NATIONAL SMALL MAMMAL SURVEY AT WALTER'S COPSE, NEWTOWN, ISLE OF WIGHT, 1983–1986

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Abstract

The aims and objects of the National Small Mammal Survey are outlined, and the preparations necessary for the Isle of Wight Natural History and Archaeological Society to take part are explained. The methods for carrying out the survey are given in detail for the benefit of future workers.

The results of eight surveys carried out in the same area for four years from 1983 to 1986, inclusive, are presented in tabulated and graphical form, together with a vegetation survey of the trapping area and details of the annual assessment of tree seed and fruit production covering the period of the survey. Note is also taken of the weather conditions between each of the surveys.

Attention is drawn to some of the interesting features disclosed by the results obtained, and an attempt is made to correlate the population dynamics of wood mice, *Apodemus sylvaticus*, and bank voles, *Clethrionomys glareolus*, with their food supply and habitat preferences, together with interspecific reactions. Suggestions are made for further investigation.

Introduction

Following the severe winter of 1981/2 a drastic decline in numbers of small mammal species was noted in many areas of Great Britain. At the same time the Mammal Society instigated a series of national small mammal surveys in different parts of the country to monitor the fluctuating populations of small rodents in woodland. The aim of the surveys was to assess the relationships between population dynamics and habitat types as well as other influences such as weather conditions, food supply and competition. It was also the intention to look for similarities in the population fluctuations from the various study areas such as the decline generally noted from winter to summer 1982.

In order to compare results from different study areas a strict method of procedure was suggested which involved the use of 98 Longworth mammal traps, as recommended in Gurnell & Flowerdew (1982). The Mammals, Reptiles and Amphibians Section of the Isle of Wight Natural History and Archaeological Society was anxious to take part, but could only muster 36 traps at that time. However, the organiser of the national survey, Dr. John Flowerdew, very kindly arranged for the supply of 70 additional traps in need of repair at a nominal cost. These were delivered to Southampton University in the autumn of 1982 and brought over to the Island, a few at a time, by John Stafford. The necessary repairs were carried out during the winter, so that we had sufficient traps ready to take part for the first time in early summer, 1983.

In the meantime, however, other arrangements had to be made. To meet the requirements laid down an area of mature woodland, deciduous or coniferous, of 10ha or more had to be chosen. Within this woodland a trapping area (90m × 90m square) had to be selected, so that it provided a good variety of the habitats present in the wood. After considerable investigation a site in Walter's Copse, Newtown, as shown in fig. 1, was

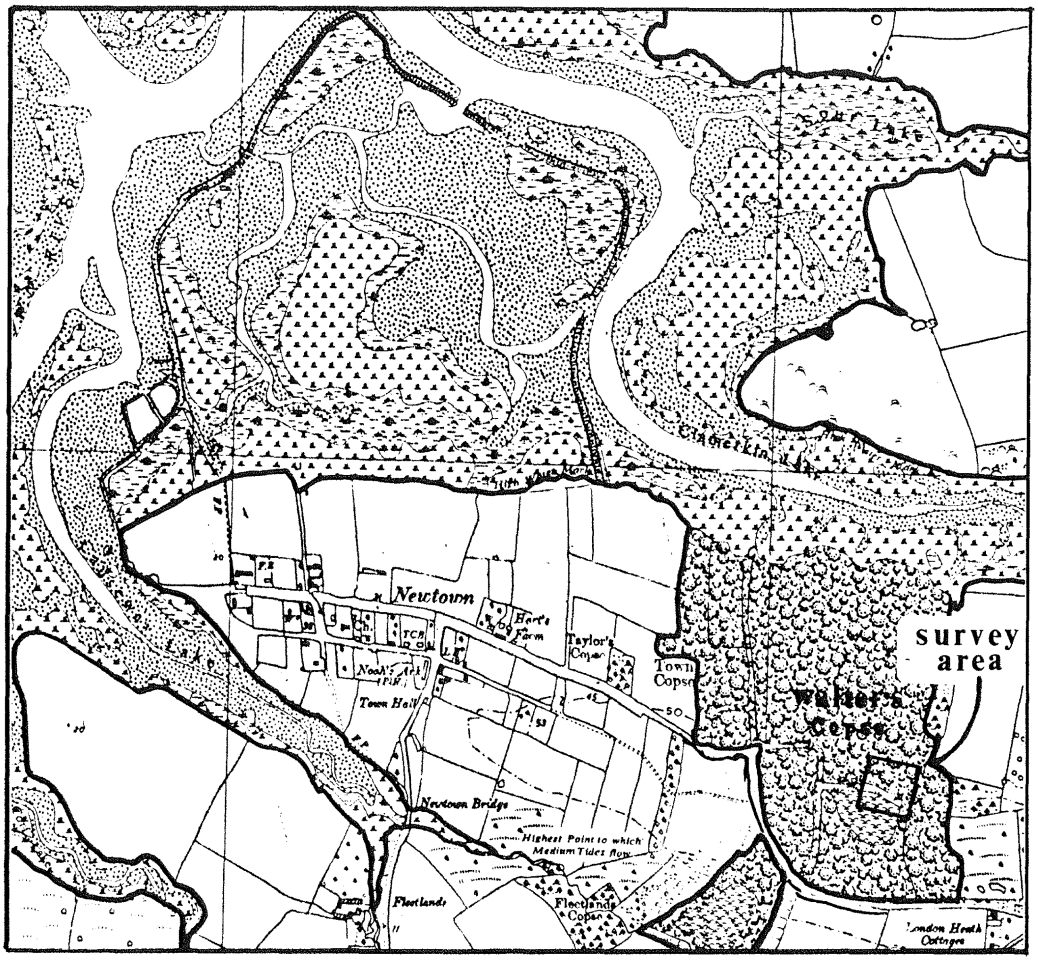

Figure 1. Map of Newtown, I.W., showing position of survey area in Walter's Copse.

considered to be the best, being rich and varied, and likely to remain reasonably undisturbed for some years. Together with Town Copse adjoining, the woodland area comprises some 34 acres or 13.8ha, and is owned by the National Trust. Most of Town Copse and the northern part of Walter's Copse consists of pre-1810 hazel/ash coppice with oak standards, somewhat neglected, but now being progressively coppiced on a 15-year cycle. The main part of Walter's Copse, including the survey area, is post-1810, but pre-1866, and predominantly ash/hazel coppice with scattered, uneven oak standards. Many coppice stools have degenerated and have been replaced by field maple, hawthorn, dogwood and privet, with more recent incursions of pine, birch and cypress. Some areas have degenerated into dense, windblown blackthorn scrub. Permission to use this area was kindly granted by the National Trust and the Management Committee of the Newtown Local Nature Reserve, of which it forms a part. It was felt that the knowledge gained by such a scientific investigation would be useful to those responsible for managing the Nature Reserve in the interests of its wildlife.

Early in 1983 the trapping grid, as shown in fig. 2, was laid out. This consists of 49 trapping points in a 7 × 7 configuration, each point being 15m from the nearest adjacent points. This might seem to be a fairly simple task, but in practice it was not at all easy as,

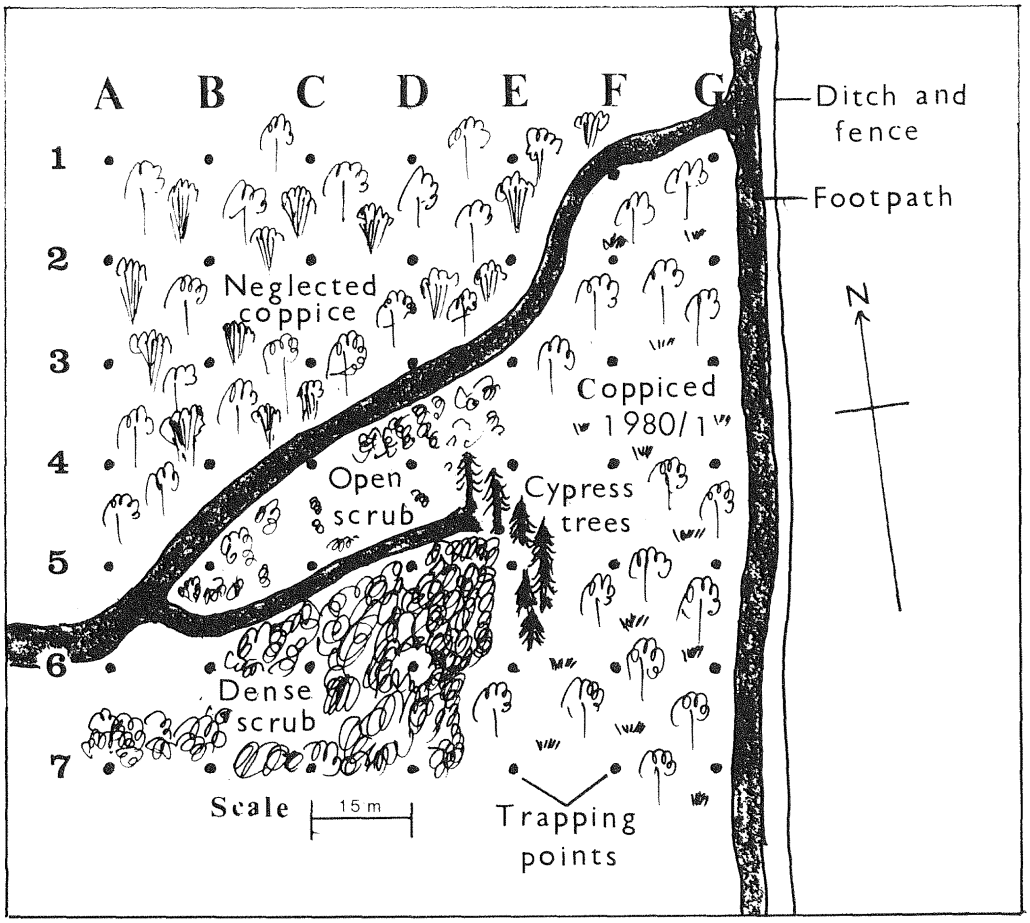

Figure 2. Sketch map of survey area in Walter's Copse, Newtown, I.W., showing trapping grid and woodland cover.

when sighting and measuring, there always seemed to be trees in the way, and in the southern part paths had to be cut through the thick thorn scrub. However, with the valuable help of Frank Heap and his volunteers, Jonathan Cox and pupils of Cowes High School, the work was completed and each of the 49 trapping points was marked by a length of metal water pipe driven into the ground with a label indicating the co-ordinates of the point on the grid, e.g. A1, A2, A3, etc. to G7. Tall flagged canes, similarly labelled, were placed in these pipes to make them more clearly seen, when carrying out each survey. One point, F1, had to be moved a metre or so to the south, as it fell in the middle of a footpath. There were some cases of interference, such as pulling up the markers and throwing them into a ditch. One trap was stolen, but in general eight surveys over a period of four years have been carried out without further trouble.

Method of procedure

As the success of such a long-term project would depend upon the continued help of trained volunteers, a well-attended meeting was held at the Lord Louis Library on 19th March, 1983, at which the methods of procedure were fully explained. This was followed

ISLE OF WIGHT NATURAL HISTORY AND ARCHAEOLOGICAL SOCIETY

NATIONAL SMALL MAMMAL SURVEY - RECORDING SHEET

RECORDERS: 1. F. Heap 2. K. Burrows 3.

LOCALITY WALTER'S COPSE, NEWTOWN, I.W.	DATE 1/6/86	TIME 07·00
WEATHER DURING LAST 12 HOURS RAIN / DRIZZLE - MIST		CLOUD COVER 8/8

Notes and abbreviations to be used:

1. Trap number - enter number as on trap, e.g. A1a, A1b, etc. to G7a, G7b.
2. Species - enter As (Wood mouse), Af (Yellow-necked mouse), Cg (Bank vole), Ma (Field vole), Mm (Harvest mouse), Mus (House mouse), Sa (Common shre Sm (Pygmy shrew). O (no catch)
3. Sex - enter M (male), F (female) or U (undetermined)
4. New/Recapture - enter N (new) or R (recapture): T.P.C.= Times previously caught.
5. Age - enter A (adult), S (subadult), J (juvenile) or U (uncertain)
6. Breeding condition (Mice and Voles only) - Males - enter TL (testes large & scrotal), TM (testes obvio but not large) or TA (testes abdominal). Females - Pg (obviously pregnant), Lact (nipples enlarged), Perf (vagina open), Imp (vagina closed), Imp/par (vagina closed, but showing signs of having been reproductively active).
7. Weights - all to the nearest gram. (a) Weight of bag + litter + specimen. (b) Weight of bag + litter only. (c) a-b = weight of specimen
8. Comments - enter anything important for which no provision has been made.

Trap number	Species	Sex	New/Recap/	T.P.C.	Age	Breeding condition	Weights in grams a	b	c(a-b)	Comments
A1a	As	M	R	1	A	TL	40	8	32	
A1b	As	M	N	–	A	TL	39	8	31	
A2a	O									
A2b	As	F	R	1	A	Perf	31	8	23	
A3a	O									
A3b	As	M	R	2	A	TM	27	8	19	Small
A4a	Cg	M	R	1	A	TL	34	8	26	
A4b	O									
A5a	Cg	M	N	–	A	TL	37	8	29	FLEAS
A5b	O									
A6a	Cg	F	R	2	A	Imp	33	8	25	
A6b	Cg	F	N	–	A	Perf	28	8	20	
A7a	Cg	F	R	1	A	Perf	29	8	21	
A7b	O									

Figure 3. Sample of Recording Sheet.

by practical sessions, also well attended, on 30th April and 1st May, 1983, at Lock's Copse, Porchfield, by kind permission of the Range Warden, Mr. T. Rolf, of the T.A.V.R. Rifle Ranges, when a survey was carried out using the procedures to be adopted. For the benefit of those who might wish to continue this work in the future, the methods used are explained in detail.

Surveys were carried out twice a year, in late May or early June, and again in late November or early December. For carrying out each survey two Longworth live mammal traps, prepared with dry bedding (e.g. hay) and a handful of wheat as food, were placed in suitable positions within about a metre of each trapping point. A handful of hay was placed over each trap and a little wheat was sprinkled near the entrance. The traps were not pre-baited, but were set out to catch on the evening before the survey was due to start. The traps were inspected in the morning and late afternoon of each day over a period of three consecutive days, thus making six sessions for each survey. It was understood that once the survey started, it must continue irrespective of the weather, unless this was seen to be having an adverse effect on the mammals, when the survey would be terminated, although this has not yet been necessary. All captures were identified, sexed, weighed and marked by clipping the fur, before being released, and all details were recorded on special Recording Sheets, as the sample in fig. 3.

From experience it has been found best to work in teams of three. No. 1, the handler, wearing gloves, emptied the trap into a plastic bag, examined, identified, sexed and noted the breeding condition of the specimen, calling this information out to No. 2, who entered the details on the Recording Sheet, clipped the fur and weighed the specimen, while No. 3, with a fresh supply of hay and food, re-set the trap and placed it back in position. On completion of the survey, all the details of captures were copied on to Summary Sheets for each session, as the sample shown in fig. 4, and also on special forms for each species, as shown in fig. 5, which were sent to Dr. Flowerdew, who compared the records from various areas and commented on the results.

The primary purpose of the survey was to monitor the variations in the numbers of wood mice and bank voles, but inevitably some shrews were caught. In order to comply with the Wildlife & Countryside Act (1981) precautions were taken to keep shrews alive if they were trapped. Insect food was provided in the traps and in the later surveys intermediate inspections at approximately two-hourly intervals were carried out during the day. Any shrews caught were recorded and released, and the trap re-set.

In addition a vegetation survey was carried out in the spring, detailing the ground cover in each of the 15m squares surrounding each trapping point, as shown in fig. 6. In practice this remained much the same throughout the four years of the survey, except for the removal of some logs and brushwood and the regrowth up to about 3m of the coppiced stools surrounding trap lines F and G. In the autumn an assessment of tree seed and fruit production was carried out by taking samples from 21 trapping points, which were sorted out and air-dried for a month before being weighed, but in recent years it was felt that the extra work involved added little of significance to a visual assessment, which in many respects was more meaningful.

A new activity carried out in 1984 was the taking of 'brushings' of specimens with special sterilised plastic 'toothbrushes' supplied by the School of Hygiene and Tropical Medicine, to whom they were returned for investigation into parasitic fungus diseases, such as ringworm.

Results of surveys

There are many different ways in which the results of a series of eight surveys can be tabulated, according to what one needs in order to make meaningful deductions. Tables have been constructed showing details of all captures in each session of each of the eight surveys, and another giving details of captures at each trapping point throughout the

ISLE OF WIGHT NATURAL HISTORY AND ARCHAEOLOGICAL SOCIETY

NATIONAL SMALL MAMMAL SURVEY - SUMMARY OF RECORDS

LOCALITY: WALTER'S COPSE, NEWTOWN/NW	DATE: 1/6/86	TIME: 07.00
WEATHER DURING LAST 12 HOURS: Rain / drizzle		CLOUD COVER: 8/8

Notes and abbreviations as on Recording Sheet.

Trap number	Species	Sex	New/ Recap.	T.P.C.	Age	Breeding condition	Weight grams	Comments
A1a	As	M	R	1	A	TL	32	
A1b	As	M	N	-	A	TL	31	
A2b	As	F	R	1	A	Perf	23	
A3b	As	M	R	2	A	TM	19	Small
A4a	Cg	M	R	1	A	TL	26	
A5a	Cg	M	N	-	A	TL	29	Fleas
A6a	Cg	F	R	2	A	Imp	25	
A6b	Cg	F	N	-	A	Perf	20	
A7a	Cg	F	R	1	A	Perf	21	
B1b	Cg	F	N	-	A	Imp	21	
B3a	As	M	N	-	A	TM	22	
B3b	Cg	F	N	-	A	Perf	21	
B4b	Cg	M	R	2	A	TA	22	
B6a	Cg	M	R	1	A	TL	27	
B6b	Cg	F	R	3	A	Perf	26	
B7a	Cg	F	R	1	A	Perf	29	One eye only Smaller right ear Yellowish fur
B7b	As	M	R	1	A	TL	26	
C1a	Cg	M	N	-	A	TL	28	
C2b	Cg	F	R	1	A	Perf	23	
C3a	As	F	R		A	Perf	24	
C3b	Cg	F	N	-	S	Perf	18	
C4b	As	F	R	1	S	Imp	21	
C5b	Cg	M	R	2	A	TM	28	
C7b	Cg	M	R	2	A	TM	25	
D1b	Cg	F	N	-	S	Imp	20	Tick
D2a	Cg	M	R	3	A	TL	28	
D2b	Cg	M	N	-	A	TL	26	(Contd)

Figure 4. Sample of Summary Sheet.

MAMMAL SOCIETY NATIONAL SMALL MAMMAL SURVEY

Species: BANK VOLE | Year: 1986 My/Jn | Locality: WALTER'S COPSE, NEWTOWN, ISLE OF WIGHT | Grid Ref E 432 N 904

Session Dates & Times:
1 30/5/86 07.00 | 3 31/5/86 07.00 | 5 1/6/86 07.00
2 30/5/86 18.00 | 4 31/5/86 18.00 | 6 1/6/86 18.00

Comments on weather in 12hr before Session; please add general comments e.g. snow cover
1 Clear - occasional showers
2 Dry, fine and mild
3 Rain
4 Rain / drizzle
5 Rain / drizzle
6 Drizzle - mild and humid.

Dominant or co-dominant tree species: neglected - Oak, Ash, Hazel

High forest | Coppice | (Coppice with standards) | Plantation

Session	New Animals m	f	m+f	Recaps m	f	m+f
1	0	6	6	0	0	0
2	8	9	17	1	3	4
1+2	8	15	23	1	3	4
3	11	3	14	3	3	6
4	9	15	24	8	10	18
3+4	20	18	38	11	13	24
5	5	6	11	15	12	27
6	7	7	14	18	15	33
5+6	12	13	25	33	27	60
TOTAL	40	46	86	45	43	88

g	MALES WEIGHT m	MALES NUMBER TA	TM	TL	J	S	A	U	FEMALES NUMBER Imp	Imp Perf	Perf	Pg	Pg Lact	Lact	J	S	A	U	f
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15	1	1				1													
16																			
17									1		1					2			2
18									1		3					3	1		4
19											1						1		1
20									1	1	5					1	6		7
21	3	2	1				3		2		1						3		3
22	2		2				2		3		4						7		7
23	2		2				2		2		6						8		8
24	7	1	5	1			7		1		3						4		4
25	5		5				5				2						2		2
26	9		5	4			9				1	2					3		3
27	4		4				4				1	1					2		2
28	4		2	2			4		1			2					3		3
29	2		1	1			2												
30	1		1				1												
TOTAL	40	4	28	8		1	39		12	1	28	5				6	40		46

A most remarkable recovery, following a steady decline since 1983/4 when the Acorn crop failed.

Heavier weights here or over page

Figure 5. Sample of Species Recording Sheet.

JUNE, 1984 NATIONAL SMALL MAMMALS SURVEY - WALTER'S COPSE, NEWTON, I.W.

ASSESSMENT OF COVER UP TO 2m. AT EACH TRAPPING POINT

Trapping point	Main species in field layer	Main species in ground zone	Cover
A1	Bramble, brier, apple	Ivy, Enchanter's-nightshade	5
A2	Bramble, honeysuckle, brier	Ivy, Wood Spurge, Bugle	5
A3	Bramble, brier	Ivy, Enchanter's-nightshade, ash	5
A4	Bramble, brier	Ivy (seedlings	5
A5	Bramble, brier, hawthorn	Ivy	5
A6	Bramble, honeysuckle	Ivy, Giant Fescue	4
A7	Blackthorn, brushwood	Ivy (5%) very wet	5
B1	Hawthorn, Privet, Honeysuckle	Ivy, Wood Spurge, Moss	5
B2	Brier, Honeysuckle, Ash	Ivy (Greater Butterfly Orchids)	5
B3	Bramble, Brier, Privet	Ivy	5
B4	Blackthorn, brushwood	Ivy, moss	5
B5	Blackthorn	Ivy, moss, grass, saw-wort	5
B6	Blackthorn, Bracken, Bramble, Sallow)	Ivy	5
B7	Blackthorn, brushwood	Ivy (5%) fairly wet	5
C1	Bramble, honeysuckle, Hazel seedlings)	Ivy, wet	5
C2	Bramble, black bryony	Ivy	5
C3	Bramble, brier, dogwood	Ivy, honeysuckle	5
C4	Blackthorn, brier	Ivy, moss, grass, saw-wort	5
C5	Hawthorn, Dogwood, brier	Grass, Saw-wort, moss	5
C6	Blackthorn, brier	Moss, wet	5
C7	Blackthorn, hawthorn	Moss, wet (almost bare earth)	5
D1	Guelder-rose, honeysuckle	Ivy	5
D2	Bramble, brier, honeysuckle	Ivy, honeysuckle, ash seedlings	5
D3	Hawthorn, brushwood	Ivy, grass, saw-wort	5
D4	Blackthorn (50%), brier	Moss, saw-wort, bugle, grass, sedge	5
D5	Blackthorn (90%)	Ivy (40%), Moss (50%), grass	5
D6	Blackthorn	Moss, saw-wort, ash seedlings	5
D7	Blackthorn (100%)	Ivy (90%), Moss (10%)	5
E1	Bramble, brier, hawthorn	Ivy	5
E2	Hawthorn, brier	Ivy	5
E3	Blackthorn, hawthorn	Ivy, moss, saw-wort, grass, logs	5
E4	Blackthorn, hawthorn, guelder-rose)	Ivy, grass, saw-wort)	5
E5	Blackthorn	Ivy (15%), ~~brushwood~~, ~~logs~~ } Taken away	4 2
E6	Honeysuckle, blackthorn, sallow	Ivy, ~~brushwood~~, ~~logs~~ }	4 2
E7	Sallow, honeysuckle, blackthorn	Ivy, brushwood, guelder-rose	5
F1	Ash/Oak saplings, hazel	Ivy, wet	5
F2	Oak/Ash/Hazel saplings	Rush, ivy, sedges - wet	4
F3	Hawthorn, Ash saplings	Ivy, rush, brambles, brushwood, wet	5
F4	Oak/Ash saplings, brier	Ivy, rush, saw-wort, grass, wet	5
F5	Sallow/Ash/Oak saplings	Rush, ivy - very wet	4
F6	Ash/Sallow/Oak saplings	Rush, brushwood/logs - very wet	4
F7	Ash/Sallow saplings	Ivy, sedges, brushwood/logs, wet	5
G1	Bramble, brier, ash	Wood Brome, Anemone, Sedges	5
G2	Ash/Hazel saplings, brier	Rush, sedge, ivy	5
G3	Field maple, Ash/Hazel, bracken	Grass, Sedge	5
G4	Ash/Sallow/Hazel	Ivy, sedges, brushwood	5
G5	Hazel, honeysuckle, ash	Ivy, wood spurge, anemone, giant	5
G6	Hazel, bramble, bracken	Ivy, honeysuckle, sedges (Fescue	5
G7	Oak saplings, bramble, hazel	Ivy (80%)	5

KEY TO COVER

0 = less than 1% cover
1 = 1-5% cover
2 = 6-25% cover
3 = 26-50% cover
4 = 51-75% cover
5 = 76-100% cover

Oliver H. Frazer
(checked by Clive Chatters)
3rd June, 1984.

Figure 6. Vegetation survey as recorded in June, 1983 and revised in June, 1984/5.

			1983		1984		1985		1986	
			M/J	N/D	M/J	N/D	M/J	N/D	M/J	N/D
Wood Mice	New	Male	6	14	6	21	8	19	15	10
		Female	4	8	2	15	7	18	10	11
	Recaps	Male	2	27	1	24	3	6	8	11
		Female	7	8	0	21	5	6	4	7
Bank Voles	New	Male	19	24	20	14	11	2	40	27
		Female	17	31	19	14	9	9	46	17
	Recaps	Male	13	36	16	6	10	0	45	23
		Female	23	19	6	6	7	1	43	24
Field Voles	New	Male				1				1
		Female				0				0
Common Shrews			0	15	0	2	1	9	1	2
Pygmy Shrews			0	3	0	1	0	1	0	0

Figure 7. Table showing details of captures in eight surveys at Walter's Copse, Newtown, I.W., 1983 to 1986.

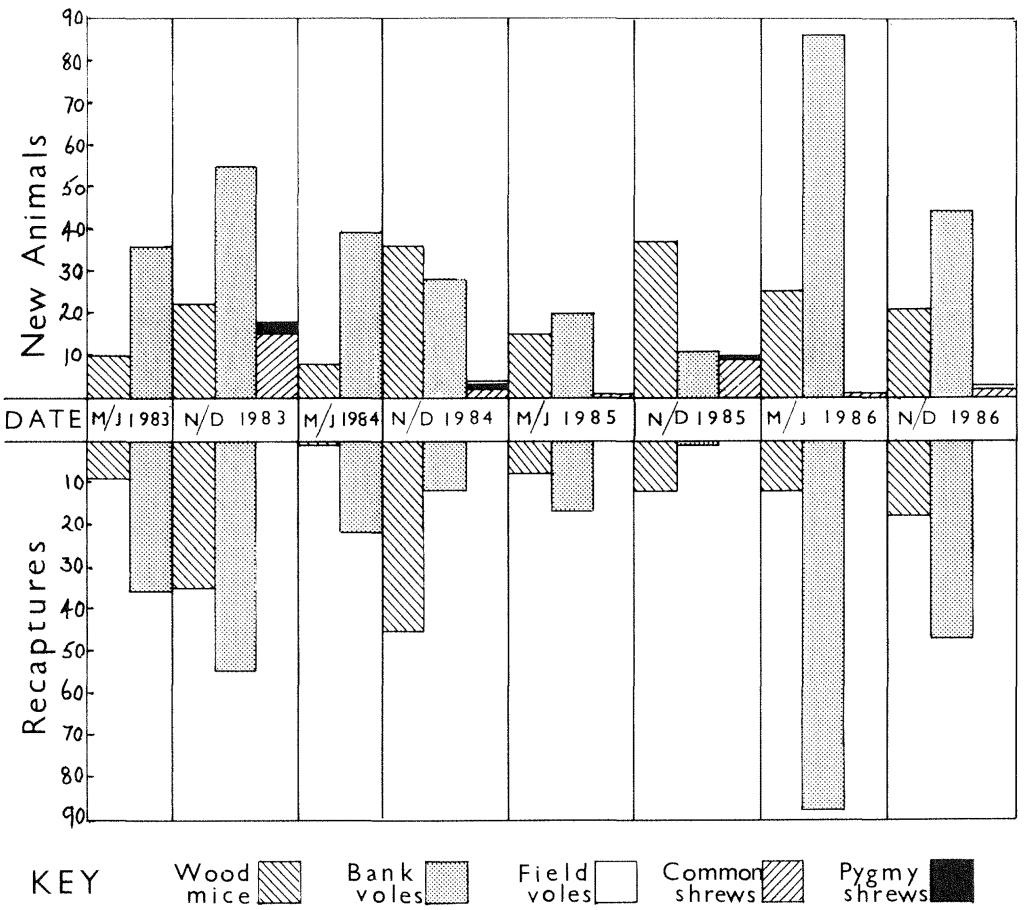

Figure 8. Graph showing captures of new animals and recaptures of each species in each of the 8 surveys, 1983 to 1986.

Species	Year 1983	1984	1985	1986
Oak	Failed	Heavy	Heavy	Very Poor
Ash	Fair	Fair	Fair	Fair
Hazel	Poor	Heavy	Poor	Fair
Field Maple	Good	Heavy	Fair	Good
Hawthorn	Good	Good	Heavy	Fair
Blackthorn	Poor	Good	Good	Failed
Rose	Good	Fair	Good	Good
Cypress	Fair	Fair	Good	Good

Figure 9. Table showing details of annual assessment of tree seed and fruit production as recorded in the autumn of each year, 1983 to 1986.

eight surveys. Neither is reproduced here, as they are both complicated masses of figures expensive to reproduce, but both are necessary for the purposes of interpreting the results in a meaningful way, and may be obtained at cost from the author. In broad terms the numbers of new and recaptured animals of each species recorded in each of the eight surveys is shown in fig. 7, and represented graphically in fig. 8. It is interesting to note how often the number of recaptures equals, or in some case exceeds the number of new animals caught, which puzzles some people, but it is easily explained by the fact that some individuals may be recaptured several times. For the sake of completeness the numbers of shrews caught are shown, but the numbers of these are not sufficient to be able to draw any useful conclusions with regard to their population dynamics or habitat preferences. Likewise the two isolated captures of field voles are interesting but not significant.

The results of the annual assesment of tree seed and fruit production is shown in fig. 9. There are some things, however, which no amount of statistical information can convey. In the first survey in June, 1983, the weather was fine until the last session, when the heavens opened and, in a violent thunderstorm, a bank vole gave birth to young in one of the traps, which, of course, had to be left in position to act as a nesting box. In December of the same year, following the failure of the acorn crop, the animals were clearly very short of food and lost no time in getting back to the food in the traps, resulting in unusually high numbers of recaptures. In June, 1984, we were surprised to find that the clip marks from the previous survey were still clearly visible. Whatever happened to the spring moult? This phenomenon had not previously been encountered by other workers, but has been confirmed since from elsewhere.

As the primary object of the survey is to monitor the numbers of wood mice and bank voles, these have been separated out and represented in graphical form, together with brief details of seed crop and weather conditions throughout the four years of the survey, in fig. 10, from which we are able to draw some conclusions and advance possible suggestions for further study.

Interpretation of results

In both wood mice and bank voles the population structure normally shows an annual fluctuation with high numbers in late summer and autumn declining through the winter and reaching a trough in April-May (Flowerdew 1984). By reference to fig. 10, it can be seen that for the first year of the survey this pattern was followed by both species, with

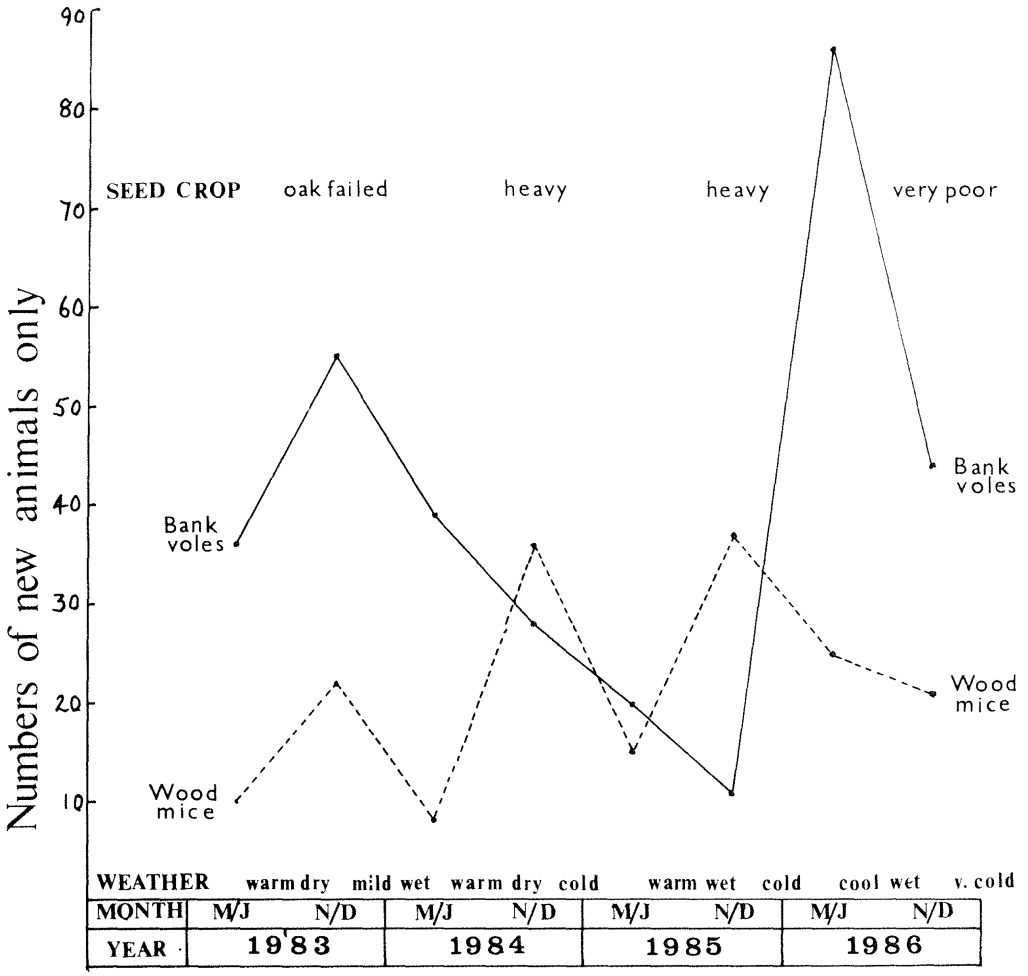

Figure 10. Graph showing the variation in numbers of new animals of wood mice and bank voles caught in 8 surveys, 1983 to 1986, together with indications of seed crop and weather conditions.

numbers of bank voles at a higher level than the numbers of wood mice. In the case of wood mice this pattern continued until June, 1986, but, from June, 1984, bank voles steadily declined for a period of two years until they returned in unusually high numbers in June, 1986. The decline in numbers from December, 1983, to December, 1985, appears, as it is shown, to be a steady reduction in numbers, but it is likely that increases due to breeding between June and November did occur in both summers, as evidence of breeding and the presence of juvenile individuals testified. The timing of the sample in spring was too early to assess the detailed nature of any increases due to breeding between June and November, but, whatever these may have been, the end result was a lower population in winter 1984 and 1985. It is tempting to speculate that following the relatively late start to breeding in both these years (only a few or no juveniles present in June) the survival rate of these young was likely to have been poor, so effecting the observed decline. The poor acorn crop in autumn, 1983, and the cold weather in winter 1984 may have prevented an early start to breeding, but the cause of the decline each year is uncertain. The heavy acorn crop in autumn, 1985, seems very likely to have

supported winter breeding for much or all of the period December-May, 1985/6, and it is interesting to note that the cold weather in January and February of this winter did not seem to have any strong effect on breeding; a similar interaction has been described for rodent winter breeding at Wytham woods, near Oxford (Smyth, 1966). Following the winter breeding and increased production of young in early 1986 numbers were unusually high in June; this is again similar to the pattern observed in many past studies (Corbet & Southern, 1977).

It is curious that the wood mice were not similarly effected by the change in acorn crop from one year to the next and the answer may lie in the different diet of the two species. It is known that the bank vole is more strictly herbivorous than the wood mouse, which often resorts to earthworms, snails and arthropods, if necessary. Or it may be that the two species favour seeds of different tree species. One cannot, of course, rule out a completely different cause, such as migration, a diurnal predator, such as stoat or weasel, or disease being responsible. It is interesting to note, however, that the spring/summer numbers were highest in 1986, following the heavy acorn crop in 1985, and the decline from the higher winter numbers was least severe in 1985/6. Juvenile wood mice were only caught in summer 1985 and 1986, again suggesting relatively early breeding following the previous autumns' heavy acorn crops. The low numbers of wood mice in winter 1986 may have been a direct response to the very poor acorn and/or failed blackthorn crop (see Flowerdew, 1985) or possibly the result of interspecific interactions with bank voles, which were at high numbers over the summer. The responses of both species to the near failure of the acorn crop in 1986 will be interesting to note in future surveys.

As the series of surveys progressed it became possible to make some predictions with increasing accuracy. There seemed to be fewer captures along the F and G rows, where it had been coppiced in 1980/1, and there had been no captures at all at Trapping Point F5 until December, 1985, when a shrew was caught. One seemed to catch more wood mice in the area of dense scrub. In some cases, however, the pattern did seem to change and this was made easier to detect by Frank Heap preparing an enlarged sketch of the trapping grid on which the species recorded were indicated with coloured dots as the survey progressed, enabling comparisons to be made with previous survey results. There certainly seemed to be some hint of a correlation between the species caught and the various habitats within the trapping grid, which was worth further investigation.

If one takes into consideration the detailed Vegetation Survey, shown in fig. 6, combined with a closer look at the area, it is possible to identify five more or less distinct types of habitat, as shown in fig. 11. These can be described as follows:

1. (16 Trapping Points) – Neglected ash/hazel coppice with irregular oak standards. Field layer: bramble, brier, honeysuckle, with some hawthorn, blackthorn, dogwood, guelder-rose and apple. Ground layer: almost continuous ivy with scattered wood spurge, enchanter's nightshade and greater butterfly orchids.
2. (16 Trapping Points) – Coppiced in 1980/1, leaving mostly oak standards with some ash and a few birch. Field layer: slow, but later increasing, regrowth from coppiced stools of hazel, ash and sallow, with bramble, brier and hawthorn. Ground layer: rush, wood brome and sedges, with some ivy, saw-wort and wood anemones. Varies from wet to very wet in places.
3. (7 Trapping Points) – Dense overgrown blackthorn scrub with occasional oak standards, some hawthorn and bramble. Much of it wind-blown. Ground layer: rather dark, some ivy, but mostly moss in spring and bare earth later. Tends to be wet and cracking when dry.
4. (7 Trapping Points) – Largely open area, lacking standards, with irregular, but slowly increasing, clumps of hawthorn and blackthorn scrub, bramble and brier. Ground layer: grass, moss, saw-wort, green-winged and early purple orchids.
5. (3 Trapping Points) – small area under the influence of seven well-grown Monterey

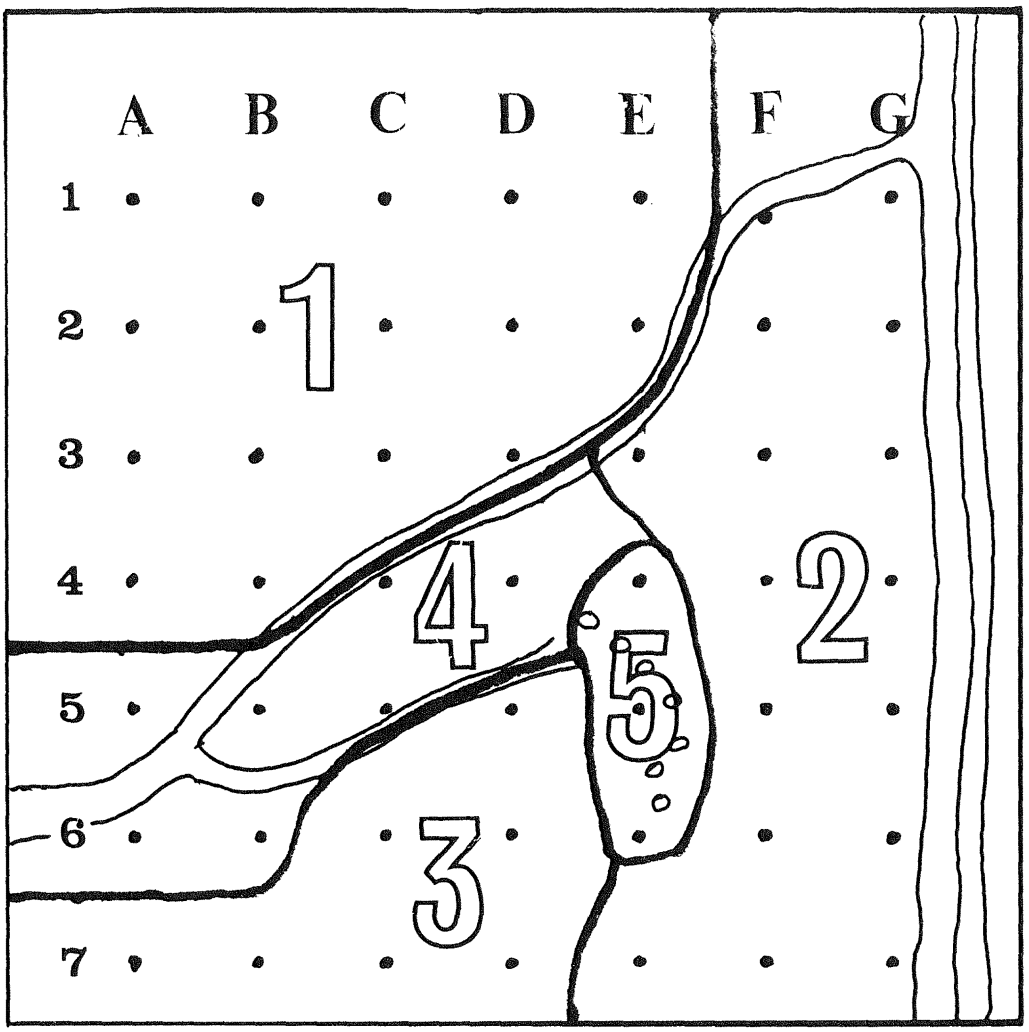

Figure 11. Sketch map showing the survey area divided into five distinct habitat types, as described in the text.

cypress trees. Ground layer: some ivy, but mostly bare earth after removal of logs and brushwood from coppicing in 1980/1. Dry.

There are a number of variables to be taken into account, chief among which is the varying number of trapping points in each area and also the subtle changes which have occurred in some areas, as indicated above. The average number of catches of both species per trapping point in each habitat area per year are shown for the four years in fig. 12. A close study of this will show that the only area which has changed its position in relation to the others is area 5, where the removal of logs and brushwood leaving bare earth has resulted in a reduction of habitat use. In all other cases the relative degree of habitat use remains remarkably constant, with most use being made of area 3, the dense scrub, and least use being made of area 2, which was coppiced in 1980/1, although starting to recover in 1986. There is little to choose between areas 1 and 4, except that area 4 seems to be inproving in 1986, probably due to the increasing clumps of thorn scrub.

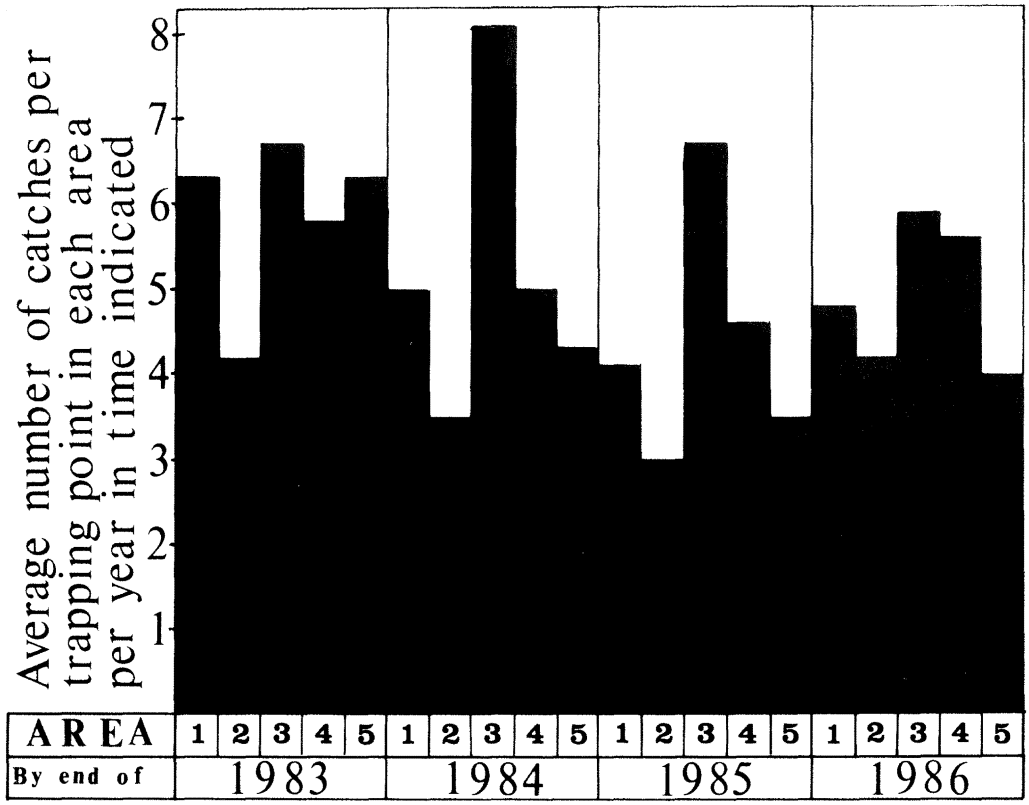

Figure 12. Graph showing variations in degrees of habitat use in each area during the course of the survey, 1983–6.

To assess the habitat preferences of each species the average number of captures of bank voles or wood mice per trapping point in each of the habitat types were calculated for the period of the survey (fig. 13). This would seem to indicate that, although both species are found in all areas, area 3, the dense scrub, is that most favoured by wood mice, while area 4, the open area with scattered scrub and good ground cover, seemed to be favoured by bank voles and was least attractive to wood mice. When this exercise was first carried out in 1984, however, area 1, also with good ground cover, was that most favoured by bank voles, but with the fall in their numbers during 1984/5, the wood mice increasingly colonised the area indicating possible inter-specific reactions. It has been stated that wood mice, being nocturnal, do not require the protection of good ground cover as is essential for the more diurnal bank voles (Corbet & Southern, 1977), and the evidence shown here supports this view. It is also possible that habitat preference is related to food supply, and it may well be that the preferred food of the wood mouse is the fruit of the blackthorn, which is abundant in area 3, and, except for only a fair crop in 1983, is normally a good and reliable food source, but completely failed in autumn, 1986, coincident with the first positive signs of a reduction for this species since the survey began in 1983. With the present state of our knowledge, it is not possible to make any positive assertions, but the evidence provided by this survey does suggest some lines of enquiry which might well be followed up by further studies both here and elsewhere.

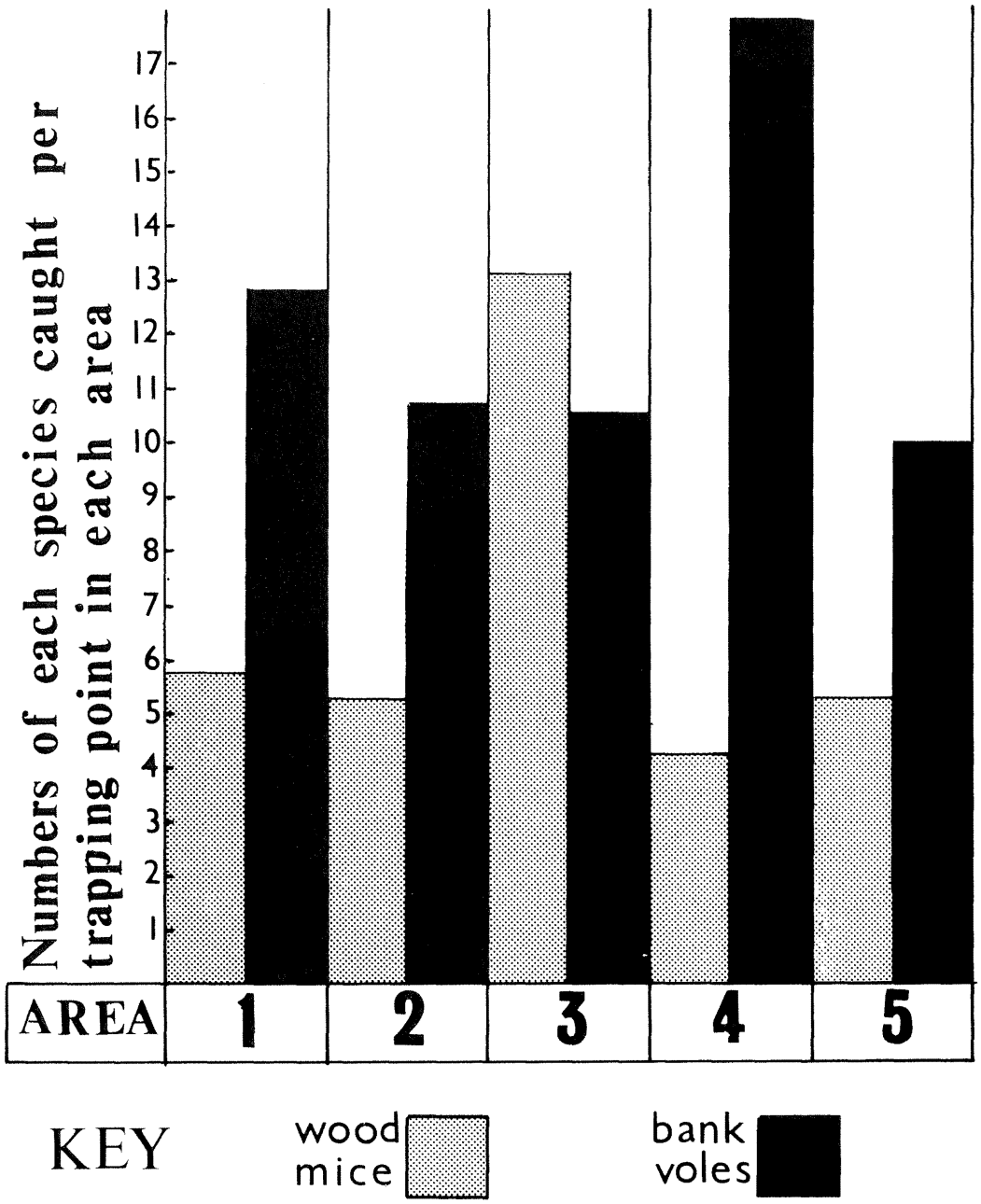

Figure 13. Graph showing the relative habitat preferences of wood mice and bank voles in each habitat type.

Summary

A series of eight surveys over four years at Walter's Copse, Newtown, disclosed a normal annual fluctuation of wood mice and a larger number of bank voles for the first year, after which the wood mice made a slight but steady increase until they declined in June,

1986. The bank voles, however, steadily declined throughout 1984 and 1985, only recovering to greatly increased numbers in June, 1986.

The habitat preferences of each species were assessed, showing that wood mice preferred the area of dense thorn scrub, with little or no ground cover, while the bank voles preferred the areas with continuous ground cover, although there was clear evidence of some interspecific reactions as the numbers of each species increased or decreased.

Possible reasons for these observations were suggested for further investigation, as follows:-

1. That the decline of the bank voles was due to the failure of the acorn crop in the autumn of 1983, and their subsequent recovery was linked to the unusually heavy acorn crop in 1985, leading to very successful winter breading.
2. That the numbers of wood mice were not similarly affected due to differences in diet, and, in particular, that as their preferred habitat was the thick blackthorn scrub, this provided their preferred food, which failed in 1986, when the numbers of wood mice seriously declined for the first time.

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