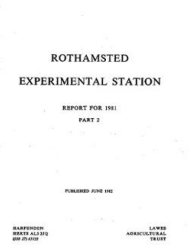
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Results from the Woburn Reference Experiment. III. Yields of the crops and recoveries of N, P, K and Mg from manures and soil, 1975–79

F. V. WIDDOWSON, A. PENNY and M. V. HEWITT

Abstract

The experiment, begun in 1960 on sandy-silty loam at Woburn, tested N, P, K and Mg fertilisers alone and with FYM on five arable crops and a long ley. Results from the fourth 5-year cycle (1975–79) and yield and crop uptake over 20 years are summarised. N increased yields greatly, P little and K more than N for sugar beet, potatoes and the clover-grass ley. Yields were largest where both FYM and NPK fertilisers were given. Nutrient balance sheets from 1975–79 showed that removals (kg ha^{-1}) ranged from 171 to 698 of N, 29 to 105 of P and 131 to 1101 of K. The soil supplied (kg ha^{-1}) 39 of N, 10·4 of P and 29 of K per annum in the final 5 years.

Introduction

The experiment was begun in 1960 on the sandy-silty loam (overlying Lower Greensand) of Stackyard Field at Woburn, Beds and continued with no change to the rotation and little change to the manuring until 1979. Its objective was to measure the effects of N, P and K fertilisers and of farmyard manure (FYM) applied alone and together on yields, crop nutrient uptakes and nutrient balances in the soil. Five arable crops (spring barley, clover-grass ley, potatoes, winter oats and sugar beet) were grown each year and in that sequence, so that during each 5-year cycle of the experiment each crop was grown once in each block. There were also blocks of long ley and soft fruit, The results obtained from 1960 to 1969 (Widdowson & Penny, 1967, 1972; Widdowson, Penny & Williams, 1967; Williams, 1973) and from 1970 to 1974 (Widdowson & Penny, 1979) have already been published and should be read in conjunction with the data given here, which are from the fourth and final 5-year cycle of the experiment. The test of magnesium fertiliser on sugar beet and potatoes, begun in 1967 following the confirmation of Mg deficiency in foliage, was continued.

This paper presents the data briefly and is intended to be used in conjunction with our previous results. However, it includes a crop nutrient balance sheet constructed from the data obtained during the entire 20-year life of the experiment.

Design and measurements

The five arable crops, the long ley and the soft fruit each received all combinations of two amounts (0 *v.* 1) of N, P and K fertilisers in the standard eight-plot factorial combination, and also a double amount of N (N2) with P and K. Farmyard manure (FYM) was also tested alone (Code D), and together with fertilisers supplying either the single or double amount of N (DN1PK and DN2PK). However, the FYM was applied only for potatoes and sugar beet and not for the other three arable crops, which therefore measured its residues; it was applied annually for the long ley and the soft fruit. The arrangement

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of the twelve treatments in each block was restricted by using six rows of a 12 × 12 Latin Square. Individual plots were small (5·8 m²).

Each year the yields of each crop were measured and samples taken to measure dry matter and N, P and K contents. These values then were used to calculate dry matter yields and the amounts of N, P, K and Mg that the crops removed. These, together with the amounts of N, P, K and Mg added in fertilisers and in FYM were used to construct nutrient balance sheets over each 5-year cycle of the experiment. The amount of each nutrient that each crop removed was used to calculate the apparent efficiency of uptake of the N, P and K in the fertilisers and in the FYM. These uptakes also allowed us to measure the quantities of N, P and K supplied by this soil and to determine whether these changed with time. Additionally, the penultimate leaflets were removed from 20 stems on each half-plot of potatoes in July, to measure Mg concentrations, which also were measured in potato tubers and in sugar-beet tops at harvest.

Experimental method

Appropriate blocks of the arable rotation were dug in autumn after applying FYM for potatoes and sugar beet; it was applied to the long ley and to the fruit in spring. P and K were broadcast during winter and N and Mg in spring. The crop varieties chosen were: barley, Julia (ethirimol dressed); rotation ley, RVP Italian ryegrass and Hungaropoly red clover; potatoes, Pentland Crown; oats, Peniarth; sugar beet, Klein E. The long ley was a composite mixture of grasses and clovers; the strawberries, Cambridge Vigour; blackcurrants, Wellington XXX and gooseberries, Careless.

Manuring. 63 kg P_2O_5 ha^{-1} (27·4 kg P) as triple superphosphate and 251 kg K_2O ha^{-1} (208·5 kg K) as potassium bicarbonate were applied to appropriate plots of each crop in each year. Amounts of N (as ammonium nitrate) differed with crop and were (in kg ha^{-1});

	Spring barley	Rotation ley	Potatoes	Winter oats	Sugar beet	Long ley	Soft fruit
N1	63	31	126	63	126	188	63
N2	126	63	251	126	251	376	126

The N was applied in one dressing for the rotation ley, but was divided into two equal dressings for barley, potatoes, oats and sugar beet and into three for the long ley. Epsom salts ($MgSO_4.7H_2O$) were broadcast (50 kg Mg ha^{-1}) over one half of each sugar-beet and potato plot in spring and to the other half after the crops had been harvested. Thus 100 kg Mg ha^{-1} were applied in each 5-year cycle to every plot in the arable rotation; the same quantity was also given to the long ley and fruit. Basal calcium carbonate was broadcast in autumn 1974 to maintain soil pH at or near 7·0 and basal boron (5 kg ha^{-1}) was sprayed over sugar beet each spring after singling.

Chemical analyses of the crops

Nitrogen was determined after Kjeldahl digestion using $CuSO_4$ and K_2SO_4 as catalysts by Technicon AutoAnalyser, using Varley's (1966) method modified by adding citrate-tartrate buffer.

Phosphorus was measured by AutoAnalysis using the method of Fogg and Wilkinson (1958) after ashing and dissolving in 0·06 N-HCl.

Potassium was measured by Unicam SP.90A after dry ashing and solution in 0·06 N-HCl.

Magnesium was measured by atomic absorption, with strontium as releasing agent using a Unicam SP.90A flame spectrophotometer, after dry ashing and solution in 0·06 N-HCl.

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Yields

Effects of N, P and K fertilisers and FYM. To allow direct comparisons between the abilities of the different crops to obtain nutrients from this soil, and between their relative responsiveness to added nutrients, most yields are presented as dry matter. However, to be able to judge the yields in conventional terms, Appendix Table 1 shows fresh yields of potato tubers and sugar beet roots and tops, the yield of sugar from the sugar beet and the yields of oats and barley grain at 15% moisture content. Though maximum yields were never large, they were largest where both FYM and fertilisers were given. The increases in yield from giving FYM were especially large for potatoes and sugar beet. Appendix Table 2 compares yields of the different crops as dry matter. The FYM and NPK fertilisers together increased yields of potatoes, sugar beet and the rotation ley four-fold and those of oats and barley grain three-fold, though straw yields were increased by more. The largest total dry matter yield (15·21 t ha^{-1}) was obtained from sugar-beet tops plus roots; winter oats grain plus straw (11·38 t ha^{-1}) outyielded spring barley (9·53 t ha^{-1}) and all three crops out-yielded the potatoes (tubers only), the rotation ley and the long ley.

Main effects and interactions of N, P and K fertilisers. The data in Table 1 were obtained in the conventional way by subtracting yields from four of the eight factorial treatments

TABLE 1

Main effects and interactions of N, P and K fertilisers on five arable crops, 1975–79

	Dry matter (t ha^{-1})								Coefficient of variation
	N	P	K	NP	NK	PK	NPK	s.e.	(%)
Oats									
grain	1·45**	0·22	0·01	0·18	0·06	0·04	0·02	±0·150	21·9
straw	1·97**	0·39	0·59*	0·26	0·38	0·20	0·10	±0·180	20·3
Barley									
grain	1·16**	0·03	0·71**	−0·01	0·55**	0·30	0·28	±0·122	19·2
straw	1·53**	0·04	0·57**	0·04	0·46**	0·12	0·16	±0·089	13·7
Potato									
tubers	0·97	0·49	2·79**	0·18	0·82	0·44	0·16	±0·439	44·2
Sugar-beet									
roots	1·69**	−0·36	1·81**	−0·30	1·06*	0·16	0·32	±0·344	28·3
tops	1·55**	−0·15	0·31	−0·09	0·30	0·12	0·23	±0·156	18·5
Rotation									
ley	1·29*	0·53	2·75**	0·08	0·00	0·46	0·22	±0·379	24·7

*, ** Significant at probability level of 1 and 0·1% respectively

(2^3) from the other four. There were highly significant main effects from N on oats, barley and sugar beet, but not on potatoes, which followed the grass-clover rotation ley. The main effects of P were always small and never significant, whilst those of K were large for some part of each crop and especially so for potato tubers and sugar-beet roots. The main effect of K was larger than that of N on the two root crops. The NP interaction was always small and sometimes negative, whereas the NK interaction was mostly positive and significant for barley and for the sugar beet roots. Whilst the PK and the NPK interactions were always positive they never reached significance, though they were sometimes of the same order of magnitude as their standard error.

Responses to N, P and K. Table 2 shows yields of the crops during the period 1975 to 1979 from soil completely unmanured since 1960, and the increases in yield given by N,

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TABLE 2

Responses to N, P and K fertilisers (means for 1975–79)

	Yields without fertiliser or FYM	Increases in the yield of dry matter (t ha^{-1}) from N1 (N1PK−PK)	N2−N1 (N2PK−N1PK)	N2-N1 (in presence of D) (DN2PK−DN1PK)	P (N1PK−N1K)	K (N1PK−N1P)
Barley						
grain	1·34	1·98	0·74	0·45	0·60	1·84
straw	1·20	2·18	1·15	0·97	0·36	1·31
Oats						
grain	1·46	1·70	0·65	1·11	0·45	0·13
straw	1·70	2·71	1·15	1·95	0·95	1·28
Potato						
tubers	1·66	2·14	0·95	0·97	1·29	4·20
Sugar-beet						
tops	1·67	2·06	1·11	1·17	0·18	0·96
roots	2·40	3·46	0·76	1·06	0·29	3·47
Rotation						
ley	2·74	1·58	0·21	0·92	1·28	3·42
Long ley	3·57	2·09	1·14	1·38	0·28	1·01

D = FYM was applied at 50 t ha^{-1} for sugar beet and potatoes and at 25 t ha^{-1} for long ley

by P and by K fertilisers on plots given the other two nutrients. Yields of all the crops were increased by the first increment of fertiliser N, but less by the second, which enhanced straw yields more than grain and the yield of sugar-beet tops more than roots. Where FYM also was given the second increment of N still increased yields even though yields then were larger, and it increased yields both of the rotation ley and of the long ley more than where fertilisers were given alone. Presumably this enhanced response to N in the presence of FYM was due to the large amount of additional K that the FYM added (Table 6). By comparison fertiliser P increased yields little, though all the crops responded to it, the largest responses being with oats, potatoes and the rotation ley. Shortage of K limited yields far more than shortage of P and responses to K were as large as or larger than those to N. Potassium was particularly important for potatoes, sugar-beet roots and the rotation ley; for potatoes the K reponse (4·20 t ha^{-1}) was roughly double that for N (2·14 t ha^{-1}).

Responses to farmyard manure. Table 3 shows that without fertilisers, FYM greatly increased the yield of every crop, especially in the year of application, though it very greatly increased yields of the grass-clover rotation ley two years afterwards. The increases in yield from FYM were greatly diminished when NPK fertilisers were also given, but doubling the amount of fertiliser N sometimes enhanced the benefit from the FYM. This happened with both root crops and with the long ley and oats, and may be explained by an interaction between the extra N given as fertiliser and the potassium supplied by the FYM. This implies that 251 kg K_2O ha^{-1} added in fertiliser may have been too little for both sugar beet and potatoes, because the largest yields were obtained where FYM was dug down in autumn and NPK fertilisers were given in spring (Appendix Table 1).

Responses to Mg by potatoes and sugar beet. Appendix Table 3 shows the effects of giving Mg fertiliser to half of each sugar-beet and potato plot. Magnesium increased potato yields most where K, or N and K was given; doubling N diminished its effect. As Mg had been applied after harvesting each root crop to half-plots not given Mg in spring, each year from 1967 onwards, it is surprising that the response to Mg was so large on the

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TABLE 3

The mean increases in yield (t ha^{-1} of dry matter) from FYM (D) tested with and without NPK fertilisers from 1975–79

	Without NPK fertiliser (D−0)	With NPK fertiliser: N at single rate (DN1PK−N1PK)	With NPK fertiliser: N at double rate (DN2PKN−2PK)
Direct effects			
Potato tubers	4·52	1·52	1·54
Sugar-beet			
tops	1·47	0·77	0·83
roots	3·94	2·18	2·48
Long ley	1·96	0·75	0·99
Residual effects (1 year later)			
Barley			
grain	0·87	0·45	0·16
straw	0·84	0·64	0·46
Oats			
grain	0·76	−0·07	0·39
straw	1·19	0·49	1·29
Residual effects (2 years later)			
Rotation ley	3·90	0·60	−1·31

plots given fertiliser. However, the potatoes also responded to Mg on the plots given FYM, which supplied about 40 kg Mg ha^{-1} twice in 5 years (Table 6). Thus these plots received a total of 180 kg Mg ha^{-1}, in each 5-year cycle of the experiment. Yields of sugar-beet roots, though not tops, were also appreciably increased by magnesium fertiliser, with a maximum response of 2·34 t ha^{-1} where N2PK fertilisers were given. FYM diminished the response to magnesium by the sugar-beet roots. Table 4 shows

TABLE 4

Mean effects of Mg fertiliser on the yields of potatoes and sugar beet 1975–79 in the presence and absence of N, P and K fertilisers

Fertiliser tested: N1		P		K	
Without	With	Without	With	Without	With
Mean effects of Mg					
Potatoes, total tubers (t ha^{-1}) fresh weight					
0·31	1·06	0·64	0·73	−0·06	1·43
Sugar-beet roots (t ha^{-1}) fresh weight					
0·04	0·48	0·43	0·06	−0·32	0·82
Sugar-beet tops (t ha^{-1}) fresh weight					
0·10	−0·02	−0·31	0·39	−0·17	0·25

how N, P and K fertilisers affected the mean response to magnesium on the eight plots testing them in factorial combination (2^3). For potatoes, both N and K greatly enhanced the response to magnesium, whilst P little affected it. This relationship applied also to sugar-beet roots, but the effect of P on Mg response was inconsistent.

Amounts of N, P, K and Mg applied 1975–79

By fertilisers. The amounts of N, P, K and Mg applied each year have been given previously.

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By FYM. Table 5 shows the percentage of dry matter and of N, P, K and Mg in each batch of FYM (always made by cattle in yards at Rothamsted) and Table 6 the amounts

TABLE 5

Chemical analyses of FYM, 1975–79

Cropping year	Dry matter %	% in dry matter of N	P	K	Mg
1975	22·62	3·51	0·530	3·76	0·310
1976	20·63	3·16	0·429	3·76	0·340
1977	24·50	3·18	0·586	5·00	0·371
1978	25·88	2·88	0·487	4·24	0·336
1979	22·01	2·75	0·467	5·14	0·324
Mean	23·13	3·10	0·500	4·38	0·336

TABLE 6

Annual amounts (kg ha^{-1}) of N, P, K and Mg supplied by 50 t ha^{-1} of FYM 1975–79

Cropping year	N	P	K	Mg
1975	399	60	427	35
1976	327	44	389	35
1977	392	72	615	46
1978	374	63	550	44
1979	304	52	568	36
Mean	359	58	510	39

added by the standard 50 t ha^{-1} dressing. Both the dry matter and the nutrient content varied from year to year, but on average the two dressings of FYM in 5 years supplied amounts of P and K (116 kg P and 1020 kg K ha^{-1}) almost equal to those added in fertilisers over the same period. The magnesium in the FYM enhanced not only the yield, but also the concentration of Mg in the potato and sugar-beet tops (Appendix Table 5).

Amounts of N, P and K removed from the soil by individual crops, 1975–79. Table 7 shows the amounts of nutrient removed from the soil by crops given the other two major

TABLE 7

The mean annual amounts of N, P and K (kg ha^{-1}) removed from the soil by crops given the other two elements as fertiliser 1975–79

	N	P	K
Barley			
grain	20	8·0	8
straw	5	1·1	6
Oats			
grain	22	8·5	14
straw	6	2·1	14
Potato			
tubers	51	8·4	22
Sugar-beet			
tops	29	6·3	23
roots	24	6·7	15
Rotation ley	123*	11·0	41
Mean	39**	10·4	29
Long ley	102*	14·4	53

* Includes contribution by clover
** Excluding clover ley

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elements. The mean annual amounts of N, obtained from the soil alone by four arable crops (excluding the rotation ley) and of P and K by all five arable crops were only 39·3, 10·4 and 28·6 kg ha^{-1} respectively, thus explaining the large responses to N and to K shown in Table 1. The ability of this soil to supply N where none was given declined with time, the supply of P changed little until the final 5-year cycle, whilst that of K fell dramatically from 120 kg K ha^{-1} in 1960 and in 1961 to 62 kg K ha^{-1} in 1964 and finally to only 28 kg K ha^{-1} (Table 8).

TABLE 8

Mean amounts of N, P and K supplied by the soil (kg ha^{-1}) in each 5-year cycle of the experiment 1960–79

	1960–64	1965–69	1970–74	1975–79
N*	59	49	43	39
P	14	14	14	10
K	89	53	37	29

* Values for N exclude grass-clover rotation ley

The values for the individual crops (Table 7) show that the potatoes (which followed the clover-grass ley) obtained almost twice as much N from this soil as did the two cereal crops. However, the sugar beet (which followed the barley) obtained as much N from the soil as the potatoes, presumably because the deep tap-roots of the sugar beet were able to take up NO_3-N in the subsoil. The rotation ley apparently fixed more than 100 kg N ha^{-1}, for roughly this amount was removed in the foliage. No proper estimate can be made of the amount of N fixed by the clover nodules that remained in the soil but the non-significant effect of fertiliser N on potato yields suggests that an appreciable part of the 51 kg ha^{-1} shown in Table 7 came from the clover. Removal of P differed little with crop, whilst that of K varied appreciably. Spring barley obtained less K from this soil than winter oats, and sugar beet more than any other crop (48 kg K ha^{-1}).

Recovery of N, P and K from the fertilisers. Table 9 gives the apparent recoveries by the crops of N, P and K from fertilisers, calculated by subtracting the amounts of each

TABLE 9

The apparent (%) recoveries of N, P and K from fertilisers by five arable crops and a long ley, 1975–79

	Percentage recovery of			
Test crop	N1	N2	P	K
Barley (grain and straw)	60	56	12	22
Oats (grain and straw)	62	58	7	33
Potato tubers	32	21	8	48
Sugar-beet (tops and roots)	54	54	14	66
Rotation ley	—	—	16	60
Long ley	—	—	11	43
Mean (arable crops)	52	47	11	46

nutrient in crops grown without it, but with the other two, from amounts in crops given all three, and then expressing this difference as a percentage of that given as fertiliser.

The recovery of N by the two leys cannot be given because the plots given P and K, but not N, contained a large proportion of clover, which fixed 80–100 kg N ha^{-1} per annum (Appendix Table 4). The recoveries of fertiliser N by oats and by barley were similar and both recovered almost the same proportion of the double as of the single dressing of N (57 and 61% respectively). Sugar beet recovered more of the applied N

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than the potatoes appeared to do, but as we did not harvest the potato tops, we do not know the total amount of N recovered by the potatoes. No more than 16% of the fertiliser P was recovered by any crop, with a mean value of only 11%. By contrast the crops recovered fertiliser K far more completely. Sugar beet apparently recovered 66% of the K applied for it, and the clover-grass rotation ley and the potatoes 60 and 48% respectively. The two cereals recovered far less, presumably because much of the K in the leaves and stems returned to the soil before harvest. Mean recovery of K was as large as that of N.

Recovery of N, P and K from FYM. In this experiment FYM was applied at 50 t ha^{-1} for potatoes and sugar beet, but none was given for the other three arable crops; the long ley was given 25 t ha^{-1} annually. The potatoes and the sugar beet recovered proportionally far less of the N and K applied in the FYM (Table 10) than they did from fertilisers

TABLE 10

The apparent recoveries (%) of the N, P and K in FYM (D) by five arable crops and a long ley, 1975–79

	FYM applied					
	Alone (D−0)			With N2PK fertilisers (DN2PK−N2PK)		
% recovery of	N	P	K	N	P	K
FYM newly applied for						
Potatoes (tubers)	16	14	23	8	6	17
Sugar-beet (roots and tops)	16	17	24	8	11	24
Long ley	—	11	16	—	—	—
FYM applied for root crops 1 year ago						
Barley (grain and straw)	4	6	4	4	13	10
Oats (grain and straw)	4	7	10	3	10	14
FYM applied for potatoes 2 years ago						
Rotation ley	22	16	23	2	7	7

(Table 9), but rather more of the P. However, even though more N was added in the FYM than in the fertilisers, yields from FYM and N1PK fertilisers were similar (Appendix Table 1) and total uptakes, especially of K, also were similar (Appendix Table 4). Thus, although much of 359 kg N ha^{-1} applied in the FYM was apparently leached from the soil during winter, the K added in the two dressings of FYM was as effective as the K in fertiliser given annually, when judged by recovery during the 5-year arable rotation. Applying fertilisers with the FYM diminished the efficiency of uptake by the root crops of the N and P in the FYM, but hardly changed that of K. The oats and barley that followed the root crops recovered little of the N added in the FYM and this amount was not diminished by also giving N2PK fertilisers. However, the residues of the P and K from FYM were used more efficiently by the two cereal crops given N2PK fertilisers than by those that were not (Table 10).

Amounts of N, P and K taken up by individual crops. These are shown in Appendix Table 4. The amounts of nitrogen removed by barley and by oats ranged from 24 to 111 kg ha^{-1}, the largest values occurring on plots given both FYM and fertilisers, which also gave the largest yields (Appendix Table 1). Similar ranges in uptake occurred with sugar beet and potatoes, though the amounts removed were larger, because the ranges in yield were larger. Sugar-beet tops removed far more N than the roots and, with N2PK fertilisers, more than potato tubers. The amounts of P removed by the crops varied by a factor of five, with sugar beet and the long ley removing most (26·9 and 26·0 kg ha^{-1}

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TABLE 11

The total amounts (kg ha^{-1}) of nitrogen (N), phosphorus (P) and potassium (K) applied for and removed by five crops grown in rotation at Woburn, 1975–79

	0	N1	P	N1P	K	N1K	PK	N1PK	N2PK	D	DN1PK	DN2PK
Nitrogen												
Added*	0	408	0	408	0	408	0	408	816	718	1126	1534
Removed	171	295	181	277	262	406	280	463	605	392	557	698
Difference	−171	+113	−181	+131	−262	+2	−280	−55	+211	+326	+569	+836
Phosphorous												
Added	0	0	137	137	0	0	137	137	137	116	253	253
Removed	29	40	34	46	36	52	45	68	78	64	90	105
Difference	−29	−40	+103	+91	−36	−52	+92	+69	+59	+52	+163	+148
Potassium												
Added	0	0	0	0	1042	1042	1042	1042	1042	1020	2062	2062
Removed	131	171	134	143	372	557	406	620	734	560	888	1101
Difference	−131	−171	−134	−143	+670	+485	+636	+422	+308	+460	+1174	+961

* As fertiliser, excludes N added by clover in rotation ley

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year^{-1} respectively). Maximum uptakes on the N2PK plots corresponded to 80% of the P applied. Because shortage of soil K greatly limited yields, uptakes of K were large only where either fertiliser K or FYM was given, then they were larger than the corresponding uptakes of N. Sugar-beet roots and tops together removed a maximum of 349, the long ley more than 250 and the potato tubers more than 210 kg K ha^{-1}.

Amounts of N, P and K added to and removed from the soil in 5 years. Table 11 shows the total amounts of each of the nutrients added by FYM and by fertilisers and the amounts removed by the five arable crops in one cycle of the experiment (1975–79). The nitrogen balance sheet takes no account of the fact that a large part of the total N removed by the five arable crops was in the clover-grass rotation ley (47–127 kg ha^{-1} annually, Appendix Table 4). As this soil provided only 39 kg N ha^{-1} per annum to the other four arable crops in the rotation (Table 8) and the clover-grass ley given P and K but no N removed 123 kg N ha^{-1} it appears that the clover nodules fixed at least 84 kg N ha^{-1}. This is far less than the 160 kg N ha^{-1} recorded in the previous 5-year cycle of the experiment, but may simply reflect the effect of seasons less favourable for the growth and development of the clover plants (the variety and cultural management were unchanged). Thus the negative nitrogen balance shown on plots given PK fertilisers alone should be diminished by more than 84 kg N ha^{-1}; also our data take no account of the N dug down in the clover roots and nodules. Wherever FYM was given there were large apparent balances of N remaining in the soil. However, the value of these N residues was small, whether judged by crop response (Table 3) or by N uptakes (Table 10) and so either this N was lost by leaching during winter or remained in the soil in a form unavailable to the crops. Balances of P and K are less difficult to interpret. Those of P were always positive where 27 kg P ha^{-1} was given annually even for crops given N2PK fertilisers, though this amount of P was far less than usually would be given. By contrast, the amount of K that we applied each year (208·5 kg K ha^{-1} = 1042 kg ha^{-1} in 5 years) was far more than would usually be recommended. Crops given the N2PK fertiliser dressing removed a total of 734 kg K ha^{-1} in 5 years, of which 145 kg ha^{-1} was provided by the soil, leaving the balance (589 kg ha^{-1}) presumably to be provided by fertiliser. This represents an apparent recovery of 56% of the fertiliser given, almost identical with that obtained in the previous 5 years of the experiment (57%), but larger than that shown in Table 9 for crops given N1PK fertilisers. The data in Table 11 show that K uptakes by the larger crops, grown where both FYM and NPK fertilisers were given, were roughly 30% larger than with NPK alone. However, because the FYM was so rich in K (Table 6) it was then evidently no longer necessary to apply so much fertiliser K. The use of FYM should therefore have allowed considerable economy in the use of fertiliser K, had the experimental design allowed us to do so, and farmers with access to FYM should consider K balances in their farming systems carefully, to determine whether they can make savings.

Mg in potato leaves and tubers and in sugar-beet tops. Appendix Table 5 shows that % Mg in potato leaves was diminished by K, either in fertiliser or in FYM, and was increased only a little by applying Mg fertiliser to the seedbed. Table 12 shows how the N, P and K fertilisers changed % Mg in the potato leaves and tubers. Evidently the concentration in the leaves was a far better guide to Mg availability in the soil than % Mg in the tubers, which was diminished by giving K fertiliser, but not changed at all by giving Mg fertiliser.

The concentration of Mg in sugar-beet tops was decreased by the K in fertilisers and in FYM just as it was in potato leaves (Appendix Table 5), but giving Mg fertiliser did not always increase % Mg in the tops, in particular where FYM was given. Table 11

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TABLE 12

Mean percentages of Mg in potato leaves in July, in the mature potato tubers and in mature sugar-beet tops, together with mean uptakes, 1975–79

	N		P		K	
	Without	With	Without	With	Without	With
			% Mg in potato leaves			
Without Mg	0·35	0·34	0·34	0·36	0·50	0·20
With Mg	0·40	0·40	0·39	0·41	0·57	0·23
			% Mg in potato tubers			
Without Mg	0·07	0·07	0·07	0·07	0·06	0·08
With Mg	0·07	0·08	0·07	0·08	0·06	0·08
			Mg (kg ha^{-1}) in potato tubers			
Without Mg	2·0	2·7	2·2	2·6	1·1	3·7
With Mg	2·2	3·0	2·4	2·9	1·1	4·1
			% Mg in sugar-beet tops			
Without Mg	0·28	0·37	0·32	0·34	0·42	0·24
With Mg	0·29	0·40	0·35	0·35	0·45	0·25
			Mg (kg ha^{-1}) in sugar-beet tops			
Without Mg	4·7	12·0	8·5	8·2	10·0	6·6
With Mg	4·9	12·5	8·8	8·5	10·6	6·8

shows that the increases in Mg concentration from giving N and the decreases from giving K were far larger than the increases from Mg fertiliser. However, because Mg fertiliser increased yields, it also increased Mg uptakes.

Practical implications

The value of FYM on a sandy soil. The fact, previously noted, that the combination of FYM and NPK fertilisers produced the largest yield of all six crops was substantiated in the final 5-year cycle of the experiment (Table 13). Thus, for sugar beet and potatoes,

TABLE 13

Mean yields (t ha^{-1}) of crops grown without and with FYM, 1975–79

	Potato tubers(1)		Winter oats grain(2)		Sugar beet roots(1)		Spring barley grain(2)		Clover-grass ley(3)		Long ley(3)	
FYM (D)	—	D	—	D	—	D	—	D	—	D	—	D
Fertilisers												
None	6·6	25·2	1·72	2·61	10·4	26·4	1·58	2·60	2·74	6·64	3·57	5·53
N1PK	25·0	34·3	3·71	3·62	25·9	35·3	4·14	4·67	7·52	8·12	6·88	7·63
N2PK	28·1	37·9	4·47	4·93	30·6	41·0	5·01	5·20	7·73	9·04	8·02	9·01

(1)=fresh weight; (2)=weight at 15% moisture content; (3)=dry weight

the increase in yield from the double dose of N (N2PK) was as large or larger where FYM was applied, than where it was not. The combined effect of the two sources of nutrients was to increase yields of potato tubers and sugar-beet roots by a third, as compared with yields from N2PK fertilisers alone. The residues from the FYM dressings given for potatoes and sugar beet also enhanced the yields of the following crops, presumably because they improved not only the nutrient content of the soil, but also its structure and permeability (Williams, 1973). After 20 years, soil on plots given FYM twice in each 5-year cycle of the experiment was darker in colour, less dense and more friable, than soil on plots given NPK fertilisers alone. It is difficult to avoid the conclusion that on poorly structured soils like this one, organic manures are of real value, even where, as

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here, short duration clover-grass leys are grown, partly with the intention of maintaining soil structure and organic matter content.

The effects of NPK fertilisers alone and with FYM through time. Twenty years is not long in the history of a soil. However, the relationship between the smaller yields with NPK fertilisers alone and the larger yields with NPK and FYM shown in the first cycle of the experiment (1960–64) was maintained throughout its life (Table 14). The benefit given by FYM in terms of dry matter was greater in the second cropping cycle than in the first, but subsequently remained unchanged, both in absolute and in relative terms. The percentage gain in dry matter yield from FYM on plots also given NPK fertilisers was remarkably consistent (Table 14), with little change, either with time or with single

TABLE 14

Mean annual production of dry matter (t ha^{-1}) from five arable crops, in each 5-year cycle of the experiment, where NPK fertilisers were given alone and where FYM also was given, together with the % increases in yield given by the FYM

Years	1960–64	1965–69	1970–74	1975–79	Mean
Without FYM					
N1PK	8·22	8·76	8·79	7·71	8·37
N2PK	9·07	10·61	10·08	9·05	9·70
With FYM					
N1PK	9·27	10·35	10·37	9·02	9·75
N2PK	10·53	12·49	11·89	10·74	11·41
% increase in yield from FYM with:					
N1PK	13	18	18	17	16
N2PK	16	18	18	19	18

and double amounts of fertiliser N (N1PK *v.* N2PK). FYM consistently increased mean annual dry matter production by 18%, over and above that obtained with N1PK or N2PK fertilisers alone. Since the additional response to N2 was far smaller than the response to N1 where fertilisers alone were given, we cannot assume that the nitrogen fertiliser dressings that we chose to give were too small. Table 1 shows that the response to N2 was larger where FYM was given than where it was not on four of the six crops, suggesting that some nutrient other than N was limiting yield, possibly K. However, we applied far more K for our crops than currently is recommended and our balance sheets showed that we always applied more K than the crops removed. We also applied magnesium basally twice in 5 years. This suggests that the FYM either enhanced the availability of nutrients already in this soil and of those in fertilisers (we measured increased uptakes of P where FYM was given, Tables 9 and 10) or so improved the soil structure that it allowed roots to make better use of available moisture. Certainly growth was much superior where both FYM and fertilisers were given, than where either was given alone. Clearly, an effect as large as this is important for evidently yields on soils like this, which initially contained only 0·68% C, will be limited unless organic manures are used. This experiment cannot fully explain the benefits that the FYM gave, but a larger and more comprehensive experiment on the same soil (Mattingly, 1974) has demonstrated that organic amendments have a large beneficial effect, for a range of arable crops, that cannot be explained by their crop nutrient contents alone.

Long-term nutrient balance sheets. Because both yield and nutrient content were measured each year for 20 years we have been able to construct a nutrient balance sheet averaged over the four complete 5-year cycles of the experiment (Appendix Table 6). This shows with considerable accuracy not only the amounts of N, P and K that the adequately manured crops removed and hence by inference required, but also the amounts of N, P and K that the crops were able to obtain from the soil alone. Thus the

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mean annual contributions (kg ha^{-1}) were 80 of N from soil and the activity of clover nodules together and 13·6 of P and 51·6 of K from soil alone. These values are larger than those obtained in the final 5-year cycle of the experiment (Table 8) and that for N is misleading, because it includes the contribution made by the clover-grass ley. However, the values given for P and K are probably the best estimates that we can make of soil supply in the absence of fertiliser residues.

Summary

The experiment was begun in 1960 on the sandy-silty loam of Stackyard Field at Woburn to test N, P, K and Mg fertilisers alone and with FYM on five arable crops grown in rotation and on a long ley and soft fruit. This paper gives results from the fourth and final 5-year cycle (1975–79) and summarises some yield and crop uptake data over the whole 20 years.

In this final cycle N continued greatly to increase yields of all crops except the clover-grass ley. P increased yields more than previously, but only little compared with K, which greatly enhanced yields of all 6 crops, but especially sugar beet, potatoes and the clover-grass ley, for all of which the effect of K was greater than that of N.

FYM was tested alone and with N1PK and N2PK fertilisers for potatoes, sugar beet and the long ley; the other crops valued its residues. Yields of all crops were largest where both FYM and NPK fertilisers were given and the effect of FYM was not diminished by doubling fertiliser N. Over the 20 years FYM increased mean yields by 16% with N1PK and by 18% with N2PK fertilisers.

Nutrient balance sheets for 1975–79 and for all 20 years showed that during each 5 years fertiliser K (1042 kg ha^{-1}) and the K applied in the FYM (1020 kg) were almost the same, as were amounts of P (137 *v.* 116 kg P ha^{-1} respectively). The total amounts of nutrients removed (in kg ha^{-1}) by the five crops from 1975–79, ranged from 171 to 698 of N, 29 to 105 of P and 131 to 1101 of K, the largest uptakes being by the largest crops.

The experiment also measured the mean annual amounts of N, P and K supplied by the soil alone. These were (in kg ha^{-1}) 39 of N, 10·4 of P and 29 of K in the final 5 years and 48 of N, 13·6 of P and 52 of K over 20 years.

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APPENDIX TABLE 1

Mean yields of agricultural produce from combinations of N, P and K fertilisers and FYM (D) tested on four arable crops and on soft fruit in the Woburn Reference experiment, 1975–79

	Treatments										
	0	N1	P	N1P	K	N1K	PK	N1PK	N2PK	D	N1PKD	N2PKD
						Fresh produce (t ha^{-1})						
Potato tubers*	6·64	7·37	6·74	7·76	13·44	19·71	16·53	24·99	28·14	25·18	34·29	37·91
Sugar-beet roots*	10·39	15·24	9·54	12·51	13·26	24·97	12·24	25·94	30·65	26·38	35·26	41·04
Sugar-beet tops*	7·96	16·54	8·27	14·11	8·44	18·66	8·54	20·57	28·98	17·80	26·35	35·98
						Grain (t ha^{-1}) at 15% moisture content						
Barley	1·58	2·64	1·61	1·98	1·74	3·44	1·81	4·14	5·01	2·60	4·67	5·20
Oats	1·72	3·16	1·74	3·55	1·64	3·18	1·71	3·71	4·47	2·61	3·62	4·93
						Sugar (kg ha^{-1})						
Sugar beet*	1631	2393	1486	1911	2180	4234	1975	4442	4974	4526	6060	6768
						Gooseberries, blackcurrants (kg per bush) and strawberries (kg per seven plants)						
Gooseberries	1·30	2·21	3·69	2·43	2·52	3·45	2·66	5·28	3·89	4·76	5·31	4·63
Blackcurrants†	2·40	2·11	2·47	3·25	3·08	3·18	3·42	4·75	3·52	3·10	3·45	5·32
Strawberries	0·70	0·74	0·89	1·40	0·95	1·29	1·31	1·30	1·07	1·27	1·11	0·57

* Averaged over without and with Mg on each treatment for all years (1975–79)
† Mean of 4 years (crop failure in 1977)

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APPENDIX TABLE 2

Mean yields of dry matter (t ha^{-1}) from combinations of N, P and K fertilisers and FYM (D) tested on five arable crops and a long ley in the Woburn Reference experiment, 1975–79

	Treatments										
	0	N1	P	N1P	K	N1K	PK	N1PK	N2PK	D	N1PKD	N2PKD
Potatoes												
total tubers*	1·66	1·80	1·69	1·87	3·35	4·78	3·93	6·07	7·02	6·18	7·59	8·56
Sugar-beet												
tops*	1·67	3·17	1·67	2·78	1·78	3·56	1·68	3·74	4·85	3·14	4·51	5·68
roots*	2·40	3·51	2·20	2·82	3·11	6·00	2·83	6·29	7·05	6·34	8·47	9·53
Barley												
grain	1·34	2·24	1·37	1·68	1·48	2·92	1·54	3·52	4·26	2·21	3·97	4·42
straw	1·20	2·40	1·24	2·19	1·36	3·14	1·32	3·50	4·65	2·04	4·14	5·11
Oats												
grain	1·46	2·69	1·48	3·02	1·39	2·70	1·45	3·15	3·80	2·22	3·08	4·19
straw	1·70	3·13	1·74	3·47	1·81	3·80	2·04	4·75	5·90	2·89	5·24	7·19
Rotation ley	2·74	4·18	2·95	4·10	5·25	6·24	5·94	7·52	7·73	6·64	8·12	9·04
Total in 5 years	14·17	23·12	14·34	21·93	19·53	33·14	20·73	38·54	45·26	31·66	45·12	53·72
Long ley	3·57	5·78	2·89	5·87	4·75	6·60	4·79	6·88	8·02	5·53	7·63	9·01

* Averaged over without and with Mg on each treament for all years (1975–79)

APPENDIX TABLE 3

Mean yields of potatoes and of sugar beet without magnesium and the increases from applying magnesium in the Woburn Reference experiment, 1975–79

	Main treatments										
	0	N1	P	N1P	K	N1K	PK	N1PK	N2PK	D	N1PKD	N2PKD
					Potatoes, total tubers (t ha^{-1}) fresh weight							
Yields without Mg	7·11	7·15	6·74	7·63	12·97	18·65	15·91	24·27	28·15	24·98	33·90	37·67
Increases from Mg	−0·93	0·44	−0·01	0·26	0·94	2·11	1·23	1·44	−0·02	0·41	0·78	0·48
					Sugar-beet roots (t ha^{-1}) fresh weight							
Yields without Mg	11·09	14·97	9·59	12·67	12·31	24·64	12·41	25·42	29·48	27·29	34·94	40·98
Increases from Mg	−1·40	0·54	−0·11	−0·33	1·90	0·68	−0·35	1·04	2·34	−1·82	0·64	0·12
					Sugar-beet tops (t ha^{-1}) fresh weight							
Yields without Mg	8·20	16·88	7·93	14·21	8·41	18·73	8·48	20·09	29·46	17·09	26·04	38·20
Increases from Mg	−0·48	−0·69	0·68	−0·20	0·06	−0·14	0·13	0·96	−0·96	1·43	0·61	−4·44

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APPENDIX TABLE 4

Mean annual amounts (kg ha^{-1}) of nitrogen (N), phosphorus (P), and potassium (K) taken up by five arable crops and by a long ley grown with combinations of N, P and K fertilisers and FYM (D) in the Woburn Reference experiment, 1975–79

	Treatments											
	0	N1	P	N1P	K	N1K	PK	N1PK	N2PK	D	N1PKD	N2PKD
	Nitrogen											
Barley												
grain	18·7	38·5	19·2	29·3	20·3	43·7	20·4	50·7	73·2	30·9	60·2	81·4
straw	4·9	13·0	5·4	13·8	4·8	12·1	4·7	12·3	21·6	7·1	15·3	28·4
Oats												
grain	23·1	45·0	24·4	48·2	20·9	41·7	22·2	51·0	71·6	34·8	51·9	76·6
straw	5·2	11·1	5·7	12·4	5·8	12·8	5·9	16·2	29·1	8·8	22·4	35·1
Potatoes												
total tubers	22·5	31·2	23·0	34·0	43·5	67·9	50·6	90·4	104·1	78·2	117·2	133·2
Sugar beet												
tops	28·8	70·2	30·4	68·5	29·7	70·8	28·9	74·0	117·7	58·4	92·9	134·0
roots	18·1	29·4	20·2	23·4	28·2	52·4	24·1	46·4	70·8	46·1	74·3	84·5
Rotation ley	49·8	56·8	52·8	47·2	109·2	104·6	122·8	121·8	116·7	127·2	123·1	124·8
Long ley	72·7	102·8	56·5	100·9	100·1	106·3	102·2	114·3	161·5	100·3	122·3	182·3
	Phosphorus											
Barley												
grain	4·7	6·8	5·0	5·4	5·4	8·0	5·8	10·9	11·8	7·5	14·1	16·0
straw	1·0	1·2	1·4	1·6	1·0	1·1	1·4	1·6	2·0	1·6	2·8	5·6
Oats												
grain	5·1	8·2	5·5	10·5	5·1	8·5	5·2	10·2	13·2	7·9	11·2	15·8
straw	1·7	1·1	2·4	2·3	1·8	2·1	3·0	2·4	3·2	3·0	5·0	6·1
Potatoes												
total tubers	4·0	4·3	4·1	4·7	6·4	8·4	8·5	10·5	11·1	12·3	15·3	14·6
Sugar beet												
tops	3·5	6·7	4·8	8·3	3·3	6·3	4·3	9·1	11·9	7·9	11·7	14·3
roots	2·8	4·1	3·0	3·9	3·4	6·7	3·7	7·8	8·7	8·2	10·9	12·6
Rotation ley	5·9	8·1	7·9	9·4	9·7	11·0	13·5	15·5	15·9	15·1	18·9	19·8
Long ley	9·2	14·4	8·1	16·6	11·6	14·4	13·2	17·1	21·2	15·7	22·9	26·0
	Potassium											
Barley												
grain	7·2	10·7	7·8	8·5	8·8	14·2	9·2	17·9	21·4	12·3	21·5	24·9
straw	7·3	7·3	8·5	5·5	16·9	39·0	16·3	41·1	58·0	24·9	67·8	106·1
Oats												
grain	7·6	12·3	7·5	14·2	7·3	14·1	7·3	16·4	20·2	11·7	16·3	22·6
straw	13·8	16·0	13·9	13·7	39·5	68·5	43·8	80·8	119·1	61·0	126·6	189·8
Potatoes												
total tubers	21·8	22·8	23·0	22·5	73·3	99·8	90·3	121·8	129·8	137·0	190·4	214·8
Sugar beet												
tops	25·4	36·5	22·5	23·0	62·0	133·4	57·8	131·2	172·5	116·5	203·8	262·9
roots	14·8	20·6	13·3	14·8	23·8	45·8	23·0	43·5	53·1	47·8	66·3	86·0
Rotation ley	32·8	44·4	37·2	41·0	140·8	142·4	158·4	167·3	159·9	148·6	195·3	193·6
Long ley	59·5	56·2	45·7	52·9	108·0	144·8	113·3	143·5	168·0	141·1	208·9	250·7

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APPENDIX TABLE 5

The mean percentages of magnesium and mean amounts (kg ha^{-1}) of magnesium in potato leaves, dry potato tubers, and dry sugar-beet tops, in the Woburn Reference experiment, 1975–79

	Main treatments											
	0	N1	P	N1P	K	N1K	PK	N1PK	N2PK	D	N1PKD	N2PKD
	% Mg in leaves in July (1975–79)											
Potatoes												
Without Mg	0·51	0·44	0·52	0·51	0·19	0·20	0·19	0·22	0·27	0·26	0·24	0·28
With Mg	0·59	0·50	0·61	0·59	0·20	0·26	0·20	0·25	0·31	0·28	0·27	0·27
	% Mg in tubers											
Without Mg	0·06	0·06	0·06	0·06	0·08	0·08	0·09	0·08	0·08	0·09	0·09	0·09
With Mg	0·06	0·06	0·06	0·07	0·08	0·08	0·09	0·09	0·08	0·09	0·09	0·09
	Mg (kg ha^{-1}) in tubers											
Without Mg	1·1	1·1	1·1	1·1	2·6	3·8	3·4	4·9	5·8	5·9	6·9	8·2
With Mg	1·0	1·2	1·1	1·2	2·9	4·4	3·8	5·4	5·8	5·8	7·8	8·2
	% Mg in tops											
Sugar beet												
Without Mg	0·37	0·45	0·36	0·48	0·20	0·27	0·21	0·29	0·30	0·31	0·28	0·32
With Mg	0·36	0·55	0·37	0·51	0·20	0·28	0·23	0·28	0·37	0·29	0·27	0·30
	Mg (kg ha^{-1}) in tops											
Without Mg	6·3	14·8	5·6	13·4	3·5	9·3	3·4	10·3	14·2	9·1	12·4	19·2
With Mg	5·8	16·5	6·3	13·7	3·6	9·5	3·8	10·3	17·7	9·4	12·3	16·1

APPENDIX TABLE 6

The mean amounts (kg ha^{-1}) of nitrogen (N), phosphorus (P) and potassium (K) applied for and removed by five arable crops during four 5-year periods of the experiment, 1960–79

	Main treatments											
	0	N1	P	N1P	K	N1K	PK	N1PK	N2PK	D	N1PKD	N2PKD
Nitrogen												
Added	0	369	0	369	0	369	0	369	738	699	1068	1437
Removed	301	417	296	396	391	523	402	567	700	508	682	850
Difference	−301	−48	−296	−28	−391	−154	−402	−198	+38	+191	+386	+587
Phosphorus												
Added	0	0	137	137	0	0	137	137	137	174	312	312
Removed	44	55	49	60	52	68	60	81	88	78	105	118
Difference	−44	−55	+88	+77	−52	−68	+77	+56	+49	+96	+207	+194
Potassium												
Added	0	0	0	0	964	964	964	964	964	960	1924	1924
Removed	239	281	242	258	485	638	505	681	757	634	952	1144
Difference	−239	−281	−242	−258	+479	+326	+459	+283	+207	+326	+972	+780

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Synoptic Monitoring for Migrant Insect Pests in Great Britain and Western Europe III. The Seasonal Distribution of Pest Aphids and the Annual Aphid Aerofauna over Great Britain 1975–80

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Abstract

To facilitate the recognition of alate aphid pest species and potential virus vectors in random samples of airborne migrants, the total aerial samples for all species between 1975 and 1980 are tabulated at 18 continuously operated sampling stations. Annual means for the geographical distributions of up to three seasonal cycles of migration of 27 species of alate aphids, including agricultural and forest pests, are mapped to verify annual life cycles and provide a basis for forecasting distribution.

Introduction

Since 1964, flying aphids have been monitored systematically at an increasing number of sites throughout Great Britain as part of an investigation into aerial populations of insects with special reference to agricultural and other pest species. An ultimate objective is to develop a forecasting system and a preliminary requisite is to establish the general level of the aerofauna in order to detect changes in populations prior to epidemics.

The sampling network has subsequently extended into Holland, Denmark, Northern Ireland, France and Belgium. This has made possible the comparison of the pest species and the total species present in the aphid aerofauna separated by ecological barriers of differing extent, such as the mountains of Wales and Scotland, the Northern Channel of the Irish Sea, the English Channel and especially the North Sea.

All the aphid species found in aerial samples from the 31 trap sites that have operated in Great Britain over a period of 16 years have been identified, the records collated, and the list of 317 species published in Part I of this paper (Taylor, French, Woiwod, Dupuch & Nicklen, 1981). For comparison, the species sampled near Copenhagen, in Denmark, between 1971 and 1976 have also been compiled and published in Part II of this paper (Heie, Philipsen & Taylor, 1981).

Not all pest aphids are well known and under constant observation. For example, increased damage to cereals over the last few decades has directed attention to some grass aphids previously ignored. It is not yet clear how much damage is done directly or by virus disease, nor which aphids are responsible in different regions and countries. Some potential vector species are rarely found on crops because they do not remain there long enough to build up populations and the chance of finding a visiting migrant during the brief moments of routine crop inspection is remote (Taylor, 1974). Nevertheless such aphids may feed long enough to transmit virus. Only by sampling and identifying all aphids in flight between crops can potential vectors be recognised because species not commonly associated with the crop concerned, or even with agricultural crops in general, may be unsuspected vectors.

Furthermore, a knowledge of the population dynamics of each pest is necessary to assess the risk of crop damage by infesting populations before they are controlled naturally by physical and biological means. Population dynamics theory is also needed to

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estimate the likely effects of treatment at a given place and time, and to assess its economic and environmental costs, such as the potential for developing insecticide resistance. Traditional approaches to population dynamics that focus on the stabilising properties balancing births and deaths in isolated elements of populations are not applicable to aphids, except possibly to a few monophagous tree-feeding species with atypical life cycles. For most aphid species, and for all those pests of annual crops, there are no persistent populations to stabilise, and hence no continuity that would make key factor or life-table analysis relevant (Gilbert, 1982). Populations of most pest aphid species become extinct on a given host two or three times each year, when they die or migrate to another host plant, often of different family, form and distribution. There, the aphid morphs, and their behaviour and dynamics, also differ. In addition, the rapid clonal multiplication of aphids leads to the successive domination of differing eco-types within the species, especially in pest species which respond to the selection pressure of changing cultivars and cropping rotations, by changes in host preference, reproductive rates and migration times (Daniels, 1981).

The geographical pattern of productivity of migrants arises from the success of the preceding cycle of apterous population growth. These distinct distributions which differ numerically, geographically and morphologically, must be known in order to predict the next population cycle.

Whatever sampling method is employed, pest-assessment requires a continuous and automatically updated concept of synoptic distribution, modified by changes in host-plant distribution throughout the seasonal cycle, by climate and biological controlling agents. This cannot be done on a local scale because aphids frequently infest crops hundreds of kilometres from their overwintering sites, and many of their parasitic organisms and predators are equally mobile. The system needs to be able to detect deficiencies in prognosis and to suggest solutions when mistakes are discovered. The historical component of changes, and the many ecological factors involved, usually require decades of continuous recording before such defects are discovered.

With such a synoptic view of populations, local deviations and field-scale factors begin to be measurable. Changes in the rate of population growth in different parts of the geographical range of each species, and on different crop hosts, can be more easily detected and analysed by comparison with changes in other areas.

Virus infection is difficult to forecast from crop samples because the range of vector aphids may be wide and unknown. Aerial samples detect the range of species necessary to recognise which vectors were responsible for infection after it has been observed. Forecasting may then depend on adequate subsampling for vector individuals (Plumb, 1981) of a wide range of species even for one virus (van Harten, 1981). Aerial sampling yields comparable population estimates for different places, crops and pest species. Results show the great variability in times and distribution of migration between different years and different places. They also show how the pattern of migration progresses over large areas, where major concentrations occur, and where the current risk is greatest (Bardner, French and Dupuch, 1981).

The numbers and distribution of aphids

This paper presents a list of all species that occurred in any of 18 major sample sites in Great Britain, Nos. 916, 907, 912, 923, 906, 905, 922, 919, 911, 904, 917, 901, 924, 914, 908, 903, 913, 910 (sites are listed and mapped in Fig. 1,* that operated between 1975 and 1980. Those 72 species that occurred five or less times are listed (Table 1, *see* pp. 36–38)

* Figs. 1–16 are in Pt I (Taylor *et al.*, *Rothamsted Experimental Station. Report for 1980*, Part 2,41–104). Figs. 17–35 are in Pt III (this paper), pp. 102–121.

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with the site, year and sample number. Those 186 species that occurred more frequently are fully tabulated (Table 2, *see* pp. 39–101) to show their changing migrant population with time and regional distribution. Some species are explosive in their annual productivity. *Aploneura lentisci* (530), for example, occurred in modest numbers, mainly in the south, in 1975. Samples increased to thousands in 1976 and the population expanded to cover the island of Great Britain. In 1977 the species had almost disappeared, diminishing further during 1978 and 1979, and disappearing altogether in 1980. In contrast *Schizolachnus pineti* (4) occurred in small numbers almost everywhere in 1975 and 1976, disappeared in 1977, reappeared in the midlands in 1978 and 1979 and reached its maximum numbers in 1980. The pest species are discussed in more detail below.

The 6-year mean geographical distributions (1975–80) for each of the migratory cycles of 27 species of special concern are mapped in Figs. 17–35 based on 18 sample sites. The number of maps presented for each species is based on the known life-history, the size of the samples and the seasonal cycle of migration in Figs. 3–9.

The basic life-histories and interpretation of the species are listed below in the same sequence as the maps. This sequence is determined partly by convenience in figure arrangement and partly to illustrate relevant features of distribution pattern.

The number of maps for a given species is based on what was already known about its ecology, or what has been found from the aerial samples. In the classical cycle of arable crop pests in temperate maritime climates, there are three seasonal cycles of migration; spring emigration of migrants from the overwintering woody hosts, if the species is holocyclic, to the developing crop; summer migration of alienicolae from the ripening crop to other herbaceous secondary hosts; autumn return migration of sexuparae from the secondary hosts to the primary overwintering hosts. This pattern is typified by *Aphis fabae* and is clearly recognisable in many species by the phenology of migration which shows three cycles, and in the maps which reflect the different distribution of the three hosts. This pattern is also recognisable in anholocyclic populations when the crop host generates a disproportionately large and geographically concentrated summer emigration. The autumn return migration is often diffuse, reflecting the widely distributed and wide host-species range of polyphagous alienicolae. The spring migration then shows how the species distribution has become concentrated by the restricted primary host range of holocyclic species and the success in overwintering survival of anholocyclic species.

When the holocyclic species remain longer, into the late spring, on the primary host and develop larger populations, the secondary host population may also grow slowly and the summer migration may then be late enough to form the sexuparous return migration. When, as in *Phorodon humuli*, the secondary host range is also botanically and geographically restricted, the resulting two migrations are clearly recognisable.

Monophagous tree aphids, like *Elatobium abietinum*, may have only one clear-cut migratory cycle.

All three classes of migration include species with less precise migratory mechanisms so that there are species with indeterminate systems not yet understood. This is evident from the maps, taken in conjunction with the phenologies shown in Figs. 3–9. In interpreting these figures, it is relevant that there are no samples from the north-west of Scotland, so the maps there are distorted. Also, the maps are based on sample means over several years, so that annual variation in timing or population distribution tends to smooth the pattern. Individual years often show greater differences between seasonal migration distributions than appears from these means.

132, *Aphis fabae* Scopoli, 1763 (Black Bean Aphid) (Figs. 8a and 17) is holocyclic in Britain, overwintering in the egg stage mainly on spindle, *Euonymus europaeus*, in the

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southern half of Britain; small numbers occur on the guelder rose, *Viburnum opulus* and possibly *Philadelphus*. Eggs hatch between late February and early April and alatae are produced in May; these migrate in late May and early June to field beans and sugar beet, on which large colonies may develop causing direct feeding damage, and also to wild plants such as dock, poppies, goosefoot and fat-hen. Alatae are produced on these secondary hosts in response to crowding which reinfest the same crop or migrate to other crops and wild plants. This summer migration is particularly noticeable in East Anglia and represents the migration from field beans and sugar beet. In the autumn *A. fabae* migrates back to *E. europaeus* where eggs are laid.

A reliable forecast of the likelihood of infestations of *A. fabae* causing damage to field beans is based on large-scale sampling of winter host plants. Suction-trap samples can also forecast infestation of bean crops (Way, Cammell, Taylor & Woiwod, 1981). It should be possible to expand this forecast to indicate the initial infestation of sugar beet and forecast direct damage. *A. fabae* is also an important pest of sugar beet because it spreads beet yellows virus and beet mosaic virus after its introduction to the crop. It is a known vector of more than 30 viruses.

The *Aphis* spp. are difficult to separate quickly, especially the males, and *fabae* grp. (132) includes several other possible species that are known to be so rare as not seriously to affect the samples. The taxonomy of this group of species is still uncertain.

The three classical migration cycles show clearly in the maps. The summer migration, mainly from agricultural crops is dominant in East Anglia and eastern Scotland. The subsequent autumn migration from wild herbaceous annuals is more diffuse, whilst the following spring migration, mainly from *Euonymus*, is concentrated near to the southern chalk downs.

389, *Acyrthosiphon pisum* (Harris, 1776) (Pea Aphid) (Figs. 7c and 18) is holocyclic or anholocyclic in Britain and is autoecious on legumes, overwintering as an egg low on the haulm of sainfoin, trefoil and lucerne or, in mild winters, active stages may survive. Eggs hatch in February and March, and alatae, produced in May, migrate to the growing points of peas, on which this aphid is a pest, and other legumes. Numbers reach a peak on peas in late June and early July shortly before peak numbers are found in the trap samples in the pea growing areas of the south-east and East Anglia. The trap samples also indicate a small autumn migration, probably of sexuparae; sexuales have been found on *Ononis*, *Lathyrus*, *Trifolium* and *Medicago*. *A. pisum* is a vector of more than 30 plant viruses, both persistent and non-persistent, including pea enation mosaic, pea leaf roll and bean leaf roll.

Whether or not damaging infestations of *A. pisum* occur on peas is partly dependent on the initial infestation of the crop. This is likely to be associated with the numbers migrating in the spring and early summer, whereas the species' success on peas can be measured by the numbers migrating from the crop in the summer. There is no known economic threshold for *A. pisum* on peas.

There are many different recognised races or biotypes, some differentiated by colour, and known to have different host preferences, reproductive rates and behaviour.

Although pea aphid has no systematic host-alternating migrations, the maps clearly show overwintering survival confined to the south and East Anglia; dominant summer populations in arable areas and totally diffuse, fairly small, autumn migration, not unlike bean aphid.

322, *Myzus* (*S. Nectarosiphon*) *persicae* (Sulzer, 1776) (Peach/Potato Aphid) (Figs. 7a and 19) is the most important pest and vector aphid in Britain due to its wide host range and its proficiency in transmitting more than 120 plant viruses. It is anholocyclic on many

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herbaceous plants and brassicas, but is also holocyclic on peach, *Prunus persica*, hence confined to small numbers in gardens in southern Britain. The survival of the anholocyclic population during the winter is particularly important in determining the timing and level of infestation of crops in the spring, and the subsequent spread of virus diseases. Alatae develop in spring and migrate to potatoes and sugar beet, as well as to other herbaceous plants. *M. persicae* does not usually form dense colonies, but tends to migrate by walking to infest other parts of the same and neighbouring plants. The anholocyclic life-cycle and the tendency to move between plants contribute greatly to the importance of this species as a vector of potato leaf-roll virus and potato virus Y, on seed potato crops, of beet yellows virus and beet mild yellowing virus on sugar beet, and a number of viruses on other crops. Numbers may sometimes increase rapidly to reach tens of thousands per plant on potato. Alatae develop during the second half of July and migrate to other crops or to wild herbaceous plants. This migration predominates in the eastern arable areas where there is the largest acreage of sugar beet and potatoes. There is a further redistribution of *M. persicae* in the autumn between herbaceous plants and brassicas, and it is on these plants that the aphids overwinter.

The spring weather at Rothamsted Experimental Station can be used to predict accurately the incidence of virus yellows in sugar beet throughout the country during the coming summer (Watson, Heathcote, Lauckner & Sowray, 1975). Analysis of the change in the distributions of the autumn and spring migrations suggest that *M. persicae* overwinters most successfully in the south-east and the London basin and this may explain these Watson–Hurst virus-incidence equations (Taylor, 1977a).

Few *M. persicae* are found in the trap samples, but those that fly early in the year give an indication of potential virus infection of crops and should therefore be included in any virus index on potatoes (van Harten, 1981) or sugar beet. This aphid damages peach directly in the Mediterranean region and can also kill potatoes when uncontrolled or insecticide-resistant.

The timing of seasonal migration cycles of peach/potato aphid differ in the north and south, but the maps reflect a similar general pattern to bean aphid. Major summer emigrations are from arable crop areas. The autumn migration tends to be rather more westerly, but by the spring, the overwintering population has been greatly reduced in the north and west, with maximum survival in the south-east.

358, *Hyperomyzus lactucae* (Linnaeus, 1758) (Current/Sowthistle Aphid) (Figs. 6c and 20) is heteroecious and holocyclic, spending the winter as an egg on black currants and occasionally on red currants. Eggs hatch in March and early April and the subsequent generations may cause damage to currants. Including necrotic yellows on lettuce, this aphid is a known vector of about ten viruses. Few alatae develop in the second generation, but more in the third generation and these migrate in late May and June to sowthistle. The suction-trap samples suggest there may be further migration between secondary hosts from late June to the end of August. In autumn the return migration to *Ribes* reaches peak numbers in early October. The numbers migrating in the autumn may indicate likely damage to currants the following spring.

The migratory cycles in spring are not very clearly separated, but overwintering is mainly in southern Britain. The summer migration reflects the distribution of *Sonchus* and the autumn migration is slightly higher in the southern half of Great Britain. There is an appreciable increase in population in the south by the next spring.

420, (*Macrosiphum*) *S. Sitobion avenae* (Fabricius, 1775) (Grain Aphid) (Figs. 8c and 21) is autoecious and can be a serious pest on cereals, particularly on wheat. This species is usually anholocyclic in Britain, but a small proportion of the population overwinters

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holocyclically as eggs on Gramineae. Eggs hatch and alatae fly in May and June to reinfest the same crop or migrate to other Gramineae. Alatae produced throughout the summer, in response to increasing density and declining food quality, may reinfest crops or migrate to other Gramineae. The later migrants infest grasses, and it is from these that the small autumn migration arises which infests early-sown winter cereals as well as grasses. Those that infest cereals can introduce barley yellow dwarf virus, but also establish overwintering populations which can develop rapidly in the spring if conditions are favourable.

The suction-trap samples in the autumn and spring indicate the numbers of *S. avenae* infesting crops, but as damage occurs some time after this initial infestation, when aphids are emigrating from crops, the samples are not ideal for monitoring the development on crops. However, development models are being devised to predict the maximum population on wheat, which use the number of aphids in the trap samples as a starting point (Carter & Dewar, 1981). The monitoring of the autumn migration to cereals is becoming increasingly important as the trend towards planting winter cereals earlier results in a larger proportion of the acreage becoming infested in the autumn.

The spring migration is much greater in southern England, diminishing northwards. The vast summer migration has a concentration in Norfolk, but is widespread at very high densities throughout the lowlands; even the highlands of the south-western peninsula, Wales, northern England and Scotland have very great aerial populations. The autumn migration is modest and diffuse so that the population increases considerably in the south during winter.

114, *Rhopalosiphum padi* (Linnaeus, 1758) (Bird-cherry Aphid) (Figs. 9d and 22) is mainly holocyclic in northern Britain, but in the south it is also anholocyclic. Eggs laid on *Prunus padus* from September to November hatch the following April. Alatae begin to migrate in early May to Gramineae, including wheat, barley and oats, where large colonies may occasionally develop, and some other monocotyledons. Alatae also migrate from anholocyclic populations at this time. The summer migration is mainly from cereals to grasses, particularly in eastern Britain, but also between grasses in western Britain. The timing of the autumn migration to *P. padus* for the holocyclic population, and to early-sown cereals and grasses for the anholocyclic population, is dependent on day length. Those aphids that migrate to the ever-increasing acreage of early sown winter cereals, are often the primary source of infection for barley yellow dwarf virus. The survival of the anholocyclic population on cereals during the winter greatly affects the subsequent spread of BYDV.

Suction-trap samples in the autumn, combined with a measure of the proportion of aphids transmitting virus, are used to give an indication of the potential risk of BYDV infection in early-sown crops in different areas of Britain (Plumb, 1981). This aphid is a vector for at least seven viruses. Its aerial populations far exceed those of any other aphid species in Britain and, in common with only *Rhopalosiphum insertum* and the *Pemphigus* spp., its cycles of migration increase progressively through the year. The losses over winter are very great and survival is maximal in the extreme east and west, unlike most aphids.

396, *Metopolophium dirhodum* (Walker, 1848) (Rose/Grain Aphid) (Figs. 8b and 23) is heteroecious and holocyclic although it may overwinter anholocyclically. Eggs laid on wild and cultivated roses in October and November hatch in the spring. Alatae migrate to grasses, especially *Bromus* spp., and cereals, particularly wheat, where the population can build up to epidemic proportions (Dewar, Woiwod & Choppin de Janvry, 1980). Alatae are produced on cereals in response to increasing population density and reinfest

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the crops or migrate to other grasses. *M. dirhodum* is a poor vector of barley yellow dwarf virus, although it can spread the virus within fields, and of radish yellows.

The suction traps monitor the small migration from roses to cereals and so give an indication of the initial infestation. However, subsequent population development is dependent on a number of factors. The suction traps monitor the emigration from cereals and grasses of alatae produced in response to increasing density and declining food quality.

In common with many crop aphids, the summer migration is much the largest but it is atypical in its distribution, maximal in the north-west and south-east, reflecting its grass hosts as well as cereals. The autumn migration is also unusual being greater in the north. By spring the distribution has reversed, overwintering evidently being more successful in the south.

111, *Rhopalosiphum insertum* (Walker, 1849) (Apple/Grass Aphid) (Figs. 9c and 24) is heteroecious and holocyclic overwintering as an egg mainly on apple, but also on pears, rowan, medlar and hawthorn. Eggs hatch in April and the developing population on apple may cause some damage in exceptional years. Alatae migrate to grasses during May and June where they colonise the roots. There is a large summer migration during which other grasses are colonised. In the autumn there is a large migration back to apple. This species transmits barley yellow dwarf virus and may be responsible for some of the initial infection of early-sown cereal crops in the autumn. Autumn suction-trap samples have been related to the number of oviparae on apple in the autumn and so to damage the following spring (Taylor, 1977b; Light, 1980). These autumn samples can now be used to warn of potential damage to apples in the following spring.

The three well-marked seasonal migrations increase progressively in size and their distributions show no regional characteristics, except that the spring migration tends to diminish slightly towards the east and west coasts. Unusually there is hardly any latitudinal segregation, overwintering losses being generally distributed throughout the island.

410, *Macrosiphum euphorbiae* (Thomas C. A., 1878) (Potato Aphid) (Figs. 7d and 25) is polyphagous and anholocyclic in Britain and only on rare occasions do sexual forms lay eggs on Rosaceae. Apterae overwinter on many species of weeds. Alatae migrate in May and June to new hosts, including potatoes on which they are a pest. If infestations are heavy there may be a second dispersal migration in July. Infestations are usually widespread on potatoes, but only occasionally reach large numbers when it causes 'false top roll'. There is a small migration of *M. euphorbiae* in the autumn. The timing and size of infestation on potatoes in the spring and early summer is dependent on the overwintering survival of the anholocyclic population which would appear to be least successful in Scotland and northern England. *M. euphorbiae* is a poor vector of potato virus Y, but may be common enough to be included in a virus index for the probable infection of potato seed crops. It is a vector of more than 50 viruses, both persistent and non-persistent, including pea mosaic, onion yellow dwarf, beet mosaic and dock viruses. It is more highly polyphagous than most aphids, on monocotyledons as well as dicotyledons; it is of American origin, introduced to Europe about 1917.

The summer migration is the largest; both it and the smaller autumn migration are widespread over Great Britain. Only the spring migration is concentrated in the south where overwintering is apparently most successful.

421, (*Macrosiphum*) *S. Sitobion fragariae* (Walker, 1848) (Blackberry/Grain Aphid) (Figs. 7b and 26) is heteroecious and holocyclic, overwintering as an egg on blackberry. Eggs hatch in spring and alatae migrate to grasses in late spring and early summer. *S. fragariae* may be found on the ears of wheat, but is much less common than *S. avenae*. Alatae

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which are produced during the summer presumably migrate to other species of Gramineae.

The spring migration is mainly in the south-west and quite prominent. The summer migration is maximal in the midlands of England. The autumn return migration to blackberry is late and mainly in the south and west, but not so concentrated as in spring.

355, *Nasonovia ribisnigri* (Mosley, O., 1841) (Currant/Lettuce Aphid) (Figs. 6a and 27) may be a pest on both its primary and secondary host. In northern Britain it is normally holocyclic, overwintering as an egg on any part of gooseberries and currants, including the fallen leaves, but in the south this species can be anholocyclic on Compositae especially lettuce, on which it is the most important aphid pest, chicory, hawkweed and speedwell. Eggs hatch on the primary host in March and alatae that develop migrate, from mid-May to June, to lettuce where large colonies stunt growth and prevent hearting. Although the numbers in the trap samples are generally small, there is a suggestion of further redistribution of alatae during the summer, presumably between secondary hosts. There is a third migration in the autumn to the overwintering hosts which can be either gooseberries and currants or lettuce. As numbers in the trap samples are usually small, it may only be possible to give an indication of seasons in which either exceptionally large, or small, numbers are expected.

The three discernible migrations in this species are all diffuse and spread widely over Great Britain.

243, *Brachycaudus helichrysi* (Kaltenbach, 1843) (Leaf-curling Plum Aphid) (Figs. 5a and 28) is holocyclic. The primary hosts are various *Prunus* species, particularly plums and damson on which it can be a serious pest. Eggs hatch in February and March and alatae are produced in the latter half of May which migrate to a number of secondary hosts including clover, asters and chrysanthemums. The migration from *Prunus* is usually complete by early July. The return migration to *Prunus* begins in the latter half of August and continues until the end of October. It is the progeny of those aphids that successfully find *Prunus* in the autumn that develop into damaging infestations the following spring. It may therefore be possible to give an indication of the potential levels of infestation in the spring from the numbers of aphids migrating the previous autumn.

B. helichrysi is a vector of a number of virus diseases including plum pox and potato virus Y. Although a poor vector of PVY, *B. helichrysi* occurs in sufficiently large numbers to cause large infections of potato seed crops (Govier, pers. comm.) and has been included in an index assessing the potential risk to seed crops (van Harten, 1981).

Separate maps have been made for weeks 1–26 and 27–33, and these maps show a marked shift in distribution from south- and west-midland to east-midland England. They are not clearly segregated in time and the aphids ecology suggests they are both part of the primary migration. The smaller return migration is uniformly distributed over Great Britain, with no population growth in the north before spring because of the southerly distribution of the primary hosts.

292, *Cavariella aegopodii* (Scopoli, 1763) (Willow/Carrot Aphid) (Figs. 4a and 29) is heteroecious between willow species and various umbelliferous plants. Eggs laid on the young shoots of willow in the autumn hatch between February and early April. Alatae, developed in May, migrate over a 5- or 6-week period to umbellifers including carrots, parsnips, celery and parsley on which the aphid is a pest. In late seasons the migration from the primary host may be delayed by 2 or 3 weeks. As populations develop on carrot crops, the alatae produced migrate to hedgerow umbellifers. By the end of July few aphids can be found on carrots. In the autumn, sexuparae migrate back to willow where eggs are laid. An anholocyclic population also remains on overwintering umbellifers such as

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late lifted carrots and carrot seed crops. Spring alatae from anholocyclic populations migrate to umbelliferous crops earlier than those from willow. However, the proportions of the population overwintering holocyclically and anholocyclically are not known. *C. aegopodii* is a vector of persistent carrot motley dwarf virus and semi-persistent parsnip yellow fleck, and a number of non-persistent viruses.

The numbers migrating in the autumn may be reflected in the numbers migrating from willow the following spring. However, the spring migration from the umbellifers will depend on overwintering success. It is therefore important to know the proportions of the population that overwinter holocyclically and anholocyclically.

The primary migration is widespread throughout England and fairly heavy. The second map (weeks 27–37) may be secondary migrants, but is not yet clearly distinguished. The autumn return migration is uniformly distributed.

308, *Phorodon humuli* (Schrank, 1801) (Damson/Hop Aphid) (Figs. 5b and 30) is heteroecious and holocyclic, laying eggs in the autumn on blackthorn, *Prunus spinosa*, and damson and plum, *P. domestica*. Eggs hatch between late February and April, and the developing population on plums may cause some damage. The migration from *Prunus* to hops begins in late May and continues until late July or early August. Some aphids may remain on the sucker growth of plums throughout the summer. *P. humuli* is a pest of hops every year and therefore the timing of the migration to hops is probably of greater importance to growers than the size of the migration. The dates of the beginning and end of the migration can be obtained from the suction-trap samples. No alatae are produced on hops until gynoparae and males develop in the autumn and these migrate back to *Prunus*. This migration is concentrated in the two hop-growing regions of Britain (Taylor, Woiwod & Taylor, 1979). The size of the autumn migration may give an indication of potential damage to plums the following spring and the subsequent migration to hops.

Like *Brachycaudus helichrysi*, this species has two clearly segregated migrations, the first reflecting the overwintering *Prunus* host distribution. The profound difference in the distribution of their return migrations shows clearly the accumulative effect of intense cultivation of the primary and secondary hosts in close proximity. *P. humuli* transmits a number of plant viruses including plum pox and hop mosaic.

264, *Brevicoryne brassicae* (Linnaeus, 1758) (Cabbage Aphid) (Figs. 6b and 30) is autoecious on brassicas and produces sexual forms in the autumn. In the milder parts of the south and west the winter may be passed anholocyclically. The eggs laid on the stems of brassicas in the autumn hatch between the end of February and the end of April, and alatae are produced from the end of May to July which migrate to newly planted brassica crops such as cabbage, cauliflower, Brussels sprouts, kale, rape, radish, swedes and mustard. The aphids are heavily wax-coated. Dense colonies may develop on the leaves, or on the flower of seed crops, causing considerable damage, particularly in warm dry weather. Alatae, produced throughout the summer, infest other brassicas. In the autumn infestations in the heads of cabbage, cauliflower and Brussels sprouts reduce market value. *B. brassicae* is a vector of cauliflower mosaic virus and cabbage black ring spot as well as about 14 other plant viruses.

Few *B. brassicae* are found in the trap samples but the number recorded early in the year might indicate seasons of either exceptionally large or small infestations.

There is no pronounced seasonal segregation of migration in this species but the pattern of migration in weeks 1–34 suggests that agricultural practice is a major factor in perpetuating distribution.

110, *Hyalopterus pruni* (Geoffroy, 1762) (Mealy Plum Aphid) (Figs. 8d and 31) is hetero-

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ecious and holocyclic with eggs being laid on *Prunus* species, mainly plums, but also peaches, apricots and almonds. The eggs hatch in April, and the aphids developing on plums can cause serious damage curling the young leaves. Alatae of *H. pruni*, which develop later than those of other aphid pests of plums, migrate to waterside grasses and reeds from the beginning of June. The population on plums continues to increase until July, and the peak migration is observed between early July and mid-August. Some alatae migrating from plums may form new colonies on other plum trees. The return migration to *Prunus* begins in September. The small autumn migration may give an indication of the level of infestation on plums the following spring. *H. pruni* is a vector of plum pox.

The primary migration of this aphid is surprisingly easterly in its distribution in England, as compared with *Phorodon humuli* and *Brachycaudus helichrysi*, and requires further investigation.

500, *Eriosoma* (*Schizoneura*) *ulmi* (Linnaeus, 1758) (Currant Root Aphid) (Figs. 3c and 31) is heteroecious and holocyclic, overwintering as eggs on *Ulmus*. The eggs hatch in the spring and the fundatrices form galls on elm. Alatae migrate, after the beginning of June, to gooseberries where aphids may seriously check growth, and also to red and black currants. The alatae larviposit on the soil near the base of stems, and the larvae work their way through the soil to infest the roots. Alatae develop on gooseberry late in the autumn and migrate back to *Ulmus* where eggs are laid. The numbers of aphids migrating in the autumn and spring may indicate subsequent infestation of gooseberries.

The autumn migration reflects the distribution of soft fruit, but the decline of elm in the south seems to be reflected in the annual totals in the samples (Table 2cc) and may change the pattern progressively northward in the future.

91, *Drepanosiphum platanoidis* (Schrank, 1801) (Sycamore Aphid) (Figs. 3d and 32) is holocyclic and autoecious on sycamore, *Acer pseudoplatanus*. During the summer all adults are alate and active. There is a migration of the aphid in spring and early summer which is larger in the north of England and Scotland than in the south. This species is of no known agricultural importance. Much work has been done on the population dynamics of this species in the field and laboratory (Dixon, 1979). However, the distribution of the migrations in the two halves of the year differ more regionally than might be expected from what is known and suggest some overriding factor not yet evident.

397, *Metopolophium festucae* (Theobald, 1917) (Fescue Aphid) (Figs. 4b and 32) is autoecious on grasses, especially meadow grasses where the life cycle is anholocyclic except in the extreme north where it may be holocyclic. Alatae are produced from May to July which migrate to other grasses and cereals. This species may stunt winter oats if attacked early but is not usually a pest of cereals; heavy infestations may develop on grass seed crops particularly in the Midlands.

Distribution is widespread and undistinguished in either part of the year.

112, *Rhopalosiphum maidis* (Fitch, 1856) (Cereal Leaf Aphid) (Figs. 6d and 33) is anholocyclic feeding on leaf blades of grasses, and occasionally occurs on barley and maize in the summer in Britain. The trap samples indicate a small summer migration which may originate in cultivated cereals, particularly as it is concentrated in eastern Britain, but it occurs sporadically over the whole country.

376, *Aulacorthum solani* (Kaltenbach, 1843) (Glasshouse/Potato Aphid) (Figs. 4d and 33) is almost entirely anholocyclic in Britain occurring on a wide variety of plants particularly

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Digitalis. When sexual forms and eggs occur, they are found on many different plant species. It is a pest of potatoes but seldom occurs in sufficiently large numbers to cause direct feeding damage. However, it transmits more than 30 plant viruses including potato leaf roll and potato virus Y, though less efficiently than *Myzus persicae*.

The few *A. solani* found in trap samples probably give little indication of potential damage to potatoes. The overwintering survival and the time that aphids move to potatoes is of greater importance. The number of *A. solani* in trap samples together with their efficiency of transmission are incorporated in an index indicating potential risk of virus spread in potato seed crops (van Harten, 1981).

Its distribution is indeterminate.

234, *Dysaphis* (*S. Pomaphis*) *plantaginea* (Passerini, 1860) (Rosy Apple Aphid) (Figs. 5d and 34) is heteroecious and holocyclic spending the winter in the egg stage on apple, pear, hawthorn and *Sorbus* species. Eggs hatch from mid-March to early April, the subsequent aphid populations cause the most serious aphid damage to apples, severe leaf curling. Alatae on the primary host are produced in July which migrate mainly to plantain but also to umbellifers and docks. However, the suction-trap samples indicate that migration begins about a month earlier. Some aphids may remain on apples until August, or even for the whole year. The return migration to apple in the autumn begins at the end of August, but most are found in the trap samples in the last half of September and the first half of October. Trap samples in the autumn indicate the levels of infestation expected the following spring.

During both primary and return migration this species remains mainly in the southern half of the island.

78, *Phyllaphis fagi* (Linnaeus, 1767) (Beech Aphid) (Figs. 5c and 34) is autoecious on beech. There is a redistribution of alatae from May to July, and another migration in the autumn which comprises sexuparae.

The summer migration is consistently larger than the autumn migration. Distribution is quite uniform in the autumn migration.

290, *Elatobium abietinum* (Walker, 1849) (Green Spruce Aphid) (Figs. 3a and 35) is autoecious on *Picea* species, particularly *P. sitchensis* on which it is a pest. In Britain it is almost exclusively anholocyclic; sexual forms or eggs only having been recorded on rare occasions. Alatae develop during the spring and early summer in response to the changing nutritional status of the host plant. They migrate from late April to the end of July to other spruce trees where they aestivate until the plants are again in a favourable condition.

The duration of the migration increases from south to north and its median date is associated with temperature (Carter & Cole, 1977). The size of the migration, together with the severity of winter weather, indicates the levels of damage expected the following year. There is a pronounced longitudinal graduation in distribution, with a maximum in the west, in contrast to the arable aphids.

318, *Myzus* (*S. Nectarosiphon*) *ascalonicus* Doncaster, 1946 (Shallot Aphid) (Figs. 3b and 35) lives anholocyclically on a wide variety of host plants and it may be a pest on a number of crops including strawberries, onions, shallots, lettuce and cabbage. Little seems to be known of its biology but it develops large populations at low temperatures. It is often one of the first aphids found in trap samples in the spring when redistribution flights begin and continues to migrate until mid-July. There is also a small autumn migration. The distribution reflects that of arable crops.

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315, *Myzus ornatus* Laing, 1932 (Violet Aphid) (Figs. 9b and 35) is anholocyclic on a wide variety of plants. Alatae develop in the spring and migrate from May to July to potatoes and other plants. Large infestations may develop on old and damaged leaves of potatoes in late August and September. A few alatae may be produced on potatoes, but few are found in the suction-trap samples throughout the year. In the laboratory *M. ornatus* has been shown to transmit a number of plant viruses including sugar beet yellows and potato leaf roll.

Occurs mainly in the south.

319, *Myzus* (*S. Nectarosiphon*) *certus* (Walker, 1849) (Violet/Dianthus Aphid) (Figs. 4c and 35) is difficult to separate taxonomically from *M. persicae* and little is known of its life history. It is most likely to be found on chickweed and violets. Few are found in the suction-trap samples, but most are found between mid-May and the end of July, and mainly in the midlands and central southern England.

1506, *Pemphigus* (*Prociphilines*) (Poplar-root Aphids) (Fig. 9a) includes a number of species which are difficult to separate taxonomically, including *P. bursarius* which is a root pest of out-door lettuces, and *P. phenax* which is occasionally a pest of carrots. Eggs are laid on poplar in autumn and hatch in March and April when the buds break. The aphids form galls on poplar in which the alatae develop in June. *P. bursarius* migrates to lettuces in July where it infests the roots. Sexuparae, which develop at the end of August, migrate back to poplar in late summer and autumn. Some aphids spend the winter anholocyclically on the roots of lettuce or even in the soil where they will colonise lettuce planted in the same soil the following year. It is difficult to give information concerning a single *Pemphigus* species from the suction-trap samples until the proportion of each species in the sample is known.

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Table 2 starts on page 39

Figures start on page 102

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TABLE 1

Annual total sample for aphid species that occurred five or less times at 12·2 m, at any of the 16 sites listed in Table 2 during 1975–80 (excluding sites 904 and 911)

24 *Maculolachnus submacula* (Walker, 1848)
1978, 919 (2); 1979, 908 (1); 1980, 924 (1).

31 *Neotrama caudata* (Del Guercio, 1909)
1975, 901 (1).

33 *Trama rara* Mordvilko, 1908
1979, 923 (1).

48 *Chaitophorus tremulae* Koch, C. L., 1854
1976, 908 (1); 1977, 908 (1); 1979, 919 (1); 1980, 906 (2).

52 *Sipha kurdjumovi* Mordvilko, 1921
1976, 903 (2); 1980, 908 (2).

60 *Callaphis juglandis* (Goeze, 1778)
1978, 917 (1).

61 *Chromaphis juglandicola* (Kaltenbach, 1843)
1975, 924 (1); 1976, 903 (1); 1980, 901 (1).

65 *Myzocallis boerneri* Stroyan, 1957
1977, 912 (7); 1980, 912 (7).

71 *Tinocallis platani* (Kaltenbach, 1843)
1976, 910 (1); 1976, 913 (4); 1977, 913 (3); 1979, 913 (4).

73 *Takecallis arundinariae* (Essig, 1917)
1975, 903 (1); 1977, 908 (2); 1977, 913 (1); 1980, 913 (3); 1980, 917 (2).

86 *Symydobius oblongus* (von Heyden, C. H. G., 1837)
1979, 903 (2).

89 *Drepanosiphum acerinum* (Walker, 1848)
1975, 914 (1); 1977, 917 (2); 1978, 917 (1); 1978, 924 (1); 1979, 917 (2).

93 *Therioaphis ononidis* (Kaltenbach, 1843)
1978, 914 (1).

731 *Therioaphis riehmi* (Börner, C., 1949)
1979, 919 (2); 1980, 919 (2).

96 *Allaphis thripsoides* (Hille Ris Lambers, 1939)
1976, 919 (1); 1979, 919 (2).

107 *Plocamaphis bituberculata* (Theobald, 1912)
1976, 917 (2).

750 *Rhopalosiphum pilipes* Ossiannilsson, 1959
1976, 917 (2); 1978, 903 (1); 1979, 903 (2); 1979, 908 (1).

115 *Euschizaphis palustris* (Theobald, 1929)
1975, 923 (2); 1976, 916 (2).

116 *Schizaphis graminum* (Rondani, 1847)
1975, 923 (1); 1978, 910 (1).

154 *Aphis ruborum* (Börner, C., 1931)
1978, 910 (1).

155 *Aphis schneideri* (Börner, C., 1940)
1978, 914 (1).

163 *Aphis craccivora* Koch, C. L., 1854
1979, 901 (1); 1979, 903 (2); 1979, 908 (3); 1979, 924 (1); 1980, 924 (2).

196 *Aphis tormentillae* Passerini, 1879
1979, 912 (1).

204 *Aphis taraxacicola* (Börner, C., 1940)
1978, 923 (1).

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208 *Toxoptera aurantii* (Boyer de Fonscolombe, 1841)
1975, 908 (1); 1976, 908 (1); 1976, 910 (1); 1980, 910 (1).

244 *Brachycaudus jacobi* Stroyan, 1957
1976, 914 (1); 1978, 919 (1); 1978, 924 (1),

747 *Brachycaudus populi* (Del Guercio, 1911)
1977, 922 (1); 1979, 919 (2).

254 *Thuleaphis sedi* (Jacob, 1964)
1975, 907 (1); 1976, 919 (1); 1976, 924 (2).

255 *Brachycolus cerastii* (Kaltenbach, 1846)
1976, 908 (1); 1976, 910 (1).

262 *Hayhurstia cucubali* (Passerini, 1863)
1980, 910 (1).

274 *Decorosiphon corynothrix* Börner, C., 1939
1976, 908 (2); 1976, 923 (1); 1979, 923 (1); 1980, 910 (1); 1980, 924 (2).

278 *Coloradoa achilleae* Hille Ris Lambers, 1939
1976, 924 (2); 1977, 901 (2).

280 *Coloradoa rufomaculata* (Wilson, 1908)
1976, 901 (2); 1976, 905 (1); 1977, 914 (1); 1977, 922 (1); 1979, 919 (1).

748 *Coloradoa inodorella* Ossiannilsson, 1959
1978, 908 (1); 1978, 923 (1); 1979, 906 (1).

284 *Ericaphis ericae* (Börner, C., 1933)
1975, 908 (1); 1975, 913 (2); 1976, 912 (1); 1976, 916 (2); 1977, 906 (1)

288 *Chaetosiphon S. Pentatrichopus potentillae* (Walker, 1850)
1977, 917 (2); 1977, 924 (1); 1979, 922 (2).

304 *Ovatus mentharius* (van der Goot, 1913)
1976, 910 (1); 1978, 914 (1).

305 *Ovatus S. Ovatoides inulae* (Walker, 1849)
1975, 910 (1); 1978, 908 (1)

321 *Myzus S. Nectarosiphon myosotidis* (Börner, C., 1950)
1977, 919 (1).

341 *Capitophorus carduinus* (Walker, 1850)
1978, 922 (1); 1980, 907 (1).

349 *Pleotrichophorus duponti* Hille Ris Lambers, 1935
1978, 924 (1).

356 *Nasonovia S. Neokakimia dasyphylli* Stroyan, 1957
1976, 908 (1).

364 *Myzotoxoptera wimshurstae* Theobald, 1927
1975, 906 (1).

370 *Rhopalosiphoninus S. Submegoura heikinheimoi* (Börner, C., 1952)
1975, 901 (1); 1979, 908 (1); 1980, 908 (2).

375 *Aulacorthum rufum* Hille Ris Lambers, 1947
1975, 908 (1); 1975, 922 (1); 1977, 901 (1); 1977, 924 (1).

394 *Subacyrthosiphon cryptobius* Hille Ris Lambers, 1947
1977, 903 (2); 1977, 907 (1); 1977, 919 (1); 1979, 908 (1); 1979, 924 (1).

405 *Anthracosiphon hertae* Hille Ris Lambers, 1947
1975, 912 (1); 1976, 914 (1); 1978, 923 (1).

408 *Macrosiphum cholodkovskyi* Mordvilko, 1909
1978, 907 (1).

426 *Dactynotus achilleae* (Koch, C. L., 1855)
1980, 912 (1).

449 *Dactynotus S. Uromelan taraxaci* (Kaltenbach, 1843)
1979, 912 (5); 1980, 912 (8).

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455 *Macrosiphoniella pulvera* (Walker, 1848)
1978, 901 (1).

459 *Macrosiphoniella usquertensis* Hille Ris Lambers, 1935
1979, 908 (4).

464 *Macrosiphoniella S. Asterobium asteris* (Walker, 1849)
1976, 903 (1); 1978, 907 (1); 1978, 914 (1).

475 *Masonaphis S. Ericobium goldamaryae* (Knowlton, 1938)
1975, 913 (1); 1975, 917 (2); 1977, 908 (2); 1980, 903 (2).

476 *Masonaphis S. Ericobium morrisoni* (Swain, 1918)
1975, 908 (1); 1975, 910 (1); 1976, 922 (1); 1978, 924 (1); 1979, 908 (2).

479 *Wahlgreniella vaccinii* (Theobald, 1924)
1975, 919 (2); 1978, 912 (1).

483 *Anoecia vagans* (Koch, C. L., 1856)
1976, 903 (1); 1978, 914 (1); 1978, 924 (1).

487 *Glyphina betulae* (Linnaeus, 1758)
1975, 908 (1).

507 *Prociphilus fraxini* (Geoffroy, 1762)
1975, 903 (1); 1975, 916 (6); 1976, 908 (4); 1976, 919 (1).

526 *Smynthurodes betae* Westwood, 1849
1975, 914 (1); 1977, 910 (2); 1977, 913 (2); 1977, 914 (2).

532 *Geoica setulosa* (Passerini, 1860)
1976, 901 (2); 1976, 908 (2); 1976, 914 (4); 1978, 903 (1).

533 *Geoica eragrostidis* (Passerini, 1860)
1975, 908 (2); 1975, 914 (3); 1976, 908 (1); 1977, 901 (1).

727 *Melanaphis pyraria* (Passerini, 1861)
1978, 901 (1); 1978, 914 (1); 1979, 914 (2).

728 *Semiaphis dauci* (Fabricius, 1775)
1975, 910 (3); 1978, 910 (1); 1979, 910 (1); 1980, 901 (2).

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TABLE 2

Annual total sample for aphid species that occurred on more than five occasions at 12·2 m, at any of 18 sites during 1975–80. Zero catches are recorded 0; dashes indicate no record.

see pages 40–101.

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
4	*Schizolachnus pineti*									
	1975	2	1	0	0	0	1	0	2	0
	1976	17	11	5	1	0	0	4	8	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	1
	1979	3	0	0	0	0	0	0	4	8
	1980	108	3	2	0	0	16	11	32	1
23	*Tuberolachnus salignus*									
	1975	0	0	0	0	0	0	0	1	0
	1976	0	0	1	0	0	0	2	8	0
	1977	0	0	0	1	1	1	0	0	0
	1978	0	0	0	0	1	0	0	0	0
	1979	0	0	0	0	1	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
28	*Protrama flavescens*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	1	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
30	*Protrama ranunculi*									
	1975	0	0	0	0	0	0	0	2	0
	1976	0	0	0	0	0	0	0	1	1
	1977	0	0	0	0	0	0	0	2	0
	1978	0	0	0	1	0	0	0	2	0
	1979	0	0	0	0	0	0	1	1	0
	1980	0	1	0	1	0	0	6	2	0
34	*Trama troglodytes*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	1	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
35	*Periphyllus acericola*									
	1975	0	1	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	1	0	0
	1977	0	0	0	0	0	0	1	0	0
	1978	0	3	1	0	0	0	2	0	0
	1979	0	0	5	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0

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2(a)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Rosewarne 910	
									4 *Schizolachnus pineti*
—	0	3	6	10	28	8	1	0	1975
—	2	8	16	5	54	17	2	0	1976
—	0	0	0	0	0	0	0	0	1977
—	0	0	0	0	0	0	0	0	1978
—	4	2	0	0	7	2	0	0	1979
—	12	23	15	4	173	31	4	0	1980
									23 *Tuberolachnus salignus*
0	0	0	0	0	1	0	0	0	1975
0	0	5	2	5	1	40	0	0	1976
2	1	0	0	1	0	1	0	0	1977
0	0	0	1	0	0	2	0	1	1978
0	0	1	0	0	1	2	0	0	1979
1	2	0	2	3	1	2	0	0	1980
									28 *Protrama flavescens*
—	1	0	0	1	1	0	0	0	1975
—	0	0	0	1	0	0	0	0	1976
—	0	2	0	0	1	0	0	0	1977
—	1	0	0	0	0	0	3	0	1978
—	0	2	0	0	4	0	0	0	1979
—	0	0	0	0	0	0	0	0	1980
									30 *Protrama ranunculi*
—	0	1	0	7	3	2	2	1	1975
—	4	2	3	3	2	2	0	0	1976
—	0	2	1	6	2	1	0	1	1977
—	0	1	1	1	1	2	0	1	1978
—	0	5	0	5	5	2	5	2	1979
—	2	4	4	6	4	0	1	1	1980
									34 *Trama troglodytes*
0	0	0	0	0	0	0	0	0	1975
0	0	0	0	2	2	0	0	0	1976
0	0	0	0	1	0	0	0	0	1977
0	0	0	0	0	0	1	0	0	1978
1	0	0	0	0	1	0	0	0	1979
2	0	0	0	0	2	0	0	0	1980
									35 *Periphyllus acericola*
—	0	0	0	0	1	0	0	0	1975
—	0	1	1	0	21	2	0	0	1976
—	0	65	1	0	0	2	1	0	1977
—	0	1	1	0	23	1	1	0	1978
—	0	0	0	0	0	0	0	0	1979
—	0	0	0	0	4	0	1	0	1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
36	*Periphyllus xanthomelas*									
	1975	1	0	0	0	0	0	0	0	0
	1976	0	0	1	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	1	0	0	0	0	0
38	*Periphyllus hirticornis*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	1	0	0	0
	1977	0	0	0	1	0	0	0	7	0
	1978	0	0	0	0	0	0	1	3	1
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
39	*Periphyllus lyropictus*									
	1975	0	0	0	0	0	0	3	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	1	0	1	1	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
41	*Periphyllus testudinatus*									
	1975	3	4	7	0	0	0	15	3	1
	1976	2	8	24	5	1	6	16	21	39
	1977	0	0	5	1	2	3	3	17	1
	1978	1	10	34	11	0	5	5	34	14
	1979	2	12	7	5	0	7	3	127	6
	1980	7	12	131	14	7	46	27	35	7
42	*Chaitophorus beuthani*									
	1975	0	0	0	0	0	0	2	0	0
	1976	0	0	1	0	0	3	4	0	0
	1977	0	0	0	0	0	0	1	2	0
	1978	0	0	0	0	0	0	2	7	0
	1979	0	1	0	0	0	0	1	14	0
	1980	0	0	0	0	0	0	1	2	0
43	*Chaitophorus capreae*									
	1975	0	1	0	1	0	0	2	0	0
	1976	0	2	0	0	0	0	0	0	1
	1977	0	0	0	0	0	0	0	2	0
	1978	0	0	0	0	0	0	0	1	0
	1979	0	0	0	0	0	0	0	2	0
	1980	0	0	0	0	0	0	1	0	0

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2(b)

Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne	
904	917	901	924	914	908	903	913	910	
									36 *Periphyllus xanthomelas*
—	0	0	0	0	0	0	0	0	1975
—	0	0	0	0	5	0	0	0	1976
—	0	0	1	0	6	0	0	0	1977
—	0	0	0	0	0	0	1	0	1978
—	0	0	1	0	5	0	1	0	1979
—	0	0	0	0	1	0	0	1	1980
									38 *Periphyllus hirticornis*
—	0	0	0	0	0	0	0	0	1975
—	0	1	1	0	13	5	0	0	1976
—	11	7	8	2	3	11	0	0	1977
—	2	1	2	2	2	2	0	0	1978
—	2	0	0	0	2	0	0	0	1979
—	0	0	1	2	0	2	0	0	1980
									39 *Periphyllus lyropictus*
—	0	0	2	0	0	0	0	0	1975
—	0	0	4	0	0	0	0	0	1976
—	0	0	0	0	6	0	0	0	1977
—	0	0	0	0	0	1	0	0	1978
—	0	0	0	0	0	0	0	0	1979
—	0	0	0	0	2	2	0	0	1980
									41 *Periphyllus testudinatus*
1	23	0	0	1	1	2	0	0	1975
66	748	52	49	147	27	82	0	0	1976
34	112	30	69	12	16	24	2	0	1977
37	290	43	49	41	30	94	8	2	1978
60	1003	145	193	62	109	35	10	0	1979
114	273	141	227	61	5	116	4	2	1980
									42 *Chaitophorus beuthani*
—	0	0	0	0	0	1	0	1	1975
—	0	0	0	0	0	0	0	0	1976
—	3	6	0	0	9	6	0	0	1977
—	2	2	4	0	3	2	0	0	1978
—	2	0	2	0	5	0	0	1	1979
—	0	0	0	0	0	4	0	1	1980
									43 *Chaitophorus capreae*
—	0	0	0	0	0	0	1	4	1975
—	8	0	0	0	0	2	0	4	1976
—	2	0	2	0	0	0	1	2	1977
—	2	0	0	0	0	2	0	0	1978
—	1	0	4	0	0	0	0	0	1979
—	0	0	0	0	0	0	0	1	1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
45	*Chaitophorus populeti*									
	1975	0	0	0	0	0	0	0	1	0
	1976	1	0	0	0	1	2	0	6	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	1	0	0	3	2	0
	1979	0	0	0	0	0	0	0	23	0
	1980	2	0	0	0	0	0	0	3	1
46	*Chaitophorus populialbae*									
	1975	0	1	1	2	0	0	1	2	0
	1976	0	0	0	0	0	3	0	0	0
	1977	0	0	0	0	0	0	1	7	0
	1978	2	0	0	1	0	1	6	11	0
	1979	0	0	0	0	0	4	2	17	0
	1980	0	0	0	0	0	0	5	12	0
47	*Chaitophorus salicti*									
	1975	0	3	1	2	0	0	0	0	0
	1976	0	2	2	2	0	0	0	0	0
	1977	0	0	0	0	0	0	2	9	0
	1978	0	2	0	2	0	0	4	0	0
	1979	0	0	0	0	0	0	5	8	0
	1980	0	2	0	0	0	1	2	9	0
49	*Chaitophorus truncatus*									
	1975	0	0	0	0	0	0	1	0	0
	1976	0	0	0	0	0	4	0	0	0
	1977	0	0	0	0	0	0	0	1	0
	1978	0	0	0	0	0	0	1	11	0
	1979	0	0	0	0	0	0	0	6	0
	1980	0	0	0	0	0	0	0	2	0
50	*Chaitophorus versicolor*									
	1975	0	0	0	0	0	0	1	1	0
	1976	0	0	0	2	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	1	1	0
	1979	0	0	0	0	0	0	1	16	0
	1980	0	0	0	0	0	0	0	0	0
742	*Chaitophorus leucomelas*									
	1975	0	0	2	0	0	0	0	2	0
	1976	0	0	0	0	0	0	4	0	0
	1977	0	0	0	0	0	0	1	1	0
	1978	2	0	0	1	0	0	1	3	0
	1979	0	0	0	1	0	0	10	30	0
	1980	2	2	0	0	0	1	0	1	0

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2(c)

	Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne	
	904	917	901	924	914	908	903	913	910	
45										*Chaitophorus populeti*
	—	0	0	0	0	0	0	0	0	1975
	—	4	8	10	0	64	9	2	0	1976
	—	2	2	18	0	13	8	0	0	1977
	—	4	2	1	4	2	4	0	0	1978
	—	8	3	24	0	76	0	1	0	1979
	—	2	2	2	12	3	1	0	0	1980
46										*Chaitophorus populialbae*
	—	2	0	0	0	1	1	0	0	1975
	—	0	2	0	0	4	1	0	0	1976
	—	2	6	1	1	7	18	1	1	1977
	—	3	4	8	0	11	8	0	6	1978
	—	5	3	4	0	17	15	0	5	1979
	—	0	0	2	0	1	6	0	2	1980
47										*Chaitophorus salicti*
	—	0	0	0	0	0	1	0	0	1975
	—	0	0	9	0	4	2	0	0	1976
	—	3	2	4	0	3	11	0	0	1977
	—	1	0	2	1	0	2	0	0	1978
	—	4	0	3	0	5	6	6	0	1979
	—	0	0	0	0	4	2	1	0	1980
49										*Chaitophorus truncatus*
	—	0	0	0	0	0	0	0	1	1975
	—	0	0	2	0	0	0	0	0	1976
	—	0	0	0	1	2	0	0	0	1977
	—	2	0	0	0	0	1	0	0	1978
	—	0	1	4	0	0	4	0	0	1979
	—	0	0	0	2	0	0	0	0	1980
50										*Chaitophorus versicolor*
	—	0	2	0	0	0	0	0	0	1975
	—	0	1	0	0	0	4	0	0	1976
	—	0	0	1	1	0	1	0	0	1977
	—	0	0	0	0	4	2	0	0	1978
	—	0	4	0	2	3	0	0	0	1979
	—	0	0	0	0	2	0	0	0	1980
742										*Chaitophorus leucomelas*
	—	0	0	0	0	0	0	0	0	1975
	—	0	0	1	0	6	0	0	0	1976
	—	3	3	10	6	4	8	0	0	1977
	—	0	1	0	0	1	5	0	0	1978
	—	14	0	3	2	17	2	5	0	1979
	—	0	0	2	0	4	2	1	0	1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
51	*Sipha glyceriae*									
	1975	9	1	0	4	1	4	59	28	1
	1976	2	2	0	2	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	1	0	0
	1979	5	1	0	1	7	0	22	14	2
	1980	18	1	0	0	3	1	111	14	3
59	*Atheroides serrulatus*									
	1975	0	0	0	0	0	0	0	0	0
	1976	2	0	0	1	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	1	1	0	0	0	0	0	0
	1979	0	0	9	0	0	0	0	0	0
	1980	0	0	2	0	0	0	0	2	0
63	*Myzocallis castanicola*									
	1975	0	6	2	3	0	0	2	0	6
	1976	0	3	0	0	0	4	6	10	20
	1977	0	0	0	0	2	0	0	2	6
	1978	0	20	0	1	0	1	7	3	4
	1979	0	2	0	0	1	0	0	4	28
	1980	0	5	0	0	0	0	0	0	11
64	*Myzocallis coryli*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	1	0	4	9	6	0
	1977	0	0	0	3	0	0	0	5	0
	1978	0	0	0	0	1	2	4	1	0
	1979	0	0	0	3	3	7	1	10	36
	1980	0	0	0	1	0	1	0	0	5
68	*Tuberculoides annulatus*									
	1975	16	275	71	26	18	10	26	98	62
	1976	51	172	139	123	190	208	569	694	443
	1977	5	26	5	12	19	9	70	282	2
	1978	9	509	4	17	206	111	310	274	131
	1979	15	43	0	24	56	25	85	393	117
	1980	83	79	0	3	13	28	65	122	88
758	*Tuberculoides borealis*									
	1975	—	—	—	—	—	—	—	—	—
	1976	—	—	—	—		—	—	—	—
	1977	8	24	36	16	22	0	84	106	0
	1978	22	217	7	13	195	63	457	107	0
	1979	9	34	0	16	33	19	91	215	0
	1980	132	121	0	2	35	17	75	84	0

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2(d)

	Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne	
	904	917	901	924	914	908	903	913	910	
51										*Sipha glyceriae*
	0	10	1	2	13	5	0	9	43	1975
	0	0	0	0	0	0	1	0	0	1976
	0	0	0	0	3	0	0	0	0	1977
	0	1	0	3	1	3	0	0	0	1978
	1	6	0	2	9	4	4	2	0	1979
	0	0	0	0	27	1	2	2	1	1980
59										*Atheroides serrulatus*
	—	0	0	0	0	0	0	0	0	1975
	—	4	2	0	0	0	0	2	0	1976
	—	0	0	0	0	0	0	0	1	1977
	—	0	1	0	1	1	0	1	0	1978
	—	0	0	1	2	0	0	0	0	1979
	—	4	6	0	0	0	2	1	0	1980
63										*Myzocallis castanicola*
	1	0	0	0	0	3	5	1	8	1975
	4	22	24	86	8	156	319	26	35	1976
	5	12	3	4	0	61	13	57	7	1977
	11	18	5	29	0	16	453	33	70	1978
	16	24	15	87	11	467	487	100	6	1979
	20	0	1	29	2	43	40	13	32	1980
64										*Myzocallis coryli*
	5	6	2	5	2	1	5	2	1	1975
	2	41	19	73	55	13	147	5	9	1976
	5	324	67	327	19	29	120	5	6	1977
	4	40	31	27	35	11	143	3	2	1978
	4	56	22	33	50	15	33	12	0	1979
	1	8	20	4	16	2	22	2	4	1980
68										*Tuberculoides annulatus*
	375	112	229	293	43	207	222	46	11	1975
	361	1493	885	2567	306	1215	1152	231	71	1976
	569	3489	806	1795	155	1480	200	272	11	1977
	1132	757	1267	1042	80	205	799	106	24	1978
	1207	864	460	2080	126	2833	761	259	6	1979
	203	252	293	239	60	215	363	68	8	1980
758										*Tuberculoides borealis*
	—	—	—	—	—	—	—	—	—	1975
	—	—	—	—	—	—	—	—	—	1976
	—	5047	199	1015	97	527	68	76	3	1977
	—	279	313	444	50	104	278	31	13	1978
	—	493	147	648	80	1520	432	126	2	1979
	—	159	185	245	48	176	374	49	7	1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
759	*Tuberculoides neglectus*									
	1975	—	—	—	—	—	—	—	—	—
	1976	—	—	—	—	—	—	—	—	—
	1977	0	0	27	0	0	0	0	1	39
	1978	0	0	1	0	0	0	1	0	1
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
69	*Tuberculatus querceus*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	1	2	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	2	1
	1980	0	0	0	0	0	0	0	0	0
70	*Eucallipterus tiliae*									
	1975	1	13	6	0	0	0	0	0	0
	1976	1	2	0	0	1	2	22	10	0
	1977	0	0	1	0	3	0	4	22	0
	1978	0	3	1	0	1	1	5	4	0
	1979	0	0	0	0	0	1	0	152	0
	1980	0	2	7	0	0	0	2	4	0
72	*Takecallis arundicolens*									
	1975	0	0	0	0	0	0	2	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	2
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
75	*Pterocallis alni*									
	1975	37	17	8	3	1	4	47	3	0
	1976	2	1	1	4	4	1	56	2	0
	1977	1	1	0	1	1	0	6	14	0
	1978	6	0	2	0	12	7	70	17	0
	1979	1	0	0	2	2	0	22	4	2
	1980	0	5	0	0	0	0	14	0	1
78	*Phyllaphis fagi*									
	1975	32	326	185	101	10	29	13	0	2
	1976	40	41	17	12	195	42	34	47	43
	1977	6	15	41	17	8	0	7	10	3
	1978	13	59	22	4	8	15	42	30	5
	1979	20	23	16	4	12	17	7	27	2
	1980	173	269	1258	85	38	23	35	6	4

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SYNOPTIC MONITORING FOR MIGRANT INSECT PESTS. III

2(e)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Rosewarne 910		
									759	*Tuberculoides neglectus*
—	—	—	—	—	—	—	—	—		1975
—	—	—	—	—	—	—	—	—		1976
—	8	1	11	0	0	2	1	0		1977
—	0	0	1	0	0	0	0	0		1978
—	0	0	0	0	0	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									69	*Tuberculatus querceus*
0	0	1	2	2	0	0	0	0		1975
0	0	0	0	0	0	0	0	0		1976
0	1	2	2	0	2	0	0	0		1977
0	0	2	0	0	0	2	0	0		1978
0	0	0	0	0	11	4	0	0		1979
0	0	0	0	0	8	0	0	0		1980
									70	*Eucallipterus tiliae*
4	0	31	17	4	14	5	1	0		1975
0	0	16	22	14	23	0	4	1		1976
1	20	107	35	7	26	7	1	0		1977
1	0	9	9	1	7	9	0	0		1978
78	0	11	25	0	62	4	1	0		1979
1	0	20	18	0	6	8	0	2		1980
									72	*Takecallis arundicolens*
—	0	1	6	0	0	1	6	10		1975
—	0	0	0	2	8	0	0	8		1976
—	0	0	14	1	1	0	3	5		1977
—	0	0	3	0	1	1	0	5		1978
—	0	0	0	0	0	0	0	0		1979
—	0	0	2	0	18	0	0	6		1980
									75	*Pterocallis alni*
—	5	0	3	0	3	14	8	2		1975
—	43	6	11	18	30	335	2	15		1976
—	205	10	41	7	33	149	1	1		1977
—	28	0	4	3	2	681	11	3		1978
—	52	0	6	10	22	338	17	0		1979
—	24	0	0	2	4	122	1	5		1980
									78	*Phyllaphis fagi*
4	2	2	0	11	8	4	2	3		1975
100	40	107	35	81	723	43	10	2		1976
16	6	29	10	4	28	62	5	0		1977
10	11	9	7	12	11	12	12	4		1978
22	6	19	30	9	188	25	15	0		1979
39	1	15	12	15	55	71	3	0		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
79	*Callipterinella calliptera*									
	1975	0	0	1	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
80	*Callipterinella minutissima*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	1	3	1	0
	1979	0	0	0	0	0	0	0	2	0
	1980	0	0	0	0	0	0	0	0	0
82	*Kallistaphis basalis*									
	1975	0	9	10	6	5	0	13	4	0
	1976	1	0	2	1	24	11	28	2	1
	1977	4	2	0	3	0	0	9	1	0
	1978	0	0	0	2	2	0	21	0	0
	1979	0	8	1	7	2	0	1	4	0
	1980	16	16	0	6	5	3	6	0	0
83	*Kallistaphis betulicola*									
	1975	2	1	0	0	0	0	0	0	0
	1976	2	0	0	2	20	2	0	0	0
	1977	1	0	0	1	0	0	0	1	0
	1978	0	10	0	1	0	0	0	0	0
	1979	0	0	0	0	2	2	0	2	0
	1980	0	1	0	0	0	0	0	0	0
84	*Betulaphis quadrituberculata*									
	1975	1	11	34	7	0	1	33	0	0
	1976	0	0	0	3	4	0	20	0	2
	1977	0	2	5	1	0	0	8	3	1
	1978	5	36	6	3	1	2	26	6	0
	1979	4	24	6	9	2	3	10	36	4
	1980	143	125	112	19	79	8	32	12	0
87	*Clethrobius comes*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	1	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	2	0	0	2	0	0	4	0

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2(f)

904 Broom's Barn	917 Hereford	901 Rothamsted	924 Writtle	914 Long Ashton	908 Silwood Park	903 Wye, Kent	913 Starcross	910 Rosewarne	
									79 *Callipterinella calliptera*
—	0	0	0	0	2	0	0	0	1975
—	0	1	0	0	10	0	0	0	1976
—	0	1	0	0	2	2	0	0	1977
—	0	0	0	0	0	1	0	0	1978
—	0	0	0	0	0	0	1	0	1979
—	0	0	0	0	4	0	0	0	1980
									80 *Callipterinella minutissima*
—	0	0	0	0	1	0	0	0	1975
—	0	0	1	0	1	0	0	0	1976
—	0	0	1	0	0	0	0	0	1977
—	0	1	0	4	1	3	0	0	1978
—	0	1	1	0	0	0	0	0	1979
—	0	3	0	0	0	0	0	0	1980
									82 *Kallistaphis basalis*
0	0	0	0	1	0	5	2	6	1975
0	15	4	6	0	35	45	0	2	1976
1	0	5	15	2	19	7	9	0	1977
0	0	1	3	2	5	24	2	13	1978
0	6	4	4	2	11	68	8	0	1979
1	0	0	2	0	6	12	4	9	1980
									83 *Kallistaphis betulicola*
0	0	0	0	0	1	1	1	0	1975
0	0	0	4	0	4	17	0	0	1976
0	1	0	2	0	6	1	0	0	1977
1	0	1	0	0	2	2	0	0	1978
0	0	0	0	0	9	43	2	0	1979
2	0	0	0	0	2	0	0	0	1980
									84 *Betulaphis quadrituberculata*
0	0	0	0	1	0	7	0	0	1975
4	12	0	0	4	8	5	0	0	1976
0	4	7	16	1	0	36	1	0	1977
44	11	2	4	5	1	49	0	0	1978
46	14	11	22	13	29	58	11	0	1979
0	1	0	7	2	3	15	2	0	1980
									87 *Clethrobius comes*
0	0	0	0	0	0	0	0	0	1975
0	0	0	0	0	0	0	0	0	1976
0	0	0	0	0	0	0	0	0	1977
0	0	0	0	0	0	0	0	0	1978
0	0	2	0	0	5	0	0	0	1979
0	0	0	0	0	6	0	0	0	1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
88	*Euceraphis punctipennis*									
	1975	65	107	21	16	14	1	35	8	17
	1976	16	20	14	15	69	19	29	69	55
	1977	71	50	38	21	39	26	19	37	17
	1978	277	77	29	14	98	50	173	124	37
	1979	12	52	46	18	38	20	11	143	29
	1980	422	288	230	138	219	123	90	175	26
90	*Drepanosiphum aceris*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
91	*Drepanosiphum platanoidis*									
	1975	261	458	1056	69	142	124	747	816	127
	1976	441	1646	3650	213	2527	1244	3566	2633	2631
	1977	163	543	315	117	219	275	1382	442	41
	1978	418	4136	5961	552	160	282	1414	320	747
	1979	328	434	672	330	318	1066	1248	2178	366
	1980	1101	2391	9000	543	2185	4128	3126	1839	1742
754	*Drepanosiphum dixon.*									
	1975	0	0	0	0	0	0	0	2	—
	1976	0	0	0	0	0	0	0	0	—
	1977	0	0	0	0	0	0	0	0	—
	1978	0	0	0	0	0	0	0	1	—
	1979	0	0	0	0	0	0	0	0	—
	1980	0	0	0	0	0	0	0	0	—
92	*Therioaphis luteola*									
	1975	0	0	0	0	0	0	0	2	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	1	0	0	0	0	0	1	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	2	0
	1980	0	0	0	0	0	0	0	0	0
95	*Trichocallis cyperi*									
	1975	0	0	0	5	0	1	0	1	0
	1976	2	0	1	0	0	0	0	0	0
	1977	0	0	0	1	0	0	0	0	0
	1978	1	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	2	0	0
	1980	1	4	0	0	0	0	2	0	0

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2(g)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Rosewarne 910		
									88	*Euceraphis punctipennis*
1	3	10	27	6	22	21	13	3		1975
56	34	59	123	55	586	93	17	1		1976
78	54	96	160	102	267	187	66	63		1977
132	47	97	169	71	88	111	43	14		1978
122	98	70	192	65	1268	164	35	0		1979
56	27	46	77	49	197	65	29	2		1980
									90	*Drepanosiphum aceris*
—	0	0	0	0	0	0	0	0		1975
—	0	2	0	0	0	0	0	0		1976
—	2	2	2	0	0	0	0	0		1977
—	1	0	0	0	0	0	0	0		1978
—	0	3	0	0	0	1	0	0		1979
—	0	1	0	0	0	0	0	0		1980
									91	*Drepanosiphum platanoidis*
91	130	18	51	139	35	25	110	129		1975
582	374	254	263	588	839	335	412	943		1976
87	367	92	172	81	222	185	43	43		1977
109	437	20	81	589	22	292	107	208		1978
727	992	565	272	827	1550	244	186	108		1979
2018	526	635	645	979	594	437	196	525		1980
									754	*Drepanosiphum dixoni*
—	2	0	0	0	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	1	0	0	0	0	0	0	0		1978
—	2	0	0	0	1	8	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									92	*Therioaphis luteola*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	1	0	0	0		1978
—	0	2	0	0	0	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									95	*Trichocallis cyperi*
—	0	0	2	0	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	1	0	0	0		1977
—	0	0	0	0	1	0	0	1		1978
—	0	0	0	0	0	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
100	*Juncobia leegei*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	2	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
102	*Pterocomma pilosum*									
	1975	0	2	1	0	1	0	1	0	2
	1976	0	0	0	0	0	0	6	1	1
	1977	0	0	0	2	0	0	1	0	0
	1978	0	0	0	0	0	1	4	0	1
	1979	1	0	0	6	1	1	3	7	0
	1980	1	1	0	0	2	0	1	0	0
103	*Pterocomma populeum*									
	1975	0	0	0	0	0	0	2	0	1
	1976	0	1	1	0	0	0	0	5	3
	1977	0	1	0	0	0	0	1	0	0
	1978	0	1	0	0	1	0	5	0	1
	1979	0	0	1	3	0	0	2	6	1
	1980	0	0	3	0	1	0	0	1	6
104	*Pterocomma salicis*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	1	1
	1979	0	0	0	0	0	0	0	1	0
	1980	0	0	0	0	0	0	0	0	0
105	*Pterocomma steinheili*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	1	0
	1977	0	0	0	0	0	0	1	0	0
	1978	0	0	0	0	0	0	2	0	0
	1979	0	0	0	0	0	0	0	10	1
	1980	0	0	0	0	0	0	0	0	0
110	*Hyalopterus pruni*									
	1975	11	2135	80	33	13	20	20	50	2
	1976	45	1198	102	58	94	166	327	285	64
	1977	25	170	68	60	8	33	197	1524	87
	1978	7	121	14	12	17	57	149	361	19
	1979	3	301	10	2	21	297	191	1749	37
	1980	18	385	77	23	78	171	350	474	24

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2(h)

904 Broom's Barn	917 Hereford	901 Rothamsted	924 Writtle	914 Long Ashton	908 Silwood Park	903 Wye, Kent	913 Starcross	910 Rosewarne		
									100	*Juncobia leegei*
—	0	0	2	0	0	0	0	0		1975
—	0	0	2	0	0	0	0	0		1976
—	0	0	0	6	0	0	23	0		1977
—	0	0	0	1	0	0	0	0		1978
—	0	0	0	4	0	0	1	0		1979
—	0	0	0	0	0	2	0	0		1980
									102	*Pterocomma pilosum*
0	0	0	0	1	0	0	1	0		1975
0	0	0	0	4	7	1	0	0		1976
0	4	1	0	0	1	0	0	2		1977
0	2	2	0	0	1	0	0	0		1978
1	12	0	1	3	4	1	0	0		1979
0	0	1	2	0	4	1	1	0		1980
									103	*Pterocomma populeum*
—	1	0	0	0	2	1	0	2		1975
—	2	0	0	0	0	0	0	0		1976
—	1	0	0	0	1	1	0	0		1977
—	1	0	0	1	3	1	0	0		1978
—	9	0	0	1	3	1	0	0		1979
—	2	3	0	0	2	0	0	0		1980
									104	*Pterocomma salicis*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	2	0	0	1	0	0	0	0		1978
—	1	0	0	0	1	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									105	*Pterocomma steinheili*
—	0	0	0	0	0	0	0	0		1975
—	0	4	0	2	0	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	0	0	0	0		1978
—	11	0	0	2	0	0	0	1		1979
—	0	0	0	0	0	0	0	0		1980
									110	*Hyalopterus pruni*
111	15	29	127	34	18	73	61	3		1975
575	240	476	1710	191	486	599	177	59		1976
589	918	1733	1711	1130	830	1769	960	107		1977
304	115	201	337	114	161	408	101	12		1978
3463	410	1747	2782	648	1549	5299	231	69		1979
167	36	121	161	60	195	324	60	7		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
111	*Rhopalosiphum insertum*									
	1975	93	448	469	521	248	220	595	659	528
	1976	358	1544	745	2261	1699	314	2113	259	764
	1977	595	1134	1010	1481	1396	387	2439	1936	313
	1978	468	3534	1607	2680	2942	1945	6561	5787	6402
	1979	2791	3192	2686	933	6524	4320	8702	7483	9133
	1980	3136	4827	1011	3752	2320	1198	10986	2002	1849
112	*Rhopalosiphum maidis*									
	1975	19	28	31	28	48	84	11	19	3
	1976	6	3	13	2	4	7	8	1	2
	1977	3	7	11	3	3	4	5	13	14
	1978	6	5	4	2	6	2	9	7	17
	1979	29	153	9	5	69	313	124	160	105
	1980	2	12	0	6	7	4	7	0	10
113	*Rhopalosiphum nymphaeae*									
	1975	0	0	1	0	0	0	0	1	0
	1976	0	0	1	0	2	1	3	65	2
	1977	0	0	1	0	0	2	6	11	1
	1978	0	0	1	0	0	0	14	1	0
	1979	0	1	0	0	2	3	5	27	0
	1980	0	1	0	0	1	0	33	2	0
114	*Rhopalosiphum padi*									
	1975	2332	4784	5516	1879	1197	681	10839	2720	2779
	1976	2107	11779	5383	3633	6012	3916	3215	4379	976
	1977	17887	10571	4356	4298	4552	2020	14580	13201	5253
	1978	18805	41677	10434	4317	7511	4797	14703	22840	10662
	1979	11301	15667	8028	1913	3361	4240	5949	7857	2197
	1980	2620	6243	4543	3693	3782	2591	11569	21658	2766
739	*Rhopalosiphum rufulum*									
	1975	0	0	0	0	0	0	0	0	—
	1976	0	0	0	0	0	0	0	0	—
	1977	0	0	0	0	0	0	0	0	—
	1978	0	0	0	0	0	0	3	7	—
	1979	0	0	0	0	0	4	56	68	—
	1980	0	0	0	0	0	0	0	0	—
121	*Paraschizaphis scirpi*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	4	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	1	0	0	0	0	2	4	0

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2(i)

Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne		
904	917	901	924	914	908	903	913	910		
									111	*Rhopalosiphum insertum*
218	171	124	208	194	167	679	259	532		1975
93	266	214	193	126	203	382	181	91		1976
1268	1060	1981	2227	540	2028	2320	1101	294		1977
5198	14537	5939	3108	6015	4626	6998	5646	3026		1978
1033	8702	1104	710	1600	1702	2244	1407	813		1979
1044	844	858	620	1623	890	1029	1043	1815		1980
									112	*Rhopalosiphum maidis*
18	8	14	16	5	5	18	31	12		1975
3	2	3	5	8	0	15	6	6		1976
31	5	27	66	12	9	30	33	37		1977
12	1	2	4	7	3	17	7	7		1978
977	77	186	255	38	75	804	88	224		1979
18	2	1	4	10	2	9	11	6		1980
									113	*Rhopalosiphum nymphaeae*
0	0	2	2	6	5	5	1	0		1975
0	4	3	20	14	24	30	7	2		1976
0	0	6	5	7	6	10	1	0		1977
0	1	0	1	5	1	16	0	3		1978
0	7	0	16	3	37	3	2	0		1979
1	6	5	8	26	12	116	2	2		1980
									114	*Rhopalosiphum padi*
5421	3974	1079	2728	1701	2153	1657	3273	2516		1975
3846	3196	1992	5644	2175	4046	5596	4586	473		1976
12177	7721	8149	15700	8723	10301	10054	13384	5385		1977
9628	9785	3254	3782	8924	5799	35749	10639	1762		1978
18815	6226	3807	6835	5480	3800	9313	6452	634		1979
4756	4417	2720	3741	3878	2688	5295	2202	675		1980
									739	*Rhopalosiphum rufulum*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	18	0	0	0		1977
—	3	3	1	0	9	0	0	0		1978
—	0	6	2	0	10	1	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									121	*Paraschizaphis scirpi*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	0	1	0	0	0		1976
—	0	0	0	0	0	2	0	0		1977
—	0	0	0	0	1	0	0	0		1978
—	0	0	0	0	2	0	0	0		1979
—	2	2	2	0	0	2	0	0		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
125	*Aphis sambuci*									
	1975	1	27	317	14	2	4	2	17	8
	1976	0	0	4	5	2	6	5	22	4
	1977	1	8	11	18	2	3	20	35	0
	1978	2	68	121	8	6	8	8	3	0
	1979	0	7	8	0	1	2	10	180	0
	1980	2	42	420	6	4	6	13	8	0
132	*Aphis fabae*									
	1975	56	195	157	187	48	7	2	13	5
	1976	34	95	16	148	132	10	13	19	19
	1977	41	211	88	185	16	11	137	613	79
	1978	180	1432	193	108	847	238	528	1024	421
	1979	35	47	50	39	161	1852	294	2401	84
	1980	58	359	195	29	410	19	118	49	47
137	*Aphis rumicis*									
	1975	0	1	0	2	0	0	0	4	0
	1976	0	0	0	1	0	0	0	0	0
	1977	0	0	0	0	0	0	1	0	0
	1978	1	1	0	0	1	0	0	0	0
	1979	0	0	0	0	7	1	17	12	0
	1980	8	3	4	1	0	0	1	0	0
142	*Aphis corniella*									
	1975	0	3	3	0	0	0	0	3	1
	1976	0	4	1	0	5	6	109	25	31
	1977	0	1	9	6	1	0	11	60	0
	1978	0	0	1	0	1	0	8	14	0
	1979	0	18	2	0	7	3	5	138	0
	1980	0	13	9	2	6	0	9	2	0
150	*Aphis idaei*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	1	0	0	0	0	0	0	0
	1977	0	0	0	1	0	0	0	0	0
	1978	0	0	0	0	0	1	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
152	*Aphis nasturtii*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	2
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	64	0
	1980	0	0	0	0	1	0	1	0	0

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SYNOPTIC MONITORING FOR MIGRANT INSECT PESTS. III

2(j)

Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne		
904	917	901	924	914	908	903	913	910		
									125	*Aphis sambuci*
—	0	6	8	3	12	5	5	5		1975
—	1	11	41	14	28	15	0	56		1976
—	19	41	72	21	87	34	7	3		1977
—	0	13	13	4	18	4	3	1		1978
—	8	43	27	26	51	24	4	3		1979
—	0	2	13	7	9	30	0	2		1980
									132	*Aphis fabae*
292	15	505	151	13	32	50	32	20		1975
22	12	155	238	48	162	149	77	57		1976
1164	511	1388	4939	470	1511	985	299	56		1977
2001	407	187	640	133	114	327	95	28		1978
8709	825	793	1508	340	501	763	181	6		1979
133	53	25	110	51	41	135	12	15		1980
									137	*Aphis rumicis*
—	0	0	0	0	0	0	0	1		1975
—	2	0	0	0	0	0	0	0		1976
—	0	1	0	0	0	0	0	0		1977
—	4	0	0	0	0	0	0	0		1978
—	20	6	0	0	2	0	0	0		1979
—	0	0	0	0	4	0	0	0		1980
									142	*Aphis corniella*
0	0	3	4	2	5	6	0	0		1975
2	0	5	26	10	8	20	5	0		1976
0	5	5	10	14	14	5	5	0		1977
6	6	2	1	12	5	7	6	2		1978
19	1	10	45	7	71	20	1	0		1979
2	6	1	2	2	13	4	2	0		1980
									150	*Aphis idaei*
—	0	0	0	0	0	0	0	0		1975
—	4	0	0	0	2	0	0	0		1976
—	0	0	5	0	0	0	0	0		1977
—	0	0	0	0	2	0	0	0		1978
—	0	2	0	0	0	0	1	0		1979
—	0	0	0	0	0	0	0	0		1980
									152	*Aphis nasturtii*
—	0	0	0	2	0	0	0	0		1975
—	0	0	0	0	1	0	0	0		1976
—	0	5	4	2	0	0	0	1		1977
—	0	0	2	0	0	0	0	0		1978
—	76	26	12	2	20	26	0	0		1979
—	0	0	0	0	0	2	0	0		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
153	*Aphis pomi*									
	1975	2	43	370	5	1	1	1	11	1
	1976	0	1	4	3	2	7	11	41	0
	1977	4	2	0	13	1	0	16	40	0
	1978	3	70	0	3	7	3	3	2	0
	1979	0	1	3	3	0	1	8	80	0
	1980	4	53	98	12	5	1	14	18	0
211	*Ceruraphis eriophori*									
	1975	4	8	9	34	4	0	4	3	46
	1976	31	45	84	511	8	0	20	5	143
	1977	35	9	18	42	2	0	38	2	50
	1978	8	6	13	18	46	7	169	24	497
	1979	49	22	57	21	55	7	159	35	234
	1980	92	54	38	132	115	14	37	19	94
234	*Dysaphis plantaginea*									
	1975	1	1	0	1	0	0	0	4	14
	1976	1	0	0	2	2	5	15	30	125
	1977	0	0	5	5	1	2	7	39	37
	1978	0	0	0	2	0	2	3	14	49
	1979	0	1	0	1	0	0	1	6	64
	1980	0	1	0	1	0	0	0	14	7
235	*Dysaphis pyri*									
	1975	0	0	0	0	0	0	0	6	1
	1976	0	1	0	1	0	0	7	17	1
	1977	2	0	0	0	0	2	7	66	0
	1978	0	1	0	7	0	0	1	3	0
	1979	2	1	0	1	1	1	0	14	0
	1980	0	3	0	2	0	0	0	4	0
238	*Anuraphis farfarae*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	1	0	0	0	0	0	3	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	1	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	1	0
239	*Anuraphis subterranea*									
	1975	0	0	0	1	0	0	0	0	0
	1976	0	0	0	0	0	0	0	4	1
	1977	0	0	0	2	0	0	0	4	0
	1978	2	5	0	2	0	1	0	0	1
	1979	1	0	0	0	0	0	0	0	1
	1980	0	1	0	0	0	0	0	0	0

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2(k)

	Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne	
	904	917	901	924	914	908	903	913	910	
153	*Aphis pomi*									
1975		4	8	12	8	31	11	6	10	
1976		6	28	64	39	86	22	5	2	
1977		18	14	45	43	53	27	18	7	
1978		1	7	10	14	11	9	3	4	
1979		6	14	8	33	57	6	7	2	
1980		2	7	4	26	11	14	3	4	
211	*Ceruraphis eriophori*									
1975		1	0	0	0	0	0	8	1	
1976		0	0	2	3	7	6	10	0	
1977		5	3	1	6	19	8	26	14	
1978		34	11	4	35	29	42	24	10	
1979		43	4	5	27	30	15	13	2	
1980		15	2	5	19	7	1	12	2	
234	*Dysaphis plantaginea*									
1975	27	10	11	2	35	20	4	29	0	
1976	44	79	36	70	172	71	79	22	5	
1977	63	70	37	32	40	51	22	17	18	
1978	14	12	13	6	31	86	15	27	29	
1979	33	6	19	8	9	22	11	6	2	
1980	43	0	2	11	7	10	4	3	1	
235	*Dysaphis pyri*									
1975		1	0	2	2	8	1	2	0	
1976		4	18	13	13	36	10	2	2	
1977		3	12	55	8	33	22	1	0	
1978		1	2	0	7	12	4	0	2	
1979		3	2	0	13	16	17	2	0	
1980		0	2	4	2	2	2	1	0	
238	*Anuraphis farfarae*									
1975		0	0	0	0	0	0	0	0	
1976		0	0	0	0	1	2	1	1	
1977		0	0	0	0	0	0	1	0	
1978		0	1	0	0	0	0	0	0	
1979		0	0	0	0	0	0	0	0	
1980		0	0	0	0	0	0	0	0	
239	*Anuraphis subterranea*									
1975		0	2	1	1	2	0	2	0	
1976		1	1	3	2	2	4	1	0	
1977		2	3	2	1	0	5	0	0	
1978		1	0	0	2	0	1	1	0	
1979		0	0	0	0	1	3	1	1	
1980		2	1	0	0	2	0	0	1	

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
241	*Brachycaudus cardui*									
	1975	0	4	0	4	1	3	15	9	8
	1976	2	7	0	5	1	0	1	16	0
	1977	0	1	0	0	1	1	1	5	3
	1978	2	4	1	0	0	0	5	4	5
	1979	0	2	1	2	5	0	1	12	0
	1980	2	1	0	2	0	0	3	8	4
243	*Brachycaudus helichrysi*									
	1975	71	181	432	106	103	1148	635	1357	146
	1976	113	120	231	143	78	155	361	637	138
	1977	59	96	240	147	74	63	270	1321	754
	1978	23	414	92	185	142	524	590	625	747
	1979	59	58	57	9	44	120	315	1083	149
	1980	92	242	197	82	172	391	446	808	718
245	*Brachycaudus klugkisti*									
	1975	0	0	1	0	0	5	2	2	0
	1976	0	0	0	0	0	0	0	0	0
	1977	1	1	0	0	0	0	0	1	0
	1978	0	0	0	0	0	1	1	0	0
	1979	0	0	0	0	0	1	1	9	0
	1980	0	0	0	0	0	0	2	2	0
249	*Brachycaudus persicae*									
	1975	0	0	0	1	0	0	0	2	0
	1976	0	0	1	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	1
	1980	0	0	0	1	0	0	0	0	2
253	*Thuleaphis rumexicolens*									
	1975	3	2	10	5	7	5	7	123	0
	1976	9	7	15	13	37	74	170	900	10
	1977	2	0	0	1	0	3	2	121	0
	1978	2	1	1	0	3	2	2	28	0
	1979	8	3	0	0	2	11	1	8	0
	1980	13	10	0	0	0	1	2	0	0
259	*Diuraphis muehlei*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	1	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0

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2(I)

Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne		
904	917	901	924	914	908	903	913	910		
									241	*Brachycaudus cardui*
8	14	8	10	27	22	3	4	6		1975
14	8	6	8	9	7	5	5	2		1976
3	7	20	4	17	25	15	13	2		1977
1	8	5	6	15	9	0	4	0		1978
4	1	0	2	7	3	5	2	0		1979
0	8	1	8	10	17	5	6	0		1980
									243	*Brachycaudus helichrysi*
1428	1129	1178	2293	760	1202	1815	383	216		1975
227	734	416	465	960	445	607	327	360		1976
921	597	1083	1306	428	855	593	550	109		1977
728	1210	971	1296	1649	943	1240	408	105		1978
899	2054	473	656	723	466	421	166	129		1979
1919	622	1626	2737	1085	713	1359	475	101		1980
									245	*Brachycaudus klugkisti*
—	1	0	1	5	1	3	4	9		1975
—	1	0	3	0	0	0	1	0		1976
—	1	4	2	0	0	0	0	1		1977
—	1	0	2	1	1	1	0	2		1978
—	0	1	1	0	0	0	1	0		1979
—	4	0	0	4	2	0	16	8		1980
									249	*Brachycaudus persicae*
—	0	3	5	4	20	4	2	1		1975
—	0	5	11	0	7	0	4	0		1976
—	1	4	4	1	13	2	6	1		1977
—	2	5	5	2	10	1	0	0		1978
—	0	2	2	0	1	1	0	0		1979
—	2	8	21	2	11	5	0	0		1980
									253	*Thuleaphis rumexicolens*
—	15	60	157	86	136	10	21	3		1975
—	36	193	424	47	269	55	21	10		1976
—	13	33	106	59	30	17	24	10		1977
—	4	12	13	7	28	17	13	0		1978
—	4	9	79	4	10	10	3	0		1979
—	0	10	37	2	7	2	1	0		1980
									259	*Diuraphis muehlei*
—	0	0	0	0	0	0	0	0		1975
—	0	2	0	0	0	0	0	0		1976
—	0	0	4	0	0	0	0	0		1977
—	0	1	0	0	0	1	0	0		1978
—	0	0	1	0	0	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
261	*Hayhurstia atriplicis*									
	1975	41	19	2	1	1	3	1	0	4
	1976	33	4	1	1	11	7	23	61	77
	1977	9	5	0	0	3	18	24	102	0
	1978	10	7	2	4	2	2	2	3	1
	1979	0	2	0	0	0	11	2	10	0
	1980	0	6	0	0	0	1	6	22	0
264	*Brevicoryne brassicae*									
	1975	4	31	22	6	1	5	24	218	13
	1976	465	50	24	50	18	88	31	1810	37
	1977	0	1	3	1	2	3	20	15	71
	1978	0	0	0	0	0	0	2	8	7
	1979	0	0	0	0	0	0	1	0	0
	1980	0	37	2	0	0	2	0	70	15
267	*Lipaphis erysimi*									
	1975	5	2	0	0	0	0	0	0	3
	1976	0	2	0	2	0	0	0	0	1
	1977	3	23	1	1	0	0	1	2	0
	1978	136	7	1	0	0	1	0	0	1
	1979	36	9	18	0	0	1	3	34	1
	1980	16	3	12	0	0	2	2	0	0
269	*Lipamyzodes matthiolae*									
	1975	0	0	0	1	1	1	0	0	0
	1976	0	0	0	0	0	2	1	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
271	*Hyadaphis foeniculi*									
	1975	4	15	39	5	20	28	19	140	10
	1976	113	24	66	6	74	48	49	94	13
	1977	1	0	3	1	0	2	6	37	2
	1978	1	0	3	1	1	2	4	7	0
	1979	0	0	0	1	3	0	2	14	0
	1980	0	1	5	0	0	1	6	6	0
273	*Staegeriella necopinata*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	1	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0

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2(m)

Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne	
904	917	901	924	914	908	903	913	910	
									261 *Hayhurstia atriplicis*
0	21	0	0	4	1	5	18	0	1975
43	588	16	25	146	86	199	189	192	1976
4	156	13	26	141	26	2	27	1	1977
6	4	0	1	2	2	2	3	3	1978
351	70	24	48	10	10	30	167	7	1979
60	8	2	4	4	16	6	1	1	1980
									264 *Brevicoryne brassicae*
258	431	405	1350	108	788	347	337	65	1975
232	475	365	643	407	1166	430	291	296	1976
70	11	5	49	20	7	3	117	1	1977
81	260	19	59	18	41	246	1185	25	1978
353	6	1	38	1	8	10	21	1	1979
109	31	14	65	42	63	14	76	4	1980
									267 *Lipaphis erysimi*
—	0	0	0	0	0	1	0	1	1975
—	0	1	0	6	1	1	1	2	1976
—	0	6	0	1	0	1	1	0	1977
—	1	0	0	2	1	0	3	2	1978
—	32	8	0	8	15	37	61	0	1979
—	0	0	0	0	2	2	2	0	1980
									269 *Lipamyzodes matthiolae*
—	0	0	3	0	1	0	0	0	1975
—	0	6	6	0	2	1	0	0	1976
—	1	1	0	0	3	0	0	0	1977
—	0	0	0	0	0	1	1	0	1978
—	0	0	0	0	0	0	0	0	1979
—	0	0	8	0	1	4	0	0	1980
									271 *Hyadaphis foeniculi*
142	106	122	230	216	161	89	96	47	1975
110	80	117	101	88	123	64	37	17	1976
70	16	39	94	30	55	57	51	5	1977
5	5	7	15	18	31	17	5	3	1978
3	4	14	22	44	21	52	6	1	1979
23	8	23	49	25	20	12	7	3	1980
									273 *Staegeriella necopinata*
—	0	0	0	0	0	0	0	0	1975
—	0	0	0	0	0	0	0	0	1976
—	0	0	0	0	8	2	1	2	1977
—	0	0	0	1	1	0	0	0	1978
—	0	0	2	2	2	2	0	0	1979
—	0	0	0	0	0	0	0	0	1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
275	*Pseudacaudella rubida*									
	1975	1	0	0	0	0	0	0	0	0
	1976	0	0	0	2	0	0	0	0	0
	1977	1	0	0	0	0	0	0	0	0
	1978	0	1	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	1
276	*Hyalopteroides humilis*									
	1975	1	0	4	0	0	2	3	15	1
	1976	0	6	6	0	3	0	3	16	0
	1977	0	0	0	0	0	0	1	0	1
	1978	0	0	0	0	0	0	0	3	0
	1979	0	0	0	0	0	0	1	0	0
	1980	0	0	0	0	1	1	11	16	0
283	*Longicaudus trirhodus*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	1	0	0	0	2	0	0
	1977	0	0	0	0	0	0	0	3	0
	1978	0	0	0	0	0	0	0	1	0
	1979	0	1	0	0	0	0	0	2	0
	1980	0	0	1	0	0	0	1	0	1
286	*Myzaphis rosarum*									
	1975	0	2	2	0	0	1	2	8	4
	1976	1	2	3	0	0	3	0	30	0
	1977	0	0	0	0	0	0	1	1	0
	1978	0	0	2	1	1	0	0	1	0
	1979	0	0	0	0	0	0	2	0	0
	1980	0	0	3	0	0	1	0	0	7
287	*Pentatrichopus fragaefolii*									
	1975	4	153	1	0	0	1	1	5	0
	1976	12	0	1	0	0	0	0	4	0
	1977	0	0	0	0	0	0	0	0	0
	1978	2	1	2	0	0	0	0	0	0
	1979	0	0	0	0	0	1	0	2	0
	1980	0	1	0	1	0	0	0	0	0
289	*Pentatrichopus tetrarhodus*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	2	0	0	0	0	0	0
	1977	0	0	4	0	0	0	0	0	0
	1978	0	0	3	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	8	0	0	0	0	0	0

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2(n

904 Broom's Barn	917 Hereford	901 Rothamsted	924 Writtle	914 Long Ashton	908 Silwood Park	903 Wye, Kent	913 Starcross	910 Rosewarne		
									275	*Pseudacaudella rubida*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	0	0	0	0		1978
—	0	0	0	0	0	0	0	0		1979
—	0	0	0	0	0	0	0	1		1980
									276	*Hyalopteroides humilis*
—	2	3	0	0	14	0	0	0		1975
—	3	2	3	2	3	4	1	8		1976
—	0	0	1	0	0	0	0	1		1977
—	3	2	1	4	4	1	0	0		1978
—	0	0	0	0	1	0	0	0		1979
—	10	6	1	0	7	16	0	0		1980
									283	*Longicaudus trirhodus*
0	0	0	0	0	0	0	0	0		1975
0	0	2	2	0	4	2	0	0		1976
0	0	0	3	0	0	0	0	0		1977
0	0	0	0	0	2	0	0	1		1978
0	0	4	2	1	4	17	0	0		1979
0	1	1	0	1	2	0	0	0		1980
									286	*Myzaphis rosarum*
3	2	13	15	11	11	6	4	6		1975
0	0	15	27	19	17	2	2	2		1976
0	0	0	2	0	1	0	0	0		1977
0	0	0	2	0	1	0	0	0		1978
0	0	2	0	0	0	0	0	0		1979
0	0	1	4	1	1	2	0	0		1980
									287	*Pentatrichopus fragaefolii*
0	4	0	1	4	1	0	5	0		1975
0	2	3	4	8	2	0	3	1		1976
0	1	0	0	1	0	0	2	0		1977
0	0	0	0	0	0	0	0	0		1978
0	0	0	0	0	0	0	0	0		1979
0	0	0	8	0	0	0	5	1		1980
									289	*Pentatrichopus tetrarhodus*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	0	4	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	1	0	0	0		1978
—	0	0	0	0	0	0	0	0		1979
—	0	0	0	0	1	0	0	0		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
290	*Elatobium abietinum*									
	1975	475	304	131	103	156	32	111	20	1821
	1976	471	93	106	173	284	162	8	12	631
	1977	11	19	7	45	82	0	98	2	887
	1978	1	18	31	106	11	30	55	20	307
	1979	34	5	5	81	3	2	3	2	1061
	1980	2116	705	952	2765	1393	149	79	22	2391
291	*Liosomaphis berberidis*									
	1975	0	0	0	0	0	0	2	1	1
	1976	2	1	2	0	0	2	0	0	0
	1977	0	0	2	0	0	0	1	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	2	0	1	0	0	0	0	0
	1980	0	1	1	0	0	0	1	0	8
292	*Cavariella aegopodii*									
	1975	26	18	33	8	11	69	64	104	7
	1976	162	93	232	41	187	282	676	220	104
	1977	456	40	43	26	26	68	472	1016	127
	1978	11	70	21	20	68	125	141	520	55
	1979	217	191	86	14	104	451	464	2930	28
	1980	10	20	14	7	14	11	92	54	12
293	*Cavariella archangelicae*									
	1975	0	13	6	29	2	1	46	3	1
	1976	4	10	5	3	3	0	10	3	1
	1977	3	9	0	8	4	2	48	4	24
	1978	0	6	1	19	15	1	49	10	22
	1979	0	5	0	5	4	5	37	59	9
	1980	5	14	22	13	12	4	29	2	10
295	*Cavariella konoi*									
	1975	0	0	2	1	0	0	2	0	0
	1976	0	2	0	2	0	0	2	0	0
	1977	0	1	0	2	1	0	3	0	0
	1978	6	2	2	1	1	0	4	2	1
	1979	0	4	1	1	2	4	84	76	10
	1980	0	7	21	6	1	0	12	2	0
296	*Cavariella pastinacae*									
	1975	12	6	6	16	4	6	43	9	8
	1976	18	201	59	45	127	191	222	23	22
	1977	8	30	55	30	11	6	165	312	139
	1978	65	147	47	44	122	96	172	310	42
	1979	10	100	164	37	163	1002	270	2432	47
	1980	36	96	73	12	38	3	50	6	5

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2(o)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Rosewarne 910	
									290 *Elatobium abietinum*
12	180	19	11	111	86	60	84	58	1975
6	163	42	8	57	237	178	76	6	1976
3	14	2	0	10	75	5	17	12	1977
46	118	91	20	150	789	122	24	49	1978
7	18	6	4	11	35	25	22	26	1979
17	741	37	26	381	153	179	184	85	1980
									291 *Liosomaphis berberidis*
0	0	0	0	4	0	0	2	0	1975
3	0	2	0	0	2	0	0	0	1976
0	1	0	1	1	0	0	0	0	1977
0	0	0	1	0	0	1	0	0	1978
0	0	0	0	0	3	0	0	0	1979
0	2	0	0	2	3	6	1	0	1980
									292 *Cavariella aegopodii*
126	9	49	252	31	69	94	63	26	1975
569	334	166	256	295	316	467	364	27	1976
976	865	807	1803	453	1771	461	928	169	1977
250	292	273	396	135	167	305	52	20	1978
631	1417	822	762	767	1055	634	82	14	1979
161	63	81	159	281	128	145	77	15	1980
									293 *Cavariella archangelicae*
0	3	0	2	4	1	1	5	34	1975
0	0	4	0	3	7	8	2	0	1976
0	8	4	3	2	5	4	5	1	1977
0	15	1	6	8	6	5	2	1	1978
4	70	12	8	21	34	43	7	0	1979
0	3	0	0	3	7	3	3	5	1980
									295 *Cavariella konoi*
0	0	0	0	0	0	0	0	0	1975
0	2	0	0	0	1	0	0	0	1976
0	0	0	1	0	0	1	2	0	1977
0	2	0	0	2	0	1	0	0	1978
0	185	6	5	12	0	21	1	0	1979
0	0	0	2	2	0	6	3	1	1980
									296 *Cavariella pastinacae*
22	5	4	27	7	8	17	1	0	1975
10	133	8	12	76	6	55	6	2	1976
301	317	598	418	370	512	199	104	25	1977
269	350	92	147	123	53	77	50	11	1978
2262	1821	435	615	520	557	277	80	5	1979
7	24	10	16	31	12	64	4	2	1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
298	*Cavariella theobaldi*									
	1975	1	8	12	5	3	2	6	8	3
	1976	19	80	31	18	92	105	55	128	39
	1977	12	21	36	15	20	22	76	620	119
	1978	18	48	8	8	17	20	62	205	32
	1979	12	29	32	11	27	41	32	417	29
	1980	4	14	12	3	5	0	7	2	1
300	*Jacksonia papillata*									
	1975	1	0	2	2	3	1	1	1	1
	1976	1	0	0	0	4	0	0	0	0
	1977	0	0	0	0	1	0	0	0	0
	1978	0	0	0	0	0	1	1	2	0
	1979	0	0	0	0	2	0	0	0	0
	1980	0	1	1	4	9	2	0	0	2
301	*Ovatus crataegarius*									
	1975	1	0	11	2	0	1	21	26	2
	1976	2	2	14	2	11	6	4	67	0
	1977	1	0	0	0	2	0	4	19	0
	1978	0	6	0	0	0	2	8	1	0
	1979	0	1	0	0	0	1	1	18	0
	1980	0	0	0	0	0	0	4	16	0
303	*Ovatus insitus*									
	1975	0	0	0	0	0	0	0	1	0
	1976	0	0	0	0	0	0	1	2	0
	1977	0	0	0	0	0	0	2	37	0
	1978	0	0	0	0	0	0	1	4	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
306	*Ovatomyzus calaminthae*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	2	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	1	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
307	*Ovatomyzus stachyos*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0

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2(p)

Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne		
904	917	901	924	914	908	903	913	910		
									298	*Cavariella theobaldi*
24	7	10	23	14	9	21	13	12		1975
36	247	34	59	69	16	84	11	0		1976
558	180	1038	1040	345	654	290	333	87		1977
57	120	20	20	31	22	36	14	18		1978
103	242	88	57	145	107	65	20	17		1979
4	1	5	6	21	11	24	5	2		1980
									300	*Jacksonia papillata*
0	2	0	0	0	4	0	0	0		1975
0	0	0	0	1	1	0	0	0		1976
1	0	0	0	0	1	0	0	0		1977
1	0	0	1	0	1	0	1	0		1978
0	0	0	0	1	0	0	0	0		1979
2	0	1	0	0	2	0	0	0		1980
									301	*Ovatus crataegarius*
6	4	12	8	27	13	6	0	6		1975
8	4	12	38	43	29	10	0	6		1976
76	10	22	53	46	23	22	4	3		1977
14	2	8	5	33	12	12	12	2		1978
6	13	8	12	47	19	23	0	2		1979
2	2	6	5	6	19	6	1	1		1980
									303	*Ovatus insitus*
—	1	0	1	0	0	0	0	0		1975
—	0	0	10	1	1	10	0	0		1976
—	4	32	103	14	58	20	6	1		1977
—	1	0	3	7	2	9	3	0		1978
—	2	0	0	4	10	13	1	0		1979
—	0	0	0	0	1	0	0	0		1980
									306	*Ovatomyzus calaminthae*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	5	4	0	0	0		1976
—	0	0	0	4	0	0	0	0		1977
—	0	0	0	1	0	1	0	0		1978
—	0	0	0	0	0	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									307	*Ovatomyzus stachyos*
—	0	1	0	1	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	4	1	0	0	0	0		1977
—	0	0	0	0	0	0	0	0		1978
—	0	0	0	0	0	0	0	0		1979
—	0	0	0	1	0	3	0	0		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
308	*Phorodon humuli*									
	1975	0	11	6	0	1	0	0	44	5
	1976	1	15	3	1	2	8	8	184	22
	1977	0	3	9	2	0	4	20	825	150
	1978	0	17	8	3	11	110	13	207	50
	1979	0	4	2	0	12	39	5	905	10
	1980	0	21	5	1	0	13	15	74	32
309	*Rhopalomyzus poae*									
	1975	2	5	8	2	1	0	0	5	1
	1976	5	8	4	0	0	0	0	22	0
	1977	0	0	0	0	0	0	0	1	2
	1978	0	0	0	1	0	0	0	3	4
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	1	1	6	0	2	0
310	*Rhopalomyzus lonicerae*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	2	0
	1978	0	0	0	0	0	0	22	3	0
	1979	0	0	0	0	0	1	5	9	0
	1980	0	1	0	0	2	0	20	6	0
311	*Myzodium modestum*									
	1975	2	0	0	0	0	0	0	0	0
	1976	0	1	1	3	0	1	1	0	0
	1977	0	0	0	1	0	0	0	0	0
	1978	0	0	0	0	0	0	0	1	1
	1979	0	0	1	0	0	0	0	0	0
	1980	0	0	1	0	0	0	0	0	0
312	*Myzus cerasi*									
	1975	16	20	19	9	4	8	19	85	1
	1976	77	157	48	23	34	5	24	68	14
	1977	23	18	24	24	3	4	23	86	34
	1978	12	185	38	29	20	6	58	61	0
	1979	24	112	84	45	52	38	132	524	7
	1980	22	169	56	31	23	15	116	43	6
314	*Myzus lythri*									
	1975	0	0	0	0	0	0	0	0	0
	1976	1	1	2	1	1	4	2	1	2
	1977	0	0	0	1	0	0	2	31	0
	1978	0	1	0	0	1	0	0	4	0
	1979	0	1	0	0	2	0	0	5	0
	1980	0	0	0	1	0	1	0	4	1

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2(q)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Rosewarne 910		
									308	*Phorodon humuli*
36	471	42	144	140	105	732	20	1		1975
297	1214	128	518	692	354	1317	13	0		1976
4719	3566	3682	13815	876	3008	2239	726	5		1977
215	2018	197	318	184	297	792	64	5		1978
518	3223	455	526	494	818	1896	62	2		1979
137	546	61	231	115	159	742	18	2		1980
									309	*Rhopalomyzus poae*
—	1	4	1	2	12	1	4	0		1975
—	0	10	8	4	34	4	5	1		1976
—	0	0	0	1	0	0	0	0		1977
—	0	0	1	0	3	4	0	1		1978
—	0	0	0	0	0	0	2	0		1979
—	0	0	2	14	3	1	3	1		1980
									310	*Rhopalomyzus lonicerae*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	4	0	3	5	0	4	0	0		1977
—	37	3	2	63	2	3	13	0		1978
—	7	2	0	4	1	0	1	0		1979
—	0	1	0	0	0	2	0	1		1980
									311	*Myzodium modestum*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	0	1	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	0	0	0	0		1978
—	2	0	0	0	0	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									312	*Myzus cerasi*
24	36	37	52	47	36	45	42	9		1975
11	64	18	77	106	54	249	67	8		1976
67	78	85	308	156	276	351	182	29		1977
49	39	77	33	60	119	76	26	7		1978
388	403	421	429	259	641	776	106	8		1979
20	15	34	56	51	70	46	35	9		1980
									314	*Myzus lythri*
—	0	0	2	2	4	0	0	0		1975
—	4	13	24	19	6	23	23	2		1976
—	6	9	18	4	15	20	15	7		1977
—	2	2	4	10	7	9	4	2		1978
—	2	0	1	0	6	0	8	2		1979
—	0	2	8	2	2	4	2	0		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
315	*Myzus ornatus*									
	1975	3	9	27	5	7	1	17	31	8
	1976	6	5	52	6	6	1	3	11	4
	1977	1	4	3	1	0	1	0	5	9
	1978	0	1	2	1	1	0	2	2	11
	1979	0	0	2	0	0	0	0	0	1
	1980	0	1	9	0	4	0	2	4	14
318	*Myzus ascalonicus*									
	1975	16	14	58	74	47	86	106	251	53
	1976	56	15	93	6	40	27	22	250	9
	1977	0	0	4	3	5	0	2	19	6
	1978	0	6	16	15	12	6	31	74	0
	1979	2	0	19	0	2	2	6	14	7
	1980	24	2	42	26	71	96	30	176	19
319	*Myzus certus*									
	1975	5	16	33	4	39	51	52	234	17
	1976	6	10	30	7	4	11	30	123	3
	1977	2	1	4	2	0	0	8	15	1
	1978	0	3	4	3	3	2	3	2	12
	1979	0	5	1	0	1	2	5	6	5
	1980	0	2	18	2	0	2	6	7	14
320	*Myzus ligustri*									
	1975	0	3	5	4	4	3	10	17	0
	1976	1	6	36	2	1	5	21	26	0
	1977	0	1	4	1	0	0	2	4	0
	1978	0	1	1	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	2	0
	1980	0	0	0	0	0	0	0	1	0
322	*Myzus persicae*									
	1975	89	292	580	84	197	153	68	926	71
	1976	75	231	97	86	84	76	286	3964	100
	1977	109	96	27	28	16	5	129	142	82
	1978	9	42	19	21	9	6	80	132	43
	1979	3	97	11	5	6	59	51	245	12
	1980	2	20	16	7	9	19	37	222	22
740	*Myzus varians*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	1	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0

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2(r)

Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne		
904	917	901	924	914	908	903	913	910		
									315	*Myzus ornatus*
6	8	44	25	101	37	10	48	12		1975
1	4	12	10	39	27	4	33	22		1976
0	1	5	2	6	11	0	3	5		1977
1	1	2	3	12	6	1	3	0		1978
0	0	4	0	1	4	0	1	1		1979
0	2	8	13	42	15	3	18	2		1980
									318	*Myzus ascalonicus*
78	217	141	68	119	128	55	26	31		1975
37	84	149	60	48	164	34	25	15		1976
14	7	14	15	3	20	11	4	7		1977
47	28	54	30	52	76	22	8	15		1978
13	3	7	13	11	16	7	7	10		1979
87	92	179	131	140	185	103	85	34		1980
									319	*Myzus certus*
40	67	34	43	55	81	25	12	14		1975
14	149	26	34	97	89	40	49	3		1976
1	8	9	9	19	22	6	26	2		1977
8	2	1	11	2	6	3	2	5		1978
5	0	0	7	3	1	7	1	4		1979
8	9	7	10	10	24	9	4	4		1980
									320	*Myzus ligustri*
—	5	13	9	17	19	7	3	2		1975
—	8	12	15	12	34	6	8	2		1976
—	3	1	0	0	9	0	2	0		1977
—	0	0	0	2	1	2	0	0		1978
—	0	0	0	0	1	2	1	0		1979
—	0	0	2	0	5	4	0	0		1980
									322	*Myzus persicae*
585	234	586	158	205	354	100	101	15		1975
1107	193	913	1526	210	463	534	58	36		1976
73	421	159	173	225	115	124	345	83		1977
127	109	52	151	54	53	303	201	36		1978
450	37	110	123	27	30	323	30	16		1979
209	35	58	200	71	82	156	19	20		1980
									740	*Myzus varians*
—	0	0	1	4	1	0	0	0		1975
—	4	2	0	1	2	1	0	0		1976
—	2	1	2	0	1	3	1	0		1977
—	0	2	1	7	1	1	0	0		1978
—	0	0	1	3	1	1	0	0		1979
—	0	1	0	0	0	0	0	0		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
323	*Myzus cymbalariellus*									
	1975	0	0	0	0	1	0	0	4	0
	1976	0	0	3	0	0	0	0	9	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	1	2
	1979	0	0	0	0	0	0	0	0	0
	1980	0	1	2	7	2	2	0	25	4
325	*Tubaphis ranunculina*									
	1975	1	2	2	1	2	0	16	74	5
	1976	0	0	3	3	1	1	10	0	1
	1977	3	0	0	0	0	0	2	0	8
	1978	0	1	0	2	1	0	1	0	4
	1979	5	0	1	1	9	0	0	0	1
	1980	2	1	1	0	2	0	5	2	3
327	*Vesiculaphis theobaldi*									
	1975	0	0	0	0	0	0	0	0	3
	1976	0	2	1	0	6	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	1	0	0	0	0	0	0
330	*Aspidaphium escherichi*									
	1975	2	1	0	0	0	0	0	0	0
	1976	2	1	0	2	0	2	0	0	0
	1977	1	0	0	0	0	0	0	0	0
	1978	5	0	2	0	2	3	0	0	0
	1979	1	2	1	0	1	0	0	0	1
	1980	4	2	0	1	3	0	0	0	1
335	*Cryptomyzus ballotae*									
	1975	0	1	0	0	0	0	1	5	0
	1976	0	0	6	0	0	1	0	17	0
	1977	2	1	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	1	0	0	0
336	*Cryptomyzus galeopsidis*									
	1975	110	35	30	17	3	5	8	56	4
	1976	24	40	58	17	14	12	51	93	17
	1977	308	52	69	90	20	7	80	57	41
	1978	114	124	15	6	5	11	31	16	29
	1979	80	31	74	14	18	85	142	198	22
	1980	11	26	10	11	3	11	4	16	12

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2(s)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Rosewarne 910	
									323 *Myzus cymbalariellus*
—	0	5	0	11	3	0	2	1	1975
—	0	1	1	16	4	0	3	2	1976
—	0	0	0	0	0	0	0	0	1977
—	0	1	0	6	1	0	0	0	1978
—	0	0	0	0	0	0	0	0	1979
—	3	17	19	25	41	9	6	0	1980
									325 *Tubaphis ranunculina*
—	23	10	7	80	25	14	43	5	1975
—	4	0	3	13	5	0	14	34	1976
—	0	0	0	2	0	0	0	1	1977
—	0	0	0	0	5	1	1	1	1978
—	1	0	0	0	1	2	1	3	1979
—	0	1	6	9	2	2	2	9	1980
									327 *Vesiculaphis theobaldi*
—	1	0	2	0	3	3	1	0	1975
—	1	0	0	0	0	0	0	0	1976
—	0	0	0	0	0	0	0	0	1977
—	1	0	0	0	0	0	0	0	1978
—	0	0	0	0	0	0	0	0	1979
—	0	0	0	0	2	0	2	0	1980
									330 *Aspidaphium escherichi*
—	0	0	0	0	0	1	0	1	1975
—	0	0	0	0	0	0	0	0	1976
—	0	0	0	0	0	0	0	1	1977
—	0	0	0	1	3	0	0	1	1978
—	0	0	0	0	2	0	0	1	1979
—	0	0	0	0	0	2	0	0	1980
									335 *Cryptomyzus ballotae*
—	1	3	20	3	8	1	1	1	1975
—	0	8	29	0	15	12	3	0	1976
—	0	0	7	0	7	0	1	0	1977
—	0	0	0	0	0	1	2	0	1978
—	1	0	0	0	0	0	1	0	1979
—	0	0	6	0	3	0	13	0	1980
									336 *Crymptomyzus galeopsidis*
14	48	11	17	41	18	26	4	7	1975
8	26	7	23	51	54	15	19	5	1976
11	23	21	37	15	10	22	17	13	1977
19	6	4	5	27	4	26	10	11	1978
115	41	47	21	19	24	72	20	7	1979
9	25	1	7	33	9	17	18	4	1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
339	*Cryptomyzus korschelti*									
	1975	1	0	0	1	0	0	3	2	1
	1976	1	0	0	0	0	0	0	1	0
	1977	1	0	0	0	0	0	1	0	0
	1978	0	0	0	0	0	0	0	0	1
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	1	1	1
340	*Cryptomyzus ribis*									
	1975	2	0	0	0	0	0	0	0	0
	1976	6	0	0	0	0	0	3	0	2
	1977	9	0	0	0	0	0	22	7	1
	1978	0	0	0	1	0	0	2	1	0
	1979	0	0	0	1	0	0	7	6	2
	1980	0	0	0	0	0	1	4	5	1
342	*Capitophorus elaeagni*									
	1975	0	2	4	0	1	0	1	0	0
	1976	4	3	4	0	8	3	1	8	1
	1977	0	1	0	1	1	0	8	12	0
	1978	6	0	0	1	0	0	0	0	5
	1979	1	0	0	2	3	0	3	4	0
	1980	0	6	0	0	2	0	5	2	0
343	*Capitophorus hippophaes*									
	1975	21	70	54	53	16	4	20	36	63
	1976	88	69	29	75	14	18	218	35	141
	1977	173	40	27	52	34	9	384	233	185
	1978	134	118	38	63	40	28	313	593	306
	1979	97	103	36	18	81	280	555	1236	129
	1980	10	70	9	20	15	4	60	57	31
344	*Capitophorus horni*									
	1975	0	1	4	0	1	0	0	0	0
	1976	0	0	0	0	0	2	1	5	0
	1977	0	0	4	0	0	0	1	1	0
	1978	0	0	0	1	0	0	0	0	0
	1979	0	0	0	0	2	0	0	2	0
	1980	0	2	0	0	0	0	0	0	0
346	*Capitophorus similis*									
	1975	8	31	25	8	4	3	31	44	10
	1976	3	39	32	17	11	6	75	25	7
	1977	9	105	107	62	62	8	71	175	0
	1978	4	49	63	18	19	7	45	72	0
	1979	7	117	137	21	37	14	49	65	0
	1980	2	60	40	15	15	6	10	27	1

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2(t)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Rosewarne 910	
									339 *Cryptomyzus korschelti*
—	7	2	9	11	7	4	10	9	1975
—	0	0	0	3	8	2	2	0	1976
—	0	0	1	0	0	0	0	0	1977
—	1	1	0	0	0	0	2	1	1978
—	0	0	1	0	0	0	0	0	1979
—	0	1	0	6	1	0	5	0	1980
									340 *Cryptomyzus ribis*
10	0	0	0	0	0	0	1	0	1975
0	0	0	1	1	0	1	4	0	1976
0	5	0	6	13	4	5	7	15	1977
0	1	1	2	2	1	2	4	2	1978
0	2	6	2	4	3	5	9	1	1979
0	0	5	2	0	0	2	1	0	1980
									342 *Capitophorus elaeagni*
—	0	1	1	7	1	2	10	4	1975
—	6	3	40	6	8	65	12	3	1976
—	0	0	10	2	2	11	4	1	1977
—	0	1	1	1	0	0	1	0	1978
—	4	9	4	3	6	12	1	1	1979
—	2	1	4	2	2	6	6	1	1980
									343 *Capitophorus hippophaes*
31	7	8	29	38	18	87	48	20	1975
36	13	15	44	74	19	109	27	68	1976
49	97	50	80	155	83	123	223	159	1977
271	186	46	86	369	150	450	408	176	1978
1541	138	213	263	124	111	491	53	28	1979
44	12	17	84	35	17	101	16	23	1980
									344 *Capitophorus horni*
—	2	0	0	0	0	0	0	0	1975
—	2	0	0	4	1	2	0	0	1976
—	0	0	6	1	0	0	2	0	1977
—	1	0	0	0	1	0	0	0	1978
—	2	0	0	0	0	0	0	0	1979
—	0	1	0	0	0	0	0	0	1980
									346 *Capitophorus similis*
11	5	11	6	16	8	7	10	5	1975
50	19	11	29	34	8	18	5	3	1976
45	32	17	46	22	23	24	20	2	1977
44	20	24	20	38	4	43	18	3	1978
83	7	5	3	9	4	1	2	0	1979
12	14	11	4	3	7	18	5	0	1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
350	*Pleotrichophorus glandulosus*									
	1975	0	0	0	0	0	0	0	1	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	1	0	0	0	4	0
	1980	0	0	0	0	0	0	0	0	0
354	*Nasonovia pilosellae*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	2	0	4	0
	1977	0	0	0	1	0	0	0	0	0
	1978	0	0	0	0	0	0	1	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
355	*Nasonovia ribisnigri*									
	1975	17	6	11	3	3	3	3	30	3
	1976	18	11	14	10	1	6	6	29	23
	1977	47	0	6	1	3	1	7	49	56
	1978	6	10	8	2	3	4	8	15	28
	1979	8	2	5	0	2	23	9	26	27
	1980	6	4	11	1	3	4	4	11	17
358	*Hyperomyzus lactucae*									
	1975	5	9	36	5	12	62	15	149	32
	1976	23	42	69	5	24	41	38	47	21
	1977	7	15	11	2	7	7	9	108	42
	1978	1	17	5	7	12	7	18	63	17
	1979	8	31	16	6	17	40	27	209	25
	1980	2	42	11	1	4	5	28	17	11
359	*Hyperomyzus lampsanae*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	2	2	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	1	0	0	0	0	0	0
	1980	0	0	1	0	0	0	0	0	1
360	*Hyperomyzus pallidus*									
	1975	0	0	0	0	0	2	0	0	0
	1976	0	2	0	0	0	6	3	0	1
	1977	0	0	0	0	0	0	8	15	1
	1978	0	0	1	0	0	0	0	0	0
	1979	0	6	0	0	0	38	2	24	0
	1980	0	0	1	0	0	0	1	1	0

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2(u)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Rosewarne 910		
									350	*Pleotrichophorus glandulosus*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	9	0	0	0		1977
—	0	0	0	0	0	0	0	0		1978
—	0	0	0	2	1	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									354	*Nasonovia pilosellae*
—	0	0	0	2	4	0	2	0		1975
—	0	0	1	2	1	0	1	2		1976
—	1	1	3	2	0	0	0	0		1977
—	0	1	1	3	0	0	2	0		1978
—	2	2	0	0	0	0	1	0		1979
—	0	0	2	3	0	0	0	0		1980
									355	*Nasonovia ribisnigri*
8	6	28	16	15	15	12	18	14		1975
7	7	7	41	24	24	27	21	4		1976
13	12	34	39	31	43	27	91	61		1977
24	10	16	8	28	21	51	14	9		1978
92	47	33	27	23	34	29	22	9		1979
21	11	13	3	11	13	13	11	9		1980
									358	*Hyperomyzus lactucae*
118	100	90	97	104	103	60	32	16		1975
29	59	33	34	60	43	34	38	14		1976
51	113	69	148	52	100	69	172	80		1977
27	43	26	19	27	21	89	32	10		1978
362	147	171	116	56	185	366	64	12		1979
13	9	14	28	64	27	34	35	2		1980
									395	*Hyperomyzus lampsanae*
1	2	0	0	0	0	0	0	0		1975
0	0	0	0	0	0	0	0	0		1976
0	0	2	2	0	0	0	0	0		1977
0	0	0	0	0	0	0	0	0		1978
7	0	0	0	0	0	0	0	0		1979
0	0	0	0	0	0	0	0	0		1980
									360	*Hyperomyzus pallidus*
0	2	0	3	0	0	2	0	0		1975
0	6	5	2	2	0	4	1	0		1976
6	7	16	8	10	7	1	8	0		1977
0	7	1	1	2	0	3	1	0		1978
0	8	22	12	1	19	31	5	0		1979
0	4	0	2	0	0	0	1	2		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
362	*Neonasonovia picridis*									
	1975	1	0	0	0	0	0	0	1	0
	1976	0	0	0	0	0	1	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
363	*Hyperomyzella rhinanthi*									
	1975	1	1	1	6	1	2	0	0	4
	1976	1	0	1	3	0	0	1	0	0
	1977	4	0	1	6	0	0	0	0	0
	1978	6	0	0	6	2	0	0	0	1
	1979	2	0	0	3	1	0	4	0	0
	1980	4	0	1	2	1	0	2	0	0
366	*Rhopalosiphoninus latysiphon*									
	1975	4	3	2	2	1	0	6	3	2
	1976	4	1	0	0	1	3	1	3	0
	1977	2	2	0	0	1	0	0	0	1
	1978	3	5	1	0	2	0	0	1	3
	1979	1	1	0	0	0	0	0	1	1
	1980	0	2	1	1	1	1	0	0	0
367	*Rhopalosiphoninus ribesinus*									
	1975	0	0	1	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	1	0	0	0	0	2	0	0
	1979	0	0	0	0	0	0	0	2	0
	1980	0	2	0	0	1	0	0	0	0
368	*Rhopalosiphoninus staphyleae*									
	1975	1	4	4	2	2	11	15	10	6
	1976	9	8	8	7	2	6	7	64	2
	1977	1	0	0	1	0	1	3	4	7
	1978	2	1	0	1	0	0	2	1	2
	1979	0	0	0	1	8	0	0	4	0
	1980	2	4	3	2	2	2	5	4	3
372	*Microlophium evansi*									
	1975	1	1	2	19	3	77	197	1092	25
	1976	623	330	555	34	217	258	335	1376	284
	1977	1	0	1	2	7	0	22	115	14
	1978	0	19	0	0	3	1	3	16	7
	1979	16	0	0	1	0	0	25	8	1
	1980	0	3	2	10	15	50	139	1105	658

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2(v)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Rosewarne 910		
									362	*Neonasonovia picridis*
0	3	2	8	1	9	8	0	0		1975
0	0	0	7	2	0	3	0	0		1976
0	0	0	16	1	1	1	6	0		1977
0	0	0	1	0	0	2	0	0		1978
0	0	3	1	0	4	2	0	0		1979
1	0	3	8	0	0	2	0	0		1980
									363	*Hyperomyzella rhinanthi*
—	0	0	0	0	0	1	0	1		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	0	1	0	8		1977
—	0	0	0	0	0	0	1	1		1978
—	0	0	0	0	8	18	0	0		1979
—	6	0	2	4	2	2	0	1		1980
									366	*Rhopalosiphoninus latysiphon*
4	1	0	5	1	1	5	1	3		1975
1	6	0	0	0	6	2	1	2		1976
0	2	0	0	0	0	7	2	2		1977
1	0	0	1	2	0	2	1	4		1978
0	0	0	4	3	1	2	1	2		1979
3	1	0	1	0	1	5	0	1		1980
									367	*Rhopalosiphoninus ribesinus*
—	0	0	2	0	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	0	0	0	0		1978
—	0	1	0	1	0	0	0	1		1979
—	0	3	0	0	0	0	0	0		1980
									368	*Rhopalosiphoninus staphyleae*
9	15	7	4	25	9	14	2	8		1975
10	5	0	17	5	3	3	2	3		1976
12	3	2	10	10	8	4	7	3		1977
3	4	5	2	6	23	3	2	3		1978
4	0	0	0	2	4	1	0	0		1979
0	0	1	1	8	21	4	2	2		1980
									372	*Microlophium evansi*
909	621	316	611	711	612	306	207	11		1975
212	324	149	1253	1319	840	637	197	148		1976
216	150	38	240	33	60	113	123	98		1977
13	2	4	22	3	1	1	1	1		1978
3	2	4	2	0	0	1	1	9		1979
1383	1187	331	859	2318	1158	1762	485	55		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
374	*Aulacorthum palustre*									
	1975	0	0	0	1	0	1	61	15	12
	1976	4	1	4	0	0	1	18	0	1
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	3	0	0	0	0	0	0
376	*Aulacorthum solani*									
	1975	6	18	11	7	5	10	143	97	17
	1976	8	12	20	5	11	6	27	119	2
	1977	2	4	3	0	1	0	8	8	4
	1978	0	2	5	0	2	0	20	10	3
	1979	0	0	5	1	0	0	1	0	2
	1980	0	1	19	1	0	0	6	14	14
377	*Aulacorthum speyeri*									
	1975	0	0	0	0	0	0	1	0	0
	1976	6	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	1	0
	1979	0	0	0	0	0	0	0	4	0
	1980	0	1	0	0	0	0	0	0	0
378	*Neomyzus circumflexum*									
	1975	0	0	0	0	1	0	3	3	4
	1976	0	0	5	0	0	0	2	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	1	0	0
381	*Acyrthosiphon loti*									
	1975	0	4	1	1	0	0	6	2	3
	1976	0	0	0	0	1	0	0	0	0
	1977	0	0	0	1	0	0	1	1	0
	1978	1	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	2	2	0
	1980	0	2	0	0	0	0	0	1	0
382	*Acyrthosiphon malvae*									
	1975	1	3	0	0	0	0	1	3	1
	1976	0	0	1	0	1	0	8	3	2
	1977	1	1	1	1	0	1	0	0	2
	1978	0	0	0	0	0	0	0	1	6
	1979	0	0	0	0	0	0	0	0	0
	1980	0	4	0	1	1	0	0	9	0

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2(w)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Rosewarne 910		
									374	*Aulacorthum palustre*
—	13	0	5	3	6	3	5	5		1975
—	15	0	2	12	0	2	0	1		1976
—	0	0	1	1	0	0	2	0		1977
—	2	0	0	1	2	0	0	1		1978
—	0	0	0	0	0	0	1	0		1979
—	1	0	2	2	2	2	5	3		1980
									376	*Aulacorthum solani*
23	41	16	38	52	15	21	19	28		1975
9	21	9	27	35	26	15	21	28		1976
6	2	0	8	5	11	8	35	5		1977
22	16	7	15	18	9	11	8	7		1978
0	0	0	0	2	4	1	9	5		1979
6	0	2	12	52	9	36	52	58		1980
									377	*Aulacorthum speyeri*
—	1	0	0	0	0	0	2	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	2	2	2	2	0	0	0		1977
—	0	1	0	0	0	0	0	1		1978
—	0	0	0	0	1	0	1	0		1979
—	0	0	0	0	0	4	0	0		1980
									378	*Neomyzus circumflexum*
0	7	4	3	14	11	3	7	6		1975
0	2	0	0	4	0	0	1	4		1976
0	0	0	0	0	0	1	2	2		1977
0	0	0	0	3	0	0	2	3		1978
0	0	0	0	0	0	0	0	2		1979
0	0	0	0	6	7	0	15	0		1980
									381	*Acyrthosiphon loti*
—	4	3	4	76	5	3	17	2		1975
—	6	0	0	2	2	1	0	0		1976
—	0	0	1	2	2	0	2	1		1977
—	1	1	1	3	1	1	0	0		1978
—	2	1	0	2	1	2	0	0		1979
—	5	1	0	14	3	4	0	5		1980
									382	*Acyrthosiphon malvae*
—	3	2	5	19	7	0	0	2		1975
—	11	3	2	7	14	0	12	2		1976
—	0	3	5	3	9	0	9	5		1977
—	3	1	1	5	0	3	0	0		1978
—	0	1	0	0	0	2	1	0		1979
—	12	2	0	93	25	2	17	0		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
389	*Acyrthosiphon pisum*									
	1975	60	39	12	25	2	30	16	60	5
	1976	50	212	37	20	38	330	86	312	31
	1977	32	25	8	4	1	3	40	101	36
	1978	13	435	5	7	14	32	9	422	29
	1979	69	210	35	26	77	735	165	386	47
	1980	4	54	8	7	15	67	16	150	5
392	*Acyrthosiphon primulae*									
	1975	0	1	3	1	0	0	0	1	0
	1976	0	2	1	0	1	2	13	1	0
	1977	0	0	0	0	0	0	0	1	0
	1978	0	0	0	0	0	0	0	1	0
	1979	0	0	0	0	0	25	0	2	0
	1980	0	0	0	0	0	1	3	2	6
395	*Metopolophium albidum*									
	1975	2	3	6	10	2	8	47	40	19
	1976	18	0	32	2	0	0	0	1	1
	1977	0	0	0	0	0	0	1	1	9
	1978	0	0	0	0	0	0	1	0	4
	1979	2	0	0	0	0	0	0	0	1
	1980	2	2	0	2	15	0	13	15	41
396	*Metopolophium dirhodum*									
	1975	109	342	1291	822	795	2084	1392	4876	198
	1976	80	1454	4522	509	2282	523	710	4277	234
	1977	393	706	198	84	44	32	83	247	43
	1978	1092	18561	4718	190	3575	2515	420	7054	141
	1979	308	1714	3567	738	2333	14999	2719	54793	738
	1980	18	1205	339	29	77	546	222	995	65
397	*Metopolophium festucae*									
	1975	283	20	75	317	85	235	1879	981	114
	1976	41	284	74	35	91	176	55	98	11
	1977	1	0	0	1	1	3	43	4	10
	1978	11	3	13	27	5	21	76	7	28
	1979	7	3	21	5	8	86	30	24	19
	1980	14	10	42	47	120	187	145	93	187
398	*Metopolophium frisicum*									
	1975	0	1	6	22	8	3	79	94	1
	1976	0	0	0	0	2	0	0	0	0
	1977	0	0	1	0	0	0	0	0	0
	1978	1	0	0	0	0	0	1	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	1	0	8	7	10	0

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2(x)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Roswearne 910		
									389	*Acyrthosiphon pisum*
249	41	41	249	27	58	71	27	16		1975
494	83	220	692	52	281	71	75	5		1976
266	97	404	697	106	213	163	148	20		1977
398	108	70	267	51	53	116	48	5		1978
2198	451	313	654	115	145	1107	190	6		1979
67	26	31	91	43	61	80	25	7		1980
									392	*Acyrthosiphon pri mulae*
—	4	0	1	6	0	1	4	2		1975
—	17	12	14	5	13	5	2	1		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	3	3	1	0	0		1978
—	16	4	1	0	5	34	0	0		1979
—	4	0	2	3	4	3	1	0		1980
									395	*Metopolophium albidum*
—	21	17	4	60	79	2	5	5		1975
—	3	3	1	6	4	1	4	0		1976
—	0	6	0	0	1	1	3	3		1977
—	2	2	0	2	0	2	2	0		1978
—	0	0	0	2	3	0	0	1		1979
—	21	15	10	83	68	50	17	10		1980
									396	*Metopolophium dirhodum*
5717	282	371	674	315	312	269	114	66		1975
1018	4154	1616	5797	2225	1364	1277	247	34		1976
855	105	501	1354	126	946	446	2144	793		1977
4114	664	606	1055	208	231	689	249	32		1978
104429	8592	18427	21085	1597	7377	34449	1967	421		1979
73	49	19	38	185	35	54	80	12		1980
									397	*Metopolophium festucae*
41	221	109	29	167	115	24	41	25		1975
138	203	163	97	43	104	71	55	11		1976
73	9	115	36	4	53	34	26	51		1977
111	32	61	73	56	31	23	8	28		1978
179	28	63	27	19	9	150	42	40		1979
145	642	160	140	1298	295	260	234	122		1980
									398	*Metopolophium frisicum*
—	17	4	2	6	9	0	2	1		1975
—	0	0	0	1	3	4	6	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	2	0	0	0		1978
—	0	0	0	0	0	2	1	0		1979
—	7	2	2	8	3	12	3	2		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
399	*Metopolophium tenerum*									
	1975	0	0	1	1	0	0	1	7	0
	1976	0	0	1	0	0	0	0	0	1
	1977	0	0	0	0	0	0	2	0	0
	1978	0	0	0	0	1	0	1	0	1
	1979	0	0	0	0	0	0	2	0	0
	1980	0	0	2	0	2	0	0	0	4
400	*Cryptaphis poae*									
	1975	0	1	0	0	2	0	5	0	1
	1976	0	0	1	0	1	0	0	11	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	7	1
402	*Linosiphon galiophagus*									
	1975	3	1	6	3	3	8	17	22	0
	1976	82	7	33	1	11	0	2	8	1
	1977	0	0	1	0	1	0	0	1	0
	1978	1	9	3	0	9	0	0	0	0
	1979	1	0	0	0	0	0	3	0	0
	1980	0	1	0	3	3	1	7	33	0
403	*Corylobium avellanae*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	2
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	1	0	1	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
410	*Macrosiphum euphorbiae*									
	1975	104	196	160	30	46	147	244	502	87
	1976	57	75	90	35	61	21	176	291	50
	1977	25	194	67	48	13	0	182	121	92
	1978	35	440	178	69	51	12	156	113	44
	1979	22	153	63	16	16	8	46	144	14
	1980	30	154	80	14	105	9	52	90	41
412	*Macrosiphum funestum*									
	1975	1	0	1	0	0	1	2	0	0
	1976	0	0	5	0	1	0	0	10	2
	1977	0	1	0	1	0	0	4	0	0
	1978	0	0	0	0	0	0	2	1	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	1	1	0	1	1	0

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2(y)

Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne		
904	917	901	924	914	908	903	913	910		
									399	*Metopolophium tenerum*
—	3	1	0	1	1	0	0	0		1975
—	0	0	0	0	2	0	0	0		1976
—	0	0	0	0	0	0	1	12		1977
—	0	1	0	2	3	0	1	0		1978
—	0	0	0	0	0	0	0	1		1979
—	1	0	4	1	4	4	0	0		1980
									400	*Cryptaphis poae*
—	1	1	2	1	8	0	0	2		1975
—	0	0	0	0	16	0	0	0		1976
—	0	0	0	0	0	0	0	1		1977
—	0	0	0	0	3	0	0	0		1978
—	0	0	0	0	1	0	0	0		1979
—	0	1	0	0	15	0	0	0		1980
									402	*Linosiphon galiophagus*
—	118	20	29	18	23	9	11	2		1975
—	2	0	0	4	2	1	9	1		1976
—	0	0	0	1	0	2	13	5		1977
—	2	1	0	2	0	0	1	0		1978
—	0	0	8	0	1	2	0	0		1979
—	132	5	1	17	4	4	74	4		1980
									403	*Corylobium avellanae*
—	0	0	0	0	0	0	0	0		1975
—	2	3	0	0	0	8	5	0		1976
—	1	0	4	2	0	1	3	0		1977
—	0	0	0	4	0	4	0	0		1978
—	2	0	1	0	0	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									410	*Macrosiphum euphorbiae*
62	143	104	124	256	152	86	72	36		1975
131	78	68	188	107	149	187	77	17		1976
37	125	87	159	88	164	87	448	743		1977
54	122	30	35	103	55	39	76	72		1978
95	111	56	20	28	64	150	33	24		1979
18	102	47	69	144	122	106	62	10		1980
									412	*Macrosiphum funestum*
—	0	0	0	2	2	4	3	3		1975
—	24	5	0	20	18	15	1	0		1976
—	5	0	1	0	2	3	4	2		1977
—	0	1	0	3	0	6	0	1		1978
—	4	0	36	0	2	0	0	2		1979
—	0	3	0	17	1	0	3	4		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
413	*Macrosiphum gei*									
	1975	2	0	1	1	7	0	5	4	5
	1976	4	0	4	0	0	0	4	0	3
	1977	1	0	0	1	0	0	0	2	0
	1978	0	0	0	1	1	0	2	2	0
	1979	0	2	0	0	0	1	0	4	0
	1980	0	1	0	0	1	1	4	0	0
416	*Macrosiphum rosae*									
	1975	4	5	8	9	4	2	5	20	8
	1976	5	11	14	18	17	8	12	35	30
	1977	0	2	4	4	1	0	2	25	7
	1978	2	9	6	1	4	1	10	4	3
	1979	2	4	5	5	1	0	15	12	10
	1980	0	4	31	3	5	6	8	13	39
420	*Sitobion avenae*									
	1975	1012	2627	3768	1505	848	4269	1905	5943	1877
	1976	1594	2578	4474	6615	3300	2871	13713	12676	4616
	1977	282	801	502	790	702	875	429	1140	598
	1978	189	287	284	50	284	316	92	1632	312
	1979	162	354	774	26	43	382	111	190	195
	1980	128	544	475	470	745	3582	1511	3695	441
421	*Sitobion fragariae*									
	1975	14	11	76	67	19	43	151	161	52
	1976	50	19	82	23	39	5	80	31	23
	1977	41	4	29	11	9	1	235	65	168
	1978	5	115	14	37	60	112	62	382	64
	1979	57	69	46	20	69	373	116	1165	35
	1980	16	46	27	14	57	102	64	160	30
450	*Macrosiphoniella abrotani*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	1	1	0	2	0	8	0
	1977	0	0	0	1	1	0	0	1	0
	1978	0	0	0	0	0	0	0	0	0
	1979	2	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
451	*Macrosiphoniella absinthii*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	4	0
	1977	0	0	0	0	0	0	0	3	0
	1978	0	0	0	0	0	0	0	4	0
	1979	1	0	0	0	0	0	0	24	0
	1980	0	0	0	0	0	0	0	0	0

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2(z)

Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne		
904	917	901	924	914	908	903	913	910		
									413	*Macrosiphum gei*
0	1	7	4	8	4	3	0	1		1975
0	6	2	0	0	8	2	0	0		1976
0	0	0	0	0	5	1	0	0		1977
0	0	0	0	7	2	2	0	0		1978
0	0	0	0	1	0	3	2	1		1979
5	4	2	4	7	2	1	0	1		1980
									416	*Macrosiphum rosae*
8	15	9	15	35	26	12	20	4		1975
0	14	19	8	54	59	38	5	6		1976
0	30	21	27	11	37	12	115	32		1977
0	7	4	3	12	13	7	2	3		1978
0	4	14	16	6	30	40	10	4		1979
0	8	13	19	82	64	39	13	5		1980
									420	*Sitobion avenae*
9676	3019	1522	2632	5851	2740	1992	2029	524		1975
8639	7567	7596	9461	4301	10261	4112	2636	262		1976
2081	1327	2794	3604	1187	3590	3096	4800	4597		1977
1134	911	578	1241	526	680	813	580	200		1978
2141	106	376	678	122	452	1828	509	222		1979
2777	999	827	2140	1115	2407	4569	628	122		1980
									421	*Sitobion fragariae*
124	101	116	187	140	137	122	120	148		1975
68	39	29	79	56	61	51	123	77		1976
58	42	18	64	63	72	37	93	53		1977
349	833	497	377	437	718	468	332	27		1978
2088	551	678	385	105	520	645	357	55		1979
33	138	69	77	180	149	106	180	43		1980
									450	*Macrosiphoniella abrotani*
—	0	0	0	1	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	0	0	0	0		1978
—	0	0	0	0	8	0	0	0		1979
—	0	1	0	0	0	0	0	0		1980
									451	*Macrosiphoniella absinthii*
—	0	0	0	0	0	2	0	0		1975
—	0	2	0	0	0	4	0	0		1976
—	0	0	0	0	0	0	2	0		1977
—	1	0	0	2	0	0	0	0		1978
—	0	0	10	0	0	0	0	0		1979
—	0	0	0	0	0	2	0	0		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
452	*Macrosiphoniella artemisiae*									
	1975	0	0	0	0	0	0	0	0	0
	1976	2	0	0	0	0	0	0	2	1
	1977	0	1	0	0	0	0	0	2	0
	1978	2	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	2	0	0	0
	1980	0	1	0	0	0	0	0	0	0
453	*Macrosiphoniella millefolii*									
	1975	1	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	1	0	0
	1978	0	0	0	0	0	0	0	3	0
	1979	0	0	0	0	1	0	0	4	0
	1980	0	0	0	1	0	0	0	0	0
462	*Macrosiphoniella persequens*									
	1975	0	0	0	0	1	0	0	1	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	1	0	0	0	0	1
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
463	*Macrosiphoniella sejuncta*									
	1975	0	0	0	0	1	0	0	0	1
	1976	1	0	0	0	0	0	0	4	0
	1977	0	0	0	0	0	0	0	4	1
	1978	0	0	0	0	0	0	0	0	0
	1979	1	0	1	0	0	0	0	0	0
	1980	0	0	0	1	0	0	0	0	0
732	*Macrosiphoniella tapuskae*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	3	8	0
	1977	0	0	0	0	0	0	2	18	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	1	0	0	0
	1980	0	0	0	0	0	0	0	0	0
467	*Amphorophora gei*									
	1975	0	0	0	0	0	0	0	1	0
	1976	0	2	2	0	2	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	1	0	0	1	0	0	0	0

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2(aa)

904 Broom's Barn	917 Hereford	901 Rothamsted	924 Writtle	914 Long Ashton	908 Silwood Park	903 Wye, Kent	913 Starcross	910 Rosewarne		
									452	*Macrosiphoniella artemisiae*
—	0	0	0	0	0	0	0	0		1975
—	2	0	12	0	0	3	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	0	0	0	0		1978
—	1	2	0	0	2	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									453	*Macrosiphoniella millefolii*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	0	0	5	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	1	0	0	0		1978
—	0	0	0	0	6	2	1	0		1979
—	4	0	0	0	0	0	0	0		1980
									462	*Macrosiphoniella persequens*
—	0	0	0	0	0	0	7	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	1	0	0	2	0	0	0		1977
—	0	0	0	0	0	2	0	0		1978
—	0	2	0	0	3	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									463	*Macrosiphoniella sejuncta*
—	0	0	0	0	0	0	1	2		1975
—	4	4	1	4	3	2	0	0		1976
—	0	0	0	2	2	0	2	0		1977
—	0	0	0	0	2	0	1	0		1978
—	0	0	0	0	1	0	2	0		1979
—	0	0	0	2	1	0	0	0		1980
									732	*Macrosiphoniella tapuskae*
—	1	0	0	2	0	2	0	0		1975
—	4	5	18	1	4	18	0	0		1976
—	1	3	6	7	2	6	7	0		1977
—	0	0	0	1	2	2	0	0		1978
—	4	0	8	0	1	0	0	0		1979
—	0	0	2	0	1	0	0	0		1980
									467	*Amphorophora gei*
—	1	2	1	0	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	0	0	0	0		1978
—	0	0	0	0	0	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
468	*Amphorophora rubi*									
	1975	0	19	1	0	1	0	16	1	6
	1976	4	15	12	0	1	6	8	0	5
	1977	1	29	11	0	1	0	3	5	1
	1978	1	9	1	0	2	3	1	3	1
	1979	10	64	2	1	2	0	0	14	0
	1980	0	8	2	0	5	1	2	4	27
470	*Megoura viciae*									
	1975	4	2	0	4	2	3	4	4	0
	1976	7	2	1	0	5	0	4	0	0
	1977	0	0	1	1	0	0	0	0	0
	1978	1	0	0	1	0	0	2	0	0
	1979	1	1	1	3	3	0	2	0	2
	1980	2	3	6	2	10	0	1	0	2
471	*Megourella purpurea*									
	1975	0	0	0	3	0	0	0	2	1
	1976	0	0	1	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	1	0
	1979	0	0	0	0	0	0	1	0	1
	1980	0	0	1	0	1	1	1	0	0
741	*Masonaphis lambersi*									
	1975	0	0	0	0	0	0	0	0	—
	1976	0	0	0	0	0	0	0	0	—
	1977	0	0	0	0	0	0	0	0	—
	1978	0	0	0	0	0	0	0	0	—
	1979	0	0	0	0	0	0	0	1	—
	1980	0	1	0	0	0	0	0	0	—
477	*Wahlgreniella arbuti*									
	1975	0	0	0	0	0	0	0	73	0
	1976	0	0	7	0	2	7	4	305	0
	1977	0	0	0	0	0	0	1	83	0
	1978	0	0	0	1	1	1	2	4	0
	1979	0	0	1	0	0	0	2	0	0
	1980	2	2	19	0	4	2	3	31	0
480	*Anoecia corni*									
	1975	4	0	0	17	0	3	17	89	28
	1976	3	2	1	7	2	3	24	62	40
	1977	0	0	0	3	1	1	8	72	40
	1978	1	1	0	6	1	3	23	121	74
	1979	0	0	0	2	0	2	21	140	54
	1980	0	5	1	7	0	8	37	69	35

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2(bb)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Rosewarne 910		
									468	*Amphorophora rubi*
24	17	4	24	61	15	17	43	33		1975
50	12	4	4	55	18	20	8	10		1976
47	9	0	10	3	2	3	18	0		1977
6	10	3	6	2	7	5	1	0		1978
7	10	4	10	0	20	4	0	0		1979
30	14	2	2	41	9	17	34	14		1980
									470	*Megoura viciae*
2	4	1	14	0	2	2	0	1		1975
2	0	0	0	0	0	3	0	0		1976
0	0	0	0	0	0	0	0	0		1977
0	0	0	0	0	0	0	0	0		1978
1	0	0	10	6	1	54	0	3		1979
3	0	2	4	0	6	4	0	1		1980
									471	*Megourella purpurea*
0	2	0	0	0	0	0	1	2		1975
0	0	0	0	0	2	0	0	1		1976
0	0	0	0	0	0	0	0	0		1977
0	0	1	0	0	1	2	0	0		1978
0	0	0	2	0	0	0	1	0		1979
0	0	0	0	0	2	0	0	0		1980
									741	*Masonaphis lambersi*
—	0	0	0	0	2	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	1	0	0	0		1978
—	0	2	0	0	19	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									477	*Wahlgreniella arbuti*
—	2	92	103	15	240	12	1	2		1975
—	35	293	288	22	309	30	0	0		1976
—	17	61	135	29	200	41	1	6		1977
—	5	15	15	19	37	1	0	0		1978
—	9	4	8	10	32	19	0	0		1979
—	15	86	174	29	152	35	6	0		1980
									480	*Anoecia corni*
48	75	75	116	275	271	84	42	24		1975
49	24	77	150	162	219	89	19	26		1976
84	66	130	220	278	318	164	130	44		1977
132	171	124	94	371	446	307	68	28		1978
87	155	76	93	201	296	183	61	16		1979
61	66	100	133	291	348	151	35	52		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
490	*Thelaxes dryophila*									
	1975	0	11	10	16	0	0	1	6	8
	1976	13	54	10	15	2	4	22	5	6
	1977	0	0	0	3	1	0	1	5	3
	1978	0	3	2	2	0	4	2	2	6
	1979	0	1	1	0	2	6	0	16	0
	1980	0	3	17	1	3	0	2	6	0
491	*Mindarus abietinus*									
	1975	0	1	0	0	0	0	0	0	1
	1976	2	0	0	2	1	0	0	0	3
	1977	1	0	0	1	0	0	1	0	9
	1978	0	0	0	0	0	0	0	0	0
	1979	0	1	0	0	0	0	0	0	2
	1980	0	0	0	0	0	0	0	0	1
499	*Eriosoma patchae*									
	1975	6	9	3	5	0	2	1	19	2
	1976	48	16	6	22	4	12	20	21	4
	1977	5	18	0	23	0	4	16	21	3
	1978	1	20	2	1	6	7	7	8	5
	1979	8	54	17	1	6	18	4	21	0
	1980	12	14	0	0	0	7	7	6	1
500	*Erisoma ulmi*									
	1975	5	38	15	5	4	11	4	15	4
	1976	121	540	63	26	72	97	229	336	15
	1977	7	118	35	15	10	9	33	22	7
	1978	32	331	75	10	37	43	118	107	10
	1979	32	244	12	4	30	94	45	218	11
	1980	18	138	25	14	7	24	32	27	8
502	*Kaltenbachiella pallida*									
	1975	1	0	0	0	0	0	0	0	1
	1976	3	2	3	1	0	0	10	0	30
	1977	0	0	0	0	0	0	0	0	0
	1978	0	1	0	3	2	0	1	0	0
	1979	0	0	0	0	0	0	0	0	2
	1980	0	0	0	0	0	0	0	2	0
503	*Tetraneura ulmi*									
	1975	2	1	0	0	0	0	2	9	3
	1976	2	0	1	1	1	0	2	3	4
	1977	3	0	0	1	0	0	2	7	357
	1978	4	3	1	5	3	1	5	10	0
	1979	8	4	0	4	0	0	7	4	3
	1980	0	10	0	4	0	1	15	14	15

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2(cc)

Broom's Barn 904	Hereford 917	Rothamsted 901	Writtle 924	Long Ashton 914	Silwood Park 908	Wye, Kent 903	Starcross 913	Rosewarne 910		
									490	*Thelaxes dryophila*
27	19	5	14	16	36	56	44	2		1975
29	153	31	48	31	654	95	130	8		1976
38	456	24	160	35	239	63	110	0		1977
45	81	10	45	32	47	60	104	0		1978
14	363	14	47	15	178	46	125	0		1979
26	97	0	37	14	113	30	41	1		1980
									491	*Mindarus abietinus*
—	0	0	0	0	2	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	0	0	0	0		1978
—	0	0	0	0	0	0	1	1		1979
—	0	0	0	0	0	0	2	0		1980
									499	*Eriosoma patchae*
—	13	1	0	12	10	4	2	3		1975
—	1	4	9	4	7	5	4	1		1976
—	4	1	6	7	16	9	3	4		1977
—	29	12	10	48	68	62	7	6		1978
—	48	15	28	18	74	40	5	3		1979
—	0	9	10	14	19	16	2	2		1980
									500	*Eriosoma ulmi*
26	20	6	7	10	7	12	4	0		1975
78	241	98	62	65	47	44	8	1		1976
31	93	5	38	10	10	36	2	0		1977
114	231	29	69	33	29	91	2	3		1978
245	425	33	71	28	52	221	1	2		1979
17	108	12	12	25	15	35	1	1		1980
									502	*Kaltenbachiella pallida*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	0	1	0	0	0		1976
—	0	1	0	0	0	0	0	0		1977
—	1	0	0	0	3	1	0	0		1978
—	0	0	0	0	1	0	0	0		1979
—	0	0	2	0	0	0	0	0		1980
									503	*Tetraneura ulmi*
—	0	6	5	28	10	6	7	1		1975
—	2	5	42	36	7	28	3	2		1976
—	1	7	14	34	9	15	5	3		1977
—	9	10	6	32	25	14	1	0		1978
—	1	2	14	18	27	14	3	0		1979
—	12	4	8	17	21	14	4	2		1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
508	*Prociphilus pini*									
	1975	51	21	0	4	8	3	0	4	22
	1976	19	3	1	4	4	3	0	27	3
	1977	14	0	0	1	2	0	0	0	0
	1978	10	7	0	1	1	1	0	0	0
	1979	3	0	0	0	0	0	0	0	0
	1980	4	3	0	0	0	1	0	0	0
510	*Mimeuria ulmiphila*									
	1975	0	0	0	2	0	1	1	0	0
	1976	0	0	0	0	0	0	0	18	0
	1977	0	0	0	0	0	0	0	0	0
	1978	1	0	0	0	0	0	0	0	0
	1979	1	0	0	0	0	0	0	0	0
	1980	0	0	0	0	1	0	0	0	0
512	*Thecabius affinis*									
	1975	16	65	51	27	75	25	55	84	124
	1976	16	26	20	118	94	6	142	7	147
	1977	37	13	4	26	17	3	25	16	0
	1978	2	27	16	21	21	2	12	26	0
	1979	47	11	23	6	87	6	30	33	15
	1980	7	17	31	3	16	2	29	12	0
523	*Parathecabius lysimachiae*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	1	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	2	0
	1978	0	0	0	1	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
527	*Forda formicaria*									
	1975	0	0	0	0	0	0	2	5	2
	1976	0	0	0	0	0	0	0	4	1
	1977	0	0	0	0	0	1	1	4	2
	1978	1	0	0	0	0	0	1	3	0
	1979	1	0	1	1	0	0	1	0	0
	1980	0	0	0	0	2	2	1	2	1
528	*Forda marginata*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	2
	1978	0	0	0	0	0	0	1	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0

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2(dd)

904 Broom's Barn	917 Hereford	901 Rothamsted	924 Writtle	914 Long Ashton	908 Silwood Park	903 Wye, Kent	913 Starcross	910 Rosewarne	
									508 *Prociphilus pini*
—	2	3	0	6	58	16	1	0	1975
—	0	1	4	0	63	5	0	0	1976
—	0	5	0	0	4	6	1	0	1977
—	0	2	0	2	9	4	0	0	1978
—	1	0	0	0	11	15	0	0	1979
—	2	0	0	0	2	0	0	0	1980
									510 *Mimeuria ulmiphila*
—	1	2	1	1	3	0	3	0	1975
—	0	4	6	0	0	1	2	0	1976
—	0	0	7	1	1	1	12	0	1977
—	0	0	6	2	17	9	23	1	1978
—	0	2	3	5	11	3	6	0	1979
—	0	2	0	5	6	2	3	0	1980
									512 *Thecabius affinis*
0	23	3	23	56	23	32	33	30	1975
0	13	3	6	15	19	5	5	5	1976
0	9	0	4	22	12	9	25	4	1977
0	32	3	6	21	22	12	30	8	1978
0	12	8	6	16	25	16	6	18	1979
0	12	3	14	18	7	2	12	10	1980
									523 *Parathecabius lysimachiae*
—	0	1	0	0	0	1	0	0	1975
—	0	0	0	1	0	0	0	0	1976
—	1	0	0	0	0	0	0	0	1977
—	1	0	0	3	0	0	0	0	1978
—	0	0	0	0	0	0	0	0	1979
—	0	0	0	0	0	0	0	0	1980
									527 *Forda formicaria*
1	1	3	2	15	6	12	0	0	1975
0	0	0	0	7	9	1	2	0	1976
0	1	1	0	9	8	1	4	6	1977
0	1	1	1	2	2	4	2	1	1978
0	0	0	0	3	3	9	4	0	1979
0	0	3	3	2	2	3	2	0	1980
									528 *Forda marginata*
—	0	0	0	1	0	0	0	0	1975
—	0	0	0	0	4	0	0	0	1976
—	0	0	0	2	0	0	0	0	1977
—	0	0	0	2	0	0	0	0	1978
—	0	0	0	0	0	0	2	0	1979
—	0	0	0	0	0	0	0	0	1980

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TABLE

		Elgin	Dundee	Edinburgh	Auchincruive	Newcastle	High Mowthorpe	Preston	Shardlow	Aberystwyth
		916	907	912	923	906	905	922	919	911
530	*Aploneura lentisci*									
	1975	0	1	15	7	2	3	0	21	3
	1976	1	5	3	42	28	37	56	680	207
	1977	1	0	2	1	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	1	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
531	*Baizongia pistaciae*									
	1975	0	0	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
726	*Melanaphis elizabethae*									
	1975	0	11	0	0	0	1	0	0	0
	1976	0	38	0	0	0	0	0	0	0
	1977	0	4	0	0	0	0	0	0	0
	1978	0	1	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	1	0	0	0	0	0	0	0
733	*Nearctaphis bakeri*									
	1975	0	0	0	0	0	0	0	2	1
	1976	0	0	5	0	1	1	1	3	1
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0
751	*Utamphorophora humboldti*									
	1975	0	0	0	0	0	0	0	6	0
	1976	0	1	10	0	0	0	2	4	0
	1977	0	0	0	0	0	0	1	3	0
	1980	0	1	4	0	0	0	14	23	0
	1979	0	0	0	0	0	0	3	0	0
	1980	0	0	0	1	2	0	13	41	24
756	*Cedrobium laportei*									
	1975	0	1	0	0	0	0	0	0	0
	1976	0	0	0	0	0	0	0	0	0
	1977	0	0	0	0	0	0	0	0	0
	1978	0	0	0	0	0	0	0	0	0
	1979	0	0	0	0	0	0	0	0	0
	1980	0	0	0	0	0	0	0	0	0

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2(ee)

Broom's Barn	Hereford	Rothamsted	Writtle	Long Ashton	Silwood Park	Wye, Kent	Starcross	Rosewarne		
904	917	901	924	914	908	903	913	910		
									530	*Aploneura lentisci*
0	19	62	30	35	23	78	23	53		1975
73	1635	680	647	3161	604	635	941	5115		1976
1	5	0	0	3	1	0	4	0		1977
0	0	0	0	7	0	0	2	1		1978
0	0	3	0	0	0	0	2	0		1979
0	0	0	0	0	0	0	0	0		1980
									531	*Baizongia pistaciae*
—	0	6	5	3	8	2	0	0		1975
—	0	0	0	0	2	2	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	2	0	0	0	0	0		1978
—	0	0	0	0	0	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980
									726	*Melanaphis elizabethae*
—	0	0	0	0	0	0	0	0		1975
—	0	0	0	0	0	0	0	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	0	0	0	0		1978
—	0	0	0	0	0	0	3	0		1979
—	0	0	0	0	0	0	0	0		1980
									733	*Nearctaphis bakeri*
—	5	9	17	2	12	12	13	1		1975
—	11	16	12	2	9	5	6	3		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	1	3	1	1	0		1978
—	0	0	0	2	0	0	0	0		1979
—	0	2	0	0	0	0	0	0		1980
									751	*Utamphorophora humboldti*
—	3	54	13	12	102	0	2	0		1975
—	23	15	5	24	15	0	5	1		1976
—	1	1	0	0	2	1	4	6		1977
—	14	10	10	45	18	12	18	13		1978
—	0	0	0	0	1	0	3	1		1979
—	7	13	15	67	35	50	77	29		1980
									756	*Cedrobium laportei*
—	0	0	4	0	4	0	1	0		1975
—	0	4	4	0	6	0	2	0		1976
—	0	0	0	0	0	0	0	0		1977
—	0	0	0	0	0	0	0	0		1978
—	0	0	0	0	0	0	0	0		1979
—	0	0	0	0	0	0	0	0		1980

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Figs. 17–35. The average geographical distribution of each seasonal migration for the years 1975–80 mapped from the 18 sample stations listed in Table 2 using the SYMAP program (Laboratory for Computer Graphics, Harvard). The number of migrations per year is based on the known biological cycles, the published phenological evidence (Taylor *et al.*, Figs. 3–9) and examination of the daily sample records from individual sites. The dates selected for separation of migratory cycles are averages over time for data that are not synchronous. This leads to a loss of definition but represents the general expectation until adequate phenological models for each species justify shifting the time scale for each site/year.

Periods for indeterminate flight activity for some species have been separated arbitrarily to show either continuation of the same geographical distribution or changed distribution not yet understood.

Layering intervals are numbered at each sampling site on the maps as follows:
1 (no shading), zero sample; 2, 1–2; 3, 3–9; 4, 10–31; 5, 32–99; 6, 100–315; 7, 316–999; 8, 1000–3161; 9 (solid black), 3162–9999.

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FIG. 17. 132, *Aphis fabae*: i, weeks 1–25; ii, weeks 26–38; iii, weeks, 39–52.

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FIG. 18. 389, *Acyrthosiphon pisum*: i, weeks 1–25; ii, weeks 26–36; iii, weeks 37–52.

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FIG. 19. 322, *Myzus persicae*: i, weeks 1–25; ii, weeks 26–35; iii, weeks 36–52.

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FIG. 20. 358, *Hyperomyzus lactucae*: i, weeks 1–25; ii, weeks 26–36; iii, weeks 37–52.

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FIG. 21. 420, *Sitobion avenae*: i, weeks 1–23; ii, weeks 24–39; iii, weeks 40–52.

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FIG. 22. 114, *Rhopalosiphum padi*: i, weeks 1–25; ii, weeks 26–34; iii, weeks 35–52.

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FIG. 23. 396, *Metopolophium dirhodum*: i, weeks 1–23; ii, weeks 24–36; iii, weeks 37–52.

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FIG. 24. 111, *Rhopalosiphum insertum*: i, weeks 1–26; ii, weeks 27–36; iii, weeks 37–52.

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FIG. 25. 410, *Macrosiphum euphorbiae*: i, weeks 1–25; ii, weeks 26–36; iii, weeks 37–52.

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FIG. 26. 421, *Sitobion fragariae*: i, weeks 1–26; ii, weeks 27–38; iii, weeks 39–52.

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FIG. 27. 355, *Nasonovia ribisnigri*: i, weeks 1–25; ii, weeks 26–34; iii, weeks 35–52.

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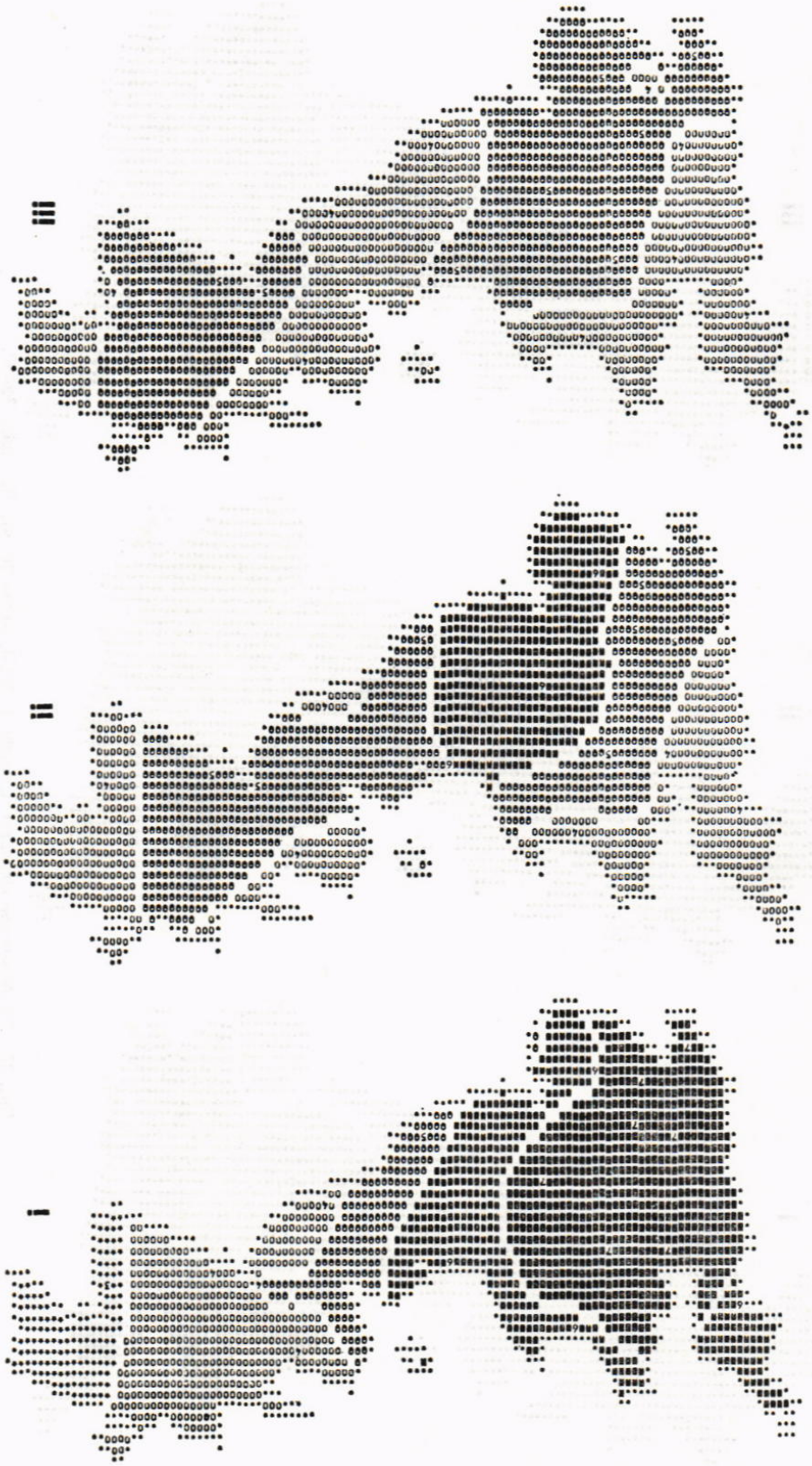


FIG. 28. 243, *Brachycaudus helichrysi*: i, weeks 1–26; ii, weeks 27–33; iii, weeks 34–52.

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FIG. 29. 292, *Cavariella aegopodii*: i, weeks 1–26; ii, weeks 27–37; iii, weeks 38–52.

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FIG. 30. 308, *Phorodon humuli*: i, weeks 1–34; ii, weeks 35–52.
264, *Brevicoryne brassicae*: iii, weeks 1–34; iv, weeks 35–52.

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FIG. 31. 110, *Hyalopterus pruni*; i, weeks 1–36; ii, weeks 37–52.
500, *Eriosoma ulmi*: iii, weeks 1–34; iv, weeks 35–52.

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FIG. 32. 91, *Drepanosiphum platanoidis*; i, weeks 1–29; ii, weeks 30–52.
397, *Metopolophium festucae*: iii, weeks 1–32; iv, weeks 33–52.

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FIG. 33. 112, *Rhopalosiphum maidis*: i, weeks 1–36; ii, weeks 37–52.
376, *Aulacorthum solani*: iii, weeks 1–36; iv, weeks 37–52.

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FIG. 34. 234, *Dysaphis plantaginea*: i, weeks 1–34; ii, weeks 35–52.
78, *Phyllaphis fagi*: iii, weeks 1–35; iv, weeks 36–52.

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FIG. 35. 290, *Elatobium abietinum*: i, weeks 1–52. 318, *Myzus ascalonicus*: ii, weeks 1–52.
315, *Myzus ornatus*: iii, weeks 1–52. 319, *Myzus certus*: iv, weeks 1–52.

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Use of Fertilisers in England and Wales, 1981

B. M. CHURCH

The series of annual surveys done by staff of the ADAS Regional Soil Scientists in collaboration with representatives of the Fertiliser Manufacturers' Association and Rothamsted (Church & Lewis, 1977) was continued in 1981 when a random sample of 1350 farms in England and Wales was surveyed.

As in the last 2 years, there is no evidence of any major change in the use of P and K, but use of N per hectare crops and grass is estimated to have been about 8% more in 1981 than in 1980. This increase, which was evident on both tillage crops and grassland, was entirely in straight N fertilisers (Table 1).

TABLE 1

Fertiliser use on tillage crops and grassland (kg ha^{-1}), 1978–81

	Tillage crops				Grassland				All crops and grass			
	1978	1979	1980	1981	1978	1979	1980	1981	1978	1979	1980	1981
N Straight	53	66	77	92	67	71	69	74	60	69	73	83
Compound	51	46	44	43	45	45	50	51	47	45	47	47
Total	104	112	121	135	112	116	119	125	107	114	120	130
P_2O_5	51	49	49	51	26	25	27	25	37	36	37	38
K_2O	56	53	54	56	24	26	26	26	39	38	40	41

The most striking increases are again in the use of straight N on cereals. In 1981, winter wheat received an average total of 162 kg ha^{-1} N, comprising 144 kg ha^{-1} straight and 18 kg ha^{-1} in compound fertilisers. Nearly a fifth of the crop got more than 200 kg ha^{-1} N, and total applications of 250 kg ha^{-1} or more were reported (Table 2).

TABLE 2

Fertiliser use on winter wheat and spring barley (kg ha^{-1}), 1978–81

	Winter wheat				Spring barley			
	1978	1979	1980	1981	1978	1979	1980	1981
N Straight	106	117	126	144	21	26	24	37
Compound	19	18	19	18	62	62	63	61
Total	125	135	145	162	83	88	87	98
P_2O_5	44	46	46	49	38	37	37	37
K_2O	37	38	39	42	39	39	40	40

On spring barley, where increases in N use have been relatively modest in recent years, the total use of N, at 98 kg ha^{-1}, was up 12% and use of straight N was 50% more than in 1980. Extra top dressings, to compensate for loss of N from the seedbed due to the wet spring, certainly explain part of this large increase. However, it will be interesting to see whether a significant trend of increasing applications to spring cereals is becoming established. The average amounts of fertiliser nutrients used per hectare in 1981 on individual tillage crops, and on grassland classified according to utilisation, and the proportions of each crop which got different amounts of nutrient are summarised in Tables 3–8 at the end of this paper.

REFERENCE

CHURCH, B. M. & LEWIS, D. A. (1977) Fertiliser use on farm crops in England and Wales: Information from the Survey of Fertiliser Practice 1942–1976. *Outlook on Agriculture* **9**, 186–193.

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TABLE 3

Fertiliser use in England and Wales, 1981

	Fields	Hectares ('000)	Overall* (kg ha^{-1})			% Area receiving				Actual* (kg ha^{-1})		
			N	P_2O_5	K_2O	N	P	K	FYM	N	P_2O_5	K_2O
Spring wheat	69	29	133	31	31	100	77	77	21	133	40	40
Winter wheat	2065	1415	162	49	42	99	88	79	12	163	56	53
Spring barley	1915	1071	98	37	40	98	95	94	19	100	39	43
Winter barley	1263	755	143	50	47	99	92	88	12	144	54	54
Spring oats	126	39	72	37	36	95	95	91	24	76	39	39
Winter oats	155	55	107	49	46	99	90	87	14	109	54	52
Mixed corn	24	9	48	33	29	75	75	75	42	63	43	38
Maize	21	6	95	44	42	89	78	76	73	107	56	56
Early potatoes	56	20	198	203	229	100	100	100	40	198	203	229
Maincrop potatoes	337	109	194	192	259	98	98	98	42	199	197	266
Sugar beet	369	200	152	67	152	94	91	93	30	162	73	162
Swedes (stock)	78	18	60	115	75	88	96	90	35	68	120	84
Turnips (stock)	82	24	87	54	49	94	79	77	39	92	68	64
Kale and cow cabbage	118	29	110	44	51	96	85	85	43	115	52	59
Rape for stockfeed	37	10	94	72	43	89	77	77	28	105	94	56
Beans for stockfeed	70	31	3	30	24	16	50	48	7	19	61	49
Other stockfeed	72	18	69	71	66	77	86	82	35	90	83	81
Peas for human consumption	170	85	16	27	28	35	56	57	8	45	48	50
Runner and French beans	34	11	95	68	83	61	85	85	1	156	79	97
Brussels sprouts	40	9	235	98	215	98	98	98	10	240	100	219
Cabbages	37	8	231	66	143	93	72	86	25	248	92	166
Cauliflower	62	12	177	91	153	100	95	95	22	177	96	161
Onions	41	6	148	102	172	100	76	97	24	148	134	178
Small fruit	74	10	68	26	70	65	48	61	19	104	55	115
Top fruit	116	33	82	20	36	80	59	59	2	102	34	61
Oilseed rape	221	128	260	46	36	99	85	65	5	263	54	55
All tillage	8030	4251	135	51	56	95	89	84	17	142	57	66
1 year leys	20	5	90	8	11	86	36	36	21	104	22	29
2–7 year leys	2769	1662	172	32	39	91	67	69	41	190	47	56
Permanent grass	3046	2706	97	21	19	75	54	52	34	131	39	37
All crops and grass	13865	8624	130	38	41	88	74	71	27	149	51	58

* The average application of any fertiliser component over all fields including those receiving none is termed 'overall'. The average excluding fields with none of the component is termed 'actual'.

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TABLE 4

Percentages of crop area getting different amounts of N (kg ha^{-1})

	Fields	0	< 25	25–	50–	75–	100–	125–	150–	200–	250–	300–	400+
Spring wheat	69	0	0	2	5	18	15	19	39	1	0	0	0
Winter wheat	2065	1	0	1	2	6	9	18	46	16	2	0	0
Spring barley	1915	2	1	4	15	27	27	16	7	1	0	0	0
Winter barley	1263	1	1	1	3	7	16	27	35	8	1	0	0
Spring oats	126	5	0	6	34	43	9	1	1	1	0	0	0
Winter oats	155	1	4	4	9	21	20	26	9	4	0	0	0
Mixed corn	24	25	2	16	30	11	16	0	0	0	0	0	0
Maize	21	11	1	0	10	24	16	20	17	0	0	0	0
Early potatoes	56	0	0	0	1	0	0	5	51	26	9	8	0
Maincrop potatoes	337	2	0	0	1	4	6	6	34	33	8	5	1
Sugar beet	369	6	0	1	0	4	7	21	45	13	1	0	0
Swedes (stock)	78	12	10	23	21	16	9	5	3	1	0	0	0
Turnips (stock)	82	6	0	24	17	19	6	5	19	0	3	0	0
Kale and cow cabbage	118	4	1	5	8	16	24	25	15	1	1	0	0
Rape for stockfeed	37	11	0	10	17	22	14	3	11	12	0	0	0
Beans for stockfeed	70	84	8	7	0	0	0	0	0	0	0	0	0
Other stockfeed	72	23	9	8	10	21	12	4	11	1	0	1	0
Peas for human consumption	170	65	13	17	0	1	0	0	3	0	0	0	0
Runner and French beans	34	39	6	1	0	1	5	6	30	12	0	0	0
Brussels sprouts	40	2	0	2	1	0	16	2	14	21	17	12	14
Cabbages	37	7	0	1	0	8	6	6	15	6	30	17	4
Cauliflower	62	0	0	2	24	2	7	10	15	10	21	4	6
Onions	41	0	0	0	21	7	15	9	22	10	14	0	0
Small fruit	74	35	5	13	12	10	4	2	5	11	2	0	0
Top fruit	116	20	5	16	6	11	8	20	13	1	1	0	0
Oilseed rape	221	1	0	0	1	0	0	3	4	18	53	20	0
All tillage	8030	5	1	3	6	12	14	17	28	9	3	1	0
1 year leys	20	14	11	10	10	23	3	16	0	7	6	0	0
2–7 year leys	2769	9	0	5	11	10	5	7	13	11	9	12	6
Permanent grass	3046	25	1	10	15	12	5	7	9	5	4	4	2
All crops and grass	13865	12	1	6	10	12	10	12	19	8	5	4	2

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TABLE 5

Percentages of crop area getting different amounts of P_2O_5 (kg ha^{-1})

	Fields	0	<25	25–	50–	75–	100–	125–	150–	200–	250–	300–	400+
Spring wheat	69	23	3	48	24	2	0	0	0	0	0	0	0
Winter wheat	2065	12	2	28	44	12	1	1	0	0	0	0	0
Spring barley	1915	5	9	65	20	1	0	0	0	0	0	0	0
Winter barley	1263	8	5	28	45	13	1	0	0	0	0	0	0
Spring oats	126	5	9	64	16	5	1	0	0	0	0	0	0
Winter oats	155	10	4	25	53	8	0	0	0	0	0	0	0
Mixed corn	24	25	12	32	17	15	0	0	0	0	0	0	0
Maize	21	22	0	23	38	17	0	0	0	0	0	1	0
Early potatoes	56	0	0	0	1	0	5	13	27	40	5	10	0
Maincrop potatoes	337	2	0	0	0	9	5	7	30	31	9	5	1
Sugar beet	369	9	0	17	42	18	8	2	3	1	0	0	0
Swedes (stock)	78	4	6	10	16	20	7	4	11	14	8	0	0
Turnips (stock)	82	21	10	17	22	16	8	5	2	0	0	0	0
Kale and cow cabbage	118	15	5	34	35	9	2	0	1	0	0	0	0
Rape for stockfeed	37	23	9	20	18	7	3	0	3	13	0	3	0
Beans for stockfeed	70	50	3	17	17	8	0	1	3	0	0	0	0
Other stockfeed	72	14	7	19	26	9	6	4	11	2	0	1	0
Peas for human consumption	170	44	15	17	15	4	3	0	1	1	0	0	0
Runner and French beans	34	15	0	9	27	30	13	6	0	0	0	0	0
Brussels sprouts	40	2	0	4	21	20	25	18	10	0	0	0	0
Cabbages	37	28	0	12	16	20	13	2	8	0	0	0	0
Cauliflower	62	5	0	9	11	12	56	1	5	0	0	0	0
Onions	41	24	0	1	11	20	1	6	35	3	0	0	0
Small fruit	74	52	4	21	6	13	3	0	0	0	0	0	0
Top fruit	116	41	30	14	9	5	0	1	0	0	0	0	0
Oilseed rape	221	15	4	18	56	8	0	0	0	0	0	0	0
All tillage	8030	11	5	35	34	9	2	1	1	1	0	0	0
1 year leys	20	64	22	15	0	0	0	0	0	0	0	0	0
2–7 year leys	2769	33	13	31	14	5	2	1	1	1	0	0	0
Permanent grass	3046	46	18	25	7	1	1	0	1	1	0	0	0
All crops and grass	13865	26	10	31	22	6	1	1	1	1	0	0	0

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TABLE 6

Percentages of crop area getting different amounts of K_2O (kg ha^{-1})

	Fields	0	<25	25–	50–	75–	100–	125–	150–	200–	250–	300–	400+
Spring wheat	69	23	4	46	25	2	0	0	0	0	0	0	0
Winter wheat	2065	21	4	31	32	11	1	1	0	0	0	0	0
Spring barley	1915	6	7	56	28	3	1	0	0	0	0	0	0
Winter barley	1263	12	3	33	38	11	1	1	0	0	0	0	0
Spring oats	126	9	6	64	19	3	1	0	0	0	0	0	0
Winter oats	155	13	4	31	35	16	0	0	0	0	0	0	0
Mixed corn	24	25	15	37	18	6	0	0	0	0	0	0	0
Maize	21	24	0	23	36	17	0	0	0	0	0	0	0
Early potatoes	56	0	0	0	0	0	4	0	37	25	12	18	4
Maincrop potatoes	337	2	0	2	0	1	1	5	12	14	33	27	4
Sugar beet	369	7	1	1	3	13	19	6	22	17	8	4	0
Swedes (stock)	78	10	6	13	24	17	15	4	11	0	0	0	0
Turnips (stock)	82	23	9	18	26	13	3	8	0	0	0	0	0
Kale and cow cabbage	118	15	4	29	35	10	5	1	2	0	0	0	0
Rape for stockfeed	37	23	2	33	31	8	0	0	2	2	0	0	0
Beans for stockfeed	70	52	4	19	17	8	0	0	0	0	0	0	0
Other stockfeed	72	18	5	20	22	6	12	4	11	1	0	0	0
Peas for human consumption	170	43	15	14	17	7	4	0	0	0	0	0	0
Runner and French beans	34	15	0	12	28	28	5	0	0	0	12	0	0
Brussels sprouts	40	2	0	0	0	2	4	15	28	8	17	24	0
Cabbages	37	14	0	1	7	17	16	1	20	4	15	0	5
Cauliflower	62	5	0	2	13	6	15	16	16	16	4	2	5
Onions	41	3	0	3	4	7	6	1	45	16	15	0	0
Small fruit	74	39	0	2	5	15	15	10	12	3	0	0	0
Top fruit	116	41	2	32	4	9	5	4	3	0	0	0	0
Oilseed rape	221	35	4	14	41	6	0	0	0	0	0	0	0
All tillage	8030	16	4	34	28	8	2	1	2	2	1	1	0
1 year leys	20	64	15	15	6	0	0	0	0	0	0	0	0
2–7 year leys	2769	31	9	27	15	8	5	3	2	0	0	0	0
Permanent grass	3046	48	14	25	9	3	1	0	0	0	0	0	0
All crops and grass	13865	29	8	30	19	7	2	1	1	1	1	1	0

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TABLE 7

Fertiliser use on grassland classified by utilisation

	Fields	% Grassland area	Overall* (kg ha^{-1})			% Area receiving				Actual* (kg ha^{-1})		
			N	P_2O_5	K_2O	N	P	K	FYM	N	P_2O_5	K_2O
Paddock grazed	130	2	236	21	24	96	56	54	26	247	37	45
Paddock grazed and mown	39	1	201	41	44	91	64	65	55	221	65	68
Strip grazed	130	2	217	24	28	98	69	69	46	221	35	41
Strip grazed and mown	121	2	204	33	48	94	58	65	63	218	57	74
Set stocked	638	11	191	26	22	83	57	53	26	230	45	41
Set stocked and mown	312	5	177	34	48	95	73	77	50	187	47	62
Cut for seed	28	0	122	28	24	79	55	62	1	154	51	40
Cut for silage	985	15	201	38	56	98	79	83	63	205	48	68
Cut for hay	117	1	71	13	13	73	34	34	29	96	38	37
Cut for hay and grazed†	1065	16	84	25	25	86	67	68	51	98	37	38
Other grazings	2131	41	73	20	15	67	48	46	23	110	41	32
Not stated/not used	165	3	69	24	14	72	48	47	12	96	50	29
All grass	5872		123	25	26	80	59	58	37	153	43	45

* The average application of any fertiliser component over all fields including those receiving none is termed 'overall'. The average excluding fields with none of the component is termed 'actual'.

† Excluding fields intensively grazed as in the first 6 categories above.

TABLE 8

Percentages of grassland area by utilisation getting different amounts of N (kg ha^{-1})

	Fields	0	<25	25–	50–	75–	100–	125–	150–	200–	250–	300–	400+
Paddock grazed	130	4	0	0	11	7	3	14	7	3	12	22	16
Paddock grazed and mown	39	9	0	19	0	14	2	3	8	9	6	15	15
Strip grazed	130	2	0	2	4	10	4	13	19	11	7	15	13
Strip grazed and mown	121	6	0	1	3	7	9	9	13	18	14	20	1
Set stocked	638	17	0	6	12	6	3	5	9	5	7	15	14
Set stocked and mown	312	5	0	10	6	11	4	4	14	20	11	11	4
Cut for seed	28	21	0	11	13	2	0	4	25	14	7	3	0
Cut for silage	985	2	0	1	6	8	6	10	19	16	12	15	4
Cut for hay	117	27	0	2	16	26	10	12	6	1	0	0	0
Cut for hay and grazed†	1065	14	1	13	23	20	6	8	8	6	1	1	0
Other grazings	2131	33	1	11	16	12	5	6	8	3	4	2	0
Not stated/not used	165	28	1	24	12	10	4	8	3	8	0	2	1
All grass	5872	20	1	9	14	12	5	7	10	7	6	7	3

† Excluding fields intensively grazed as in the first 6 categories above.

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Rothamsted Insect Survey

Thirteenth Annual Summary

L. R. TAYLOR, E. D. M. MACAULAY, MAUREEN J. DUPUCH and JOAN NICKLEN

Suction traps 1981

Daily samples were collected from 6 April to 4 November 1981 and the *Aphid Bulletins* were issued weekly from 6 April (*Bulletin* No. 1) to 1 November (*Bulletin* No. 30). The 33 aphid taxa listed in Table 1 (a–h) are those in the *Aphid Bulletin*.

From 6 April 1981 Dr L. A. D. Turl and colleagues at the Department of Agriculture and Fisheries for Scotland (DAFS) East Craigs took over responsibility for the traps at Elgin, Dundee, East Cragis, Pathhead, Ayr and Stirling.

In 1981 records for the trap at Pathhead in Scotland appeared on the *Bulletin* and in Table 1 (a–h). The trap at Rainham was only operating from 30 March until the end of July; it only appears on the *Bulletins* until the end of June and in Tables 1 (a–d). Traps in Holland, operated by Dr A. van Harten of Wageningen, continued during 1981, but records do not appear on the *Bulletins* nor in Table 1. A trap was also operating at Stirling in Scotland. Suction traps sampling at 5 ft (1·5 m) were operating at East Craigs, Ingraston, Broom's Barn (until 1 June only), Hereford and Rothamsted Tower; records for these do not appear in *Bulletins* nor in Table 1.

Catches from Aberystwyth were identified by Mr J. A'Brook and Mr H. Evans of the Welsh Plant Breeding Station; Dr G. D. Heathcote of Broom's Barn Experimental Station identified aphids from Broom's Barn. The catches from the Scottish traps were identified by Dr L. A. D. Turl, Dr D. A. Cooper, Mr D. B. Cole and Mr R. Burns of DAFS, East Craigs. Dr H. L. G. Stroyan of the Ministry of Agriculture, Fisheries and Food, Plant Pathology Laboratory confirmed difficult identifications.

The *Bulletin*, despatched each Friday, lists aphids caught between 5 and 12 days earlier. This timing is dictated by the postal services.

The *Bulletins* cover the working week Monday to Sunday. Table 1 is for standard 4-week periods constant from year to year (see *Rothamsted Report for 1972*, Part 2, 211, Table 4).

Sample volumes were halved at various sites as follows: Rothamsted Tower from 13 July–5 October, Preston, Kirton, Shardlow, Hereford, Writtle, Long Ashton and Silwood from 14 July to 12 October, Wye 15 July–12 October, Starcross from 6 August to 5 October, Broom's Barn from 17 August to 2 September. In addition, when numbers were high, catches were sub-sampled in the laboratory to reduce the pressure of work. The weekly *Bulletins* and Table 1 (a–h) are corrected to full volume samples.

In Table 1 (a–h) there are no missing values, a blank records a zero catch.

Light traps

Table 2 (a–f) gives the annual catches during 1979 and 1980 of the same pest, or migratory Lepidoptera as in previous years.

Eighty-two sites completed the 364-day sample for 1980.

The sites in Table 2 are arranged in sequence from north to south and the species are in the same order as in previous years. Zero catches are recorded as 0; dashes indicate missing records.

Once again voluntary workers operated most of the traps and identified many of the insects; we are most grateful for their help.

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TAB

The Rothamsted Insect Survey—Suction Traps: four-weekly total catc
Week Nos 13 to 16

Species \ Sites	Elgin	Dundee	Edinburgh	Pathhead	Auchincruive	Newcastle	Belfast	High Mowthorpe	Preston	Kirton	Shardlow	Aberystwyth
Acyrthosiphon pisum												
Amphorophora rubi												
Aphis fabae grp.												
Aphis spp.												
Aulacorthum solani	1											1
Brachycaudus helichrysi												
Brevicoryne brassicae												
Cavariella aegopodii		1					1					
Cinara spp.												
Drepanosiphum platanoidis												
Dysaphis plantaginea												
Elatobium abietinum												
Eriosoma ulmi												
Hyalopterus pruni												
Hyperomyzus lactucae							1					
Macrosiphum euphorbiae		1										
Megoura viciae												
Metopolophium dirhodum												
Metopolophium festucae s.l.							1	2			1	
Myzus ascalonicus		1		1			2			1	4	
Myzus certus												
Myzus ornatus							8					
Myzus persicae grp.							1					
Nasonovia ribisnigri												
Pemphigus spp.												
Pentatrichopus fragaefolii												
Phorodon humuli												
Phyllaphis fagi												
Rhopalosiphum insertum												
Rhopalosiphum maidis												
Rhopalosiphum padi		2	1				6		1			1
Sitobion avenae												
Sitobion fragariae			1									
First aphid caught	April 17	March 19–25	April 20	April 17			April 7	April 11	April 8	Jan 22–28	April 8	Ap 9

Silwood 8–14 January, 1 *Sitobion fragariae*
Hereford 15–21 January, 1 *Sitobion fragariae*
Littlehampton 21–27 January, 1 *Myzus ornatus*
Kirton 22–28 January, 1 *Sitobion fragariae*
Rosewarne 5–11 March, 2 *Rhopalosiphum padi*
Long Ashton 19–25 March, 1 *Myzus ornatus*
Dundee 19–25 March, 1 *Myzus ornatus*

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aphids of economic, or other interest reported in the Weekly Bulletin 1981
March to 22 April 1981

Species	Broom's Barn	Hereford	Rothamsted Tower	Writtle	Rainham	Long Ashton	Silwood Park	Wye, Kent	Littlehampton	Starcross	Rosewarne
Acrythosiphon pisum											
Amphorophora rubi											
Aphis fabae grp.											
Aphis spp.											
Aulacorthum solani		1			1					1	4
Brachycaudus helichrysi											
Brevicoryne brassicae											1
Cavariella aegopodii											
Cinara spp.											
Drepanosiphum platanoidis											
Dysaphis plantaginea											
Elatobium abietinum											
Eriosoma ulmi											
Hyalopterus pruni											
Hyperomyzus lactucae											
Macrosiphum euphorbiae					6	2			1	1	
Megoura viciae											
Metopolophium dirhodum				1	3	2	1			2	
Metopolophium festucae s.l.		1	2	9	14	5	2	1	5	1	
Myzus ascalonicus	1	4		2	13	4	3		1	4	5
Myzus certus											
Myzus ornatus		1	2	1		7	1	1		1	1
Myzus persicae grp.							1				2
Nasonovia ribisnigri											
Pemphigus spp.				1							
Pentatrichopus fragaefolii											
Phorodon humuli											
Phyllaphis fagi											
Rhopalosiphum insertum											
Rhopalosiphum maidis									1		
Rhopalosiphum padi		1		1	2	2	2		1	1	1
Sitobion avenae				1						1	
Sitobion fragariae					1						1
First aphid caught	pril 16	Jan 15–21	March 26–1 April	March 26–1 April	April 7	March 19–25	Jan 8–14	March 26–1 April	Jan 21–27	April 8	March 5–11

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TABLE

The Rothamsted Insect Survey—Suction Traps: four-weekly total catches
Week Nos 17 to 20—

Species \ Sites	Elgin	Dundee	Edinburgh	Pathhead	Auchincruive	Newcastle	Belfast	High Mowthorpe	Preston	Kirton	Shardlow	Aberystwyth
Acyrthosiphon pisum	1		1				1		1		2	
Amphorophora rubi									1			
Aphis fabae grp.												
Aphis spp.									1	1	6	
Aulacorthum solani	1	2	1		1	3	9		8	11	10	
Brachycaudus helichrysi	2		5	1		2	6	1	7	8	8	8
Brevicoryne brassicae							2					
Cavariella aegopodii				2			4		11		1	1
Cinara spp.									1			
Drepanosiphum platanoidis		8	5		1	4	2	11	139	6	18	1
Dysaphis plantaginea												
Elatobium abietinum	9	2	2	3	4	4	69	18	11	5	11	63
Eriosoma ulmi												
Hyalopterus pruni												
Hyperomyzus lactucae							1		1		1	
Macrosiphum euphorbiae		1	8				24		2	6	7	4
Megoura viciae												
Metopolophium dirhodum			3	1	2	1	6	1	6		12	
Metopolophium festucae s.l.	1	4	20	44	11	32	51	37	106	21	295	28
Myzus ascalonicus	11	4	8	3	1	11	18	7	25	20	43	3
Myzus certus				1						3		
Myzus ornatus			20		1		30		2		3	
Myzus persicae grp.		1					2		2	4	5	
Nasonovia ribisnigri												
Pemphigus spp.												
Pentatrichopus fragaefolii												
Phorodon humuli												
Phyllaphis fagi												
Rhopalosiphum insertum							6	1	73	8	22	1
Rhopalosiphum maidis							1					4
Rhopalosiphum padi		3	1		2		24	1	3	10	2	6
Sitobion avenae	1		2			1	7	1	6	30	15	15
Sitobion fragariae							2		3	1	1	
First aphid caught					May 8	May 7						

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(b)

of aphids of economic, or other, interest reported in the Weekly Bulletin 1981
23 April to 20 May 1981

Broom's Barn	Hereford	Rothamsted Tower	Writtle	Rainham	Long Ashton	Silwood Park	Wye, Kent	Littlehampton	Starcross	Rosewarne	Species
			2	10		2	1	1			*Acyrthosiphon pisum*
5				2						1	*Amphorophora rubi*
		3	3	8	1	4	1	3			*Aphis fabae* grp.
	1	5	4	6		3	3	3			*Aphis* spp.
1	7		3	10	8	2	5	5	5	2	*Aulacorthum solani*
7	8	63	84	107	15	50	5	31	10		*Brachycaudus helichrys*
			1	1	2				1		*Brevicoryne brassicae*
4	1	17	27	50	1	25	7	16	1	1	*Cavariella aegopodii*
1			1								*Cinara* spp.
1	7	5	15	2		41	3	2	1		*Drepanosiphum platanoidis*
											Dysaphis plantaginea
18	39	42	26	2	12	80	116	20	6		*Elatobium abietinum*
											Eriosoma ulmi
											Hyalopterus pruni
1	1	1	1	1		1		1	1	2	*Hyperomyzus lactucae*
	8	1	5	48	11	10	1	6	4	2	*Macrosiphum euphorbiae*
											Megoura viciae
5	5	2	4	14	11	4		2	2		*Metopolophium dirhodum*
40	85	23	71	88	24	110	48	24		17	*Metopolophium festucae s.l.*
20	18	24	48	74	16	53	25	30	4	4	*Myzus ascalonicus*
				10	1		1				*Myzus certus*
	1	3	4	5	8	6		5	1		*Myzus ornatus*
3	4	4	17	22	6	4	2	5	1		*Myzus persicae* grp.
			1	3	1		1				*Nasonovia ribisnigri*
				1							*Pemphigus* spp.
				2				1			*Pentatrichopus fragaefolii*
	1	1	5	4		1		1			*Phorodon humuli*
											Phyllaphis fagi
	5	15	13	24	7	14	10	29	5	2	*Rhopalosiphum insertum*
	1	1		1	3		2	1	4		*Rhopalosiphum maidis*
6	1	3	7	40	7	13	1	10	2	8	*Rhopalosiphum padi*
21	44	6	17	26	24	49	13	21	6	1	*Sitobion avenae*
	2	2	6	6		3	1	4		2	*Sitobion fragariae*
											First aphid caught

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TABLE

The Rothamsted Insect Survey—Suction Traps: four-weekly total catches
Week Nos 21 to 24—

Species \ Sites	Elgin	Dundee	Edinburgh	Pathhead	Auchincruive	Newcastle	Belfast	High Mowthorpe	Preston	Kirton	Shardlow	Aberystwyth
Acyrthosiphon pisum	14	6	1				1		1	1	3	2
Amphorophora rubi							1				3	2
Aphis fabae grp.	1		2				1		3	4	3	2
Aphis spp.	5								4	8	11	1
Aulacorthum solani	4	2	8	3	2	8	12	1	14	13	11	4
Brachycaudus helichrysi	28	15	48	15	54	14	45	74	479	185	464	151
Brevicoryne brassicae											9	
Cavariella aegopodii	10	8	26	8	18	11	18	24	118	180	251	22
Cinara spp.		1	1		1	1			1	6	9	1
Drepanosiphum platanoidis		32	36	20	27	18	6	26	282	10	161	5
Dysaphis plantaginea												1
Elatobium abietinum	90	25	37	36	231	55	200	60	22	30	47	326
Eriosoma ulmi		11							5	2	8	2
Hyalopterus pruni	1	2		1	1	2		1	5	1	5	1
Hyperomyzus lactucae	1	13	3				7	1	12	5	7	9
Macrosiphum euphorbiae	6	20	19	6	4	13	12	1	6	7	21	21
Megoura viciae												
Metopolophium dirhodum	4	6	16		6	3	1	2	17		6	15
Metopolophium festucae s.l.	84	139	148	177	63	256	45	180	193	144	192	35
Myzus ascalonicus	50	11	31	20	4	32	12	26	21	11	33	2
Myzus certus			2	1			1			2	8	1
Myzus ornatus	2	5	35		1	2	22		3	1	6	1
Myzus persicae grp.	2	1	5	2	1		1	4	1	9	68	1
Nasonovia ribisnigri	1		2	2			1		5	5	4	1
Pemphigus spp.												
Pentatrichopus fragaefolii										1	1	
Phorodon humuli			2					3	8	10	65	12
Phyllaphis fagi	1		2			1			1			1
Rhopalosiphum insertum	1	7	4	9	7	26	35	9	66	31	42	6
Rhopalosiphum maidis							2		3	1	1	5
Rhopalosiphum padi	2	3	30	11	45	7	132	5	22	37	30	51
Sitobion avenae	3	15	9	2	3	12	31	11	28	182	69	62
Sitobion fragariae	2	4	6	2	1	2	12	2	21	4	18	3

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1(c)

of aphids of economic, or other, interest reported in the Weekly Bulletin 1981
21 May to 17 June 1981

Broom's Barn	Hereford	Rothamsted Tower	Writtle	Rainham	Long Ashton	Silwood Park	Wye, Kent	Littlehampton	Starcross	Rosewarne	Species
1	2		9	13	1	11	12		5	1	*Acyrthosiphon pisum*
39	2		4	4	6	10	2	16	1	1	*Amphorophora rubi*
5	3	5	19	11	5	15	11	4			*Aphis fabae* grp.
2	9	8	21	43	8	29	7	12	2	4	*Aphis* spp.
1	7			7	11	3	9	7	8	5	*Aulacorthum solani*
195	513	488	597	302	344	216	397	78	64	12	*Brachycaudus helichrysi*
	12	2	31	13	1	5	1	1	7	1	*Brevicoryne brassicae*
395	139	406	673	364	101	231	205	59	15	3	*Cavariella aegopodii*
2		8	16	3	3	6	2				*Cinara* spp.
10	13	54	33	10	18	77	14	36	20	2	*Drepanosiphum platanoidis*
1		2		1		1					*Dysaphis plantaginea*
97	80	135	25	3	65	32	193	8	23	10	*Elatobium abietinum*
2	11	1	2	9	5	9	5				*Eriosoma ulmi*
3	3	1	30	142	13	3	12	4			*Hyalopterus pruni*
3	7	4	16	9	6	3	3	11	4		*Hyperomyzus lactucae*
1	9	4	13	24	17	17	8	5	4	1	*Macrosiphum euphorbiae*
		1	1		1	5					*Megoura viciae*
2	8	2	4	19	21	5	3	10	14	3	*Metopolophium dirhodum*
104	88	37	21	13	27	77	93	11	8	6	*Metopolophium festucae s.l.*
12	7	15	12	10	4	16	9		2	1	*Myzus ascalonicus*
	2	3	1	6	3	3	1	2	2		*Myzus certus*
		2	7	1	6	1		4	1	1	*Myzus ornatus*
21	11	11	58	17	8	3	12	3	1	2	*Myzus persicae* grp.
1		5	5	2	1	3		4			*Nasonovia ribisnigri*
			1	5		1					*Pemphigus* spp.
			1	1				2			*Pentatrichopus fragaefolii*
23	137	31	156	115	31	66	182	2	1		*Phorodon humuli*
1		2	2	1		9					*Phyllaphis fagi*
	12	25	21	42	11	14	16	17	14	9	*Rhopalosiphum insertum*
	3	1	3	1	1	1	3	6	4	3	*Rhopalosiphum maidis*
63	132	27	81	305	63	76	58	56	26	18	*Rhopalosiphum padi*
129	174	23	51	55	85	111	106	24	18	2	*Sitobion avenae*
6	9	18	32	23	23	52	6	14	9	17	*Sitobion fragariae*

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TABLE

The Rothamsted Insect Survey—Suction Traps: four-weekly total catches
Week Nos 25 to 28—

Species \ Sites	Elgin	Dundee	Edinburgh	Pathhead	Auchincruive	Newcastle	Belfast	High Mowthorpe	Preston	Kirton	Shardlow	Aberystwyth
Acyrthosiphon pisum	6	15	1	4	1	3		8		52	5	2
Amphorophora rubi	3	3				3		3		2	5	2
Aphis fabae grp.	1		2	2	2	2		9	24	66	66	4
Aphis spp.	9	8	10	13	3	20	15	9	10	92	86	2
Aulacorthum solani	2	2	1		1	3	1	3	9	4	3	1
Brachycaudus helichrysi	77	24	7	31	5	49	9	145	27	199	207	11
Brevicoryne brassicae	1		1	1		1	1	3		1	462	
Cavariella aegopodii	8	11	13	19	2	114	41	93	59	240	327	1
Cinara spp.		1	1		1	1	2	5	1	3	14	
Drepanosiphum platanoidis	7	47	36	13	12	91	3	53	217	11	79	5
Dysaphis plantaginea												
Elatobium abietinum	1	1	14	1	8	11	2	2	6			3
Eriosoma ulmi	6	80	4	7	5	7	1	14	12	11	4	4
Hyalopterus pruni		2	5	1	2	14	5	33	109	248	317	3
Hyperomyzus lactucae		14	2	2		2	4			13	4	1
Macrosiphum euphorbiae	10	131	18	20	6	11	2	4	17	16	11	5
Megoura viciae	5			6	9	6	1	2				
Metopolophium dirhodum	3	217	24	20	12	7	3	4	2	3	12	13
Metopolophium festucae s.l.	9	30	4	33	3	5		1		2	1	1
Myzus ascalonicus	3		2	7	1	5		1	2	2		
Myzus certus		1	1			3			3	6	3	1
Myzus ornatus	4	1	1	2		2	3					
Myzus persicae grp.		6	2	9		14	3	24	2	26	253	1
Nasonovia ribisnigri								1		5	3	2
Pemphigus spp.	1	3				2	1	1	6	8	7	
Pentatrichopus fragaefolii						4					1	
Phorodon humuli					2	3	2	16	1	89	189	2
Phyllaphis fagi	2	10	11	2	4	3	1	6	5	9	6	
Rhopalosiphum insertum		5	4	3	20	48	25	31	260	272	250	
Rhopalosiphum maidis	3	24	7	10		20	1	17	3	71	13	3
Rhopalosiphum padi	5	381	13	47	37	67	110	40	59	926	108	35
Sitobion avenae	5	35	5	15	4	26	15	30	26	500	332	23
Sitobion fragariae	1	11	3	3	2	4	4	6	2	20	20	1

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1(d)

of aphids of economic, or other, interest reported in the Weekly Bulletin 1981
18 June to 15 July 1981

Broom's Barn	Hereford	Rothamsted Tower	Writtle	Rainham	Long Ashton	Silwood Park	Wye, Kent	Littlehampton	Starcross	Rosewarne	Species
44	1	11	73	14	4	12	20	13	5	2	*Acyrthosiphon pisum*
6	16	6			9	12	7	9	8	2	*Amphorophora rubi*
114	149	392	217	132	93	85	119	48	40	2	*Aphis fabae* grp.
37	34	116	86	258	61	89	77	28	16	4	*Aphis* spp.
3	3		4	3	9	1	2	1	12	8	*Aulacorthum solani*
82	245	75	42	50	27	26	15	15	15		*Brachycaudus helichrysi*
176	53	22	233	137	2	77	6	5	3		*Brevicoryne brassicae*
135	82	256	107	130	43	149	28	62	16	2	*Cavariella aegopodii*
4	3	6	6	7	2	1	7	6	6	3	*Cinara* spp.
8	21	21	25	4	2	26	3	11		9	*Drepanosiphum platanoidis*
4			5	5				4			*Dysaphis plantaginea*
	5										*Elatobium abietinum*
4	8	1	2	3	1	2	1	2	2	1	*Eriosoma ulmi*
227	59	475	1056	4475	131	377	667	179	53	1	*Hyalopterus pruni*
11	1	5	4	26	4	7	8	5	6		*Hyperomyzus lactucae*
4	5	1	10	17	8	9		3	13	2	*Macrosiphum euphorbiae*
5		9	10	15	2	33	6	5		2	*Megoura viciae*
5	27	6	14	51	47	10	6	25	95	2	*Metopolophium dirhodum*
4	1	3		1	1	1	1		3		*Metopolophium festucae s.l.*
1					2			1			*Myzus ascalonicus*
3	2	1	2	3	4	6			2		*Myzus certus*
		1			2	5		2	3		*Myzus ornatus*
262	9	76	83	21	6	9	24	5			*Myzus persicae* grp.
		1	4	3	2	2		1	1		*Nasonovia ribisnigri*
5	10	2	27	64	4	6	6	5	3	2	*Pemphigus* spp.
			1								*Pentatrichopus fragaefolii*
102	301	79	143	91	125	132	74	21	14		*Phorodon humuli*
2	1	9	3	3	3	6	4				*Phyllaphis fagi*
58	27	370	338	420	53	269	77	132	48	18	*Rhopalosiphum insertum*
52	13	20	34	24	3	7	46	11	16	2	*Rhopalosiphum maidis*
242	327	64	92	298	82	139	135	324	142	52	*Rhopalosiphum padi*
379	355	154	379	380	262	413	412	287	252	7	*Sitobion avenae*
7	15	17	27	30	4	11	11	8	15	7	*Sitobion fragariae*

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TABLE

The Rothamsted Insect Survey—Suction Traps: four-weekly total catches
Week Nos 29 to 32—

Species \ Sites	Elgin	Dundee	Edinburgh	Pathhead	Auchincruive	Newcastle	Belfast	High Mowthorpe	Preston	Kirton	Shardlow	Aberystwyth
Acyrthosiphon pisum	1	101	1	1	6	2	1	13	2	92	52	
Amphorophora rubi		4				1			2		2	
Aphis fabae grp.	1	26	11	15	49	23	134	167	82	1090	494	75
Aphis spp.		13	13	6	5	15	17	48	16	372	250	5
Aulacorthum solani	2	8	1	2	4	2			4	2		1
Brachycaudus helichrysi	14	25	5	10	6	6	3	14	6	26	16	8
Brevicoryne brassicae	1	31	12	2			1			8	150	1
Cavariella aegopodii	5	8	12	10	5	10	2	25	12	28	22	1
Cinara spp.	3	3	1	3	1	2	1	1		8	12	
Drepanosiphum platanoidis		22	10	5	1	40	4	20	198	12	34	5
Dysaphis plantaginea												
Elatobium abietinum					1					2		
Eriosoma ulmi	3	1	1				1	1			2	
Hyalopterus pruni	7	10	17	5	11	4	14	48	108	244	748	8
Hyperomyzus lactucae		5	2	1		1	2	6		8	14	2
Macrosiphum euphorbiae	10	303	16	13	10	4	4	1		12		6
Megoura viciae	1		1			2	4					1
Metopolophium dirhodum	13	322	63	36	35	2	9	6	18	86	144	29
Metopolophium festucae s.l.	1	16		2	1		1	2			2	1
Myzus ascalonicus												
Myzus certus		3	1	1		1		2	2	2	8	
Myzus ornatus	2	2	1	1		1	2					
Myzus persicae grp.	9	141	32	46	12	9		12	2	32	6	
Nasonovia ribisnigri	1	1								2		4
Pemphigus spp.	7	5	4	1	4	3	1		2	2	8	3
Pentatrichopus fragaefolii	1											
Phorodon humuli							1	2	2	8	16	
Phyllaphis fagi		1			1							
Rhopalosiphum insertum	26	266	207	184	527	440	458	221	2258	1220	1952	62
Rhopalosiphum maidis		4		1		2	7	2	6	10	4	12
Rhopalosiphum padi	151	2892	545	573	536	432	955	262	1020	2140	2078	376
Sitobion avenae	29	524	57	68	43	46	117	366	86	1872	1046	126
Sitobion fragariae	1	22	19	18	9	11	4	22	12	66	48	2

Elgin trap not operating 3–9 August

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1(e)

of aphids of economic, or other, interest reported in the Weekly Bulletin 1981
16 July to 12 August 1981

Broom's Barn	Hereford	Rothamsted Tower	Writtle	Rainham	Long Ashton	Silwood Park	Wye, Kent	Littlehampton	Starcross	Rosewarne	Species
56	24	10	74		6	10	18	26	5	3	*Acyrthosiphon pisum*
						2		2			*Amphorophora rubi*
416	502	433	560		244	204	198	222	313	31	*Aphis fabae* grp.
43	122	338	224		80	144	102	80	100	20	*Aphis* spp.
2			2		2		4	1	1		*Aulacorthum solani*
6	52	12	16		30	8	4	16	11	1	*Brachycaudus helichrysi*
128	100	20	98		26	46		10	36	6	*Brevicoryne brassicae*
5	16	2	12		10	12	4	2	7	1	*Cavariella aegopodii*
7	2	2	2		2	2		2	1		*Cinara* spp.
11	8	4	4		4	8	14	16	1	9	*Drepanosiphum platanoidis*
			6			2			1		*Dysaphis plantaginea*
	2						2				*Elatobium abietinum*
											Eriosoma ulmi
1153	436	1098	3034		724	884	2408	1272	277	20	*Hyalopterus pruni*
5	10	8	14		6	12	10	17	6		*Hyperomyzus lactucae*
7	28	8	8		10	2	4	7	16	3	*Macrosiphum euphorbiae*
6	2		14		2	12	12	13	7		*Megoura viciae*
125	240	30	134		164	34	92	182	217	10	*Metopolophium dirhodum*
1	10	2						1	1	2	*Metopolophium festucae s.l.*
											Myzus ascalonicus
	8		2			2	2	2			*Myzus certus*
					2			1		1	*Myzus ornatus*
44	20	28	30			2	18	23		3	*Myzus persicae* grp.
	2	2	2			4			3		*Nasonovia ribisnigri*
2	4		14		2	10	6	20	5	5	*Pemphigus* spp.
							2				*Pentatrichopus fragaefolii*
30	36	20	62		22	42	26	26	5		*Phorodon humuli*
	2	2			2		2				*Phyllaphis fagi*
189	882	1372	1100		436	1026	394	2294	532	215	*Rhopalosiphum insertum*
95	8	12	16		16		10	7	3	8	*Rhopalosiphum maidis*
859	1476	252	594		510	370	998	1612	2069	861	*Rhopalosiphum padi*
810	1306	490	1296		988	978	1208	1560	673	112	*Sitobion avenae*
27	130	42	42		20	68	60	48	24	29	*Sitobion fragariae*

Trap not operating

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TABLE

The Rothamsted Insect Survey—Suction Traps: four-weekly total catches
Week Nos 33 to 36—

Species \ Sites	Elgin	Dundee	Edinburgh	Pathhead	Auchincruive	Newcastle	Belfast	High Mowthorpe	Preston	Kirton	Shardlow	Aberystwyth
Acyrthosiphon pisum	4	5	2	1	2	11	3	9	4	12	6	11
Amphorophora rubi									2			
Aphis fabae grp.	18	143	33	47	103	128	320	184	68	326	258	51
Aphis spp.	1	29	17	6	3	35	37	62	56	252	364	8
Aulacorthum solani		1			1	2			8			1
Brachycaudus helichrysi	41	121	52	64	41	61	37	73	50	110	116	42
Brevicoryne brassicae	10	224	38	40	3	16	3	5	8	12	30	
Cavariella aegopodii	2	5		1	3	1	3	4	4	10	2	
Cinara spp.	1	5	1				1	2	2	4		
Drepanosiphum platanoidis	17	68	11	28	15	73	17	73	194	20	34	1
Dysaphis plantaginea					1					2		
Elatobium abietinum						1						
Eriosoma ulmi	2	2			1		1				4	4
Hyalopterus pruni	23	1600	7	15	29	27	99	53	96	496	116	13
Hyperomyzus lactucae	1	2	2	1	1	6	5	5		18	4	2
Macrosiphum euphorbiae	6	78	33	5	3	2	18	2	8	20	22	13
Megoura viciae								1				
Metopolophium dirhodum	12	32	12	6	11	49	10	8	24	52	24	15
Metopolophium festucae s.l.	1		1		7	7		6		4	16	4
Myzus ascalonicus												
Myzus certus	1	4		1		3	4	1				
Myzus ornatus	2					1						
Myzus persicae grp.	72	229	46	23	13	48	1	15	14	10	16	8
Nasonovia ribisnigri	4	1	1	3				2		2	4	6
Pemphigus spp.	34	79	14	20	138	74	19	14	76	62	98	143
Pentatrichopus fragaefolii					2	1		2				
Phorodon humuli		2				1					2	
Phyllaphis fagi						3	1					
Rhopalosiphum insertum	207	393	276	348	923	821	1158	329	1582	294	556	387
Rhopalosiphum maidis						1	2	1		2		1
Rhopalosiphum padi	3424	7068	3109	2715	1930	1961	1616	1182	2154	2740	542	876
Sitobion avenae	150	437	136	203	71	240	574	456	338	536	542	259
Sitobion fragariae	3	15	15	7		52	22	19	12	36	12	7

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(f)

f aphids of economic, or other, interest reported in the Weekly Bulletin 1981
3 August to 9 September 1981

Broom's Barn	Hereford	Rothamsted Tower	Writtle	Rainham	Long Ashton	Silwood Park	Wye, Kent	Littlehampton	Starcross	Rosewarne	Species
4	14	2	12		4	2	8	12		9	*Acyrthosiphon pisum*
											Amphorophora rubi
34	110	20	22		10	10	24	12	22	67	*Aphis fabae* grp.
21	84	52	52		26	62	96	21	38	66	*Aphis* spp.
									2	1	*Aulacorthum solani*
49	54	34	36		10	14	24	28	18	11	*Brachycaudus helichrysi*
4	62	2	8		6	6	6	3	18	13	*Brevicoryne brassicae*
2	4	2				2	2	2		2	*Cavariella aegopodii*
1		4			4			1			*Cinara* spp.
8	2	24	12		6	4	2	13		42	*Drepanosiphum platanoidis*
							2				*Dysaphis plantaginea*
											Elatobium abietinum
											Eriosoma ulmi
61	96	130	212		74	118	278	142	58	18	*Hyalopterus pruni*
3	10	2					4	2	4	1	*Hyperomyzus lactucae*
4	14	4	14		4	14	8	5		4	*Macrosiphum euphorbiae*
22	2	2	38			6	8		2	3	*Megoura viciae*
29	76	6	26		18	8	20	9	10	8	*Metopolophium dirhodum*
	6						2			3	*Metopolophium festucae s.l.*
											Myzus ascalonicus
	8		2		2						*Myzus certus*
								4			*Myzus ornatus*
3	22		28		6	2	6	3		7	*Myzus persicae* grp.
1		2				4	2			3	*Nasonovia ribisnigri*
15	70	24	20		66	64	82	42	44	243	*Pemphigus* spp.
											Pentatrichopus fragaefolii
	78		2				8			1	*Phorodon humuli*
											Phyllaphis fagi
113	844	458	338		206	456	548	372	418	1415	*Rhopalosiphum insertum*
3	2		2			2	4	3	4	4	*Rhopalosiphum maidis*
420	786	346	440		110	178	726	262	364	1465	*Rhopalosiphum padi*
187	688	220	404		214	220	482	159	128	374	*Sitobion avenae*
14	46	10	18		14	8	34	4	14	85	*Sitobion fragariae*

Trap not operating

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TAB

The Rothamsted Insect Survey—Suction Traps: four-weekly total catc
Week Nos 37 to 4

Species \ Sites	Elgin	Dundee	Edinburgh	Pathhead	Auchincruive	Newcastle	Belfast	High Mowthorpe	Preston	Kirton	Shardlow	A
Acyrthosiphon pisum		2				1		4		2	2	
Amphorophora rubi							1					
Aphis fabae grp.	4	29	10	23	9	89	3	29	44	96	48	
Aphis spp.	2	52	17	7	1	55	5	30	30	146	130	
Aulacorthum solani		1										
Brachycaudus helichrysi	47	75	25	38	5	47	8	155	20	28	38	
Brevicoryne brassicae	6	178	25	29	2	32		4	2	10	18	
Cavariella aegopodii	2	2		2		2	1	1	6	4	2	
Cinara spp.	2		1			1	1					
Drepanosiphum platanoidis	34	131	45	29	11	41	40	30	48	8	72	
Dysaphis plantaginea										4	6	
Elatobium abietinum												
Eriosoma ulmi							1		4		2	
Hyalopterus pruni	8	1691	8	4	3	10		47	6	134	14	
Hyperomyzus lactucae	3	5		2		9	1	11	2	20	14	
Macrosiphum euphorbiae		5	2	1		3	7	6	16	14	18	
Megoura viciae												
Metopolophium dirhodum	30	15	5	2	14	21	2	4	28	12	10	
Metopolophium festucae s.l.	1					2		1				
Myzus ascalonicus												
Myzus certus	1	1	4	1		1				2		
Myzus ornatus				2								
Myzus persicae grp.	22	66	16	22	1	51	1	7	12	2	4	
Nasonovia ribisnigri	5	2		1			1	7	4	4	6	
Pemphigus spp.	115	92	46	28	28	69	11	62	176	136	58	1
Pentatrichopus fragaefolii	1											
Phorodon humuli						1						
Phyllaphis fagi		2	2	2	1	3	1					
Rhopalosiphum insertum	1298	828	435	693	1050	1623	645	754	3604	134	546	11
Rhopalosiphum maidis							1					
Rhopalosiphum padi	6198	11073	4296	2660	698	3657	132	1549	972	154	332	1
Sitobion avenae	6	19	20	29	8	75	22	36	52	8	14	
Sitobion fragariae		3	1			15		5	2		14	

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aphids of economic, or other, interest reported in the Weekly Bulletin 1981
September to 7 October 1980

Broom's Barn	Hereford	Rothamsted Tower	Writtle	Rainham	Long Ashton	Silwood Park	Wye, Kent	Littlehampton	Starcross	Rosewarne	Species
Sites											
2							4	5		2	*Acyrthosiphon pisum*
											Amphorophora rubi
45		2	8			4		5	2	1	*Aphis fabae* grp.
10	12		16		8	4	32	18	12	6	*Aphis* spp.
											Aulacorthum solani
58	10	31	4		16	8	28	30	15	3	*Brachycaudus helichrysi*
2	4		2			2	6	4	4	6	*Brevicoryne brassicae*
1						2	2		2		*Cavariella aegopodii*
1							2				*Cinara* spp.
9	16	6	8		20	2	4	8		54	*Drepanosiphum platanoidis*
6		4			8	14	4	4			*Dysaphis plantaginea*
											Elatobium abietinum
3	2						2	2	2		*Eriosoma ulmi*
8		4				22	2	4	2		*Hyalopterus pruni*
6	2		2				4	1			*Hyperomyzus lactucae*
4	10	2	6		8	2	4	3	4		*Macrosiphum euphorbiae*
1											*Megoura viciae*
1	2				2		4				*Metopolophium dirhodum*
		2									*Metopolophium festucae s.l.*
											Myzus ascalonicus
	4						2				*Myzus certus*
											Myzus ornatus
7	10	1	10		6	4	12	8		6	*Myzus persicae* grp.
4			2			2		1	4	2	*Nasonovia ribisnigri*
32	22	12	22		34	36	92	25	24		*Pemphigus* spp.
											Pentatrichopus fragaefolii
	266	2				6	96				*Phorodon humuli*
	2										*Phyllaphis fagi*
96	204	142	68		230	166	504	129	220	33	*Rhopalosiphum insertum*
											Rhopalosiphum maidis
71	114	43	110		48	48	328	39	28	6	*Rhopalosiphum padi*
6		4	8		4	2	6	5	6	2	*Sitobion avenae*
		2	2			2	4		4		*Sitobion fragariae*

Trap not operating — Rainham

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TABL

The Rothamsted Insect Survey—Suction Traps: four-weekly total catch
Week Nos 41 to 44–

Species \ Sites	Elgin	Dundee	Edinburgh	Pathhead	Auchincruive	Newcastle	Belfast	High Mowthorpe	Preston	Kirton	Shardlow	Aberystwyth
Acyrthosiphon pisum												
Amphorophora rubi												
Aphis fabae grp.						1				132	2	
Aphis spp.						1			2	205	4	
Aulacorthum solani										3	1	
Brachycaudus helichrysi						1			1	9		
Brevicoryne brassicae												
Cavariella aegopodii							1		1	8		
Cinara spp.												
Drepanosiphum platanoidis	10	18	13	3		8	20	8	9	16	81	1
Dysaphis plantaginea										8		
Elatobium abietinum												
Eriosoma ulmi										2	3	1
Hyalopterus pruni										2	1	
Hyperomyzus lactucae								2		1		
Macrosiphum euphorbiae										4		
Megoura viciae												
Metopolophium dirhodum	1		1	1	2	3		2	23	10	7	1
Metopolophium festucae s.l.				1								
Myzus ascalonicus												
Myzus certus										1		
Myzus ornatus												
Myzus persicae grp.	1			1	1						2	
Nasonovia ribisnigri	1	1						1	1	3		
Pemphigus spp.	3			2	2	8	1	1	12	837	37	2
Pentatrichopus fragaefolii												
Phorodon humuli							1					
Phyllaphis fagi											1	
Rhopalosiphum insertum	93	109	43	16	122	158	301	164	764	495	280	429
Rhopalosiphum maidis												
Rhopalosiphum padi	153	227	155	46	66	140	9	68	71	1090	166	3
Sitobion avenae			2				1		1			
Sitobion fragariae						1	2	6	1	17	13	

Dundee trap not operating 9–19 October

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(h)

of aphids of economic, or other, interest reported in the Weekly Bulletin 1981
3 October to 4 November 1981

Broom's Barn	Hereford	Rothamsted Tower	Writtle	Rainham	Long Ashton	Silwood Park	Wye, Kent	Littlehampton	Starcross	Rosewarne	Species
				Trap not operating							*Acyrthosiphon pisum*
											Amphorophora rubi
46			4					1			*Aphis fabae* grp.
2	1		10		1	2	2		1		*Aphis* spp.
							2		3		*Aulacorthum solani*
1	3		3		3	1	1	1	2		*Brachycaudus helichrysi*
			1								*Brevicoryne brassicae*
12	1	1					2			1	*Cavariella aegopodii*
											Cinara spp.
8	5	14	3		20	6	5	3	2	13	*Drepanosiphum platanoidis*
			2			6		4	1		*Dysaphis plantaginea*
											Elatobium abietinum
	9		4		1	4	16	1	1		*Eriosoma ulmi*
						4					*Hyalopterus pruni*
2			2						1		*Hyperomyzus lactucae*
											Macrosiphum euphorbiae
											Megoura viciae
2							1	1			*Metopolophium dirhodum*
											Metopolophium festucae s.l.
						1					*Myzus ascalonicus*
											Myzus certus
											Myzus ornatus
3			3			1	1	1	1		*Myzus persicae* grp.
4							1		1		*Nasonovia ribisnigri*
10	7	3	3		2	16	5	3	7		*Pemphigus* spp.
											Pentatrichopus fragaefolii
	2						7				*Phorodon humuli*
									1		*Phyllaphis fagi*
196	154	117	73		214	169	231	166	721	158	*Rhopalosiphum insertum*
											Rhopalosiphum maidis
44	29	23	59		25	38	111	34	50	4	*Rhopalosiphum padi*
			1			1		1			*Sitobion avenae*
9	1	1	4		5	20	3	4	6		*Sitobion fragariae*

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TABLE

The Rothamsted Insect Survey—Light Traps: annual records

Pest Species	Year	Reay 415	Stronchrubie 418	Inverpolly 352	Knockan 351	Cromarty 398	Newton, Elgin 58	Beinn Eighe 350	Rannoch 29	Dundee 47	Rowardennan 97	East Craigs 261	Glentress 339	Culzean Castle 264	Auchincruive 293
Gortyna micacea	1979	—	—	14	—	45	—	41	48	0	8	7	—	20	0
Rosy Rustic	1980	67	2	33	0	23	156	43	49	4	12	13	60	23	4
Bupalus piniaria	1979	—	—	0	—	0	—	0	0	0	0	0	—	1	0
Bordered White	1980	0	0	0	0	0	0	1	0	0	0	0	0	1	0
Panolis flammea	1979	—	—	0	—	0	—	0	0	0	0	0	—	1	0
Pine Beauty	1980	0	0	0	0	0	0	1	0	0	0	0	0	4	0
Cerapteryx graminis	1979	—	—	94	—	4	—	21	50	3	2	5	—	12	5
Antler Moth	1980	32	82	243	53	10	11	44	59	3	6	12	34	11	8
Erannis aurantiaria	1979	—	—	30	—	141	—	6	470	0	185	0	—	1	0
Scarce Umber	1980	0	2	85	4	61	14	25	469	1	178	0	0	0	0
Operophtera fagata	1979	—	—	17	—	1	—	0	105	0	29	0	—	0	0
Northern Winter Moth	1980	0	1	29	0	9	1	2	72	0	14	0	0	1	0
Apamea sordens	1979	—	—	0	—	3	—	0	0	0	0	3	—	1	1
Rustic Shoulder-knot	1980	0	0	0	0	3	1	0	0	6	0	19	0	1	2
Gortyna flavago	1979	—	—	0	—	1	—	0	0	0	0	0	—	2	0
Frosted Orange	1980	0	0	0	0	0	12	0	0	1	0	0	1	0	0
Mamestra brassicae	1979	—	—	0	—	0	—	0	0	6	0	3	—	1	0
Cabbage Moth	1980	0	0	0	0	0	3	0	0	9	0	2	0	0	0
Noctua pronuba	1979	—	—	5	—	44	—	2	2	16	1	5	—	9	2
Large Yellow Underwing	1980	1	2	8	0	11	17	1	1	20	3	9	8	19	3
Diataraxia oleracea	1979	—	—	8	—	1	—	0	0	0	0	3	—	4	0
Bright-line Brown-eye	1980	0	0	4	0	1	2	0	0	1	0	1	0	1	1
Euxoa nigricans	1979	—	—	0	—	0	—	0	0	0	0	0	—	0	0
Garden Dart	1980	0	0	0	0	1	0	0	0	0	0	5	0	0	0
Apamea secalis	1979	—	—	7	—	22	—	0	0	3	1	30	—	7	4
Common Rustic	1980	15	1	1	1	3	73	3	1	9	3	36	9	0	10
Melanchra persicariae	1979	—	—	0	—	0	—	0	0	0	0	0	—	0	0
Dot Moth	1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operophtera brumata	1979	—	—	10	—	31	—	18	27	0	202	0	—	7	0
Winter Moth	1980	1	0	27	8	4	5	31	19	5	134	0	3	1	0

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of moths of economic, or other importance for 1979 and 1980

Waterside Mains	Kielder	Gatehouse of Fleet	Alston	Windermere	Wykeham	Arnside	Baldersby	Castletown, I.O.M.	Acomb	Harrogtate	Hayton	Preston	Longridge	Year	Pest Species
338	296	287	408	323	187	403	315	306	363	410	291	288	124		
—	34	—	—	—	66	19	71	13	5	—	—	4	5	1979	*Gortyna micacea*
125	28	23	85	2	49	20	64	20	3	9	15	15	2	1980	Rosy Rustic
—	1	—	—	—	2	0	0	0	0	—	—	0	0	1979	*Bupalus piniaria*
0	0	0	0	2	2	0	0	0	0	0	0	0	0	1980	Bordered White
—	0	—	—	—	1	0	0	0	0	—	—	0	0	1979	*Panolis flammea*
0	0	0	0	0	13	0	0	0	0	1	0	0	0	1980	Pine Beauty
—	5	—	—	—	8	0	3	3	0	—	—	0	3	1979	*Cerapteryx graminis*
25	18	9	32	2	17	4	3	6	0	2	3	0	1	1980	Antler Moth
—	23	—	—	—	12	11	7	0	1	—	—	5	28	1979	*Erannis aurantiaria*
20	24	14	3	0	5	0	11	0	4	14	2	1	10	1980	Scarce Umber
—	68	—	—	—	—	6	0	0	0	—	—	0	3	1979	*Operophtera fagata*
126	89	3	19	0	4	6	0	0	0	27	1	0	0	1980	Northern Winter Moth
—	0	—	—	—	0	0	5	4	0	—	—	0	1	1979	*Apamea sordens*
0	0	0	0	0	3	0	7	0	5	0	6	0	0	1980	Rustic Shoulder-knot
—	0	—	—	—	0	1	1	0	0	—	—	0	0	1979	*Gortyna flavago*
4	0	1	0	0	0	2	8	0	0	0	3	1	0	1980	Frosted Orange
—	0	—	—	—	1	0	16	1	4	—	—	1	1	1979	*Mamestra brassicae*
0	0	0	0	8	2	0	11	0	1	0	7	2	0	1980	Cabbage Moth
—	5	—	—	—	8	9	4	9	1	—	—	6	18	1979	*Noctua pronuba*
119	4	24	49	123	33	17	42	18	5	18	35	29	6	1980	Large Yellow Underwing
—	0	—	—	—	0	0	5	2	3	—	—	5	1	1979	*Diataraxia oleracea*
0	0	0	0	0	0	0	3	3	0	0	2	2	0	1980	Bright-line Brown-eye
—	0	—	—	—	0	0	0	0	0	—	—	0	0	1979	*Euxoa nigricans*
0	0	0	0	0	0	0	0	0	0	1	0	0	0	1980	Garden Dart
—	7	—	—	—	8	5	27	122	1	—	—	17	14	1979	*Apamea secalis*
12	1	10	0	29	11	2	68	37	3	20	21	8	6	1980	Common Rustic
—	0	—	—	—	0	1	0	0	8	—	—	0	0	1979	*Melanchra persicariae*
0	0	0	0	9	1	2	0	0	1	0	3	0	0	1980	Dot Moth
—	103	—	—	—	—	187	28	23	13	—	—	17	36	1979	*Operophtera brumata*
102	70	48	21	5	14	70	8	29	5	20	13	1	6	1980	Winter Moth

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TABLE

The Rothamsted Insect Survey—Light Traps: annual records

Pest Species	Year	Tarleton	Spurn Head	East Didsbury	Bangor	Jodrell Bank	Gleadthorpe	Matlock	Hope	Gibraltar Point	Leek	Empingham	Wells next the Sea	Shardlow	Sutton Bonington
		371	131	269	35	337	257	279	380	223	385	280	274	378	168
Gortyna micacea	1979	11	43	5	0	21	40	5	—	9	—	4	1	12	14
Rosy Rustic	1980	12	42	4	0	24	21	5	24	13	21	4	1	9	7
Bupalus piniaria	1979	0	0	0	0	0	0	0	—	0	—	0	0	1	0
Bordered White	1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panolis flammea	1979	0	0	0	0	0	0	0	—	0	—	0	0	0	0
Pine Beauty	1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerapteryx graminis	1979	1	70	1	0	91	4	1	—	2	—	0	0	0	1
Antler Moth	1980	2	73	0	1	100	8	6	1	14	16	0	0	0	0
Erannis aurantiaria	1979	0	0	1	0	22	1	0	—	0	—	0	0	2	1
Scarce Umber	1980	0	0	0	0	14	0	0	0	0	0	1	0	0	0
Operophtera fagata	1979	0	0	0	0	4	3	0	—	0	—	0	0	0	0
Northern Winter Moth	1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apamea sordens	1979	1	0	0	0	0	0	4	—	2	—	0	0	0	1
Rustic Shoulder-knot	1980	1	5	0	0	0	0	0	18	1	8	3	0	0	3
Gortyna flavago	1979	2	1	0	0	1	11	0	—	1	—	1	0	1	3
Frosted Orange	1980	0	1	1	0	2	12	0	0	0	0	2	0	1	1
Mamestra brassicae	1979	7	2	5	10	0	3	18	—	0	—	20	4	1	0
Cabbage Moth	1980	9	0	1	2	0	3	7	17	0	5	18	3	2	5
Noctua pronuba	1979	13	30	2	9	11	8	37	—	4	—	44	5	11	39
Large Yellow Underwing	1980	22	59	5	12	12	6	14	29	15	108	54	6	5	28
Diataraxia oleracea	1979	14	53	0	3	0	13	10	—	1	—	7	3	22	15
Bright-line Brown-eye	1980	12	41	0	0	0	37	1	2	4	2	2	1	7	16
Euxoa nigricans	1979	0	0	0	0	2	0	1	—	0	—	1	0	0	0
Garden Dart	1980	1	0	0	0	0	0	0	0	0	0	0	0	1	1
Apamea secalis	1979	15	17	2	5	3	21	28	—	10	—	90	0	8	52
Common Rustic	1980	10	9	1	3	9	14	51	53	5	16	44	4	10	45
Melanchra persicariae	1979	15	1	0	0	0	0	1	—	0	—	11	1	0	1
Dot Moth	1980	4	0	0	0	0	1	0	0	0	2	14	0	0	3
Operophtera brumata	1979	0	17	0	0	54	8	9	—	5	—	47	3	4	16
Winter Moth	1980	0	4	0	0	25	4	0	6	0	1	32	1	1	4

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2(b)

of moths of economic, or other importance for 1979 and 1980

Preston Montford	Wolverhampton I	Santon Downham	Aberystwyth	Monks Wood	Monks Wood (Ewingswode)	Broom's Barn	Tregaron	Waresley	Luddington	Cockayne Hatley	Hereford	Rhandirmwyn	Year	Pest Species
382	267	259	340	94	277	88	331	360	414	336	212	346		
47	0	—	7	41	—	3	39	21	—	14	—	32	1979	*Gortyna micacea*
21	0	10	13	19	8	4	18	10	5	11	10	29	1980	Rosy Rustic
0	0	—	3	0	—	0	0	0	—	0	—	0	1979	*Bupalus piniaria*
0	0	0	1	0	0	0	0	0	0	0	0	0	1980	Bordered White
0	0	—	0	0	—	0	0	0	—	0	—	0	1979	*Panolis flammea*
0	0	69	1	0	1	0	0	0	0	0	0	0	1980	Pine Beauty
1	0	—	1	0	—	1	88	0	—	0	—	3	1979	*Cerapteryx graminis*
1	0	21	0	1	0	1	165	1	0	0	1	19	1980	Antler Moth
10	0	—	3	0	—	0	115	0	—	0	—	309	1979	*Erannis aurantiaria*
2	0	4	0	0	74	0	41	0	2	0	0	270	1980	Scarce Umber
0	0	—	1	2	—	0	188	0	—	0	—	7	1979	*Operophtera fagata*
1	0	0	0	0	127	0	53	0	0	0	0	10	1980	Northern Winter Moth
1	0	—	0	0	—	2	0	13	—	3	—	0	1979	*Apamea sordens*
3	0	4	0	6	3	0	0	28	1	4	0	3	1980	Rustic Shoulder-knot
1	0	—	0	3	—	0	8	4	—	2	—	2	1979	*Gortyna flavago*
3	0	1	1	5	6	0	10	7	0	2	0	2	1980	Frosted Orange
2	0	—	0	0	—	6	0	2	—	0	—	0	1979	*Mamestra brassicae*
3	0	12	1	0	0	3	0	6	11	1	0	1	1980	Cabbage Moth
4	1	—	7	3	—	2	22	10	—	4	—	40	1979	*Noctua pronuba*
24	2	2	36	6	13	0	50	8	11	6	3	63	1980	Large Yellow Underwing
2	1	—	1	0	—	0	4	30	—	7	—	4	1979	*Diataraxia oleracea*
10	4	0	1	0	1	2	1	19	1	21	0	4	1980	Bright-line Brown-eye
0	10	—	0	1	—	1	0	4	—	2	—	0	1979	*Euxoa nigricans*
0	9	2	0	0	7	1	0	5	0	3	0	0	1980	Garden Dart
66	0	—	27	3	—	5	10	38	—	10	—	8	1979	*Apamea secalis*
52	3	14	18	8	4	15	7	13	13	15	25	6	1980	Common Rustic
1	0	—	1	0	—	1	1	2	—	2	—	2	1979	*Melanchra persicariae*
1	0	7	1	0	0	0	0	10	5	0	0	1	1980	Dot Moth
25	0	—	15	54	—	1	352	21	—	65	—	267	1979	*Operophtera brumata*
12	0	6	14	2	285	0	196	2	0	1	0	319	1980	Winter Moth

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TABLE

The Rothamsted Insect Survey—Light Traps: annual records

Pest Species	Year	Trelech	Eaton Bray	Rothamsted (Barnfield)	Rothamsted (Allotments)	Rothamsted (Geescroft)	Writtle	Dale Fort	Chigwell Row	Westonbirt	Hurley	Lambourne	Cardiff	Sheppey	Stratfield Mortimer
		233	412	1	34	22	87	17	305	292	180	328	347	370	16
Gortyna micacea	1979	17	—	4	2	10	2	—	1	2	8	—	0	12	3
Rosy Rustic	1980	20	0	21	6	11	3	6	0	1	13	0	1	6	0
Bupalus piniaria	1979	0	—	0	0	0	0	—	0	4	0	—	0	0	0
Bordered White	1980	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Panolis flammea	1979	0	—	0	0	0	0	—	0	0	0	—	0	0	0
Pine Beauty	1980	0	0	0	0	0	0	0	0	0	1	0	0	0	2
Cerapteryx graminis	1979	2	—	0	1	0	0	—	1	0	0	—	0	0	0
Antler Moth	1980	2	1	0	0	0	0	0	0	0	1	4	0	2	0
Erannis aurantiaria	1979	0	—	0	0	23	0	—	1	18	7	—	0	0	6
Scarce Umber	1980	0	0	0	0	20	4	0	1	5	1	1	0	0	9
Operophtera fagata	1979	0	—	0	0	3	0	—	3	4	10	—	0	1	0
Northern Winter Moth	1980	0	0	0	0	0	0	0	1	4	1	0	0	0	0
Apamea sordens	1979	0	—	2	0	1	1	—	0	0	1	—	0	0	0
Rustic Shoulder-knot	1980	0	5	6	1	0	0	0	0	0	0	6	5	0	0
Gortyna flavago	1979	10	—	0	0	1	0	—	0	1	1	—	0	0	1
Frosted Orange	1980	6	2	1	0	0	3	0	0	1	7	0	0	1	1
Mamestra brassicae	1979	0	—	3	3	0	2	—	8	1	0	—	1	0	2
Cabbage Moth	1980	0	2	2	0	2	5	0	23	0	0	0	4	4	1
Noctua pronuba	1979	25	—	46	5	217	3	—	4	48	8	—	14	12	12
Large Yellow Underwing	1980	32	2	66	13	244	5	5	17	47	20	5	29	0	28
Diataraxia oleracea	1979	0	—	24	3	8	14	—	4	0	2	—	10	20	2
Bright-line Brown-eye	1980	0	5	25	1	3	11	2	3	0	1	0	10	14	1
Euxoa nigricans	1979	0	—	5	0	2	2	—	0	0	0	—	0	0	1
Garden Dart	1980	0	0	2	1	5	1	6	11	0	0	0	0	0	1
Apamea secalis	1979	49	—	90	7	57	21	—	25	39	17	—	35	17	11
Common Rustic	1980	12	12	179	23	42	32	13	9	8	10	16	40	13	7
Melanchra persicariae	1979	0	—	0	0	3	3	—	0	0	1	—	0	1	0
Dot Moth	1980	0	4	0	0	1	3	0	1	0	0	0	1	1	0
Operophtera brumata	1979	18	—	7	0	156	19	—	7	29	14	—	2	3	162
Winter Moth	1980	17	1	1	0	101	3	0	5	11	0	11	0	0	88

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Windlesham	Wisley	Lordsfield	Alice Holt	Haslemere	Winchester	Lydd	Denny Lodge	Starcross	Yarner Wood	Rosewarne	Guernsey	Jersey	Year	Pest Species
171	289	406	46	219	379	366	368	149	266	114	252	146		
0	2	—	4	3	2	10	0	8	5	4	2	1	1979	*Gortyna micacea*
0	2	11	9	2	7	4	0	3	3	4	1	2	1980	Rosy Rustic
5	2	—	0	0	0	0	0	0	0	0	0	0	1979	*Bupalus piniaria*
2	0	0	0	0	0	0	0	0	0	0	0	0	1980	Bordered White
1	0	—	0	0	0	0	0	0	0	0	0	0	1979	*Panolis flammea*
4	3	3	3	0	0	0	1	0	2	1	2	0	1980	Pine Beauty
0	1	—	10	1	0	33	0	6	6	0	0	0	1979	*Cerapteryx graminis*
0	0	0	10	0	1	7	0	1	2	0	0	0	1980	Antler Moth
27	1	—	—	16	0	0	15	0	63	0	0	0	1979	*Erannis aurantiaria*
12	1	3	—	11	0	0	3	0	102	0	0	0	1980	Scarce Umber
0	1	—	—	2	0	0	0	0	1	0	0	0	1979	*Operophtera fagata*
0	1	0	—	1	1	0	4	0	14	0	0	0	1980	Northern Winter Moth
0	4	—	0	0	2	0	0	0	0	0	0	0	1979	*Apamea sordens*
0	4	5	0	0	3	0	0	0	0	0	0	0	1980	Rustic Shoulder-knot
0	1	—	1	0	1	0	1	0	8	0	0	1	1979	*Gortyna flavago*
0	0	0	0	0	0	0	0	0	6	0	0	1	1980	Frosted Orange
9	4	—	0	5	5	0	0	1	0	5	1	11	1979	*Mamestra brassicae*
7	7	1	0	2	1	0	0	0	0	8	11	8	1980	Cabbage Moth
4	1	—	10	9	22	3	2	0	29	7	1	0	1979	*Noctua pronuba*
15	5	26	21	9	34	2	4	4	74	19	2	3	1980	Large Yellow Underwing
2	1	—	1	6	30	4	3	1	1	10	10	9	1979	*Diataraxia oleracea*
0	0	1	0	0	12	0	1	3	4	4	18	6	1980	Bright-line Brown-eye
1	0	—	0	0	0	0	0	0	0	6	0	0	1979	*Euxoa nigricans*
1	0	1	0	0	0	0	0	0	0	0	0	0	1980	Garden Dart
6	16	—	16	9	55	321	1	9	30	8	3	16	1979	*Apamea secalis*
6	21	11	1	20	39	24	5	19	13	14	12	1	1980	Common Rustic
0	0	—	0	1	1	3	0	0	0	3	0	0	1979	*Melanchra persicariae*
0	1	1	0	1	0	5	0	0	0	2	0	0	1980	Dot Moth
13	9	—	—	20	4	0	2	6	269	3	1	3	1979	*Operophtera brumata*
9	9	15	—	23	1	0	19	3	76	2	7	1	1980	Winter Moth

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TABLE

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Pest Species	Year	Reay	Stronchrubie	Inverpolly	Knockan	Cromarty	Newton, Elgin	Beinn Eighe	Rannoch	Dundee	Rowardennan	East Craigs	Glentress	Culzean Castle	Auchincruive
		415	418	352	351	398	58	350	29	47	97	261	339	264	293
Abraxas grossulariata	1979	—	—	13	—	0	—	80	0	0	0	0	—	1	0
Magpie Moth	1980	0	34	16	6	0	0	46	0	0	0	0	2	0	0
Agrotis segetum	1979	—	—	0	—	0	—	0	0	0	0	0	—	1	0
Turnip Moth	1980	0	0	0	0	0	0	0	0	3	0	1	1	0	1
Erannis defoliaria	1979	—	—	1	—	3	—	4	24	1	1984	0	—	5	0
Mottled Umber	1980	0	0	8	0	11	3	13	26	2	1453	0	4	3	0
Phlogophora meticulosa	1979	—	—	0	—	0	—	0	0	0	0	0	—	0	0
Angle Shades	1980	1	0	3	0	0	0	0	0	0	0	0	0	0	0
Alsophila aescularia	1979	—	—	0	—	0	—	0	0	3	66	1	—	8	1
March Moth	1980	0	0	0	0	0	2	0	0	0	—	0	0	14	0
Hepialus humuli	1979	—	—	0	—	2	—	0	3	0	0	0	—	4	0
Ghost Swift	1980	0	0	0	0	0	0	0	0	0	7	0	1	0	0
Hepialus lupulina	1979	—	—	7	—	0	—	0	7	1	0	0	—	0	7
Common Swift	1980	0	0	4	0	0	0	0	3	1	0	2	1	0	0
Agrotis ipsilon	1979	—	—	1	—	2	—	0	0	0	0	0	—	0	0
Dark Sword Grass	1980	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Euproctis chrysorrhoea	1979	—	—	0	—	0	—	0	0	0	0	0	—	0	0
Brown-tail	1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agrotis exclamationis	1979	—	—	0	—	2	—	1	0	6	0	15	—	54	29
Heart and Dart	1980	0	0	0	0	0	1	4	0	2	0	51	2	16	4
Plusia gamma	1979	—	—	0	—	3	—	0	6	2	0	0	—	4	0
Silver Y	1980	3	3	8	1	13	1	10	3	13	1	1	5	12	0
Laphygma exigua	1979	—	—	0	—	0	—	0	0	0	0	0	—	0	0
Small Mottled Willow	1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nycterosea obstipata	1979	—	—	0	—	0	—	0	0	0	0	0	—	0	0
The Gem	1980	0	1	0	0	0	0	0	0	0	0	0	1	1	0
Nomophila noctuella	1979	—	—	0	—	0	—	0	0	0	0	0	—	0	0
Rush Veneer Pearl	1980	0	0	0	0	0	1	1	0	5	2	0	0	9	2
Plutella maculipennis	1979	—	—	0	—	2	—	0	0	0	0	0	—	0	29
Diamond-back Moth	1980	15	96	0	209	0	7	0	0	2534	0	11	0	7	647
Udea ferrugalis	1979	—	—	0	—	0	—	0	0	0	0	0	—	0	0
Rusty Dot Pearl	1980	0	1	0	6	17	24	1	0	49	19	0	18	179	13

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Waterside Mains	Kielder	Gatehouse of Fleet	Alston	Windermere	Wykeham	Arnside	Baldersby	Castletown I.O.M.	Acomb	Harrogate	Hayton	Preston	Longridge	Year	Pest Species
338	296	287	408	323	187	403	315	306	363	410	291	288	124		
—	0	—	—	—	0	10	11	13	5	—	—	4	0	1979	*Abraxas grossulariata*
0	0	4	0	0	4	10	3	7	9	0	6	1	1	1980	Magpie Moth
—	0	—	—	—	0	0	1	0	0	—	—	0	0	1979	*Agrotis segetum*
0	0	1	0	1	0	0	1	1	0	0	0	0	0	1980	Turnip Moth
—	13	—	—	—	53	26	5	16	3	—	—	15	16	1979	*Erannis defoliaria*
251	16	95	1	2	21	18	8	2	2	8	5	6	22	1980	Mottled Umber
—	0	—	—	—	0	5	2	18	0	—	—	2	0	1979	*Phlogophora meticulosa*
5	0	4	0	11	1	1	2	12	0	0	1	1	0	1980	Angle Shades
—	0	—	—	—	—	24	20	0	0	—	—	11	7	1979	*Alsophila aescularia*
19	0	44	1	2	12	28	8	0	0	27	11	7	7	1980	March Moth
—	0	—	—	—	3	0	0	0	0	—	—	2	0	1979	*Hepialus humuli*
0	0	0	0	0	1	2	0	0	0	0	3	1	0	1980	Ghost Swift
—	0	—	—	—	0	1	9	0	0	—	—	3	0	1979	*Hepialus lupulina*
0	0	0	4	0	0	1	17	0	1	64	25	0	1	1980	Common Swift
—	1	—	—	—	0	0	0	1	0	—	—	0	0	1979	*Agrotis ipsilon*
2	0	1	2	0	0	0	0	8	0	0	0	0	0	1980	Dark Sword Grass
—	0	—	—	—	0	0	0	0	0	—	—	0	0	1979	*Euproctis chrysorrhoea*
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1980	Brown-tail
—	0	—	—	—	13	9	11	124	15	—	—	14	11	1979	*Agrotis exclamationis*
14	0	1	0	44	10	11	18	63	37	31	23	5	14	1980	Heart and Dart
—	0	—	—	—	5	19	47	40	86	—	—	14	1	1979	*Plusia gamma*
60	6	15	12	2	7	42	103	56	54	1	47	41	3	1980	Silver Y
—	0	—	—	—	0	1	0	0	0	—	—	0	0	1979	*Laphygma exigua*
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1980	Small Mottled Willow
—	0	—	—	—	0	0	0	0	0	—	—	0	0	1979	*Nycterosea obstipata*
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1980	The Gem
—	0	—	—	—	0	0	0	0	0	—	—	1	0	1979	*Nomophila noctuella*
0	0	2	0	0	0	0	0	1	0	0	—	5	0	1980	Rush Veneer Pearl
—	0	—	—	—	9	0	5	0	15	—	—	1	0	1979	*Plutella maculipennis*
0	2	9	0	4	196	0	225	0	869	0	—	222	4	1980	Diamond-back Moth
—	0	—	—	—	0	0	0	0	0	—	—	0	0	1979	*Udea ferrugalis*
116	64	65	0	82	7	5	106	0	13	0	—	117	10	1980	Rusty Dot Pearl

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TABLE

The Rothamsted Insect Survey—Light Traps: annual records

Pest Species	Year	Tarleton 371	Spurn Head 131	East Didsbury 269	Bangor 35	Jodrell Bank 337	Gleadthorpe 257	Matlock 279	Hope 380	Gibraltar Point 223	Leek 385	Empingham 280	Wells next the Sea 274	Shardlow 378	Sutton Bonington 168
Abraxas grossulariata	1979	7	1	0	1	1	2	28	—	0	—	44	11	6	0
Magpie Moth	1980	4	0	1	0	0	0	15	28	0	1	25	1	3	2
Agrotis segetum	1979	0	0	0	0	0	0	0	—	0	—	2	0	0	2
Turnip Moth	1980	1	1	0	0	0	16	0	1	0	0	4	1	2	2
Erannis defoliaria	1979	0	1	1	1	66	0	3	—	0	—	1	1	5	1
Mottled Umber	1980	0	1	0	0	99	0	0	9	0	1	3	0	0	1
Phlogophora meticulosa	1979	3	7	0	1	0	1	1	—	1	—	6	1	0	2
Angle Shades	1980	4	4	0	2	1	0	2	2	1	0	19	1	0	2
Alsophila aescularia	1979	1	0	1	0	33	2	3	—	0	—	5	0	2	5
March Moth	1980	2	0	1	0	18	8	3	2	4	3	4	2	6	15
Hepialus humuli	1979	0	0	0	0	1	0	0	—	0	—	0	2	0	1
Ghost Swift	1980	2	0	1	0	2	1	0	1	0	0	0	1	0	2
Hepialus lupulina	1979	2	6	4	0	2	10	4	—	4	—	57	4	3	44
Common Swift	1980	0	42	4	0	2	46	6	5	7	7	99	15	18	92
Agrotis ipsilon	1979	0	1	0	0	0	0	0	—	0	—	0	0	0	0
Dark Sword Grass	1980	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Euproctis chrysorrhoea	1979	0	0	0	0	0	0	0	—	0	—	0	0	0	0
Brown-tail	1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agrotis exclamationis	1979	8	18	11	5	6	26	8	—	18	—	33	6	70	61
Heart and Dart	1980	18	52	6	19	24	67	12	125	73	73	150	10	212	334
Plusia gamma	1979	21	66	0	1	4	2	4	—	8	—	44	5	4	3
Silver Y	1980	21	79	0	2	10	10	8	89	63	9	41	5	23	6
Laphygma exigua	1979	0	0	0	0	0	0	0	—	0	—	0	0	0	0
Small Mottled Willow	1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nycterosea obstipata	1979	0	0	0	0	0	0	0	—	0	—	0	0	0	0
The Gem	1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nomophila noctuella	1979	0	6	0	0	0	0	0	—	0	—	0	0	—	0
Rush Veneer Pearl	1980	0	1	0	0	0	1	0	0	1	0	0	0	1	0
Plutella maculipennis	1979	0	31	0	1	0	0	6	—	0	—	3	0	—	1
Diamond-back Moth	1980	1	600	0	6	0	236	76	3	0	167	10	0	534	19
Udea ferrugalis	1979	0	1	0	0	0	0	0	—	0	—	0	0	—	0
Rusty Dot Pearl	1980	1	0	0	1	0	8	0	71	0	3	0	0	0	0

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Preston Montford	Wolverhampton I	Santon Downham	Aberystwyth	Monks Wood	Monks Wood (Ewingswode)	Broom's Barn	Tregaron	Waresley	Luddington	Cockayne Hatley	Hereford	Rhandirmwyn	Year	Pest Species
382	267	259	340	94	277	88	331	360	414	336	212	346		
0	0	—	12	6	—	2	17	18	—	10	—	3	1979	*Abraxas grossulariata*
5	0	1	7	12	107	1	18	18	1	1	4	2	1980	Magpie Moth
0	0	—	0	0	—	0	0	2	—	2	—	0	1979	*Agrotis segetum*
0	1	0	0	0	4	6	1	5	14	27	0	0	1980	Turnip Moth
40	0	—	30	1	—	0	657	4	—	4	—	1452	1979	*Erannis defoliaria*
26	0	2	13	0	480	0	264	1	0	0	2	1118	1980	Mottled Umber
3	0	—	1	2	—	1	5	6	—	1	—	8	1979	*Phlogophora meticulosa*
0	0	3	1	2	8	7	7	4	1	0	1	6	1980	Angle Shades
55	0	—	—	4	—	2	41	30	—	10	—	19	1979	*Alsophila aescularia*
29	0	17	5	7	127	7	99	27	2	4	19	22	1980	March Moth
1	0	—	1	1	—	0	0	1	—	2	—	0	1979	*Hepialus humuli*
2	0	2	0	1	0	0	0	0	0	0	2	0	1980	Ghost Swift
0	0	—	0	35	—	4	1	7	—	44	—	0	1979	*Hepialus lupulina*
2	0	1	0	74	119	6	0	3	3	5	0	0	1980	Common Swift
1	0	—	0	0	—	0	1	0	—	0	—	0	1979	*Agrotis ipsilon*
0	0	0	0	0	0	0	1	0	0	0	0	1	1980	Dark Sword Grass
0	0	—	0	0	—	0	0	0	—	0	—	0	1979	*Euproctis chrysorrhoea*
0	0	0	0	0	0	0	0	0	0	0	0	0	1980	Brown-tail
44	1	—	9	24	—	9	44	42	—	13	—	7	1979	*Agrotis exclamationis*
133	2	23	34	40	13	25	34	120	234	90	79	47	1980	Heart and Dart
8	0	—	17	3	—	9	7	31	—	3	—	26	1979	*Plusia gamma*
9	0	19	14	12	34	11	28	17	4	7	6	76	1980	Silver Y
0	0	—	0	0	—	0	0	0	—	0	—	0	1979	*Laphygma exigua*
0	0	0	0	0	0	0	0	0	0	0	0	0	1980	Small Mottled Willow
0	0	—	0	0	—	0	0	0	—	0	—	0	1979	*Nycterosea obstipata*
0	0	0	1	0	0	0	1	0	0	0	1	0	1980	The Gem
0	0	—	—	0	—	0	—	0	—	1	—	0	1979	*Nomophila noctuella*
4	0	0	—	0	0	8	—	0	0	0	9	4	1980	Rush Veneer Pearl
0	0	—	—	10	—	3	—	22	—	31	—	0	1979	*Plutella maculipennis*
51	0	0	—	162	2	19	—	88	129	415	78	1	1980	Diamond-back Moth
0	0	—	—	0	—	1	—	0	—	1	—	2	1979	*Udea ferrugalis*
70	0	1	—	3	9	4	—	0	11	1	11	42	1980	Rusty Dot Pearl

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TABLE

The Rothamsted Insect Survey—Light Traps: annual records

Pest Species	Year	Trelech 233	Eaton Bray 412	Rothamsted (Barnfield) 1	Rothamsted (Allotments) 34	Rothamsted (Geescroft) 22	Writtle 87	Dale Fort 17	Chigwell Row 305	Westonbirt 292	Hurley 180	Lambourne 328	Cardiff 347	Sheppey 370	Stratfield Mortimer 16
Abraxas grossulariata	1979	41	—	3	1	41	7	—	0	7	0	—	8	0	23
Magpie Moth	1980	20	65	1	1	23	5	36	0	0	0	2	2	2	23
Agrotis segetum	1979	0	—	4	1	8	2	—	0	3	1	—	0	0	0
Turnip Moth	1980	0	2	15	17	11	4	7	0	0	1	0	0	2	1
Erannis defoliaria	1979	14	—	0	0	43	3	—	1	79	5	—	0	0	28
Mottled Umber	1980	1	0	0	0	36	0	0	2	13	7	4	1	0	33
Phlogophora meticulosa	1979	9	—	0	0	4	1	—	2	10	0	—	1	8	0
Angle Shades	1980	8	1	0	1	9	2	5	3	8	0	0	2	1	2
Alsophila aescularia	1979	30	—	0	0	36	0	—	0	8	24	—	0	0	17
March Moth	1980	8	4	1	3	58	2	5	0	2	31	1	0	0	9
Hepialus humuli	1979	0	—	0	1	3	0	—	2	2	0	—	0	0	1
Ghost Swift	1980	0	1	1	1	2	0	0	1	0	0	4	0	0	0
Hepialus lupulina	1979	0	—	12	1	10	3	—	19	13	28	—	27	13	8
Common Swift	1980	0	77	22	11	16	0	1	18	5	8	15	28	5	9
Agrotis ipsilon	1979	4	—	0	0	0	0	—	0	1	0	—	0	0	0
Dark Sword Grass	1980	1	0	0	0	0	0	7	0	0	0	0	0	0	0
Euproctis chrysorrhoea	1979	0	—	0	0	0	2	—	3	0	0	—	0	19	0
Brown-tail	1980	0	0	0	0	0	0	0	0	0	0	0	0	4	0
Agrotis exclamationis	1979	43	—	41	2	20	45	—	5	2	13	—	7	51	11
Heart and Dart	1980	37	95	108	29	42	64	10	34	29	37	66	27	56	26
Plusia gamma	1979	5	—	0	5	11	29	—	25	16	0	—	25	10	12
Silver Y	1980	22	7	8	3	10	11	19	20	22	5	6	24	21	9
Laphygma exigua	1979	0	—	0	0	0	0	—	0	0	0	—	0	0	0
Small Mottled Willow	1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nycterosea obstipata	1979	0	—	0	0	0	0	—	0	0	0	—	0	0	0
The Gem	1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nomophila noctuella	1979	0	—	0	0	0	—	—	0	0	0	—	0	0	0
Rush Veneer Pearl	1980	0	—	4	2	0	0	22	0	0	0	0	0	1	0
Plutella maculipennis	1979	0	—	49	35	0	—	—	7	0	0	—	3	29	0
Diamond-back Moth	1980	0	—	580	471	5	271	82	36	0	0	0	55	202	0
Udea ferrugalis	1979	0	—	0	0	0	—	—	0	0	0	—	0	0	0
Rusty Dot Pearl	1980	3	—	11	2	8	1	419	0	3	5	0	0	0	0

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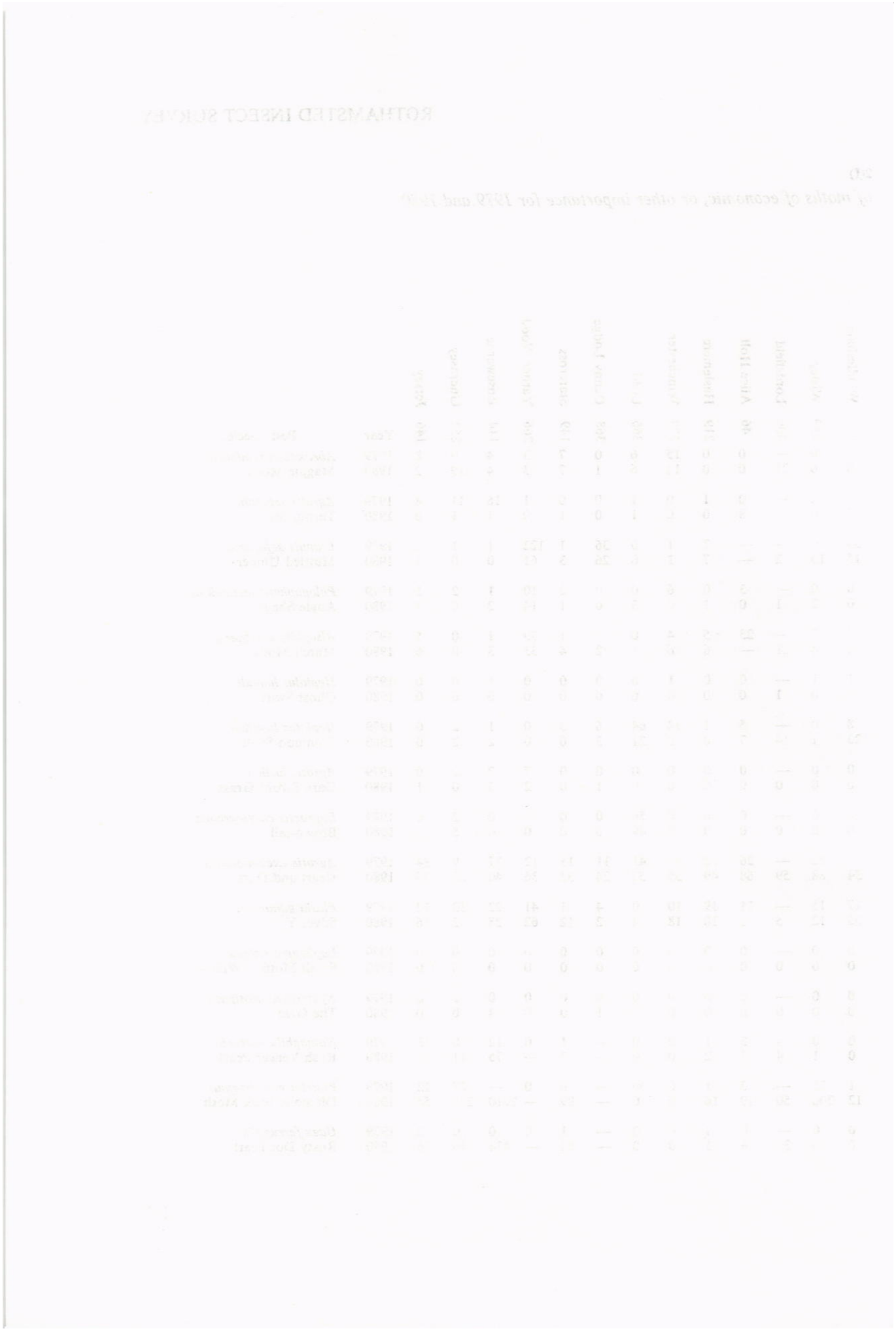
2(f)

of moths of economic, or other importance for 1979 and 1980

Windlesham	Wisley	Lordsfield	Alice Holt	Haslemere	Winchester	Lydd	Denny Lodge	Starcross	Yarner Wood	Rosewarne	Guernsey	Jersey	Year	Pest Species
171	289	406	46	219	379	366	368	149	266	114	252	146		
0	0	—	0	0	15	6	0	7	3	4	9	8	1979	*Abraxas grossulariata*
0	0	21	0	0	14	6	1	7	3	4	19	2	1980	Magpie Moth
0	2	—	0	1	0	1	0	0	1	16	11	4	1979	*Agrotis segetum*
3	0	1	8	0	0	1	0	1	0	1	1	0	1980	Turnip Moth
33	9	—	—	7	1	0	36	1	122	1	1	1	1979	*Erannis defoliaria*
15	15	2	—	7	1	0	26	3	61	0	0	1	1980	Mottled Umber
0	0	—	3	0	6	0	0	2	10	1	2	1	1979	*Phlogophora meticulosa*
0	2	1	0	1	0	3	0	1	14	2	0	3	1980	Angle Shades
5	7	—	23	5	4	0	3	1	39	1	0	5	1979	*Alsophila aescularia*
4	6	21	—	6	6	1	2	4	33	3	0	6	1980	March Moth
1	1	—	0	0	1	0	0	0	0	1	0	0	1979	*Hepialus humuli*
0	0	1	0	0	0	0	0	0	0	0	0	0	1980	Ghost Swift
8	0	—	5	1	14	64	6	3	0	1	2	0	1979	*Hepialus lupulina*
23	1	14	7	0	0	21	3	0	0	2	2	0	1980	Common Swift
0	0	—	0	0	0	0	0	0	7	2	2	0	1979	*Agrotis ipsilon*
0	0	0	0	0	0	0	1	0	2	3	0	1	1980	Dark Sword Grass
0	0	—	0	0	0	54	0	0	0	0	2	0	1979	*Euproctis chrysorrhoea*
0	0	0	0	0	0	49	0	0	0	0	5	1	1980	Brown-tail
16	23	—	26	12	49	41	11	13	12	77	9	34	1979	*Agrotis exclamationis*
54	88	59	68	49	35	52	24	32	36	40	23	36	1980	Heart and Dart
17	15	—	11	19	10	0	4	1	41	22	13	12	1979	*Plusia gamma*
35	12	5	3	10	18	4	2	12	62	28	2	16	1980	Silver Y
0	0	—	0	0	0	0	0	0	0	0	0	0	1979	*Laphygma exigua*
0	0	0	0	0	0	0	0	0	0	0	0	0	1980	Small Mottled Willow
0	0	—	0	0	0	0	0	0	0	0	1	0	1979	*Nycterosea obstipata*
0	0	0	0	0	0	0	1	0	0	4	0	0	1980	The Gem
0	0	—	3	1	0	0	—	1	0	12	0	13	1979	*Nomophila noctuella*
0	1	4	3	2	0	0	—	2	—	75	11	12	1980	Rush Veneer Pearl
1	25	—	3	1	0	50	—	6	0	—	27	12	1979	*Plutella maculipennis*
12	206	50	19	16	0	0	—	99	—	2010	203	54	1980	Diamond-back Moth
0	0	—	0	1	0	0	—	1	0	0	0	2	1979	*Udea ferrugalis*
0	0	35	9	1	0	0	—	52	—	434	49	56	1980	Rusty Dot Pearl

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CONVERSION FACTORS

Factors for the Conversion of Imperial to Metric Units

1 inch (in.)	= 2·540 centimetres (cm)
1 foot (ft) (=12 in.)	= 30·48 cm
1 yard (yd) (=3 ft)	= 0·9144 metre (m)
1 square yard (yd^2)	= 0·8361 m^2
1 acre (ac) (=4840 yd^2)	= 0·4047 hectare (ha)
1 ounce (oz)	= 28·35 grams (g)
1 pound (lb)	= 0·4536 kilogram (kg)
1 hundredweight (cwt) (=112 lb)	= 50·80 kg
1 ton (=2240 lb)	= 1016 kg = 1·016 metric tons (tonnes) (t)
1 pint	= 0·5682 litre (l)
1 gallon (gal) (=8 pints)	= 4·546 litres
1 fluid ounce = 1/20 pint	= 0·02841 litre = 28·41 ml
1 cubic foot	= 28·32 litres

To convert	*Multiply by*
oz ac^{-1} to g ha^{-1}	70·06
lb ac^{-1} to kg ha^{-1}	1·121
cwt ac^{-1} to kg ha^{-1}	125·5
cwt ac^{-1} to t ha^{-1}	0·1255
ton ac^{-1} to kg ha^{-1}	2511
ton ac^{-1} to t ha^{-1}	2·511
gal ac^{-1} to l ha^{-1}	11·233

The following factors are accurate to about 2 parts in 100:

1 lb ac^{-1} = 1·1 kg ha^{-1}
1 gal ac^{-1} = 11 litres ha^{-1}
1 ton ac^{-1} = 2·5 t ha^{-1}

In general reading of the text there will be no great inaccuracy in regarding:

1 lb = 0·5 kg
1 lb ac^{-1} = 1 kg ha^{-1}

Temperatures

To convert °F into °C subtract 32 and multiply by $\frac{5}{9}$ (0.556)
To convert °C into °F multiply by $\frac{9}{5}$ (1·8) and add 32

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Factors for the Conversion of Metric to Imperial Units

1 centimetre (cm)	=	0·3937 inch (in.) = 0·03281 ft
1 metre (m)	=	1·094 yards (yd)
1 square metre (m^2)	=	1·196 square yards (yd^2)
1 hectare (ha)	=	2·471 acres (ac)
1 gram (g)	=	0·03527 ounce (oz)
1 kilogram (kg)	=	2·205 pounds (lb)
1 kg	=	0·01968 hundredweight (cwt) = 0·0009842 ton
1 metric ton (tonne) (t)	=	0·9842 ton
1 litre	=	1·760 pints = 0·2200 gallon (gal)

1 litre = 1000 millilitres (ml) = 35·20 fluid ounces = 0·03531 cubic foot (ft^3)

To convert	*Multiply by*
g ha^{-1} to oz ac^{-1}	0·01427
kg ha^{-1} to lb ac^{-1}	0·8921
kg ha^{-1} to cwt ac^{-1}	0·007966
t ha^{-1} to cwt ac^{-1}	7·966
kg ha^{-1} to tons ac^{-1}	0·0003983
t ha^{-1} to tons ac^{-1}	0·3983
l ha^{-1} to gal ac^{-1}	0·08902

Plant nutrients

Plant nutrients are best stated in terms of amounts of the elements (P, K, Na, Ca, Mg, S); the old 'oxide' terminology (P_2O_5, K_2O, Na_2O, CaO, MgO, SO_3) is still used in work involving fertilisers and liming since Regulations require statements of P_2O_5, K_2O, etc.

For quick conversions

(accurate to within 2%) the following factors may be used:

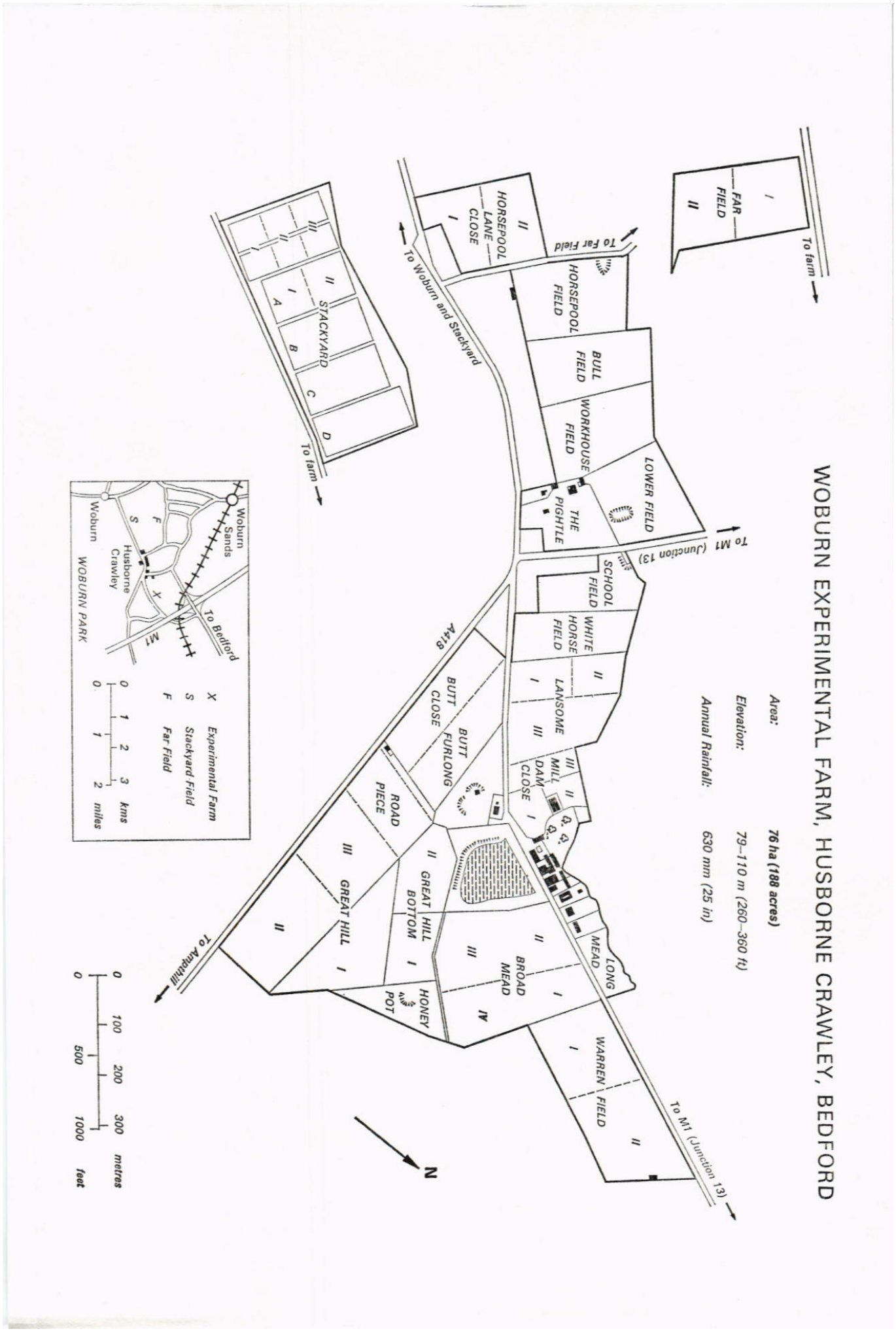
$2\frac{1}{3} \times P = P_2O_5$	$\frac{3}{7} \times P_2O_5 = P$
$1\frac{1}{5} \times K = K_2O$	$\frac{5}{6} \times K_2O = K$
$1\frac{2}{5} \times Ca = CaO$	$\frac{7}{10} \times CaO = Ca$
$1\frac{2}{3} \times Mg = MgO$	$\frac{3}{5} \times MgO = Mg$

For accurate conversions:

To convert	*Multiply by*	*To convert*	*Multiply by*
P_2O_5 to P	0·4364	P to P_2O_5	2·2915
K_2O to K	0·8301	K to K_2O	1·2047
CaO to Ca	0·7146	Ca to CaO	1·3994
MgO to Mg	0·6031	Mg to MgO	1·6581

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