphological correspondence to a presumed parental diploid, only to be re-evaluated as "segmental allopolyploids" (Stebbins, 1947) on a more complete analysis. We hope that the present investigation will show clearly that the concept of *segregation* following allopolyploidy (intergenomic segregation, Jones 1967) can offer another possible explanation of this phenomenon.

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558/-. HIERACIUM—Two *Hieracia* Sect. Alpestria from the British mainland.

At the time of Sell & West's (1965) revision, *Hieracium mirandum* Sell & C. West was known only from a single gathering in 1962 and *H. carpathicum* Besser, in Britain, from four gatherings between 1889 and 1956. Further herbarium material of *H. mirandum* has since been discovered, collected by A. Ley at Ribblehead in 1902 and by E. C. Wallace from Masson Hill, Bonsall in 1946. Bearing in mind the remarkable persistence of hawkweeds in restricted localities, we and Dr C. West in 1967 searched for both species without success, for *H. mirandum* around Masson Hill and for *H. carpathicum* up the Lochsie Burn from the Spittal of Glenshee. In 1968, however, we succeeded in finding both species. *H. mirandum* was growing in moderate quantity in the Ribblehead area, where it was in grave danger from grazing animals and most plants had the capitula nibbled off; *H. carpathicum* was on the bank of the Shee water a

few miles below the Spittal, where it appeared to be in no danger unless from acquisitive botanists. It was apparently absent between the Spittal and this new locality, but we did not explore further downstream. By contrast *H. magniceps* Sell & C. West, hitherto known only from a limited region near the Spittal, was frequent beside the river for some miles further downstream.

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