

A cytological study of the Compositae (excluding *Hieracium* and *Taraxacum*) of the British Isles

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ABSTRACT

Chromosome numbers based on indigenous material are reported for 79 of the 97 species native in the British Isles. Counts for *Cirsium dissectum* (L.) Hill ($2n = 34$) and *C. tuberosum* (L.) All. ($2n = 34$) appear not to have been reported before. Also, chromosome numbers in 53 of the taxa are reported for the first time in material from the British Isles. A spectrum of polyploidy is given. The incidence of polyploidy in the Compositae of the British Isles is calculated to be 44·6%. The occurrence of dwarf, genetically maintained ecotypes in *Aster tripolium* L., *Leucanthemum vulgare* Lam., *Serratula tinctoria* L. and *Solidago virgaurea* L. is noted. The results of transplant experiments with *Solidago virgaurea* are discussed.

INTRODUCTION

The Compositae of the British Isles comprise 97 native species if the genera *Hieracium* (incl. *Pilosella*) and *Taraxacum* are excluded. The exclusion of these genera in the compilation of any statistics for the family is unfortunately necessary, for a combination of sexual and apomictic reproduction in them has led to the origin of a very large number of more or less stable and self-perpetuating genotypes. Though these are often treated as microspecies they cannot be equated with conventional species, and if included would radically distort any statistics. Other genera in the Compositae besides *Hieracium* and *Taraxacum* have developed forms of apomixis, but in the British Isles none of these have produced the wealth of variation and the great taxonomic complexity found in these two genera. An account of *Taraxacum* in the British Isles has recently been produced (Richards 1972) and includes full information on chromosome numbers. Chromosome numbers for some of the species of *Hieracium* in the British Isles have recently been published (Mills & Stace 1974, Morton 1974). Hybrids have been excluded from the present study. Currently available information on them is reviewed in Stace (1975).

The present study was undertaken as part of a survey of the incidence of polyploidy in this and other families. Publication has been delayed for many years in the hope that a more complete list could be produced. However, it now appears preferable to publish the available data without further delay. Chromosome numbers based on material of known origin are reported for 79 of the 97 native species, together with several alien species and a number of infraspecific taxa. Details of the plants studied, their chromosome numbers, ploidy level, and the location of voucher specimen are given in Table 1.

MATERIALS AND METHODS

Living material was collected in the field and brought into cultivation either by transplanting or by growing from seed. In most cases chromosomes were studied in root-tip preparations using a squash technique (Morton 1962). Root-tips were taken from well-grown plants to prevent anomalies arising from seedling root-tips or from misidentification of immature material.

TABLE 1. CHROMOSOME NUMBERS IN THE COMPOSITAE (EXCLUDING *HIERACIUM* AND *TARAXACUM*) OF THE BRITISH ISLES

Name (* = alien)	Collection No. ¹ or reference	Vouchers ²	Origin	2n	Base No.	Ploidy level (x)
<i>ACHILLEA millefolium</i> L.	Morton s.n.	JKM	Bowes, Barnard Castle, v.c. 65	54	9	6
<i>A. ptarmica</i> L.	4702	DHM, JKM	Westgate in Weardale, v.c. 66	18	9	2
* <i>ANAPHALIS margaritacea</i> (L.) Benth.	Maude (1940)		British, unlocalized	28	7	4
<i>ANTENNARIA dioica</i> (L.) Gaertn. var. <i>dioica</i>	4778	JKM	Cul Mor, v.c. 105	28	7	4
<i>A. dioica</i> var. <i>hyperborea</i> (D. Don) DC.	A. J. Richards (pers. comm. 1975)	OXF	Creag Mhor, v.c. 103	28		
<i>ANTHEMIS arvensis</i> L.	Kay (1971b)		Worm's Head, v.c. 41	18	9	2
	Kay (1971b)		Woodstock, v.c. 23	18		
	Kay (1971b)		Thetford, v.c. 28	18		
<i>A. cotula</i> L.	5085	DHM, JKM	A3054 W. of Newport, v.c. 10	18	9	2
	Kay (1971a)		Ardley, v.c. 23	18		
	Kay (1971a)		Perranuthno, v.c. 1	18		
	Kay (1971a)		Llanishen, v.c. 35	18		
	Kay (1971a)		Hilton, v.c. 40	18		
	Kay (1971a)		Motlinsford, v.c. 22	18		
<i>ARCTIUM lappa</i> L.	Morton s.n.	JKM	Durnford, Amesbury, v.c. 8	36	9	4
<i>A. minus</i> Bernh. subsp. <i>minus</i>	5083	JKM	A3054 W. of Newport, v.c. 10	36	9	4
	Morton s.n.	JKM	Barnham Common, v.c. 26	36		
<i>A. minus</i> subsp. <i>nemorosum</i> (Lej.) Syme	4719	JKM	Cirencester, v.c. 33	36	9	4
<i>A. minus</i> subsp. <i>pubens</i> (Bab.) J. Arènes						
<i>ARNOSERIS minima</i> (L.) Schweigg. & Koerte	Maude (1940)		British, unlocalized	18	9	2
	Stebbins 3345 (Stebbins et al. 1953)	UC	Potterne, v.c. 7	18		
<i>ARTEMISIA absinthium</i> L.	5006	JKM, WAT	Birtley, v.c. 66	18	9	2
<i>A. campestris</i> L.				—		
<i>A. maritima</i> L. var. <i>maritima</i>	Morton s.n.	No voucher	Greatham, Teesmouth, v.c. 66	54	9	6
<i>A. maritima</i> var. <i>subgallica</i> Rouy				—		
<i>A. norvegica</i> Fr. var. <i>scotica</i> Hultén	4776	DHM, JKM, S	Cul Mor, v.c. 105	18	9	2
<i>A. vulgaris</i> L.	4713	JKM	Kew, v.c. 17 (wild)	16	8	2
<i>ASTER linosyris</i> (L.) Bernh.	4866	JKM	Durl Head, Brixham, v.c. 3	18	9	2
	C. D. Pigott (pers. comm. 1975)		Durl Head, Brixham, v.c. 3	18		
	C. D. Pigott (pers. comm. 1975)		Humphrey Head, Cartmel, v.c. 69	18		
<i>A. tripolium</i> L.	A. S. Gray (pers. comm. 1975)		12 localities in v.c. 28, 52, 54, 58, 60 and 111	18		2

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<i>A. tripolium</i> var. <i>arcticum</i> Fries	Morton s.n.	No voucher	Lochmaddy, N. Uist, v.c. 110	18
<i>A. tripolium</i> var. <i>discoideus</i> Reichenb. f.	Morton s.n.	No voucher	Waterford, v.c. H6	18
<i>BELLIS perennis</i> L.	Maude (1939) ⁴		British, unlocalized	18
	C. J. Marchant (pers. comm. 1975)		Teesdale, v.c. 66 (5 localities)	18
	C. Brighton (in Stearn & Brighton (1969))		Kew, v.c. 17 (5 wild plants)	18
<i>BIDENS cernua</i> L.	4843	JKM	Wokingham, v.c. 22	24
<i>B. tripartita</i> L.	4844	DHM, JKM, WAT	Wokingham, v.c. 22	48
<i>CARDUUS acanthoides</i> L.			—	—
<i>C. crispus</i> L.	5018	DHM, JKM	Bollihope, Frosterley, v.c. 66	16
<i>C. nutans</i> L.	4734	JKM	Seaton Carew, v.c. 66	16
<i>C. tenuiflorus</i> Curt.	5102	CAN, JKM, WAT	Lydd, v.c. 15	54
<i>CARLINA vulgaris</i> L.	Morton s.n.	No voucher	Cirencester, v.c. 33	20
* <i>CENTAUREA aspera</i> L.	Maude (1939)		British, unlocalized	22
* <i>C. calcitrapa</i> L.				11
<i>C. cyanus</i> L.				2
* <i>C. jacea</i> L.	Roy (1937)			
<i>C. nigra</i> L.	S. M. Walters (in Elkington & Middlefell (1972))		Crowthorne, v.c. 22	44
	Elkington & Middlefell (1972)		Ardtornish, Morven, v.c. 97	22
	Elkington & Middlefell (1972)		Miller's Dale, v.c. 57	44
	Elkington & Middlefell (1972)		Totley Bents, v.c. 57	44
	Elkington & Middlefell (1972)		Stony Houghton, v.c. 57	44
	Elkington & Middlefell (1972)		North Anston, v.c. 63	44
<i>C. nigra</i> L. subsp. <i>nigra</i>	5097	DHM, JKM	Westgate in Weardale, v.c. 66	c 44
<i>C. nigra</i> L. subsp. <i>nigra</i> (eradiate plant)	Roy (1937)		Rendlestone, v.c. 3	11
	Roy (1937)			44
<i>C. nigra</i> L. subsp. <i>nigra</i> (radiate plant)	Roy (1937)		Harbury Cutting, v.c. 38	44
<i>C. nigra</i> subsp. <i>nemoralis</i> (Jord.) Gugl.	5086	JKM	Devizes, v.c. 8	44
	Roy (1937)		Apes Down, W. of Newport, v.c. 10	44
<i>C. nigra</i> subsp. <i>nemoralis</i> (Jord.) Gugl. (semi-radiate plant)	Roy (1937)		Burford, v.c. 23	11
<i>C. scabiosa</i> L.	4977	JKM	Amesbury, v.c. 8	44
	Clapham (1962)		British, unlocalized	20
	Böcher & Larsen (1955)		Mullaghmore, v.c. H28	14, 20
	Roy (1937)		Devizes, v.c. 8	20
	Roy (1937)		Erlestoke, v.c. 8	20
	Frost (1958)		12 populations from southern and central England	20
<i>CHAMAEMELUM nobile</i> (L.) All.	5076	JKM	Kynance Cove, v.c. 1	18
	4808	JKM	Cambridge, v.c. 29	18

TABLE 1—continued

Name (* = alien)	Collection No. ¹ or reference	Vouchers ²	Origin	2n	Base No.	Ploidy level (x)
* <i>CHRYSANTHEMUM segetum</i> L.	4745	JKM		18	9	2
<i>CICERBITA alpina</i> (L.) Wallr.				—		
<i>CICHORIUM intybus</i> L.				34	17	
<i>CIRSIUM acaule</i> Scop.	4718 Pigott (1968)	JKM	Cirencester, v.c. 33 England, unlocalized	34	17	
<i>C. arvense</i> (L.) Scop. var. <i>arvense</i>	Morton s.n.	JKM	Bishop Auckland, v.c. 66	34	17	2
* <i>C. arvense</i> var. <i>incanum</i> (Fisch.) Ledeb.	Morton s.n.	JKM	Hull, v.c. 61	34	17	
<i>C. dissectum</i> (L.) Hill	4086	JKM	Port Ellen, Islay, v.c. 102	34	17	2
<i>C. eriophorum</i> (L.) Scop. subsp. <i>britannicum</i> Petrik	4716	JKM	Cirencester, v.c. 33	34	17	2
<i>C. heterophyllum</i> (L.) Hill	4729	JKM	Westgate in Weardale, v.c. 66	34	17	2
<i>C. palustre</i> (L.) Scop.	4741	JKM	Westgate in Weardale, v.c. 66	34	17	2
<i>C. tuberosum</i> (L.) All.	5095	JKM	Avebury, v.c. 7	34	17	2
<i>C. vulgare</i> (Savi) Ten.	Morton s.n.	JKM	Bowes, Barnard Castle, v.c. 65	68	17	4
<i>CREPIS biennis</i> L.	4942 = 5015 Edmonds <i>et al.</i> (1974) Edmonds <i>et al.</i> (1974) Edmonds <i>et al.</i> (1974)	DHM, JKM	Staines, v.c. 21 Fen Ditton Lane, v.c. 29 Fen Ditton Lane, v.c. 29 Lord's Bridge, v.c. 29	40	10	4
<i>C. capillaris</i> (L.) Wallr. var. <i>capillaris</i>	Morton s.n. Edmonds <i>et al.</i> (1974) Edmonds <i>et al.</i> (1974) Edmonds <i>et al.</i> (1974) Edmonds <i>et al.</i> (1974) J. S. Parker (pers. comm. 1975) J. S. Parker (pers. comm. 1975)	JKM	Crowthorne, v.c. 22 Hauxton Mile Bridge, v.c. 29 Cambridge Airport, v.c. 29 Lakenheath Warren, v.c. 26 Harlton, v.c. 29 Loch Garten, v.c. 96 Cumnor, v.c. 22 W. of Inverness, v.c. 96	6	2	
<i>C. capillaris</i> var. <i>glandulosa</i> Druce	4775	JKM	High Force, Upper Teesdale, v.c. 66	12	4	
<i>C. foetida</i> L.			Westgate in Weardale, v.c. 66	12	4	
<i>C. mollis</i> (Jacq.) Aschers.	4820	JKM	Braunton Burrows, v.c. 4	8	2	
<i>C. paludosa</i> (L.) Moench	4731	DHM, JKM	Bishop Middleham, v.c. 66	8	2	
* <i>C. setosa</i> Haller f.	4985	JKM	Cambridge, v.c. 29			
* <i>C. vesicaria</i> subsp. <i>taraxacifolia</i> (Thuill.) Thell.	4732 Edmonds <i>et al.</i> (1974) Edmonds <i>et al.</i> (1974) Edmonds <i>et al.</i> (1974) P. E. Brandham (pers. comm. 1975) 64/1038	JKM K	Chesterton, v.c. 29 Hauxton Mile Bridge, v.c. 29 Kew, v.c. 17 (wild)			

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<i>ERIGERON acer</i> L.	J. S. Parker (pers. comm. 1975)		Ongar, v.c. 18	8
<i>E. borealis</i> (Vierh.) Simmons	T. G. Tutin (pers. comm. 1975)		Knighton, Leicester, v.c. 55	8
<i>EUPATORIUM cannabinum</i> L.	Rutland (1941)		British, unlocalized	18
<i>FILAGO lutescens</i> Jord.	Morton s.n.	No voucher	Ben Lawers, v.c. 88	18
<i>F. minima</i> (Sm.) Pers.	4800	JKM	Waldridge Fell, v.c. 66	10
<i>F. pyramidata</i> L.				
<i>F. vulgaris</i> Lam.	4967	DHM, JKM	Saunton to Croyde, v.c. 4	28
	4687	JKM	Bishop Middleham, v.c. 66	28
* <i>GALINSOGA ciliata</i> (Raf.) Blake	Haskell & Marks (1952)		Claygate, v.c. 17	32
* <i>G. parviflora</i> Cav.	Haskell & Marks (1952)		Bayfordbury, v.c. 20	16
<i>GNAPHALIUM luteoalbum</i> L.				
<i>G. norvegicum</i> Gunn.	Rutland (1941)	DHM, JKM	British, unlocalized	28
<i>G. supinum</i> L.	4766	JKM	Strath Rory, v.c. 106	7
<i>G. sylvaticum</i> L.				56
<i>G. uliginosum</i> L.				
<i>HYPOCHOERIS glabra</i> L.	4955	JKM	Braunton Burrows, v.c. 4	10
	J. S. Parker (pers. comm. 1975)		Barton Mills, v.c. 26	10
	J. S. Parker (pers. comm. 1975)		Thetford and Blakeney Point, v.c. 28	10
<i>H. maculata</i> L.	Morton s.n.	JKM	Lizard, v.c. 1	5
	J. S. Parker (pers. comm. 1975)		7 localities in England	10
<i>H. radicata</i> L.	4736	JKM	Seaton Carew, v.c. 66	4
	4862	JKM	Studland, Swanage, v.c. 9	8
<i>INULA conyza</i> DC.	J. S. Parker (pers. comm. 1975)	JKM	10 localities in Britain	8
<i>I. crithmoides</i> L.	4725		Wotton-under-Edge, v.c. 34	32
' <i>I. helenium</i> L.	Rutland (1941)		British, unlocalized	8
<i>I. salicina</i> L.	Rutland (1941)		British, unlocalized	20
<i>LACTUCA saligna</i> L.	Morton s.n.	No voucher	Lough Derg, v.c. H10	10
<i>L. serriola</i> L.	2599	JKM	Holborn, London, v.c. 21	16
	Edmonds <i>et al.</i> (1974)		Cherry Hinton, v.c. 29	8
<i>L. virosa</i> L.	2535	JKM	West Malling, v.c. 16	18
<i>LAPSANA communis</i> L.	Clapham (1962)		British, unlocalized	12
	4730	DHM, JKM	Westgate in Weardale, v.c. 66	14
<i>L. intermedia</i> M. Bieb.	Edmonds <i>et al.</i> (1974)		Cambridge, v.c. 29	14
<i>LEONTODON autumnalis</i> L.	Burtt (1950)		Totternhoe, v.c. 30	14
	Edmonds <i>et al.</i> (1974)		Grimes Graves, v.c. 28	12
	Elliot (1950)		British ³	12
	Finch (1967)		Many British localities	12

TABLE 1—*continued*

Name (* = alien)	Collection No. ¹ or reference	Vouchers ²	Origin	2n	Base No.	Ploidy level (x)
<i>LEONTODON autumnalis</i> var. <i>pratensis</i> (Link) Koch	4743	JKM	Glen Doll, Clova, v.c. 90	12		
	5060, 5061	JKM	Lochnagar, v.c. 92	12		
<i>L. hispidus</i> L.	Elliot (1950)	JKM	British ³	14		
	Edmonds <i>et al.</i> (1974)		Grimes Graves, v.c. 28	14		
	Finch (1967)		Many localities in England	14		
	Finch (pers. comm. 1975)		White Horse Hill, v.c. 22	21	7	
<i>L. taraxacoides</i> (Vill.) Mérat	Elliot (1950)	JKM	British ³	8	4	
	4818	JKM	Tytherington, v.c. 34	8		
	Edmonds <i>et al.</i> (1974)		Lakenheath Warren, v.c. 26	8		
	Finch (1967)		Many localities in England and Wales	8		
	Finch (pers. comm. 1975)		Fairlight Quarry and Telham, v.c. 14	12	4	
<i>LEUCANTHEMUM vulgare</i> Lam. (dwarf ecotype)	Morton s.n.	JKM	Kynance Cove, v.c. 1	18	9	
<i>L. vulgare</i> Lam.	Böcher & Larsen (1957)		Scraw Bog, v.c. H21 or 22	18		
	Böcher & Larsen (1957)		Edenderry, v.c. H18	18		
	A. J. C. Malloch (pers. comm. 1975)	CGE	3 localities in v.c. 20 and 29	18		
	Pearson (1967)		18 localities in v.c. 1, 2, 45, 48, 49, 51, 64 and 66	18		
	A. J. C. Malloch (pers. comm. 1975)	CGE	7 localities in v.c. 29, 63, 76 and 98	36	9	
	Morton s.n.	DHM, JKM	Hazeley Heath, v.c. 12	36		
	Pearson (1967)		29 widely spread localities in British Isles	36		
* <i>MATRICARIA matricarioides</i> (Less.) Porter	Rutland (1941)		British, unlocalized	18	9	
<i>M. recutita</i> L.	5016	DHM, JKM	Englefield Green, v.c. 17	18	9	
	Maude (1940)		British, unlocalized	18		
<i>MYCELIS muralis</i> (L.) Dum.	4794	JKM	Marlow, v.c. 24	18	9	
	Edmonds <i>et al.</i> (1974)		Cambridge, v.c. 29	18		
	Edmonds <i>et al.</i> (1974)		Princes Risborough, v.c. 24	18		
	J. S. Parker (pers. comm. 1975)		Barnard Castle, v.c. 66	18		
* <i>ONOPORDUM acanthium</i> L.	4970	JKM	Saunton to Croyde, v.c. 4	34	17	

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<i>OTANTHUS maritimus</i> (L.) Hoffmans. & Link	Rutland (1941)		British, unlocalized	18
* <i>PETASITES fragrans</i> (Vill.) C. Presl	Maude (1940)		British, unlocalized	52
* <i>P. fragrans</i> (Vill.) C. Presl (♂)	Sørensen & Christiansen (1964)		Wales	26
<i>P. hybridus</i> (L.) Gaertn., Mey. & Scherb. (♂)	4740	JKM	Westgate in Werdale, v.c. 66	c 60
<i>PICRIS echiooides</i> L.	Clapham (1962)	DHM, JKM	British, unlocalized	30
	Morton s.n.		Steyning, v.c. 13	c 60
	Edmonds <i>et al.</i> (1974)		Harlton Wheatsheaf to Lord's Bridge, v.c. 29	30
	J. S. Parker (pers. comm. 1975)		Brentwood and Tollesbury, v.c. 19	10
<i>P. hieracioides</i> L.	4722	JKM	Wotton-under-Edge, v.c. 34	10
<i>PULICARIA dysenterica</i> (L.) Bernh.	J. S. Parker (pers. comm. 1975)		Ongar, v.c. 18	5
<i>P. vulgaris</i> Gaertn.	Morton s.n.	JKM	Seaton Carew, v.c. 66	10
<i>SAUSSUREA alpina</i> (L.) DC.	5080	JKM	Brockenhurst, v.c. 11	18
<i>SCORZONERA humilis</i> L.	4754	JKM	Clova, v.c. 90	9
<i>SENECIO aquaticus</i> Hill	4863	JKM	Stoborough, v.c. 9	2
<i>S. camrensis</i> Rosser	4801	JKM	Chester-le-Street, v.c. 66	6
<i>S. erucifolius</i> L.	Rosser (1955)	JKM	Frith, v.c. 51	7
	4720	JKM	Ingleston Common, Hawkesbury, v.c. 34	10
<i>S. integrifolius</i> (L.) Clairv.	Rutland (1941)		British, unlocalized	40
<i>S. jacobaea</i> L.	Morton s.n.	JKM	Bowes, Barnard Castle, v.c. 65	12
	Böcher & Larsen (1955)		Kincasslegh, v.c. H35	4
	Böcher & Larsen (1955)		Lady's Island Lake, v.c. H12	40
	Böcher & Larsen (1955)		Skull Harbour, v.c. H3	10
	Böcher & Larsen (1955)		Ben of Fore, Westmeath, v.c. H23	4
<i>S. paludosus</i> L.				
<i>S. palustris</i> (L.) Hook.				
* <i>S. squalidus</i> L.	Clapham (1962)		British, unlocalized	20
	4711	JKM	Kew, v.c. 17 (wild)	10
<i>S. sylvaticus</i> L.	4899	JKM	Harbledown, Canterbury, v.c. 15	20
<i>S. viscosus</i> L.	5013	DHM, JKM	Edinburgh, v.c. 83	10
<i>S. vulgaris</i> L.	Clapham (1962)		British, unlocalized	40
<i>S. vulgaris</i> L. (radiate & eradiate plants)	4827	DHM, JKM	Pirbright, v.c. 17	10
<i>SERRATULA tinctoria</i> L.	3919	JKM	Winch Bridge, v.c. 66	22
	Maude (1940)		British, unlocalized	11
<i>S. tinctoria</i> L. (dwarf maritime ecotype)	Morton s.n.	JKM	Marsden, v.c. 66	22

TABLE 1—continued

Name (* = alien)	Collection No. ¹ or reference	Vouchers ²	Origin	2n	Base No.	Ploidy level (x)
<i>SOLIDAGO virgaurea</i> L.	p801	JKM	Tetbury, v.c. 34	18	9	2
<i>S. virgaurea</i> L. (dwarf maritime ecotype)	2241	JKM	Kynance Cove, v.c. 1	18		
<i>S. virgaurea</i> L.	3940	JKM	Strath Fillan, Tyndrum, v.c. 88	18		
	4267	JKM	Black Head, v.c. H9	18		
	4426	DHM, JKM	Exeter, v.c. 3	18		
	4448	DHM, JKM	The Sneap, Muggleswick, v.c. 67	18		
	4540	JKM	Falcon Clints, Upper Teesdale, v.c. 66	c 18		
	4550	JKM	Avon Gorge, Bristol, v.c. 34	18		
	4563	DHM, JKM	Cheddar Gorge, v.c. 6	18		
	4564	JKM	Cheddar Gorge, v.c. 6	18		
	4595	DHM, JKM	Penzance, v.c. 1	18		
<i>S. virgaurea</i> L. var. <i>cambrica</i> (Huds.) Sm.	3945	JKM	Ben Nevis, v.c. 97	18		
	4248	JKM	Malin Head, v.c. H34	18		
	4535 to 4539	JKM	Winch Bridge, v.c. 66	18		
	4656	JKM	Beinn na Caillich, Islay, v.c. 102	18		
<i>S. virgaurea</i> L. intermediate between vars. <i>virgaurea</i> & <i>cambrica</i>	3144	JKM	The Castle, Rhum, v.c. 104	18		
	3228	JKM	Toe Head, S. Harris, v.c. 110	18		
<i>SONCHUS arvensis</i> L.	4819	JKM	Doncaster, v.c. 63	54		5
	Edmonds <i>et al.</i> (1974)		Shingay, v.c. 29	54		
	Curran (1968, 1969)		Rathcoole, v.c. H20	54		
<i>S. asper</i> (L.) Hill	K. Jones (pers. comm. 1975)		Hythe, v.c. 11	54		
	Edmonds <i>et al.</i> (1974)		Ely, v.c. 29	18		2
	Edmonds <i>et al.</i> (1974)		Shingay, v.c. 29	18		
	Curran (1968, 1969)		Celbridge, v.c. H19	18		
	Rutland (1941)		British, unlocalized	18		
	Barber (1941)		Merton, Wimbledon, v.c. 17	18		
	K. Jones (pers. comm. 1975)		Cheam, v.c. 17	c 18		
	K. Jones (pers. comm. 1975)		Kew, v.c. 17 (wild)	18		
<i>S. oleraceus</i> L.	Rutland (1941)		British, unlocalized	32		4
	Edmonds <i>et al.</i> (1974)		Cambridge, v.c. 29	32		
	Edmonds <i>et al.</i> (1974)		Lord's Bridge, v.c. 29	32		
	Curran (1968, 1969)		Calbridge, v.c. H19	32		
	Barber (1941)		Merton, Wimbledon, v.c. 17	32		

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<i>S. palustris</i> L.	5099			Rochester, v.c. 15	18	9
' <i>TANACETUM parthenium</i> (L.) Schultz Bip.	4739	JKM, WAT DHM, JKM		Westgate in Weardale, v.c. 66	18	9
' <i>T. vulgare</i> L.	Rutland (1941)			British, unlocalized	18	9
<i>TRAGOPOGON porrifolius</i> L.	Edmonds <i>et al.</i> (1974)			Diggings, v.c. 29	12	6
<i>T. pratensis</i> L. subsp. <i>pratensis</i>						
<i>T. pratensis</i> subsp. <i>minor</i> (Mill.) Wahlenb.	4738	JKM		Seaton Carew, v.c. 66	12	6
	Edmonds <i>et al.</i> (1974)			Grimes Graves, v.c. 28	12	
	Barling (1955)			Cirencester and area, v.c. 33 and 34 (<i>c</i> 200 plants)	12	
	Morton s.n.	JKM		Mickleham, Dorking, v.c. 17	12	
<i>TRIPLEUROSPERMUM maritimum</i> (L.) Koch subsp. <i>maritimum</i> var. <i>maritimum</i>	5069	J.S. Parker (pers. comm. 1975)	DHM, JKM	Docking, v.c. 28	12	
				Land's End, v.c. 1	18	9
<i>T. maritimum</i> subsp. <i>maritimum</i> var. <i>phaeocephalum</i> (Rupr.) Hyl.	Kay (1972)			Many British localities	18 (0-2B)	
<i>T. maritimum</i> subsp. <i>inodorum</i> (L.) Hyl. ex Vaarama var. <i>inodorum</i>	4809, 4810	JKM		Doncaster, v.c. 63	18	9
	Kay (1969, 1972)			Many British localities	18	
	Kay (1969)			Ardley, v.c. 23	36	9
					—	4
<i>T. maritimum</i> subsp. <i>inodorum</i> var. <i>salinum</i> (Wallr.) Clapham						
<i>TUSSILAGO farfara</i> L.	Morton s.n.	No voucher		Birtley, v.c. 66	c 60	30
					2	

¹ Collection numbers refer to those of J. K. Morton unless otherwise stated.

² Abbreviations for herbaria are as given in Holmgren & Keuken (1974), except WAT, which refers to herb. University of Waterloo, Ontario, Canada; and JKM, to herb. J. K. Morton.

³ Elliot (1950) gives no locality, but her material came from the south-eastern part of v.c. 67—Newcastle upon Tyne, Tynemouth and Seaton Sluice.

⁴ The count is attributed to Dr K. B. Blackburn but the reference is incorrect. Tischler (1935, 1937, 1950) also cited Blackburn, but did not include the reference. I have been unable to trace a relevant publication of Blackburn.

DISCUSSION

CHROMOSOME NUMBERS AND TAXONOMY

Most of the chromosome numbers reported in this account confirm those already reported for the same species in other parts of their range. The only species whose chromosome numbers were previously unreported are *Cirsium dissectum* and *C. tuberosum*. Those of several varieties also appear to be new, viz. *Antennaria dioica* var. *hyperborea*, *Aster tripolium* var. *arcticum*, *Cirsium arvense* var. *incanum*, *Crepis capillaris* var. *glandulosa*, *Leontodon autumnalis* var. *pratensis* and *Solidago virgaurea* var. *cambrica*. In addition, chromosome numbers for 53 of the taxa are here reported for the first time from material from the British Isles. Most of these counts call for no comment, but the following are worthy of note:

Aster tripolium var. *arcticum* Fries. This is a dwarf northern variant not recognized in most British Floras. It occurs in salt-marshes on several of the Hebridean islands (Heslop-Harrison *et al.* 1946, 1951). It grows from 5 to 15 cm high and bears only a few capitula, which are of full size. Material transplanted from North Uist to a garden in northern England grew well for several years and retained its dwarf habit.

Leucanthemum vulgare Lam. The material from Kynance Cove was of a dwarf maritime ecotype about 10–15 cm high growing in the short turf near the top of the wind-swept cliffs. It retained its dwarf habit in cultivation.

Senecio vulgaris L. Seed from radiate plants found on a cindery roadside near Pirbright produced plants both with and without conspicuous ray florets. All had $2n = 40$. The radiate plant is referable to var. *hibernicus* Syme on the basis of Allen's (1967) account of variation in this species. However, Crisp & Jones (1970) and others have suggested that var. *hibernicus* may represent stages of introgression between *S. vulgaris* and *S. squalidus*.

Serratula tinctoria L. The small population growing on the steep, grassy slopes atop the magnesian limestone cliffs at Marsden consists of a distinctive maritime ecotype of shorter, more stocky habit with larger capitula in compact inflorescences. In cultivation it made an attractive rock-garden plant and retained its characters, though after several years it increased in stature from about 30 cm to nearer 40 cm.

Solidago virgaurea L. This is a very variable species found in a wide range of habitats. Over a period of many years I kept plants showing much of this variation under observation in cultivation in a garden in northern England. These observations demonstrated that material of this species from the British Isles behaves in a very similar manner to Continental material studied many years ago by Turesson (1925, 1930) and more recently by Björkman and co-workers (Björkman 1966, 1968; Holmgren 1968; Björkman *et al.* 1960). All this work indicates that in this species there is a wide range of genetically fixed variants, each closely adapted in physiology, phenology and morphology to particular habitats. Two major variational trends are recognizable; one of dwarf plants from open exposed habitats in the mountains, and the other of taller plants of woodland and heaths at lower elevations. The two differ in many ways though they are not wholly discrete and various intermediates are encountered. The differences are sufficient to warrant taxonomic recognition and, in view of the nature of this variation, subspecific status is appropriate. British botanists have for many years referred to the dwarf variant as var. *cambrica* (Huds.) Sm., but it is doubtful whether our material is different from that occurring on the Continent, where Wagenitz (1964) referred to it as subsp. *minuta* (L.) Arcangeli. However, Turesson (1925), in a discussion of the systematics of this variation, suggested that the Scandinavian material may not be the same as *S. minuta* L. from the Alps, but be referable to var. *alpestris* (Waldst. & Kit. ex Willd.) DC., which Hegi included in subsp. *minuta*. Pending a resolution of these nomenclatural and taxonomic problems it is probably better that we continue to refer to our material as var. *cambrica*, whilst recognizing that it may not be endemic to the British Isles.

Var. *cambrica* occurs in most of the mountainous areas of the British Isles—in Wales, the Pennines, the Lake District, mainland Scotland, the Hebrides and Ireland, where it also comes down to low altitudes on sea-cliffs. All the material that I grew retained its characters in cultivation. In cultivation var. *cambrica* flowers from mid June to the end of July, about 6 weeks earlier than the lowland variety—a difference which is also noticeable in the wild. Var. *cambrica* is characterized by its short, stocky habit, from 5 to 20 cm in height; its larger capitula, which range from 8 to 10 mm long in dried material; its compact, few-flowered inflorescences, in which the capitula are

borne more or less singly in a compact racemose arrangement on the main axis; its rounded, obtuse and spathulate basal leaves; and its bracts of the main axis, which are large and leaf-like. Usually the phyllaries are very narrowly lanceolate and sharply acute.

Var. *virgaurea*, though very variable, is characteristically a lowland species of open woodland, heaths and hedgebanks. In cultivation it flowered in August and September, with material from south-western England being several weeks later than the other material. It is characterized by its taller, less sturdy stature, from 60 to over 150 cm in height; its smaller capitula, 5 to 8 mm long, arranged in slender panicles or clustered in axillary branches along the tall, slender inflorescence; its acute, oblanceolate, petiolate basal leaves; and its small, narrow bracts or reduced leaves in the upper three-quarters of the stem. The phyllaries tend to be oblanceolate and more or less blunt in many, but not all, populations. Capitulum size tends to increase from south-western to northern districts. In the valleys of northern England and Scotland, populations combining the characters of the type variety and var. *cambrica* are sometimes encountered. That on the upper reaches of the River Tees is particularly well developed and extensive. A stunted ecotype occurs on the grassy slopes atop the sea-cliffs at Kynance Cove. Though compact, its other characters are those of the lowland variant. It retained its characters in cultivation though it increased in height from about 20 cm to 30 cm.

POLYPLOIDY

The spectrum of polyploidy for the Compositae native to the British Isles is as follows:

	Numbers of species
Primary diploids	50
Triploids	2
Tetraploids	22
Hexaploids	6
Octoploids	1
Secondary base numbers	10
% polyploidy	44·6

Only species and subspecies have been used in compiling these data, except where variants of a lower level have a different ploidy level. Three native genera (*Cirsium*, *Petasites* and *Tussilago*) have high base numbers which are almost certainly of secondary origin due to allopolyploidy, and these have been regarded as polyploids.

The incidence of polyploidy in the Compositae (44·6%) can be compared with that in other families for which fairly complete data from the British Isles are available—41·2% in the Caryophyllaceae (Blackburn & Morton 1957) and 69·8% in the Labiateae (Morton 1973). There appears to be no particularly convincing reason for the lower incidence of polyploidy in the Caryophyllaceae and Compositae than in the Labiateae, though the reason may in part be associated with the predominance of vigorous, vegetatively reproducing rhizomes in the Labiateae, a mode of reproduction occurring much less frequently in the other two families.

ACKNOWLEDGMENTS

I am very much indebted to Mr D. M. Cranston for information on previously published and unpublished chromosome counts; to the several workers who have permitted me to use their unpublished data (their names appear in Table 1); to Dr P. L. Pearson for permission to quote from his thesis; to Professor D. A. Webb, who many years ago supplied me with living material of *Inula salicina*; and to Miss J. M. Venn, who has assisted in preparing the data for publication. Completion of this work was facilitated by a fellowship from the Nuffield Foundation and an operating grant from the National Research Council of Canada.

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(Accepted April 1976)