ECOLOGICAL STUDIES ON THE SPIDER FAUNA OF THE MALHAM TARN AREA

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Introduction

This paper summarizes the work carried out during 1960, 1961 and 1962 by the Spider Course held annually at the Field Centre. The Course met for a week in mid-September and concerned itself primarily with completing on each occasion a simple field study of the fauna of selected habitats. In addition to the normal field work, pitfall traps (1 lb. jam jars) were established in three grassland areas, from which collections were made each month from October 1960 to August 1962 by the Warden of the Field Centre. Most of the work by the Courses took place on sites in the immediate vicinity of the Centre, but the following areas were also visited and collections made during the three years: Colt Park Wood, Helwith Moss, Ling Gill, Fleet Moss, Swaledale Lamps Moss, Malham Cove, Gordale Scar and Pen-y-ghent. A few records from collections made in 1946 and 1947 by Dr. A. A. D. La Touche from Ingleborough and Widdale Fell and from earlier visits to the Malham area by Mr. G. H. Locket are also included. A complete species list with localities is appended.

The vegetation of the localities studied in the Malham area are described by Sinker (1960) and can be assigned to the following habitats:

(1) *Highfolds*, 1,500 ft. alt.

(a) *Fescue-Bent grassland.* A sheep-grazed grassland in which *Festuca ovina* and *Agrostis tenuis* are dominant with tussocks or local patches of *Nardus*. The soil is derived from drift but partly flushed from surrounding limestone pavements. A special study was made in September 1961 of the spiders in a 6 × 2 metre plot of this vegetation in which *Nardus* formed scattered dense tussocks. The 12 sq. metres of the plot were subdivided into 192 sections and the spiders hand-sorted from each so that distribution maps could be drawn.

(b) *Limestone grassland.* Pitfall traps were operated about 100 yards from the above plot, one series in heavily grazed and the other in ungrazed grassland. The soil here was shallow and with a high base status, bearing a grassland dominated by *Festuca ovina* and *Sesleria albicans*.

(2) *Cliff and scree.* Only small collections were made in this type of habitat, mainly in Malham Cove, Gordale Scar and on Pen-y-ghent.

(3) *Drift grassland.* In 1960 one of the two main habitats studied was an area of pure *Nardus stricta* grassland on drift soils forming part of Malham Lings. Pitfall traps were laid down, some hand collecting carried out and a series of grass samples were cut out for sorting in the laboratory.

(4) *Calcareous marsh.* Several collections were made in the vegetation of Ha Mire and Great Close Mire, both wet meadows with short grazed vegetation. Spiders were collected mainly around the grassy hummocks, which were situated very often in mud or standing water. Spiders were also taken from the holes made by the hoof-prints of cattle.

(5) *Fen and carr.* A few hand collections were made in the vegetation by the inflow stream to Malham Tarn and particularly in a wet area dominated by *Deschampsia flexuosa* and *Eriophorum vaginatum.* Pitfall traps were established for five days in September 1960 and a series of vegetation samples were cut out and examined by hand.

(6) *Raised bog.* A number of collections was made in acid bog areas within easy reach of the Field Centre, e.g. on the lower slopes of Pen-y-ghent, Helwith Moss, Fleet Moss and Swaledale Moss, but the main attention of the Courses was devoted to the study of Malham Tarn Moss. The Moss is described by Sinker as a mature raised bog, "a gently domed mass of peat several yards thick, which rises to a crown well over 20 feet above Tarn water level". In 1962 a special study was made of the three main vegetation types on the Moss, which —following Sinker—may be described as:

(a) "*Lawns*" *and low cushions.* These are areas where *Sphagnum* species grow in wet ground but rise above the free water surface. In 1962 we did not find extensive sheets of sphagna (the best area at Spiggot Hill was avoided so that there should be no disturbance to the plant life) and we sampled carefully in areas on the east side of the Moss so that there should be minimum damage to the habitat. Some areas of *Polytrichum commune* were also sampled.

(b) *Tussocks.* This vegetation consisted mainly of *Eriophorum vaginatum* with *Deschampsia flexuosa* locally frequent. It formed the commonest type of plant cover on the Moss and was characterized by wet areas of peat and vegetation litter in the inter-tussock spaces. In 1962 this area was sampled equally with (a) and (c).

(c) *Dry hummocks.* As the ground becomes drier with increasing elevation of the tussocks, the growth of woody shrubs is favoured. In our samples these included *Calluna vulgaris*, which was much the most common, *Vaccinium myrtillus*, *V. vitis-idaea* and some *Empetrum nigrum.* Although these shrubs differed structurally, all were considered to form a similar environment for spiders for the purpose of this study.

(7) *Woodland.* Collections in woodlands were made in 1960 in Colt Park Wood, a National Nature Reserve on limestone pavement; Ling Gill, a wooded steep-sided valley with a stream, also a National Nature Reserve, and in leaf litter under larch and beech near the Field Centre in 1962.

The vegetation types with the most extensive development in the Malham area are open herbaceous formations of bog or marsh and upland areas on limestone or drift soils. Woodland and shrub stands are local and small in area. The above summary of habitats studied makes it clear that the greater part of the collection was made in bog, marsh or fen, where the ground is for the most

part permanently wet and the species list is probably biased in favour of those species associated with such areas. Limestone and drift grasslands cover large areas in the Malham district but intensive study was carried out in only two localities. Scree slopes and other rock-covered areas are locally frequent and several collections were made, but it is difficult in such places to obtain a sufficiently large sample for comparison with other habitats.

The fauna

A total of 146 species was recorded, distributed among 13 families. All these families, apart from the Linyphiidae, are poorly represented and very few of the non-Linyphiidae species were important numerically; exceptions were *Clubiona trivialis*, which was frequent in the heather on Tarn Moss; *C. diversa*, which occurred regularly in the grass and *E. vaginatum* areas; and *Lycosa pullata*, which was widespread in both grass and heather. In addition the pitfall traps in *Nardus* and limestone grassland took considerable numbers of *Tarentula pulverulenta*, *Trochosa terricola*, *Xysticus cristatus*, *Amaurobius atropos*, and *Pachygnatha degeeri*, all common and widespread species. The Linyphiidae is by far the largest British family, with 252 species, of which 105 were recorded in the Malham area, constituting 72% of the fauna. This is in close agreement with Cherrett (in press), who studied the spider fauna at Moor House at 1,800 ft. in the Pennines, where 73% were Linyphiids, and both contrast with a study of spiders in limestone grassland near Oxford (Duffey, 1962) where 58 species of this family scored 41·1%. Most of the ecological work was therefore concerned with the species of this family.

The 105 Linyphiid species include several which in Great Britain are largely confined to mountain areas or northern latitudes, for example *Cornicularia karpinskii*, *Caledonia evansi*, *Rhaebothorax morulus*, *Eboria caliginosa*, *Meioneta gulosa* (out of 20 listed by Bristowe, 1939-41), together with *Hilaira nubigena*, *H. pervicax*, *Bolyphantes alticeps*, *Lepthyphantes angulatus*. 14 other species of Malham Linyphiids and 5 from other families are also included in Bristowe's list of spiders (out of 26) which are common on mountains and also at low altitudes. The general agreement between the Malham species list and that of Cherrett for Moor House is shown by the fact that out of 71 species recorded in the Westmorland locality, all but 8 are included in the Malham list.

Methods

Detailed studies of the spiders in the main herbaceous formations examined were made mainly by hand-sorting $\frac{1}{4}$ m^2 samples of vegetation cut out by using a wire quadrat, of which a few were examined in the field but the majority were placed in polythene bags and sorted in the laboratory. Smaller samples 1/16 m^2 were taken when the distribution of the fauna was mapped in a 6 × 2 m. plot. In 1960/61 a Tullgren funnel extraction apparatus was used to obtain some estimate of the efficiency of hand-sorting. Pitfall traps were also used

each year in one or more of the areas studied. Further information on methods used to obtain spiders from ground vegetation can be found in Duffey, 1962 and Macfadyen, 1963.

THE SPIDERS OF *Nardus stricta* TURF AND WET *Deschampsia flexuosa* SWARD

The *Nardus* grassland studied was on an area of glacial drift on the east side of the Tarn and open to cattle and sheep grazing, although it appeared to be avoided because of unpalatability. This formation on fairly well drained soil was thick and compact, varying in height from 4-9 in., but averaging 6 in. or less. It was characterized by greater floristic and structural uniformity than other grassland types in the area. The *Deschampsia* on the other hand formed a more heterogeneous stand with the average height of the grass leaves and flowering stems twice that of the *Nardus*. The sward which was not grazed was situated on peaty waterlogged ground adjacent to the Tarn inflow stream and consisted of a relatively loose formation with tussocks well developed. The small spaces between the tussocks usually consisted of wet leaf litter or bare peaty mud. 7 samples $\frac{1}{4}$ m^2 of *Deschampsia* and 6 of *Nardus* were cut out and hand-sorted mainly in the field. The following numbers of spiders were obtained:

Deschampsia:	70, 60, 32, 34, 60, 57, 44.	Mean = 51.	Density/m^2 = 204
Nardus:	96, 103, 41, 113, 132, 36.	Mean = 86·8.	Density/m^2 = 347·2.

Time only allowed one sample (730 cm^2) of each formation to be processed in a Tullgren funnel, and the greater number of individuals in the *Nardus* turf was confirmed, and although the samples may not be typical this technique would appear to be several times more efficient than hand-sorting, as follows:

Deschampsia sample:	48 spiders = 652/m^2
Nardus sample:	110 spiders = 1,496/m^2

Both grassland formations scored 32 species each. Taking into consideration hand collections made at the same time, 11 species occurred exclusively in the *Nardus*, and 8 exclusively in the *Deschampsia* (Table 1). Four species of *Lepthyphantes* were taken in the *Deschampsia* and only two (one by hand collection) in the *Nardus*, the taller growth of *Deschampsia* providing a greater web-spinning area for these species. The *Nardus* supported a much higher population of *Clubiona diversa*, *Micrargus herbigradus* and *Centromerita concinna*. 53 specimens of *Erigonella hiemalis*, a small erigonid, were taken in *Nardus* samples, but it was absent in the *Deschampsia*. On the other hand only 12 *Diplocentria bidentata*, another erigonid, were taken in the *Nardus*, while the *Deschampsia* samples produced 59. The 12 pitfall traps placed in each habitat operated for only four days, so that the catches were small. Five species were taken in them which were not recorded in the samples, *Mengea scopigera* in *Nardus*, and the following in *Deschampsia: Wideria cucullata*, *Oreonetides abnormis*, *Antistea elegans*, *Agroeca proxima*.

Table 1. *Spiders collected from* Nardus *and* Deschampsia *samples, September,* 1960

Species	*Nardus*		*Deschampsia*	
	Ad.	Imm.	Ad.	Imm.
Micrargus herbigradus	126		22	
Clubiona diversa	12	61	4	1
Erigonella hiemalis	53			
Centromerita concinna	47	1	4	
Lycosa pullata	1	53		11
Robertus lividus	7	12	4	3
Pachygnatha degeeri	13		2	
Tiso vagans	10			
Diplocentria bidentata	12		59	
Walckenaera acuminata	9			
Tapinopa longidens	8		1	
Bolyphantes luteolus	6		1	
Xysticus cristatus	5	7		
Wideria antica	5		4	
Lepthyphantes ericaeus	5		3	
Oedothorax gibbosus/tuberosus	5			
Caledonia evansi	5			
Lycosa nigriceps	Several			
Trachynella nudipalpis	3		4	
Trochosa terricola	2	4		
Tarentula pulverulenta		8		1
Lycosa sp.				12
Ceratinella brevis			9	
Cnephalocotes obscurus			7	
Gonatium rubens	2		5	
Drassodes sp.		1		6
Ceratinella brevipes	2		5	
Trochosa sp.				4
Linyphia clathrata				4
Erigone atra	2			
Lepthyphantes mengei			2	
Linyphia sp.				14
Robertus arundineti	1		1	
Meioneta saxatilis	1		1	
Meioneta beata	1			
Wideria nodosa	1			
Cornicularia vigilax			1	
Gonatium rubellum			1	
Pocadicnemis pumila	1			
Oedothorax agrestis			1	
Lepthyphantes zimmermanni			1	
L. angulatus			1	
Clubiona sp.		1		1
Agroeca sp.				1
Xysticus sp.				1
Oxyptila sp.		1		
Unidentified immature		142		54

In summary, the study indicated that the fauna of the two grassland types was similar in terms of species present and the only striking difference was the large number of *Erigonella hiemalis* only in the *Nardus*, while there was a greater

abundance of *Diplocentria bidentata*, and better representation of *Lepthyphantes* species in the *Deschampsia*. The high population density figures for the *Nardus* can perhaps be explained by its uniform dense structure on better drained soil, maintaining an environment not subject to great change, and because it was unpalatable to sheep and cattle it was seldom trampled. The *Deschampsia* developed a more open formation with a much wetter soil surface and litter layer.

VERTICAL ZONATION OF SPIDERS IN GROUND VEGETATION

To obtain a better idea of the influence on the fauna of the greater vertical development of the *Deschampsia*, $5\frac{1}{4}$ m² samples were examined by hand and collections made of those species inhabiting the leaf and stem zone (approximately above 12 in. in height) and those inhabiting the litter. 14 species were found only in the litter, of which all but 3 were Linyphiids. 13 species were found only in the leaf zone (7 Linyphiids), including 5 species of *Lepthyphantes*, which construct "hammock" webs in the open spaces between the leaves:

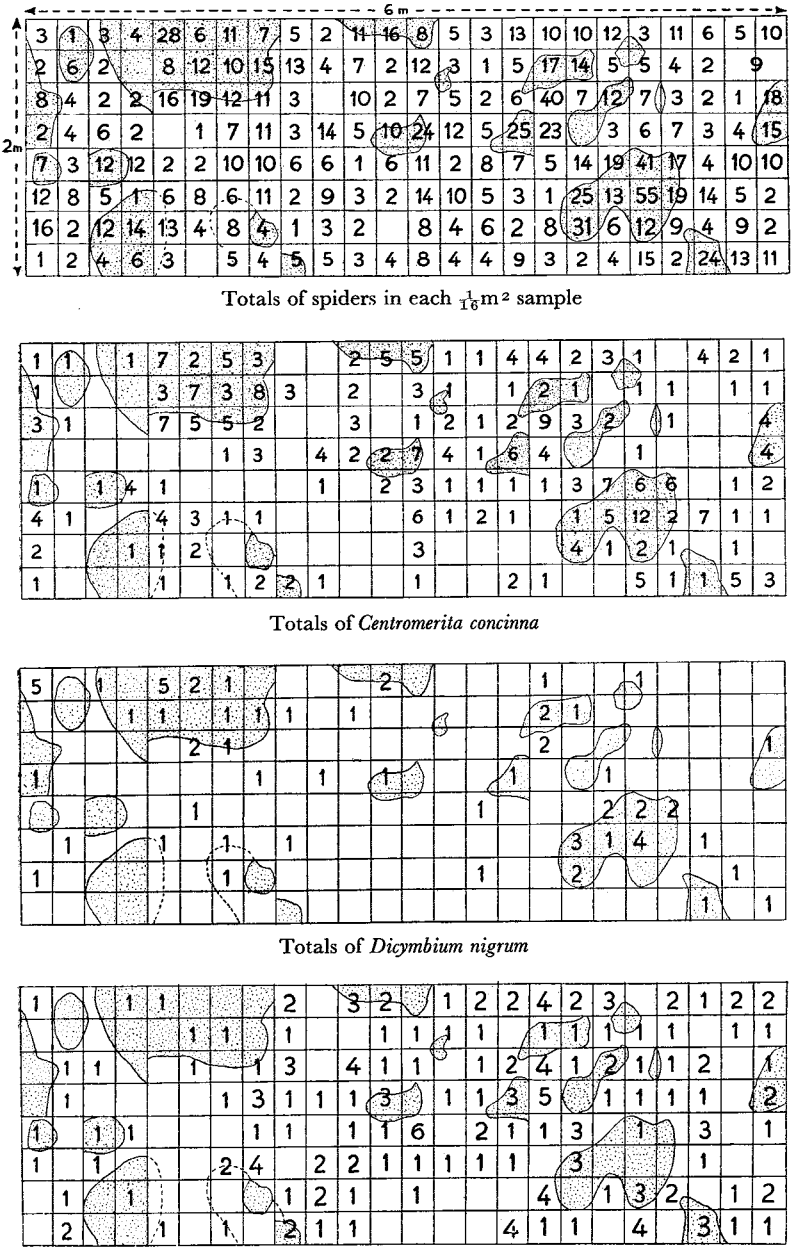
Litter species	Total	Leaf zone species	Total	
Diplocentria bidentata	45	Lepthyphantes mengei	3	
Micrargus herbigradus	14	L. ericaeus	2	
Ceratinella brevis	8	L. angulatus	1	All linyphiids
Gonatium rubens	5	L. tenuis	1	on webs
Robertus lividus	5	L. zimmermanni	1	between leaves
Trachynella nudipalpis	4	Tapinopa longidens	1	
Ceratinella brevipes	3	Bolyphantes luteolus	1	
Wideria antica	2	Lycosa pullata	17	
Centromerita concinna	2	Clubiona diversa	12	
Cnephalocotes obscurus	2	Trochosa sp.	4	Cursorial spp.
Meioneta saxatilis	1	Tarentula pulverulenta	1	on upper parts
Robertus arundineti	1	Xysticus cristatus	1	of vegetation
Drassodes sp.	4 im.	Oxyptila sp.	1	

In 1961 20 samples ($\frac{1}{4}$m²) of heather and 19 of grass and sedge (*D. flexuosa* and *E. vaginatum*) were examined for the same purpose on Tarn Moss. A clear height separation was difficult to establish because in the heather the spiders were either in the litter layer, which had a depth of 2 to 3 in., or in the open twiggy zone above. The leaf zone of the *Eriophorum* was mainly horizontal, drooping over the tussock sides. In practice the fauna was separated into those spiders which could be collected with the minimum disturbance from the upper parts of the vegetation and those taken close to the ground in the litter and around the stem bases. 605 spiders of 39 species were taken (Table 2). As might be expected, a vertical separation of the fauna is easier to detect in the heather than in the grass and sedge. In the heather twig zone 25 *Bolyphantes luteolus* were taken and 6 in the litter, while in the grass and sedge the numbers are nearly equal; 55 *Lepthyphantes zimmermanni* were taken in the heather leaf zone and 7 in the litter, but equal numbers in the grass and sedge. *L. ericaeus*, which is one of

the smallest members of the genus, appears to prefer the lower vegetation strata, but no clear picture emerges of the zonation of *L. mengei*, which may be intermediate between *L. zimmermanni* and *L. ericaeus*. The most abundant spider was *Centromerita concinna*, of which 78·7% were taken close to the ground. The collection of spiders from different strata in the vegetation is made difficult because even a slight disturbance causes some specimens to fall to the ground, where they may be collected with the litter fauna. The figures in Table 2 suggest this happened more often in the grass and sedge formation than in the heather.

Table 2. *Zonation of spiders in Heather and Grass/Sedge, Tarn Moss, September,* 1961

	Heather		Grass/Sedge	
	Upper	Lower	Upper	Lower
Lepthyphantes zimmermanni	55	7	7	7
Bolyphantes luteolus	25	6	5	6
Lepthyphantes mengei	13	10	2	5
Clubiona trivialis	8	14	5	12
Centromerita concinna	7	30	20	70
Lycosa nigriceps	5		1	1
L. ericaeus	4	16	3	24
Gonatium rubens	3		1	8
Lepthyphantes angulatus	2	9	2	10
Ceratinella brevipes	2	9		13
Clubiona diversa	1		1	2
Diplocentria bidentata	1	17		9
Peponocranium ludicrum	1	2		
Pholcomma gibbum	1	5	4	4
Tapinopa longidens	1	3	7	8
Trachynella nudipalpis	1		1	2
Trichopterna mengei	1			1
Micrargus herbigradus		19	2	10
Robertus lividus		8	1	11
Bathyphantes gracilis		6	1	7
Centromerus dilutus		3		
Silometopus elegans		3	1	3
Oreonetides abnormis		3		2
Minyriolus pusillus		1	1	
Centromerita bicolor		1		
Cnephalocotes obscurus		1		
Cornicularia karpinskii		1		
Eboria caliginosa		1		1
Macrargus rufus			1	1
Linyphia pusilla			1	
Lycosa pullata			1	
Pirata piraticus				2
Agyneta conigera				1
Erigone dentipalpis				1
Hahnia montana				1
Hillhousia misera				1
Meioneta saxatilis				1
Pocadicnemis pumila				1
Trochosa terricola				1



Totals of spiders in each $\frac{1}{16}$m² sample

Totals of *Centromerita concinna*

Totals of *Dicymbium nigrum*

Totals of *Tiso vagans*

FIG. 1

The distribution of all spiders and of 3 common species in grazed fescue-bent grassland.

Tussock areas, mainly *Nardus*, over 6 in. high.
Short grazed grass, mainly *Festuca/Agrostis*, less than 6 in. high.
Marginal areas.

Mapping the distribution of spiders in fescue-bent grassland

The site selected for this work in September 1961 lay on a hill above the Field Centre (Highfolds) and within an area of grassland which at that time was being enclosed to prevent sheep grazing. The plot chosen measured 6 × 2 m. and prior to the census a rough vegetation map was drawn in which a distinction was made between vegetation 6 in. or less in height, mainly sheep-grazed *Festuca/Agrostis* turf, and vegetation taller than 6 in., mainly dense tussocks of *Nardus stricta*, which is unpalatable to sheep and more resistant to trampling. Each of the 12 metres was divided into 16 samples of 25 × 25 cm. making a total of 192. The samples were examined by hand and each collection preserved separately. Over 1,500 spiders were collected and the mean population density worked out at 127/m². One sample each of short turf and long turf was taken and placed in a Tullgren funnel for comparison. Population density figures per sq. metre were as follows:

	Short turf	Long turf
Tullgren Funnel (714 cm² from each habitat)	188 per m²	622 per m²
Hand sorting	96 ,, ,, (139 samples 1/16 m² each)	217 ,, ,, (49 samples 1/16 m² each)

There was a clear correlation between high populations and presence of tussock areas, the latter averaging 13·6 spiders per sample and the short turf averaging 6·0 spiders per sample. Very few of the species taken were sufficiently numerous for distribution maps to be drawn in relation to the vegetation map. Two species, *Centromerita concinna*, and *Dicymbium nigrum*, were clearly more abundant in the taller and denser grass area, while *Tiso vagans* appeared to show a preference for the shorter *Agrostis/Festuca* turf (Figure 1). The 6 × 2 m. plot produced a total of 30 species of adult spiders (compared with 32 species in each of the *Nardus* and *Deschampsia flexuosa* samples in 1960). The most numerous species were *Centromerita concinna*, *Tiso vagans*, *Centromerita bicolor*, and *Dicymbium nigrum*, with 230, 182, 63 and 58 adult specimens respectively.

The spiders of a more varied vegetation cover on Tarn Moss

In September 1962 it was decided to extend the mapping study described above by sampling the three main vegetation types growing on the raised bog of Tarn Moss. Preliminary collecting in this area in previous years suggested that the Moss fauna was of particular interest. A plot measuring 6 × 2 m. was selected in which the three plant formations were represented as follows:

(a) Woody vegetation 12 in. or more in height with *Calluna* as a dominant but with *Vaccinium myrtillus* and *V. vitis-idaea*. Smaller quantities of *Empetrum nigrum* and *Erica tetralix* were also present. The whole formed a loose structure of more or less erect woody stems with a shallow leaf litter on the ground.

(b) A dense tussock formation consisting of *E. vaginatum* as dominant with much *D. flexuosa* and some *Molinia caerulea*. The leaves of the first two were

thin, spreading horizontally although the few flowering stems were erect. Nearly all the vegetation sampled was 6 in. or less from the ground surface. In this case the tops of the firm part of the tussocks were considered to form part of an undulating ground surface.

(c) Small areas of *Sphagnum* "lawns" with occasional patches of *Polytrichum commune*, growing in wet areas but without standing water.

After familiarizing ourselves with the form taken by these different plant structures in the 6 × 2 m. plot, $\frac{1}{4}$m² samples of each type were selected in different parts of Tarn Moss and removed to the laboratory for hand sorting. The numbers of spiders taken in each were as follows:-

Calluna/Vaccinium

36, 44, 11, 10, 23, 23, 84, 16, 69, 23. Mean 33·9 (135 per m²)

E. vaginatum/D. flexuosa

83, 110, 48, 31, 70, 69, 104, 15, 36, 40. Mean 60·6 (242 per m²)

Sphagnum/Polytrichum

22, 39, 40, 63, 76, 8, 28, 41, 77, 20, 22. Mean 39·6 (158 per m²)

A total of 61 species was taken from $7\frac{1}{4}$ sq. metres examined (Table 3).

Table 3. *Distribution and numbers of species in 3 habitats on Tarn Moss.*

First column — total specimens
Second column — number of samples in which species occurred out of total

	Calluna/ Vaccinium		*Eriophorum/ Deschampsia*		*Sphagnum/ Polytrichum*	
Centromerita concinna	35	7/10	49	10/10	12	4/11
Ceratinella brevipes	9	6/10	16	6/10	5	4/11
Clubiona trivialis	10	5/10	2	2/10	2	2/11
Diplocentria bidentata	11	6/10	38	8/10	1	1/11
Gonatium rubens	2	2/10	2	1/10	2	1/11
Lepthyphantes mengei	5	4/10	6	2/10	1	1/11
Maro minutus	6	2/10	5	22/10	3	1/11
Micrargus herbigradus	13	6/10	27	7/10	2	2/11
Robertus lividus	1	1/10	10	5/10	2	2/11
Trachynella nudipalpis	1	1/10	5	3/10	2	2/11
Trichopterna mengei	5	2/10	7	6/10	1	1/11
Bathyphantes gracilis	2	1/10	1	1/10		
Bolyphantes luteolus	16	4/10	4	4/10		
Centromerus dilutus	22	4/10	18	2/10		
Centromerus prudens	1	1/10	1	1/10		
Gongylidiellum latebricola	3	2/10	9	2/10		
Hahnia montana	1	1/10	1	1/10		
Lepthyphantes angulatus	1	5/10	14	5/10		
Lepthyphantes ericaeus	15	7/10	5	4/10		
Peponocranium ludicrum	2	2/10	2	2/10		

	Calluna/ Vaccinium		*Eriophorum/ Deschampsia*		*Sphagnum/ Polytrichum*	
Pholcomma gibbum	5	2/10	7	2/10		
Tapinopa longidens	2	2/10	2	2/10		
Centromerus expertus			9	4/10	2	2/11
Clubiona diversa			11	2/10	2	2/11
Cornicularia vigilax			3	3/10	3	1/11
Cnephalocotes obscurus			4	3/10	3	2/11
Oreonetides abnormis			4	2/10	1	1/11
Trochosa terricola			2	2/10	1	1/11
Wideria nodosa	1	1/10			3	1/11
Bathyphantes parvulus	1	1/10				
Cornicularia karpinskii	1	1/10				
Lepthyphantes zimmermanni	13	8/10				
Maso sundevalli	4	1/10				
Poeciloneta globosa	2	1/10				
Ceratinella brevis			2	2/10		
Hilaira nubigena			2	1/10		
Hillhousia misera			2	7/10		
Hypomma bituberculatum			1	1/10		
Lycosa nigriceps			2	1/10		
Lycosa pullata			2	1/10		
Meioneta saxatilis			5	3/10		
Oedothorax gibbosus/tuberosus			3	3/10		
Oxyptila trux			2	2/10		
Pocadicnemis pumila			2	1/10		
Theonoë minutissima			1	1/10		
Tigellinus furcillatus			1	1/10		
Walckenaera acuminata			1	1/10		
Wideria antica			2	2/10		
Xysticus cristatus			1	1/10		
Agyneta decora					1	1/11
Antistea elegans					11	5/11
Diplocephalus permixtus					11	6/11
Drepanotylus uncata					5	3/11
Eboria caliginosa					17	2/11
Erigone capra					2	1/11
Hilaira pervicax					5	3/11
Oedothorax fuscus					3	1/11
Oedothorax retusus					1	1/11
Pachygnatha clercki					1	1/11
Pirata piraticus					1	1/11
Trochosa spinipalpis?					1	1/11

Only 11 species occurred in all three formations, of which the most abundant was *Centromerita concinna*, recording peak numbers and frequency in the *Eriophorum/Deschampsia*. *Diplocentria bidentata*, *Ceratinella brevipes*, and *Micrargus herbigradus* showed the same pattern but were less numerous. Of the other 7 species, only one, *Clubiona trivialis*, showed a clear preference for the heather formation. A further 11 species were recorded from the *Calluna/Vaccinium* and *Eriophorum/Deschampsia* but not in the moss. The 4 most abundant species *Lepthyphantes angulatus*, *L. ericaeus*, *Centromerus dilutus* and *Bolyphantes* are all web spinners requiring small open spaces within relatively loose vegetation (see

Table 2 for vertical zonation of some of these species). Generally, these species occurred with equal frequency in the samples from each of these two habitats but in varying numbers.

The 6 species recorded only from the *Eriophorum/Deschampsia* and the moss were not sufficiently numerous to draw firm conclusions. The most numerous was *Clubiona diversa*, a widespread grassland species, absent from the heather, from which the highest number of the closely related *C. trivialis* were obtained. The next most common, *Centromerus expertus*, is a widespread species found generally in wet places and on Tarn Moss it was absent from the heather, which was at the driest end of the moisture gradient in the three habitats. The totals of exclusive species for each habitat are shown in Table 3. In the *Calluna/Vaccinium*, only one species scored 5 or more specimens. In the *Eriophorum/Deschampsia*, 2, and in the Moss, 5. The single species in the first habitat, *Lepthyphantes zimmermanni*, has already been discussed and although occurring in other collections made in *Eriophorum* and *Deschampsia* a preference is shown for the woody plant cover when available. The single specimen of the rare *Cornicularia karpinskii* was also taken in this habitat. In the sedge and grass, *Hillhousia misera* occurred in 7 out of 10 samples (22 specimens), and *Meioneta saxatilis* in three out of 10 samples (5 specimens). Not enough is known about these species to explain their absence from the other two habitats, although both are widespread in the north, particularly (in the case of *H. misera*) in wet areas. The rare *Hilaira nubigena* was also taken in this habitat. The 11 exclusive species in the Moss formation included *Erigone capra*, which is only known in Great Britain from the Malham locality. It occurred in several places close to the Field Centre in open wet habitats. The 5 species scoring 5 or more specimens are *Antistea elegans* and *Drepanotylus uncata*, both common in England in marshy places, *Diplocephalus permixtus*, also widespread in similar sites, but less common, and *Hilaira pervicax* and *Eboria caliginosa*, rare species of northern upland areas and taken elsewhere in *Sphagnum*. Hand collecting (by J. R. Parker) in *Sphagnum* on Tarn Moss also produced 1 male and several females of *Maro lepidus* Casemir, a rare spider recently described from Germany. It was first identified in this country from Rusland Moss, Lancashire, in *Sphagnum* (Parker 1962), although a male had been taken by A. A. D. La Touche in 1946 from *Sphagnum* on Pen-y-ghent, Yorkshire, and not identified until it was re-examined recently by G. H. Locket.

The highest species total and population density was recorded in the *Eriophorum/Deschampsia*, which was much the commonest type of plant cover on Tarn Moss. *Calluna* and the *Vaccinium* species showed a relatively poor development and may be more recent invaders, coming in on the drier areas of the raised bog. Surface drying-out would have been speeded up by the construction of drainage ditches during the peat cutting period, although burning would have prevented full development of these woody plants. It is reasonable to suppose that *Sphagnum* "lawns" were much more extensive and widespread in the past during the active growing phase of the bog and this may account for the relatively rich fauna of the few small patches which are present today. Tarn Moss is not now cut for peat nor burned and in the course of time the existing ditches will silt up and grow over. Should this result in an increase of surface moisture, a greater development of *Sphagnum* "lawns" will be encouraged

while some local recovery of *Calluna* should take place in drier areas in the absence of burning.

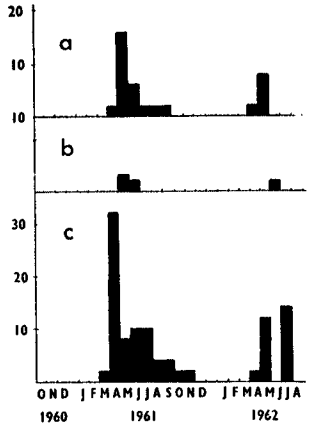
Analysis of the pitfall catch in limestone and *Nardus* grassland October, 1960—August, 1962*

During this period 12 pitfall traps were operated in the *Nardus* and 6 each in the grazed and ungrazed limestone grassland on Highfolds. Collections were made every month and provide confirmation of the ecological preferences described for several species which also occurred in the samples (Figs. 2). *Nardus* grassland again proved to have a rich fauna scoring 39 species against 32 species in the ungrazed limestone grassland and 28 in the grazed. The totals of the more common species are listed in Table 4, in which the figures for grazed and ungrazed limestone grassland have again been doubled for comparison with *Nardus*. The interpretation of pitfall catches must be made with caution because some species which are numerically common may seldom be taken in the traps because of behaviour differences. In addition the nature of the vegetation cover in the trapping area may influence catch totals; for example, a dense plant growth reduces horizontal movement over the ground (Duffey, 1962). Large numbers of three common lycosids were taken and although totals varied according to habitat the month of peak catches was the same in each case. The catch at this time is made up largely of males which on reaching maturity move actively over the ground in search of a mate. The short vegetation in the grazed area makes movement easier and a higher catch would result in this area if the populations were equal in all three localities. *Lycosa pullata* and *Trochosa terricola* nevertheless were more abundant in the taller grass of the ungrazed and *Nardus* grasslands. *Tarentula pulverulenta* has a shorter period of peak activity with higher numbers in the *Nardus* and the short grazed turf.

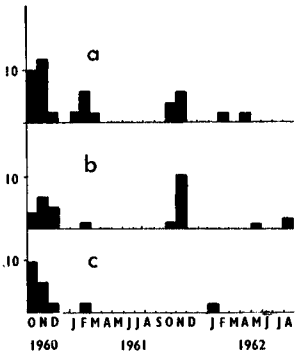
The most abundant linyphiid spiders were the closely related *Centromerita concinna* and *C. bicolor*, both widespread spiders in this country whose ecological preferences are not clearly understood. In the sampling and mapping studies both were shown to prefer the lower strata of the vegetation, occurring mainly in the leaf litter, and higher numbers of *C. concinna* were recorded for the denser tussocks of grass than for the more open grazed *Festuca/Agrostis* grassland. This is confirmed to some extent by greater pitfall catches in the *Nardus*, although considerable numbers were also taken in the other two areas. *C. bicolor*, however, was more common in the shorter turf of the grazed limestone and significantly less numerous elsewhere. There is also evidence that *C. bicolor* becomes active, i.e. reaches maturity, in its optimum habitat a little earlier than *C. concinna*.

During the mapping study, *Tiso vagans* was more widespread and common in the short turf between the tussocks and this is confirmed by the pitfall catch which recorded the smallest catch from *Nardus*. Unlike the *Centromerita* species, *Tiso vagans* reaches maturity in the summer extending into the autumn. *Walckenaera acuminata*, another linyphiid, occurred frequently in all three areas

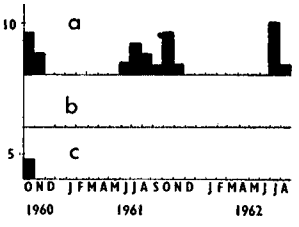
* Part of an investigation still being carried out by G. H. Locket and P. Merrett.



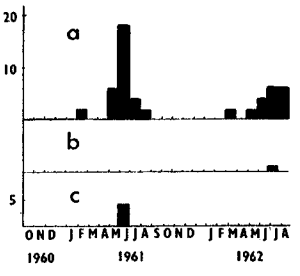
Tiso vagans



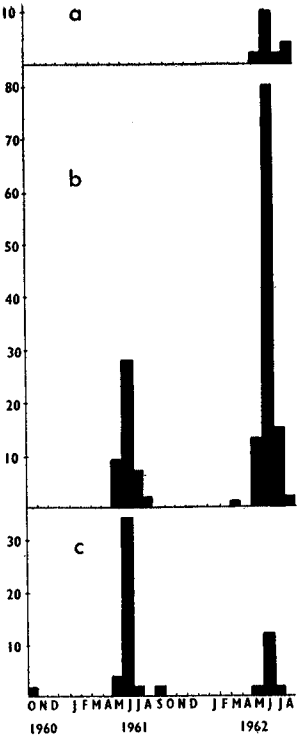
Bolyphantes luteolus



Lepthyphantes zimmermanni



Pocadicnemis pumila



Silometopus elegans

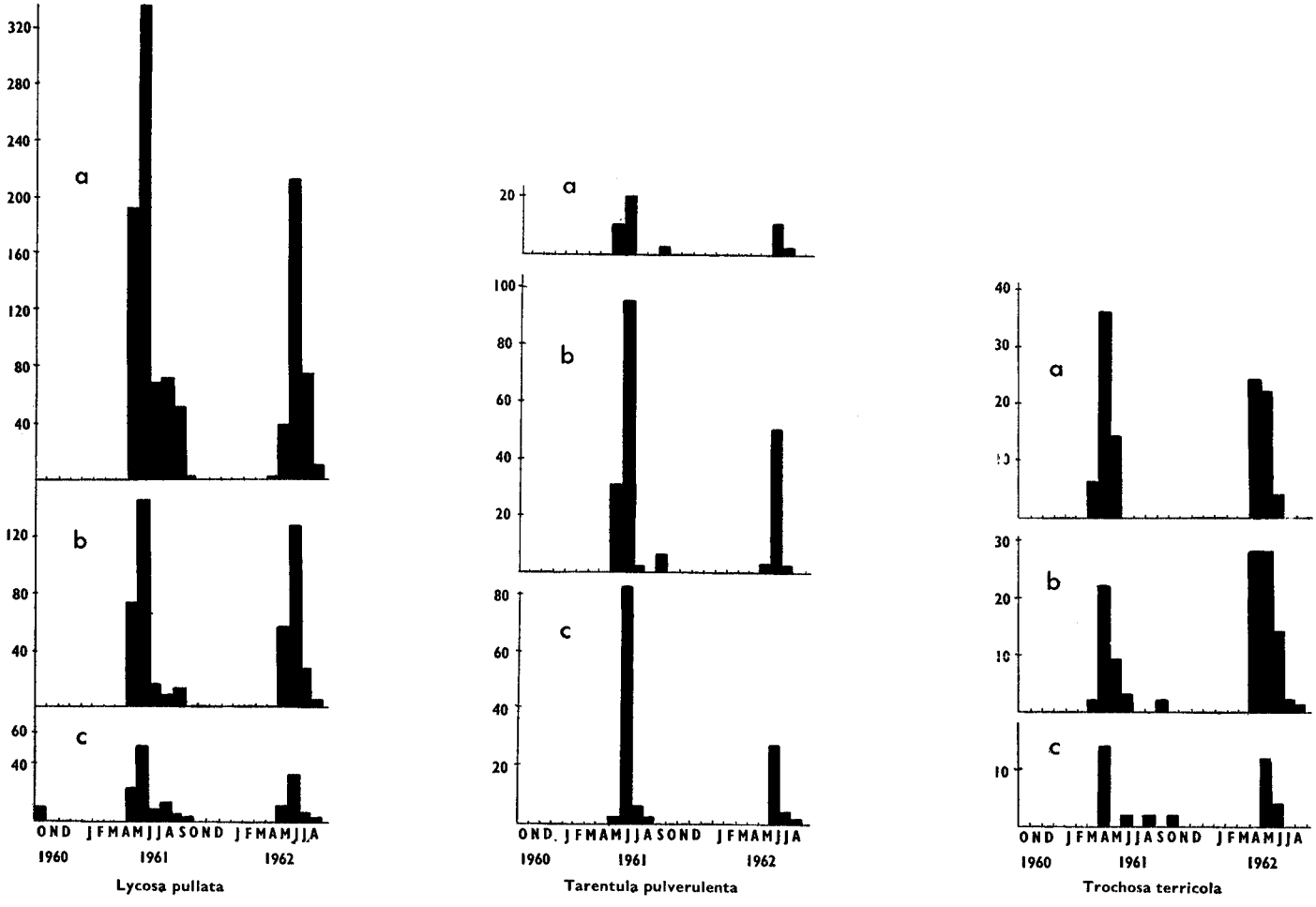


FIG. 2 (1)
Some common spiders taken in pitfall traps, Oct. 60'-Aug. 62':
a, ungrazed limestone grassland; *b*, *Nardus*; *c*, grazed limestone grassland.

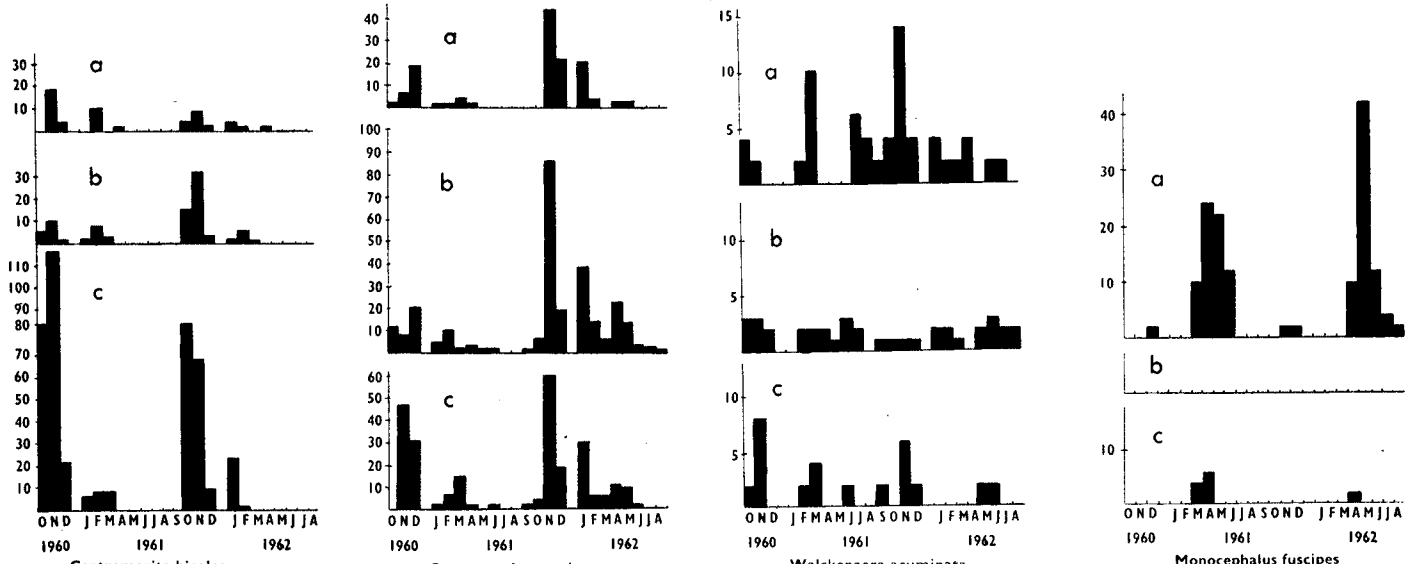


FIG. 2 (2)
Some common spiders taken in pitfall traps, Oct. '60-Aug. '62:
a, ungrazed limestone grassland; *b*, *Nardus*; *c*, grazed limestone grassland.

Table 4. *Totals of the more common spiders taken in pitfall traps, October, 1960—August, 1962.*

Figures for ungrazed and grazed grassland are doubled to make direct comparison with *Nardus* possible.

Species are listed according to habitat preference along the gradient from tall ungrazed limestone grassland through *Nardus* to short grazed turf.

Species	Ungrazed	*Nardus*	Grazed
Lycosa pullata	1,046	566	162
Monocephalus fuscipes	144	—	12
Trochosa terricola	106	111	36
Walckenaera acuminata	68	38	32
Amaurobius atropos	52	—	56
Pocadicnemis pumila	52	1	4
Bolyphantes luteolus	48	28	22
Lepthyphantes zimmermanni	48	—	4
Gonatium rubens	38	2	2
Lepthyphantes ericaeus	30	3	—
L. mengei	22	29	—
Oreonetides abnormis	20	—	4
Ceratinella brevipes	16	3	—
Centromerita concinna	130	280	240
Tarentula pulverulenta	44	189	126
Silometopus elegans	18	157	60
Oedothorax retusus	4	69	8
Mengea scopigera	2	43	—
Pachygnatha degeeri	—	90	—
Meioneta saxatilis	6	16	—
Erigonella hiemalis	10	13	6
Robertus lividus	—	22	—
Diplocentria bidentata	—	4	—
Centromerita bicolor	56	83	436
Tiso vagans	40	7	102
Agyneta decora	—	15	50
Xysticus cristatus	2	9	20
Erigone promiscua	—	—	24
E. dentipalpis	2	—	36
E. atra	—	1	14
Eboria fausta	—	—	8

and was taken at all times of the year. No clear peak is shown for the sub-optimum habitats, while in the ungrazed limestone grassland, where the highest numbers were recorded, there was more activity in the autumn and winter. *Silometopus elegans* is another summer-maturing linyphiid with a very pronounced peak of activity in June. It was particularly common in the *Nardus* in 1962, when it also occurred for the first time in the ungrazed grassland.

The remaining four species in Figs. 2 are web-spinning linyphiids showing a clear preference for the taller more open structure of the ungrazed limestone grassland, with the exception of *Bolyphantes luteolus* which was more evenly distributed. This species and *Lepthyphantes zimmermanni* are autumn- and winter-active species, although adults of both may be taken at all times of the year.

Most species which are readily taken in pitfall traps show a marked preponderance of males in the catches, but this may not be so in many linyphiids. Both *C. bicolor* and *C. concinna* produced peaks of females as well as males, although the former were lower and slightly later in time. The total catches of *L. zimmermanni* and *B. luteolus* included only slightly more males than females and there was no clear peak period for either sex. *Walckenaera acuminata* also showed no clear peak but the considerably longer season of maturity for the female was reflected in the total catch of 43 males to 72 females; males were not trapped from March-September inclusive, being taken in each of 9 months and females in each of 20 months from October, 1960—August, 1962.

Other species which should be mentioned (Table 4) are *Pachygnatha degeeri* and *Robertus lividus*, which showed a preference for *Nardus* in both the samples and pitfall catches. *Ceratinella brevipes*, a litter species, preferred the ungrazed grassland in the pitfall areas and the tall *Eriophorum/Deschampsia* on Tarn Moss. *Diplocentria bidentata* occurred commonly in the *Deschampsia* sward and in the *Eriophorum/Deschampsia* on Tarn Moss but was scarce in the *Nardus* samples. In the three pitfall localities it scored only four specimens in the *Nardus*. In this case there appears to be a distinct preference for wet places with a fairly thick vegetation cover.

DISCUSSION

The main purpose of the brief field studies undertaken by the Malham spider courses was to investigate the faunal characteristics of a series of described habitat types. The habitat classification used was based on the system proposed by Elton and Miller (1954) in which height limits are assigned to vegetation formation types. The different categories of plant cover described in this paper come within (*a*) the "field type", which is divisible into a ground layer including vegetation and inorganic debris less than about 6 in. in height, and a field layer including vegetation from 6 in. to 6 ft.; (*b*) "open ground type" in which the vegetation does not exceed about 6 in. in height. Further analysis has been attempted by distinguishing between woody and non-woody plants, describing plant dominants which have a characteristic structure, e.g. *Nardus*, and separating those habitats on well-drained alkaline soils (limestone grassland) from those on water-logged acid soils, such as *Deschampsia flexuosa* meadow and the *Eriophorum/Deschampsia* bog on Tarn Moss.

Spiders are often good indicators of habitat conditions but it is usually difficult to describe these precisely and to build up community lists which enable one to understand how the biology of the species is linked to the habitat characteristics. As all spiders are predators, the species of plants making up the vegetation cover may not be significant except in so far as they influence the food supply, but the vegetation structure, moisture content of the soil and microclimate are of great importance. Nörgaard (1951) studied lycosid spiders in Denmark and found that *L. nigriceps* only occurred in localities with *Calluna*. In Britain we could extend this observation by noting that *L. nigriceps* is a lycosid which readily climbs tall vegetation when hunting and may be equally common in *Brachypodium pinnatum* grassland and in other habitats with a well

developed field layer. Knülle (1953) investigated the ecology of spiders in salt marshes along the North German coast and found faunal differences between tall and short growths of the grass *Puccinellia maritima*, while at Malham species requiring a particular type of structure for web-spinning were more common in the ungrazed limestone grassland than in grazed. Similarly the *Nardus* environment was preferred by some linyphiids to the shorter grazed turf a few inches away and the mosaic of vegetation structures on Malham Moss produced distinct communities for each type.

Tretzel (1952) studied the spiders of an area at Erlangen, Germany, which included many different types of vegetation cover, by pitfall trapping and sweeping. He assigned an ecological status to each species by classifying them according to "ecological valency", "ecological type", and vegetation stratum in which they occurred: O=under stones or in earth fissures; I=upon the earth, in detritus; II=in the herb layer (5-50 cm. above ground); III=bush and low tree foliage (50-150 cm. above ground); IV=tree association (1·5 m.-4 m. above ground). As an example, *Lycosa nigriceps* was described as follows:

Stratum I-II	
Ecological valency	"mesök"
Ecological type	"photophil-xerophil"

This method has been widely used on the continent and provides a useful summary of certain ecological characteristics. Its greatest deficiency would appear to be due to the very inadequate knowledge of the biology of all but a very few species so that the description for a species in one locality may not hold for a different area. For example, *Lepthyphantes zimmemanni* was a common spider in the Malham area in several types of field layer habitat in both wet and dry localities. In Berkshire (Duffey, 1962) it occurred mainly in deciduous woodland, although in the same vegetation stratum, while in the open field layer formations it was replaced by *L. tenuis*. Similarly on Malham Moss *Lycosa nigriceps* could not be described as "xerophil". In our present state of knowledge probably the most rewarding method of investigating the ecology of spiders and the inter-relations between different communities is to adopt a habitat classification system and study both the characteristic features of the environment together with the species associated with them.

Summary

1. Field studies on spiders in localities near Malham Tarn are described with special reference to the fauna of defined vegetation types.

2. Spiders were collected by examining turf samples, in pitfall traps and by hand.

3. Intensive quantitative studies were made in the following: *Nardus stricta* grassland, *Deschampsia flexuosa* meadow, Fescue-Bent grassland, and in three types of vegetation on Malham Moss raised bog.

4. The vertical zonation of spiders in different field layer habitats is described.

5. A plot of Fescue-Bent grassland measuring 6 × 2 m. was divided into 192 samples, the fauna of each extracted and distribution maps drawn.

6. An analysis is made of the pitfall catch in three grassland areas from October, 1960, to August, 1962.

7. Methods of studying and recording the ecology of spiders are discussed.

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Appendix

Species List (1960-1962 and some earlier records)

Although this list includes 146 species (about 25% of the British Spider fauna) the collections were made almost entirely in mid-September, with a few records from other months in the late summer and autumn. Further studies in spring and summer would most probably reveal a number of additional species, and this list should not be regarded as comprehensive for the Malham area.

NS—*Nardus;* TM—Tarn Moss; TH—Localities in and around Tarn House; CPW—Colt Park Wood; HM—Helwith Moss; LG—Ling Gill; FM—Fleet Moss; LM—Swaledale Lamps Moss; MC: GS—Malham Cove and Gordale Scar; MT—Vegetation debris by water's edge, Malham Tarn; BL—South of Tarn House, Beech Litter; LT—West of Tarn House, Larch Litter; H—Highfolds, Limestone Grassland; PG—Pen-y-Ghent; WF—Widdale Fell; I—Ingleborough; CFM—Great Close and Ha Mires, Calcareous Fen Meadow.

Nomenclature after Locket and Millidge, 1951-53

Ciniflo fenestralis (Stroem)	♂♀	TH, CPW, MC: GS, H
Oonops pulcher Templ.	♂♀	MC: GS
Dysdera crocata CLK	♀	MC: GS
Harpactea hombergi (Scop.)	♀	MC: GS
Segestria senoculata (Linn.)	♂♀	TH, MC: GS
Drassodes lapidosus (Walck.)	♂	NS
D. signifer (C.L.K.)	♂♀	NS. H
Micaria pulicaria (Sund.)	♀	H
Clubiona reclusa O.P.-Camb.	♀	TM
C. trivialis C.L.K.	♂♀	TM, HM, CFM
C. diversa O.P.-Camb.	♂♀	NS, TM, HM, H
Agroeca proxima (O.P.-Camb.)	♂♀	NS, TM
Xysticus cristatus (Clerck)	♂♀	NS, TM, FM, H, PG
Oxyptila trux (Bl.)	♂♀	TM, H
Neon reticulatus (Bl.)	♀	TM, TH, H
Lycosa tarsalis Thor.	♀	NS, H
L. pullata (Clerck)	♂♀	NS, TM, FM, MC: GS, PG, CFM, H
L. nigriceps Thor.	♂♀	TM
Tarentula pulverulenta (Clerck)	♂♀	NS, H
Trocosa terricola Thor.	♂♀	NS, TM, MC: GS, H, PG
T. spinipalpis (F.O.P.-Camb.)	♀	TM
Pirata piraticus (Clerck)	♀	TM, CFM
P. hygrophilus Thor.	♀	CFM
Textrix denticulata (Oliv.)	♂♀	TH, MC: GS, H
Amaurobius atropos (Walck.)	♂♀	CPW, MC: GS, H, PG
Cryphoeca silvicola (C.L.K.)	♂♀	H
Antistea elegans (Bl.)	♂♀	TM, HM, MC: GS, CFM
Hahnia montana (Bl.)	♀	TM, TH
Robertus lividus (Bl.)	♂♀	NS, TM, CPW, H, PG, CFM
R. arundineti (O.P.-Camb.)	♀	NS, TM
R. neglectus (O.P.-Camb.)	♂♀	PG
Pholcomma gibbum (Westr.)	♂♀	TM
Theönoe minutissima (O.P.-Camb.)	♀	TM
Pachygnatha clercki Sund.	♂♀	TM, TH, CFM
P. degeeri Sund.	♂♀	NS, TM, MC: GS, H
Meta segmentata (Clerck)	♂♀	TM, MC: GS
M. segmentata mengei (Bl.)	♂	LG
M. merianae (Scop.)	♂♀	MC: GS, PG
M. menardi (Latr.)	♀	TH

Araneus diadematus Clerck	♂♀ TH, MC: GS
Zygiella atrica (C.L.K.)	♀ MC: GS
Ceratinella brevipes (Westr.)	♂♀ NS, TM, LM, PG, CFM, H
C. brevis (Wid.)	♂♀ TM, CFM
Walckenaera acuminata Bl.	♂♀ NS, TM, FM, LM, MC: GS, H, PG, CFM
Wideria antica (Wid.)	♂♀ NS, TM, HM, H
W. cucullata (C.L.K.)	♂♀ TM, CPW
W. nodosa (O.P.-Camb.)	♂♀ NS, TM, PG
W. fugax (O.P.-Camb.)	♀ NS
Trachynella nudipalpis (Westr.)	♂♀ NS, TM, PG, CFM
Tigellinus furcillatus (Menge)	♀ TM
Cornicularia kochi (O.P.-Camb.)	♀ PG
C. karpinskii (O.P.-Camb.)	♀ TM, PG
C. cuspidata (Bl.)	♂♀ CPW, LG, FM, H, PG
C. vigilax (Bl.)	♂♀ TM
Dicymbium nigrum brevisetosum Locket	♂♀ PG
D. tibiale (Bl.)	♂ PG, TM
Entelecara erythropus (Westr.)	♀ MC
Tmeticus affinis (Bl.)	♀ (TH)
Hypomma bituberculatum (Wid.)	♀ TM, CFM
Gonatium rubens (Bl.)	♂♀ NS, TM, HM, FM, MC: GS, CFM, H
G. rubellum (Bl.)	♀ TM
Peponocranium ludicrum (O.P.-Camb.)	♂♀ TM, NS
Pocadicnemis pumila (Bl.)	♀ NS, TM, MC: GS, PG, H
Oedothorax gibbosus (Bl.)	♂♀ NS, TM, FM, H, PG, CFM
Oe. tuberosus (Bl.)	♂ NS
Oe. fuscus (Bl.)	♂♀ TM, MT, CFM, NS
Oe. agrestis (Bl.)	♂♀ TM, LG, MT
Oe. retusus (Westr.)	♂♀ TM, H, PG, CFM, NS
Oe. apicatus (Bl.)	♀ PG
Trichopterna thorelli (Westr.)	♀ MC: GS
T. mengei (Sim.)	♂♀ TM, CFM
Cnephalocotes obscurus (Bl.)	♂♀ TM, HM, FM, PG
Silometopus elegans (O.P.-Camb.)	♂♀ TM, H, PG, NS
Tiso vagans (Bl.)	♂♀ NS, FM, MC: GS, H, PG
Minyriolus pusillus (Wid.)	♀ TM, PG
Monocephalus fuscipes (Bl.)	♂♀ TH, CPW, LG, LM, MC: GS, BL, LT, H, I, CFM
Monocephalus castaneipes (Sim.)	♂♀ MC: GS, PG
Lophomma punctatum (Bl.)	♂♀ TM, FM, PG, CFM
Gongylidiellum vivum (O.P.-Camb.)	♀ H
G. latebricola (O.P.-Camb.)	♂♀ TM
Micrargus herbigradus (Bl.)	♂♀ NS, TM, LM, H, PG, CFM
Erigonella hiemalis (Bl.)	♂♀ NS, LM, L, PG
Savignia frontata (Bl.)	♀ H
Diplocephalus cristatus (Bl.)	♂♀ LG, FM, MC: GS
D. permixtus (O.P.-Camb.)	♂♀ TM, PG, CFM
D. latifrons (O.P.-Camb.)	♂♀ CPW, LG, LT, H, CFM
Araeoncus humilis (Bl.)	♀ LG
Asthenargus paganus (Sim.)	♀ LG
Caledonia evansi O.P.-Camb.	♂♀ NS, PG
Diplocentria bidentata Emert.	♂♀ NS, TM, PG, CFM
Erigone dentipalpis (Wid.)	♂♀ TM, FM, MT, H, PG
E. atra (Bl.)	♂♀ NS, TM, MT, H, CFM
E. promiscua (O.P.-Camb.)	♂♀ TM, PG, CFM, H
E. capra Sim.	♂♀ TM, CFM
Rhaebothorax morulus (O.P.-Camb.)	♀ FM
Eboria fausta (O.P.-Camb.)	♂♀ LG. FM. PG. CFM, H

E. caliginosa Falc.	♂♀	TM, WF
Drepanotylus uncatus (O.P.-Camb.)	♂♀	TM, FM, PG, CFM
Hilaira excisa (O.P.-Camb.)	♂♀	TM, FM, PG
H. nubigena Hull	♂♀	TM
H. pervicax Hull	♂♀	TM, FM
Hillhousia misera (O.P.-Camb.)	♂♀	TM
Porrhomma convexum (Westr.)	♂♀	LT
P. campbelli F.O.P.-Camb.	♂♀	PG
P. egeria Sim.	♂♀	PG
P. montanum Jacks.	♂	PG
Agyneta conigera (O.P.-Camb.)	♂♀	TM, NS
A. decora (O.P.-Camb.)	♂♀	TM, H, NS
Meioneta saxatilis (Bl.)	♂♀	NS, TM, PG, CFM, H
M. beata (O.P.-Camb.)	♀	NS
M. gulosa (L. Koch)	♂	PG
Microneta viaria (Bl.)	♀	BL
Maro minutus O.P.-Camb.	♂♀	TM, CFM
M. lepidus Casemir	♂♀	TM
Centromerus expertus (O.P.-Camb.)	♂♀	TM, FM, PG, CFM
C. prudens (O.P.-Camb.)	♂♀	PG, CFM, NS, H
C. dilutus (O.P.-Camb.)	♂♀	TM, LT, H
Centromerita bicolor (Bl.)	♂♀	FM, H, PG, CFM
C. concinna (Thor.)	♂♀	NS, TM, HM, FM, LM, MC: GS, H, PG
Sintula cornigera (Bl.)	♂♀	PG
Oreonetides abnormis (Bl.)	♂♀	TM, MC: GS, H, PG
Macrargus rufus (Wid.)	♀	BL, LT, H
Bathyphantes concolor (Wid.)	♀	CPW, MC: GS
B. approximatus (O.P.-Camb.)	♂♀	TM
B. gracilis (Bl.)	♂♀	TM, PG, CFM
B. parvulus (Westr.)	♂	TM, FM
B. nigrinus (Westr.)	♂	TH
Poeciloneta globosa (Wid.)	♂♀	TM, MC: GS, H, PG
Drapetisca socialis (Sund.)		TH
Tapinopa longidens (Wid.)	♂♀	NS, TM, HM, MC: GS, H, PG, CFM
Labulla thoracica (Wid.)	♀	MC: GS
Stemonyphantes lineatus (Linn.)	♀	MC: GS
Bolyphantes luteolus (Bl.)	♂♀	NS, TM, MC: GS, H, PG, CFM
B. alticeps (Sund.)	♂	H
Lepthyphantes minutus (Bl.)	♀	TH
L. alacris (Bl.)	♂♀	LG, LT
L. tenuis (Bl.)	♂♀	TM, MC: GS, NS
L. zimmermanni Bertk.	♂♀	TM, TH, LG, LM, MC: GS, LT, H, PG, CFM
L. mengei Kulcz	♂♀	NS, TM, HM, MC: GS, PG, CFM
L. ericaeus (Bl.)	♂♀	NS, TM, H, PG, CFM
L. pallidus (O.P.-Camb.)	♀	PG
L. angulatus	♂♀	TM, MC: GS, PG
Helophora insignis (Bl.)	♂♀	TH, LG, BL
Linyphia triangularis (Clerck)	♀	TM
L. clathrata Sund.		TH
L. pusilla Sund.	♂	H
Mengea scopigera (Grube)	♂♀	NS, H, PG