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The Epping Forest Survey.
THIRD YEAR.

PRICE ONE SHILLING.

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1945.

Month-by-Month Statistics.

Full particulars are summarized in the following table:—

Month.	Barometer (Inches of Mercury).			Temperature (Shade) in degrees Fahr.						Amount in inches.	Rain.		No. of days on which there was a Gales.		Thunderstorms.	Fog.	
	Max.	Min.	Ave.	Max.	Min.	Ave.	Daily Range.	Ave. Range.	No. of Wet Days.		No. of Rain Days.	No. of Gales.	No. of Days.				
Jan.	30.75	29.40	30.27	55	26	44.77	39.03	43.40	8.74	29	1.57	8	11	2	—	—	4
Feb.	30.60	29.50	30.20	55	25	43.69	33.65	38.67	10.04	30	0.84	8	15	3	—	—	1
Mar.	30.75	29.70	30.19	72	24	50.13	33.45	41.79	16.68	48	0.07	1	3	—	—	—	3
Apr.	30.60	29.50	30.08	76	29	61.30	42.20	51.75	19.10	47	1.43	7	13	—	—	—	1
May	30.45	29.50	30.10	90	28	67.45	41.65	54.55	25.80	62	0.51	6	7	5	—	—	—
June	30.20	29.40	29.90	78	38	69.06	49.30	59.18	19.76	40	1.74	9	12	2	1	2	—
July	30.10	29.60	29.87	83	46	73.19	54.77	63.98	18.42	37	1.78	11	13	7	1	1	—
Aug.	30.20	29.55	29.92	90	49	77.06	55.42	66.24	21.64	41	2.43	8	10	3	—	—	—
Sept.	30.40	29.50	29.99	74	36	65.30	47.53	56.41	17.77	38	3.19	13	14	4	3	—	3
Oct.	30.25	29.10	29.82	61	31	56.77	42.90	49.83	13.87	30	3.25	14	22	4	4	2	4
Nov.	30.40	29.25	29.81	60	30	49.46	37.96	43.71	11.50	30	3.73	17	20	4	4	—	4
Dec.	30.70	29.05	30.00	56	21	42.90	33.93	38.41	8.97	35	1.93	10	19	4	—	—	9
Year	30.75	29.05	30.01	90	21	58.67	42.65	50.66	16.02	69	21.77	112	159	38	20	12	25

Report on the Survey of the Cuckoo Pits Area, 1942-44.

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1. Introduction and Acknowledgments.

Owing to war-time difficulties and shortage of workers, it has not been possible to make the survey of the Cuckoo Pits area as comprehensive as is really desirable. Nevertheless, in the three years during which the survey has been in progress, a considerable amount of data has been accumulated, and the Chingford Branch Council have decided that some of this should be published for record and for the guidance of workers in the future. The sections of data published in the present report are in themselves more or less complete. It must be emphasized that *this report represents only a preliminary stage of the ecological study.*

The survey is a team effort of the members of the Chingford Branch and of other members who visit Epping Forest from time to time. The report is similarly the result of team-work, and is therefore published anonymously. However, individual acknowledgments and responsibilities are listed below:—

Recorders: — K. E. Hoy, E. T. Nicholson, J. H. Peterken, E. B. Pinniger, and D. G. Tucker.

Sections of Report drafted by:—

Sections 1, 2, and 4—D. G. Tucker.

Sections 3.1 and 3.2—J. H. G. Peterken.

Sections 3.3 and 6.3—J. Ross.

Section 5—K. E. Hoy and D. G. Tucker.

Sections 6.1. and 6.2—E. B. Pinniger.

General Organiser and Editor of Report:—D. G. Tucker.

In addition, particular acknowledgment is due to the following for their regular and active field-work in connection with the survey:—R. Mears, D. C. Rattenbury, J. F. Tucker, and W. A. Wright; and to the following for special help from time to time:—Miss G. F. Woodhurst, K. W. Bourne, G. F. Mugele, L. Parmenter, L. G. Payne, J. H. Richter, E. A. Round, P. F. C. Rumsey and A. C. Wheeler and various members of the British Mycological Society.

2. General Account of Area.

A brief description of the Cuckoo Pits Survey Area was published in the *L.N.* for 1942, together with the survey map showing the vegetation units. This preliminary account explained the subdivision of the area adequately, and no further description need be given here. For convenience of reference, however, this map is included again here (Fig. 4; facing p. 64), and the vegetation units are summarised in Table 1.

TABLE 1.
Summary of Vegetation Units.

Unit.	Nature of Vegetation.
A	Oak-hornbeam woodland; bramble.
B	As A, together with bracken.
C	As B.
D	As B.
E	Series of ten small ponds and marshy areas; rushes.
F	Open, gravel soil; grasses, bracken, rushes, a little bramble and heather.
G	Pond, shallow, often dry. Overgrown with willow and rushes.
H	Small pond, mostly dry; bare.
J	Small pond, mostly dry; rushes and grasses.
K	Pond, only partially overgrown with reed-mace, bur-reed, and grasses and rushes.
L	As A.
M	Open; grasses, sedges and rushes; bramble and blackthorn spreading.
N	Forest rides; only trodden grass.
P	The Cuckoo Brook; running water, many plants along the banks.

Note.—Oak=*Quercus Robur*, Hornbeam=*Carpinus Betulus*, Bramble=*Rubus fruticosus* agg., Bracken=*Pteris aquilina*, Rushes=mainly *Juncus effusus* and *J. sylvaticus*.

The particulars of the vegetation as previously given are still substantially correct, the only changes to record being (a) the drying-up of the ponds (*v. infra*) and (b) a grass fire on Pear Tree Plain (unit M) in May, 1944, which destroyed the upper parts of the clumps of *Deschampsia caespitosa** and *Rubus fruticosus*, over an area of perhaps 1000 sq. yds. This fired area showed signs of recovery by the end of the summer.

In the paragraphs below some general particulars are given relating to altitudes, soil, and pond and stream water.

2.1. Altitudes.

In the preliminary description, it was stated that the land rises perhaps 20 feet from the stream to the gravel cap where the ponds are situated. Accurate measurements of the altitude (above O.S. Liverpool datum) at various points have been made (by Mr G. F. Mugele) and are as follows:—

Reference Point 1—158 ft.—lowest point of area.
Stream opposite R.P.2—165 ft.

*For the authority of all plant names throughout the report, refer to Section 3 (Table 4, etc.).

Pond region—185 ft.

Reference Point 9—188 ft.—highest point of area.

Pear Tree Plain (M)—about 180 ft.

The stream thus falls 7 ft. in a length of about 1000 ft.

2.2. The Soil.

The soil of the survey area is essentially sandy. The gravel cap around the ponds is, of course, almost entirely composed of coarse particles, but even in the lower and wetter parts, near the stream, the proportion of clay particles is low. This may be due to the washing down of sand from the higher parts. In the woodland portions, there is a layer of pure humus (leaf-mould) about one inch deep; in the open portions there is no pure humus, but, of course, the proportion of humus is high in the surface layer. Details of sample analyses made by Dr. D. G. Tucker are given in Tables 2 and 3.

TABLE 2.

Soil Analyses, Woodland Area A, near stream.

[Note.—All figures quoted are percentages of the dry weight.]

Depth (Inches).	1	3	12	36	72
Loss on Air Drying	50	17	12	15	18
Loss on Steam Drying	17	4	3	3	4
Loss on Ignition	29	10	6	2	8
Stones (> 2 mm.)	3	—	—	—	—
Coarse Sand (2 to 0.2 mm.)	34	36	40	35	37
Fine Sand (0.2 to 0.02 mm.)	30	44	35	30	20
Silt and Clay (< 0.02 mm.)	4	10	19	33	35

TABLE 3.

Soil Analyses, Other Parts of Area.

[Note.—All figures quoted are percentages of the dry weight.]

Location and Remarks.	F, 1" depth, N.W. corner of Pond G.	M, 2" depth, Centre of Plain.	P, from muddy bed of stream.
	Loss on Air Drying	7	22
Loss on Steam Drying	4	6	4
Loss on Ignition	13	23	10
Stones	—	—	10
Coarse Sand	66	29	44
Fine Sand	19	44	33
Silt and Clay	2	4	3

The loss of weight on air-drying represents the proportion of free water in the soil. This factor is therefore more variable than the others. The loss on steam-drying represents the water held by colloids. The loss on ignition gives the proportion of humus in the soil. The separation into the various sizes of basic particles was effected by suspension in water and decantation at intervals of time corresponding to the rate of precipitation of the various sizes of particle. All figures quoted are percentages of *dry weight* (i.e. the weight after steam drying).

It will be seen that the proportion of the finer particles increases rapidly with depth in the lower woodland, but even at 6 ft. the proportion of sand is high. The soil of the higher parts is almost entirely sand, apart from the humus and water content.

2.3. The Water Reaction (Acidity).

The reaction of the water in Pond K and in the stream P has been measured by Mr E. B. Pinning, both in 1943 and in 1944 (summer). The pH values have differed by only about 0.2 from year to year. The figures are given below:—

- Pond K*: (a) Near south bank, pH 6.4.
 (b) Among rush and bur-reed near north bank, pH 5.8
 (c) Near east bank, pH about 7.0.
 (d) South-west corner, among *Glyceria*, pH 5.6.

Stream P: pH 7.7.

A block comparator with buffer tubes was used for these tests, and for Pond K the indicator was Brom Cresol Purple, and for the stream Phenol Red.

It is to be concluded that the pond water is by no means of uniform reaction, but varies between neutral and distinctly acid, the zones of any particular reaction apparently remaining constant. The stream is distinctly alkaline, but this is probably due to the liming of fields near its source.

3. Plant Distribution—General.

The area is not particularly rich in species, many plants known to be present in Epping Forest being absent from the survey area. The greatest number of species is to be found on the banks of the Cuckoo Brook (Area P).

Table 4 in Section 3.1 shows the full list and frequency of species recorded. It is not pretended that it is complete, and additional notes will always be welcome. Enough has been recorded to give an idea of the nature of the area and the several plant communities to be found therein.

Woodland. (A. & D.)—with little or no Bracken, *Pteris Aquilina* L. The chief associates of the dominant Hornbeam, *Carpinus Betulus* L., are pedunculate oak, *Quercus Robur* L. (vc)*, Holly *Ilex Aquifolium* L. (c) and Hawthorn, *Crataegus monogyna* Jacq. (c). On the ground there are few flowering plants to be seen other than trailing species of bramble, *Rubus fruticosus* L. (agg.) (vc), and—chiefly in Area D—the grasses *Holcus mollis* L. (vc), *H. lanatus* L. (c), and *Festuca ovina* L. (agg) (c). Wood Sorrel, *Oxalis acetosella* L., is locally common in area A and Marsh Thistle *Cnicus palustris* Willd., locally common in area D. The chief ground mosses in this habitat are *Dicranella heteromalla*

*Abbreviations:—(d) dominant, (vc) very common, (c) common, (l) local, (o) occasional.

Schp., *Webera nutans* Hedw., *Brachythecium rutabulum* B. and S., *Hypnum cupressiforme* L. These are all common, as also is the liverwort *Lophocolea heterophylla* (Schrad.) Dum.

Woodland. (B, C & L)—with much bracken. Here the canopy of the trees opens out. The same species of trees and large shrubs are in much the same proportion as in areas A & D. On the ground *Pteris* becomes dominant, little else appearing except at the edges of the paths, where the chief associates are *Potentilla erecta* Hampe, *Galium saxatile* L., and the grasses—chiefly in B—*Anthoxanthum odoratum* L., *Agrostis canina* L., and *Festuca ovina* L. (agg.). In the shadier parts where the *Pteris* thins out, *Rubus* spp. compete with it and become in places co-dominant. The moss *Brachythecium purum* Dixon is locally common in area C amongst grasses.

Grassland. This comprises Pear Tree Plain (area M) only, where the dominant grass is *Deschampsia cespitosa* Beauv. On the south side a dense thicket of scrub is encroaching, consisting of *Prunus spinosa* L. (ld), *Crataegus monogyna* Jacq., *Rosa canina* L. (agg) *R. arvensis* Huds., and *Rubus* spp. Locally *Pteris* also is dominant. Associated with *Deschampsia*, the common plants are *Stellaria graminea* L., *Galium saxatile* L., *Potentilla erecta* Hampe, *Cnicus palustris* Willd., *C. arvensis* Hoffm., *Achillea Ptarmica* L., *Juncus effusus* L., *Juncus sylvaticus* Reich., *Carex leporina* L., *C. hirta* L., the grasses *Festuca ovina* L. (agg.) and *Holcus lanatus* L. and the mosses *Aulacomnium palustre* Schwaeg. and *Hypnum aduncum* Hedw. The dampness of the area is indicated by many of the above, but the ground has dried considerably in the last two years. It will be interesting to observe the future effect of the grass fire in May, 1944.

Area F, which surrounds ponds E and G, has a somewhat different association of plants from the other parts of the survey area. Typical heathland plants are mixed here with no particular dominant species. Some small fairly pure patches are found locally of *Calluna vulgaris* Hull, *Luzula campestris* DC., *Deschampsia flexuosa* Trin., the mosses *Polytrichum formosum* Hedw. and *P. juniperinum* Willd., and the liverwort *Cephalozia bicuspidata* L. (Dum.). *Pteris* is invading here also, and will probably increase.

The Ponds are dealt with later as a special study.

The Cuckoo Brook and its banks constitute the southern boundary of the survey area. The actual boundary has been regarded as approximately six feet beyond the further bank. The brook is shady for most of its length, having the hornbeam woodland on each side. The water is nearly always very shallow, and at times almost dries up. No plants appear to be growing entirely in the water, although some are very low down the slope of the bank such as *Carex sylvatica* Huds. (c), *Epilobium palustre* L. (o), *Veronica Beccabunga* L. (o), and *Scrophularia nodosa* L. (o). The most common plants on the top of the banks are *Ranunculus Ficaria* L., *R. repens* L., *Lysimachia Nummularia*

Area :	A	B	C	D	E	F	G	H	J	K	L	M	N	P
<i>Crataegus Oxyacantha</i> L.	—	—	—	—	—	r	—	—	—	—	—	r	—	—
<i>C. monogyna</i> Jacq.	—	—	—	c	—	o	—	—	—	o	—	c	—	o
<i>Callitriche stagnalis</i> Scop.	—	—	—	—	—	—	vc	—	—	o	—	—	—	—
<i>Lythrum Salicaria</i> L.	—	—	—	—	—	—	o	—	—	—	—	—	—	—
<i>Epilobium angustifolium</i> L.	—	—	—	—	—	—	—	—	—	—	—	r	—	—
<i>E. palustre</i> L.	—	—	—	—	—	—	—	—	—	r	—	—	—	o
<i>Sison Amomum</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	r
<i>Angelica sylvestris</i> L.	—	—	r	—	—	—	—	—	—	—	—	c	—	—
<i>Caucalis Anthriscus</i> Huds.	—	—	—	—	—	—	—	—	—	—	—	—	—	r
<i>Hedera Helix</i> L.	—	r	—	—	—	—	—	—	—	—	—	—	—	o
<i>Lonicera Periclymenum</i> L.	—	—	—	—	—	o	—	—	—	—	o	—	—	o
<i>Galium saxatile</i> L.	—	o	—	o	—	c	c	—	—	c	c	c	c	—
<i>G. palustre</i> L.	—	—	—	—	—	—	c	—	—	c	—	—	—	o
<i>G. Aparine</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	o
<i>Scabiosa Succisa</i> L.	—	—	o	—	—	—	—	—	—	o	—	—	—	—
<i>Bidens cernua</i> L.	—	—	—	—	—	—	c	—	—	r	—	—	—	—
<i>Achillea Millefolium</i> L.	—	—	o	—	—	—	—	—	—	—	—	o	—	r
<i>A. Ptarmica</i> L.	—	—	—	—	—	—	—	—	—	—	—	c	—	—
<i>Matricaria inodora</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	o
<i>Tussilago Farfara</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	o
<i>Senecio vulgaris</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	r	—
<i>Arctium minus</i> Bernh.	—	—	—	—	—	—	—	—	—	—	—	—	—	r
<i>Cnicus lanceolatus</i> Willd.	—	—	—	—	—	—	—	—	—	—	—	o	—	r
<i>C. palustris</i> Willd.	—	—	—	lc	—	—	—	—	—	—	—	c	—	—
<i>C. arvensis</i> Hoffm.	—	—	—	—	—	—	—	—	—	—	—	c	o	o
<i>Hieracium Pilosella</i> L. (agg.)	—	—	—	—	—	—	—	—	—	o	—	—	—	—
<i>Sonchus arvensis</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	r
<i>Campanula rotundifolia</i> L.	—	—	—	—	—	o	—	—	—	o	—	—	—	—
<i>Calluna vulgaris</i> Hull.	—	—	—	—	—	l	lc	—	—	o	—	—	—	—
<i>Lysimachia Nummularia</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	lc
<i>Fraxinus excelsior</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	r
<i>Solanum Dulcamara</i> L.	—	—	—	—	—	—	lc	—	—	o	—	o	—	o
<i>Scrophularia nodosa</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	o
<i>Veronica Chamaedrys</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	o
<i>V. Beccabunga</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	o
<i>Utricularia vulgaris</i> L.	—	—	—	—	—	—	—	—	—	lc	—	—	—	—

Area :	A	B	C	D	E	F	G	H	J	K	L	M	N	P
<i>Mentha aquatica</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	r
<i>Lycopus europaeus</i> L.	—	—	—	—	—	—	—	—	—	o	—	—	—	c
<i>Nepeta hederacea</i> Trev.	—	—	—	—	—	—	—	—	—	—	—	—	—	c
<i>Prunella vulgaris</i> L.	—	—	o	—	—	—	—	—	—	—	—	o	—	o
<i>Stachys sylvatica</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	r
<i>Lamium album</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	r
<i>Teucrium Scorodonia</i> L.	l	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Plantago major</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	l
<i>Polygonum Hydroptiper</i> L.	—	—	—	—	lc	—	o	—	—	la	—	r	o	c
<i>Rumex condyloides</i> Bieb.	—	—	—	—	—	—	—	—	—	lc	c	—	o	c
<i>R. obtusifolius</i> L.	—	—	—	—	—	—	—	—	—	—	—	o	o	o
<i>R. Acetosa</i> L.	—	—	—	—	—	—	—	—	—	—	—	c	o	o
<i>R. Acetosella</i> L.	—	—	—	—	—	o	c	—	—	o	—	—	o	o
<i>Mercurialis perennis</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	o	o
<i>Urtica dioica</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	o	c
<i>Betula alba</i> L.	—	—	—	r	—	o	—	—	—	r	—	—	—	—
<i>Carpinus Betulus</i> L.	d	vc	vc	d	—	c	r	—	—	c	d	o	—	c
<i>Quercus Robur</i> L.	vc	c	c	c	—	e	—	o	—	o	c	o	o	r
<i>Q. cerris</i> L.	—	r	—	—	—	—	—	—	—	—	r	—	—	—
<i>Fagus sylvatica</i> L.	—	—	—	—	—	—	—	r	—	o	—	—	—	—
<i>Salix cinerea</i> L.	—	—	o	—	—	o	ld	—	—	c	—	o	—	—
<i>Tamus communis</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	r
<i>Ruscus aculeatus</i> L.	o	—	o	—	—	—	—	—	—	—	—	o	—	—
<i>Scilla non-scripta</i> Hoffm. & Link.	—	o	o	—	—	—	—	—	—	r	r	—	o	o
<i>Juncus effusus</i> L.	—	—	—	—	ld	o	vc	o	ld	c	—	c	lc	c
<i>J. conglomeratus</i> L.	—	—	—	—	lc	—	o	—	—	—	—	c	—	—
<i>J. sylvaticus</i> Reich.	—	—	—	—	—	—	—	—	—	la	—	—	—	—
<i>Luzula campestris</i> DC.	—	—	—	—	—	lc	—	—	—	c	—	o	o	—
<i>Typha latifolia</i> L.	—	—	—	—	—	—	—	—	—	ld	—	—	—	—
<i>Sparganium ramosum</i> Curt.	—	—	—	—	—	—	—	—	—	ld	—	—	—	—
<i>Arum maculatum</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	r
<i>Lemna trisulca</i> L.	—	—	—	—	—	—	—	—	—	c	—	—	—	—
<i>L. minor</i> L.	—	—	—	—	—	—	lc	—	—	c	—	—	—	—
<i>Potamogeton natans</i> L.	—	—	—	—	—	—	—	—	—	l	—	—	—	—
<i>Eleocharis palustris</i> Roem & Schultz.	—	—	—	—	—	—	—	—	—	lc	—	—	—	—
<i>Carex remota</i> L.	—	—	—	—	—	—	—	—	—	—	—	—	—	c

Area:	A	B	C	D	E	F	G	H	J	K	L	M	N	P
<i>C. leporina</i> L.														
<i>C. Goodenowii</i> Gay														
<i>C. sylvatica</i> Huds.														
<i>C. hirta</i> L.														
<i>Anthoxanthum odoratum</i> L.		lc												
<i>Allopecurus pratensis</i> L.														
<i>Mitium effusum</i> L.														
<i>Agrostis tenuis</i> Sibth.														
<i>A. canina</i> L.		lc												
<i>Atra praecox</i> L.														
<i>Deschampsia caespitosa</i> Beauv.														
<i>D. flexuosa</i> Trin.														
<i>Holcus mollis</i> L.														
<i>H. lanatus</i> L.														
<i>Arrhenatherum elatius</i> M. & K.														
<i>Dactylis glomerata</i> L.														
<i>Poa nemoralis</i> L.														
<i>P. annua</i> L.														
<i>P. pratensis</i> L.														
<i>P. trivialis</i> L.														
<i>Glyceria fluitans</i> Br.														
<i>Festuca ovina</i> L. (agg.)														
<i>Bromus giganteus</i> L.														
<i>Brachypodium sylvaticum</i> R. & S.														
<i>Nardus stricta</i> L.														
<i>Pteris aquilina</i> L.														
<i>Lastrea Filix-mas</i> Presl														
<i>L. aristata</i> Rendle & Britten														

3.2. Mosses and Liverworts.

The following notes shew the species recorded with habitat and frequency (c.fr. = with fruit, c.g. = with gemmae):—

MOSSSES.

Sphagnum auriculatum Schp., (lc), in ponds G and K.

Tetraphis pellucida Hedw., c.g., on stumps occasionally in ponds G and K.

Polytrichum piliferum Schreb., small tuft on bank of K mixed with other spp. of *Polytrichum*.

P. juniperinum Willd., c.fr. (lc) in F and on banks of G and K. (o) in L and N.

P. formosum Hedw., c.fr. (l) in F and H and on banks of G and K.

Pleuridium nitidum (Hedw.), Rabenh., c.fr. (= *axillare* Lindb.) (l) in mud at edge of pond G.

Ceratodon purpureus Brid. (o) on ground in D.

Dicranella heteromalla Schp., c.fr., the commonest moss in the survey area. Recorded in all divisions except Pear Tree Plain (M). On the ground, banks, stumps and roots of trees.

Dicranoweisia cirrata Lindb. (o) on tree trunks in A, B & C. (lc) in L. *Campylopus pyriformis* Brid., one small tuft on a log in E.

Dicranum scoparium Hedw. (ld) in F. (c) on banks of G and K. (o) in D. On bare ground.

Fissidens bryoides Hedw., c.fr., small tuft on a log in A and on bank of Cuc'oo Brook.

Aulacomnium palustre Schwaeg. c.g. (vc) amongst grass in M. (o) on bank of pond K.

A. androgynum Schwaeg. c.g., on logs and on ground under scrub, scattered over the area. (lc) in D.

Webera nutans Hedw. c.fr. (vc) on ground near the ponds, and in D. Well distributed over the area.

Bryum capillare L. (o) on logs in A.

Mnium affine Bland., a few tufts on bank of P.

M. undulatum L., one tuft on bank of P.

M. hornum L. (vc) on banks of ponds. (c) on banks of P. (o) elsewhere.

M. punctatum L., one tuft on bank of P.

Brachythecium rutabulum B. & S., c.fr. (o) on ground in various parts of the area. (c) in A.

B. velutinum B & S. (o) on logs in E.

B. purum Dixon, on ground amongst grass. (lc) in A and C. (o) in D. *Eurhynchium Stokesii* (C.M.) B. & S. (= *praelongum* Hobk.). On ground and stumps of trees. (vc) on banks of P. (c) in A. (o) elsewhere.

Plagiothecium denticulatum B. & S. (o) on ground in various parts of the area.

- Hypnum riparium* L., c.fr. (o) on stumps in K.
H. aduncum Hedw. non L. (c) amongst grass in wetter parts of M., and in shallow water in pond K.
H. exannulatum Güm. (c) in shallow water in pond K.
H. cupressiforme L., c.fr., on ground and on roots of trees and on stumps. Common over most of the area.
H. cuspidatum L., one patch in M.
Hylocomium squarrosum B. & S. (lc) in A mixed with grass and *Brachythecium purum*.

LIVERWORTS.

- Riccia fluitans* L., floating in pond K and attached to the submerged stems of *Utricularia*.
Lunularia cruciata (L.) Dum., one patch on bank of P.
Pellia epiphylla (L.) Corda (o) on bank of P. One patch on ground in A.
Lophocolea heterophylla (Schrad.) Dum., c.fr., the commonest liverwort. On many logs and tree roots, sometimes on ground. In most parts of the area.
L. bidentata (L.) Dum., one patch on ground on bank of G. and on ground in L.
Chiloscyphus polyanthus (L.) Corda, one tuft on bank of P.
Cephalozia bicuspidata (L.) Dum., c.fr., a large patch on ground by pond K. Smaller patches by ponds E, G and H.
Calypogeia Trichomanis (L.) Corda, c.g., rare on stumps in G and J.

3.3. Mycetoza.

The Mycetoza, otherwise known as Myxomycetes, Myxogasters or Slime Fungi, usually feed on decaying vegetable matter and, to a great extent, are dependent on moist conditions for their development. With few exceptions, the plasmodia of these organisms feed inside vegetable matter, and it is in the spore-bearing stage that they are found. A notable exception is *Badhamia utricularis* which, as plasmodium, feeds on the surface of living woody fungi.

In a small area of woodland the number of species to be found will probably be restricted and, of the 106 species reported for the County of Essex (and mainly from Epping Forest, inclusive of Wanstead Park), thirty have been recorded for the area of Cuckoo Pits which has been under survey, whereas since September 1939, eighty have been recorded for the County. A very small extension of the surveyed area would have added more species, but, on the other hand, *Oligonema nitens*, first recorded for Essex in October 1942, occurred in the surveyed area, and has not been reported elsewhere in the County up to the time of writing.

The species found in the area are:—

- Ceratiomyxa fruticulosa* (Müll) Macbr. On decayed wood.
Badhamia utricularis (Bull) Berk. Plasmodium on *Stereum purpureum* Pers., and later as sporangia.

- Physarum nutans* Pers. On decaying logs and fallen sticks.
Fuligo septica (L.) Gmel. Rotting stumps and logs.
Craterium minutum (Leers) Fries. Dead leaves, etc., under holly trees.
Diderma radiatum (L.) Morg. var. *umbilicatum* (Pers.) Meyl. Shed hornbeam bark.
Didymium Clavus (Alb. & Schw.) Rabenh. Leaves under hollies.
D. nigripes (Link) Fries. Leaves under hollies.
D. squamulosum (Alb. & Schw.) Fries. Leaves under hollies.
Stemonitis fusca Roth. Decaying logs.
S. splendens Rost var. *flaccida* Lister. Dead wood.
S. flavogenita Jahn. Dead wood.
S. ferruginea Ehrenb. Decaying logs in E.
Comatricha nigra (Pers.) Schroet. Sticks and dead wood.
C. typhoides (Bull) Rost. Dead wood.
C. pulchella (Church Bab.) Rost. Leaves under hollies.
Enerthenema papillatum (Pers.) Rost. Decaying log.
Lamproderma scintillans (Berk & Br.) Morg. Leaves under hollies.
Dictydium cancellatum (Batsch.) Macbr. Large development on log lying at verge of G.
Reticularia Lycoperdon Bull. Logs and dead or partly dead standing trees.
Lycogola epidendrum (L.) Fries. Rotting wood.
Trichia varia Pers. Dead wood.
T. decipiens (Pers.) Macbr. Decaying wood.
T. Botrytis Pers. Rotting wood and sticks.
Oligonema nitens (Libert) Rost. Sticks and dead wood that had been submerged in G.
Arcyria ferruginea Sauter. Dead wood.
A. cinerea (Bull) Pers. Dead wood and leaves.
A. pomiformis (Leers) Rost. Sticks and dead wood.
A. incarnata Pers. Dead wood.
A. nutans (Bull) Grev. Decaying wood and sticks.
 Times of appearance are not given, as in a small area a species may be found once or twice only, whereas elsewhere its occurrence may extend over four or six months.

4. Plant Distribution: Special Studies of the Ponds.

From most points of view the pond area is the most interesting portion of the survey, and the vegetation of the two main ponds (G and K) has been studied fairly closely.

Charts have been made each year showing the distribution of the main vegetation over the area of each of the ponds G and K. These ponds tend to dry up in the summer, and their vegetation is dense. Conditions have grown drier during the three years of observation, and this has led to a general increase in quantity of vegetation, with particularly noticeable growth of *Solanum Dulcamara* and *Glyceria fluitans*.

In the charts which illustrate the next two paragraphs the following letters have been used to represent species as follows:—

Be = <i>Betula alba</i> .	P = <i>Pyrus Malus</i> .
Ca = <i>Carpinus Betulus</i> .	Pn = <i>Potamogeton natans</i> .
Cl = <i>Callitriche stagnalis</i> .	Pp = <i>Potentilla palustris</i> .
Cr = <i>Crataegus monogyna</i> .	Pt = <i>Pteris aquilina</i> .
F = <i>Fagus sylvatica</i> .	Q = <i>Quercus Robur</i> .
G = <i>Glyceria fluitans</i> .	R = <i>Rubus fruticosus</i> L. agg.
I = <i>Ilex Aquifolium</i> .	Ra = <i>Ranunculus repens</i> .
Js = <i>Juncus sylvaticus</i> .	S = <i>Salix cinerea</i> .
Je = <i>Juncus effusus</i> .	Sn = <i>Sphagnum auriculatum</i> .
L = <i>Lythrum Salicaria</i> .	So = <i>Solanum Dulcamara</i> .
N = <i>Nymphaea alba</i> .	Sp = <i>Sparganium ramosum</i> .
Na = <i>Nardus stricta</i> .	T = <i>Typha latifolia</i> .

In connection with trees, the use of a dot beside the letters indicates that the tree is only a seedling or very young sapling (say up to 10 ft. high); but if the letters are enclosed in a small circle, the tree is larger than this, and can be regarded as permanently established.

4.1. Pond G. (See Fig. 2 opposite.)

This pond has for a long time been overgrown with vegetation, but since the summer of 1943 has been almost devoid of standing water. The chart of the distribution of the vegetation shows the position during 1943. The numbered vegetation units are as follows:—

- | | |
|--|---|
| 1. <i>Juncus effusus</i> . | 14, 15. <i>S. Dulcamara</i> . |
| 2, 3, 4, 5, 6. <i>Salix cinerea</i> . | 16. <i>Carpinus Betulus</i> (scrub). |
| 7. <i>J. effusus</i> . | 17, 18, 19. <i>Sphagnum auriculatum</i> . |
| 8. <i>Glyceria fluitans</i> and <i>J. effusus</i> (not dense). | 20. <i>S. Dulcamara</i> . |
| 9. <i>G. fluitans</i> . | 21. <i>J. effusus</i> . |
| 10. <i>Callitriche stagnalis</i> . | 22. <i>C. Betulus</i> (scrub). |
| 11. <i>C. stagnalis</i> and <i>G. fluitans</i> . | 23. <i>C. stagnalis</i> . |
| 12. <i>Solanum Dulcamara</i> . | 24. Bare. |
| 13. <i>Lythrum Salicaria</i> . | |

There have been considerable changes in the vegetation during the three years of observation, and these are indicated below:—

1942. *Juncus effusus* about the same as in chart.
Salix cinerea occupied considerably smaller area.
Solanum Dulcamara occupied about same area, but much less dense.
Callitriche stagnalis absent.
 Large growth of *Bidens cernua* in central part of pond, and some at western end.
1943. As chart.
1944. Pond completely dry.
 Much less *C. stagnalis* than in chart.

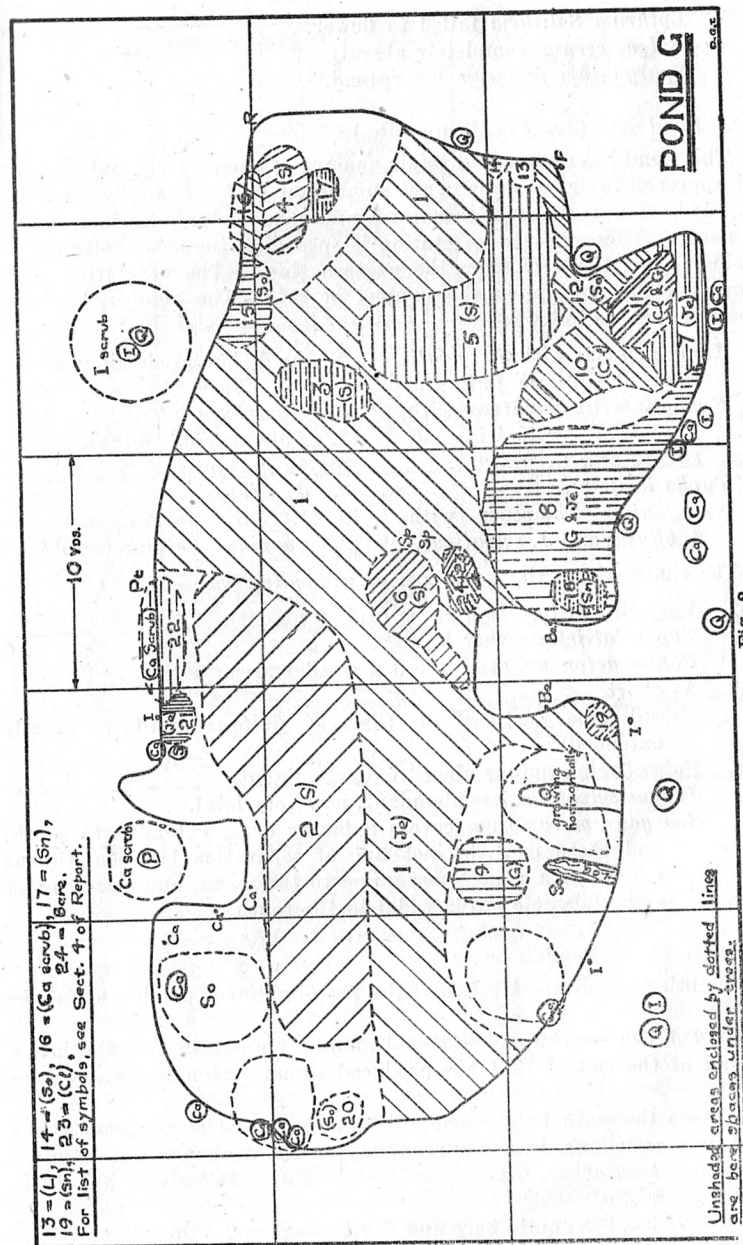


FIG. 2.

Lythrum Salicaria failed to flower.
Bidens cernua completely absent.
Sparganium ramosum has spread.

4.2. Pond K. (See Fig. 3 opposite.)

This pond has always had a fair amount of open water, and its nearest approach to dryness was in the summer of 1944, when only about 200 sq. yards of water surface remained, and this was only an inch or two in depth. However, the vegetation is spreading towards the centre of the pond, particularly from the western side. The vegetation chart shows the distribution in the summer of 1943. The numbered vegetation units are as follows:—

- | | |
|--|--|
| 1. <i>Juncus effusus</i> with <i>J. sylvaticus</i> and <i>Glyceria fluitans</i> . | 5. As 4, but predominance of <i>J. effusus</i> . |
| 2. <i>Sphagnum auriculatum</i> with <i>Potentilla palustris</i> , <i>J. effusus</i> and <i>G. fluitans</i> . | 6. <i>Nymphaea alba</i> . |
| 3. <i>Typha latifolia</i> . | 7. <i>Potamogeton natans</i> . |
| 4. <i>Sparganium ramosum</i> with <i>J. effusus</i> and <i>J. sylvaticus</i> . | 8. <i>G. fluitans</i> . |
| | 9. <i>J. effusus</i> . |
| | 10, 11. <i>Salix cinerea</i> . |
| | 12. <i>Carpinus Betulus</i> (scrub). |

The changes over the 3-year period are as follows:—

1942. Very little *Glyceria fluitans* (unit 8 absent).
Typha latifolia rather less.
Potamogeton natans covered a smaller area.
1943. As chart.
1944. Considerable increase of *Glyceria fluitans* (unit 8 greatly extended).
Potamogeton natans almost entirely absent.
Juncus sylvaticus less abundant, now very local.
Sparganium ramosum covers a larger area, extended to south, and there is a distinct line of separation between *Juncus effusus* with some *Sparganium* to the north, and *Sparganium* alone (about 5 yards wide) to the south.

4.3. The Other Ponds.

The other ponds are H, J, and the ten diminutive ponds grouped as E.

Pond J has been dry almost continuously since 1942, but the heavy rainfall of the end of 1944 has produced signs of standing water once more.

In 1944 the main vegetation, which covered most of the area of the pond, was as follows, in the approximate order of abundance:—*Juncus effusus*, *Festuca ovina*, *Glyceria fluitans*, *Solanum Dulcamara* and *Polygonum Hydropiper*.

Pond H has been quite bare and dry throughout.

Ponds E hold water during part of the winter; they are mostly overgrown with *Juncus effusus*.

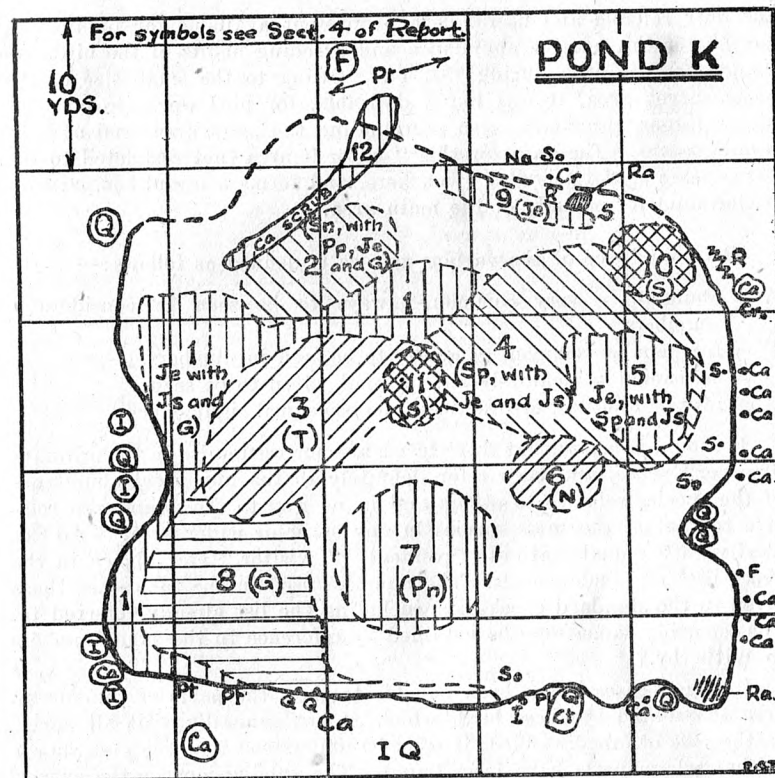


Fig. 3.

5. The Vertebrate Population.

(Sub-kingdom Vertebrata.)

The most conspicuous and numerically most abundant vertebrates are, of course, the birds, and for this reason they have been studied much more fully than any other vertebrates. They are not necessarily the most important class, however, if the ecological aspect of their influence on the area is considered. The grazing of deer and rabbits, for instance, may have a far greater effect on the condition and development of the vegetation.

The bird population is dealt with separately from the rest of the vertebrate population in the following section.

5.1. The Bird Population (Class Aves).

It has been found surprisingly difficult to make a serious ecological study of the bird population. Problems of conspicuousness, zonation (horizontal and vertical), and census work generally, have been considered, and some preliminary field work carried out; but it is felt that

the only reliable and useful data at present available for publication consists of the relative abundance and breeding habits of the birds recorded for the area during 1942-44. Owing to the small size of the basic survey area, it was found desirable, for bird work, to consider also a larger, secondary, area surrounding the main area, and of half-a-mile radius. The data for this "outer" area (not restricted to the three years 1942-44) is also given here, and forms a useful comparative background for a study of the main area.

The abundance of the various species is defined as follows:—

A = abundant = very common, always to be seen in considerable numbers.

F = frequent = common, generally to be seen in numbers.

O = occasional = definitely not unusual, often to be seen.

R = rare = unusual, of practically no ecological significance.

It should be noted that these terms are not used quite in the ordinary observer's sense, and they refer definitely to the numerical abundance of the species relative to others and in no way to the abundance relative to that of the *same* species in any other or wider area. All are used with the qualifications "resident," "visitor," etc., shown in the check-list* of London birds. The numbers used in the tables are those given in the standard check-lists, including the list already referred to. The scientific names may be obtained by reference to the same numbers in Witherby.†

In a few cases it has been possible to show the parts of the survey area frequented by those birds which do not generally visit all parts. In the case of breeding birds it must be understood that the area shown is that where nests have been found. The subdivisions of the survey area for the present purposes are as follows:—

- a. Pear Tree Plain, vegetation unit M.
- b. Woodland north of the ponds, units C, D and L (part).
- c. Pond region, units E, F, G, H, J, K.
- d. Lower woodland, units A, B, L (part), N, P.

Birds are not shown as breeding unless definite evidence has been recorded.

The large number of water birds shown as "No record" for the main area and "R" for the outer area is accounted for by the presence of Connaught Waters, a stretch of water which is suitable for visiting birds to feed and roost, etc.

The total number of species is 64 for the main area (1942-44) and 92 for the outer area.

*R. S. R. Fitter and E. R. Parrinder, "A Check-List of the Birds of the London Area," *London Bird Report*, 1943, p. 20.

†H. F. Witherby, *A Check-List of British Birds*, London, 1941.

TABLE 5. BIRDS.

No.	Species.	Main Area.	Outer Area.
3.	Carrion-Crow	F, breeds, a.	A, breeds.
4.	Rook	Usually only flying over.	F (A, Chingford Plain).
5.	Jackdaw	As 4.	A, probably breeds.
11.	British Jay	F, breeds, a.	A, breeds.
14.	Starling	F (seen only in numbers in Spring and summer), breeds, a.	A, breeds.
18.	Hawfinch	F.	F, breeds.
19.	Greenfinch	O, a and c.	F, probably breeds.
20.	Goldfinch	No record.	F.
24.	Lesser Redpoll	No record.	O.
30.	Linnet	R (once flying over).	O, breeds.
33.	Bullfinch	O, a and c.	F, breeds.
41.	British Chaffinch	F, breeds.	A, breeds.
42.	Brambling	No record.	O.
44.	Yellow Bunting	R, a.	O, breeds.
56.	Reed-Bunting	R, a.	O.
61.	House-Sparrow	No record.	O.
62.	Tree-Sparrow	No record.	O, breeds.
70.	Sky-Lark	No record.	O, breeds.
75.	Tree-Pipit	R, a.	O, breeds.
76.	Meadow-Pipit	R, a.	O.
88.	Yellow Wagtail	No record.	R.
89.	Grey Wagtail	R, c (one record).	R.
90.	Pied Wagtail	R, c (one record).	O.
93.	Tree-Creeper	O, breeds, d.	F, breeds.
96.	Nuthatch	R.	O, breeds.
98.	Great Tit	A, breeds, a, b, c, d.	A, breeds.
100.	Blue Tit	A, breeds, a, b, c, d.	A, breeds.
102.	Coal-Tit	F, breeds, a, b, c, d.	F, breeds.
107.	Marsh-Tit	F, a, b, c, d.	F, breeds.
108.	Willow-Tit	R.	O, breeds.
111.	Long-tailed Tit	O, breeds, a.	F, breeds.
119.	Red-backed Shrike	No record.	O, breeds.
121.	Spotted Flycatcher	No record.	O, breeds.
127.	British Goldcrest	O.	O.
129.	Chiffchaff	O.	F, breeds.
132.	Willow-Warbler	O.	A, breeds.
135.	Wood-Warbler	No record.	R.
161.	Garden Warbler*	O.	F, breeds.
162.	Blackcap	O.	F, breeds.
163.	Whitethroat	O.	F, breeds.
164.	Lesser Whitethroat	R.	O, breeds.
173.	Fieldfare	R (one record).	O.
174.	Mistle-Thrush	O.	O, breeds.
175.	British Song-Thrush	O.	F, breeds.
178.	Redwing	O, c.	O.
184.	Blackbird	A, breeds.	A, breeds.
186.	Wheatear	No record.	R.
197.	Whinchat	No record.	R.
201.	Redstart	O, breeds, d.	O, breeds.
203.	Nightingale	R.	F, breeds.
208.	British Robin	F.	A, breeds.
211.	British Hedge-Sparrow	O, a.	F, breeds.
213.	Wren	F.	F, breeds.

No.	Species.	Main Area.	Outer Area.
220.	Swallow	O.	O.
222.	House-Martin	O.	O.
223.	Sand-Martin	No record.	R.
225.	Swift	O.	O.
227.	Nightjar	R (one record).	R.
234.	Kingfisher	No record.	R.
235.	Green Woodpecker	R.	O.
237.	Great Spotted Woodpecker	O.	O, breeds.
238.	Lesser Spotted Woodpecker	R.	O.
240.	Cuckoo	O.	F.
249.	Little Owl	No record.	O, probably breeds.
253.	Tawny Owl	O, d.	O.
263.	Kestrel	O, flying over.	O.
277.	Sparrow-Hawk	O.	O.
289.	Common Heron	R (one record).	O.
300.	Whooper Swan	No record.	R (one record).
302.	Mute Swan	No record.	R, breeds, 1944.
317.	Mallard	O, c.	O, breeds.
319.	Teal	No record.	R.
323.	Wigeon	No record.	R.
328.	Common Pochard	No record.	R.
330.	Tufted Duck	No record.	R (breeds some years).
342.	Goosander	No record.	R.
344.	Smew	No record.	R.
370.	Great Crested Grebe	No record.	R.
380.	Wood-Pigeon	O.	F, breeds.
381.	Stock-Dove	R (usually flying over).	O, breeds.
383.	Turtle-Dove	No record.	O.
393.	Woodcock	R, a, b, c.	R.
421.	Common Sandpiper	No record.	R.
449.	Lapwing	R (flying over).	O.
456.	Stone Curlew	No record.	R (one record).
478.	Black-headed Gull	O (flying over).	O (flying over).
481.	Common Gull	O (flying over).	O (flying over).
482.	Herring Gull	O (flying over).	O (flying over).
485.	British Lesser Black-backed Gull	O (flying over).	O (flying over).
510.	Moorhen	O, breeds, c.	O, breeds.
517.	Pheasant	O.	O.
518.	Common Partridge	No record.	R.

As a kind of summary, the more important and abundant birds are listed below, in approximate order of abundance.

Great Tit, Blue Tit, Blackbird—Abundant.

Robin, Wren, Jay, Carrion-Crow, Coal-Tit, Marsh-Tit, Chaffinch, Hawfinch—Frequent.

Sparrow-Hawk, Tawny-Owl—Although only occasionally seen, they may be of some importance.

From the preliminary censuses it would seem that the average winter population of the main area is about 100 individuals, i.e., about 5 birds per acre. The spring and summer population is, of course, greatly in excess of this.

5.2. Other Vertebrates.

Vertebrate species apart from birds are not numerous. Moreover, most of them are very inconspicuous. A great deal of observation is therefore required to obtain any significant quantity of data. The only species whose status is at all well established are the fallow deer, red and grey squirrel, and rabbit. Deer are regularly seen in the main survey area, and evidence (faeces, etc.) of their presence is common. Sometimes a dozen or more deer are seen together. The squirrels are seen at practically every visit, and several nest in the main area. Ten dreys (used and disused) have been recorded, and it is thought that eight of these are probably the work of the grey, although observation does not suggest that this species greatly outnumbers the red, either in the main survey area or the surrounding forest. Rabbits are seen throughout the area, but are most abundant on the gravel, around the ponds, where there are eleven burrows, seven of which were evidently in use during 1944.

The scientific names given are according to M. A. C. Hinton and others (1935), *List of British Vertebrates*, British Museum (Nat. Hist.).

MAMMALIA.

Insectivora.

Mole, *Talpa europaea* L. Workings are regularly seen all over Pear Tree Plain (M), mole carcase found there, 30.4.44.

Chiroptera.

Bat. Unidentified species, in M, 22.8.43.

Carnivora.

Fox, *Vulpes vulpes crucigera* Bechstein. One seen in May 1940.

Stoat, *Mustela erminea stabilis* Barr.-Ham. One seen at Pond G, June 1941.

Weasel, *Mustela n. nivalis* L. Young one seen, August 1942.

Rodentia.

Rabbit, *Oryctolagus cuniculus* (L.). Frequent, especially around the ponds.

Vole. Unidentified species, in M, 24.5.43.

Ditto. Pond K, 4.10.44.

Grey Squirrel, *Sciurus carolinensis* Gm. Frequent throughout area.

Red Squirrel, *Sciurus vulgaris*. Frequent throughout area.

Ungulata.

Fallow Deer, *Dama dama* (L.). Frequent throughout area.

REPTILIA.

Squamata.

Slow Worm, *Anguis fragilis* L. One dead in M, 30.4.44.

Common Lizard, *Lacerta vivipara* Jacquin. Occasionally seen (three or four at a time) in M.

Grass Snake, *Natrix n. natrix* (L.). Occasionally seen at various places in the area.

AMPHIBIA.

Caudata.

Common Newt, *Triturus v. vulgaris* (L.). Several seen in pond area, 1944, at intervals during spring.

Salientia.

Common Frog, *Rana t. temporaria* L. Surprisingly uncommon. Seen only once or twice in a year.

Common Toad, *Bufo b. bufo* (L.). One record, Pond K, 17.9.44.

PISCES.

Three-Spined Stickleback, *Gasterosteus aculeatus* L. Occasionally found in stream (P).

6. The Invertebrate Population.

(Sub-kingdom *Invertebrata*).

Despite evidence that many phyla of the invertebrata are represented in the population of the survey area, only a small section of one phylum, the Arthropoda, has been studied.

In the class Insecta some work has been possible on the following orders: Orthoptera, Odonata, Hemiptera, Neuroptera, Lepidoptera, Coleoptera, Hymenoptera and Diptera. Detailed information and full lists of species are only available for the Odonata, diurnal Lepidoptera, and those insects causing plant galls.

It must be emphasized that the estimation of frequency of occurrence of sun-loving insects is a difficult matter. Many species have a short season, and unless visits for recording happen to coincide with the season and favourable weather conditions, the number of examples seen will be deceptively small.

6.1. Order Odonata.

The Cuckoo Pits habitat, considering the small area covered, has a large population of Odonata in numbers of both species and individuals. Many species are known to breed, and as they are predaceous insects throughout the active stages of their metamorphosis a marked effect must be exerted on the remaining invertebrate population. Naiads of the larger species devour prey as large as tadpoles and small earth worms, and an adult male *Anax imperator* Leach has been observed taking large flies and the butterfly *Coenonympha pamphilus* L. In turn the naiads are the prey of larger predaceous aquatic animals, but the imagines have few natural enemies.

A list of the fifteen species recorded from the area together with the appropriate data will be found in Table 6. The letters indicating areas are those applied to the original vegetation units, and degree of frequency is indicated as follows:—

TABLE 6. ODONATA.

Generic and Specific Names.	Relative abundance	Area.	Period of flight.	General Data.
<i>Pyrithosoma nymphula</i> (Sulzer)	A	K	May-Aug.	Breeds at Pond K; frequently flying over vegetation round ponds.
<i>Ischnura elegans</i> (Van der Lind)	F	KG	May-Aug.	Breeds at Pond K; probably bred at G in past years.
<i>Enallagma cyathigerum</i> (Charp.)	F	K	June-Aug.	Breeds at Pond K.
<i>Coenagrion puella</i> (L.)	A	KG	June-Sept.	Breeds at Pond K; formerly bred at G.
<i>Lestes sponsa</i> (Hans)	R	F	June-Aug.	Eliminated as breeding sp. by drying of ponds; may return.
<i>Aeshna grandis</i> (L.)	F		Aug.-Sept.	Strong on the wing. Hawks in suitable open spaces.
<i>Aeshna cyanea</i> (Müll.)	A		Aug.-Sept.	Breeds at K; flies in suitable spots over whole area.
<i>Aeshna mixta</i> (Fabr.)	O	Pond area and M	Aug.-Sept.	Migrant species; formerly very rare.
<i>Anax imperator</i> (Leach)	O	K	June-July	Strong on wing; probably only visits area.
<i>Orthetrum cancellatum</i> (L.)	R		May-July	May breed in bomb craters in outer area. New sp. to Forest.
<i>Libellula quadrimaculata</i> (L.)	O	K	May-July	Breeds at K.
<i>Libellula depressa</i> (L.)	A	Whole Pond area	May-Aug.	Breeds at K and at craters in outer area.
<i>Sympetrum s. striolatum</i> (Charp.)	A	Whole Pond area	Aug.-Oct.	Breeds in all permanent ponds.
<i>Sympetrum flavoolum</i> (L.)	VR		Aug.-Sept.	Very rare migrant; recorded prior to 1942.
<i>Sympetrum sanguineum</i> (Müll.)	R		Aug.-Sept.	Status not known.

A = abundant (always seen in numbers).
 F = frequent (usually seen in numbers).
 O = occasional (a few pairs seen regularly).

R = rare (not seen regularly).
 VR = very rare (only recorded once or twice).

Orthetrum coerulescens Fabr. has been once recorded from the outer area and the habitat appears to be suitable for *Cordulia aenea* L. and *Sympetrum danae* Sulzer, which both occur in nearby areas.

6.2. Order Lepidoptera.

The Butterflies are represented by 21 species, many of which breed in the area. Table 7 contains a list of species together with the relevant details. A large number of Moths are known to occur but owing to their nocturnal habits it is difficult to obtain a complete list of species or any figures of relative abundance.

The Lepidoptera exert a great influence on vegetation in the larval stage, and the ravages of such species as *Hibernia defoliaria* have been very evident in some seasons. Butterfly larvae are rarely found in large colonies (there are exceptions in the Nymphalidae) and the damage to vegetation is not so obvious. As insects exert little influence on their habitat, being sun-loving nectar-feeders with few natural enemies at this stage. The larvae of many species constitute a considerable proportion of the diet of some insectivorous birds.

6.3. Plant Galls.

Consideration of the galls on the oak (*Quercus Robur* L.) found in the survey area directs attention to the following facts:—(i) the extent to which the leaves and twigs of the trees are beyond human reach from the ground; (ii) that trees that can be examined at open parts like Pear Tree Plain, those parts near the ponds and on some of the rides have given fairly good results; and (iii) that galls that could be picked up on the rides after stormy nights in autumn gave some indication of what had been happening in the higher parts of some tall trees.

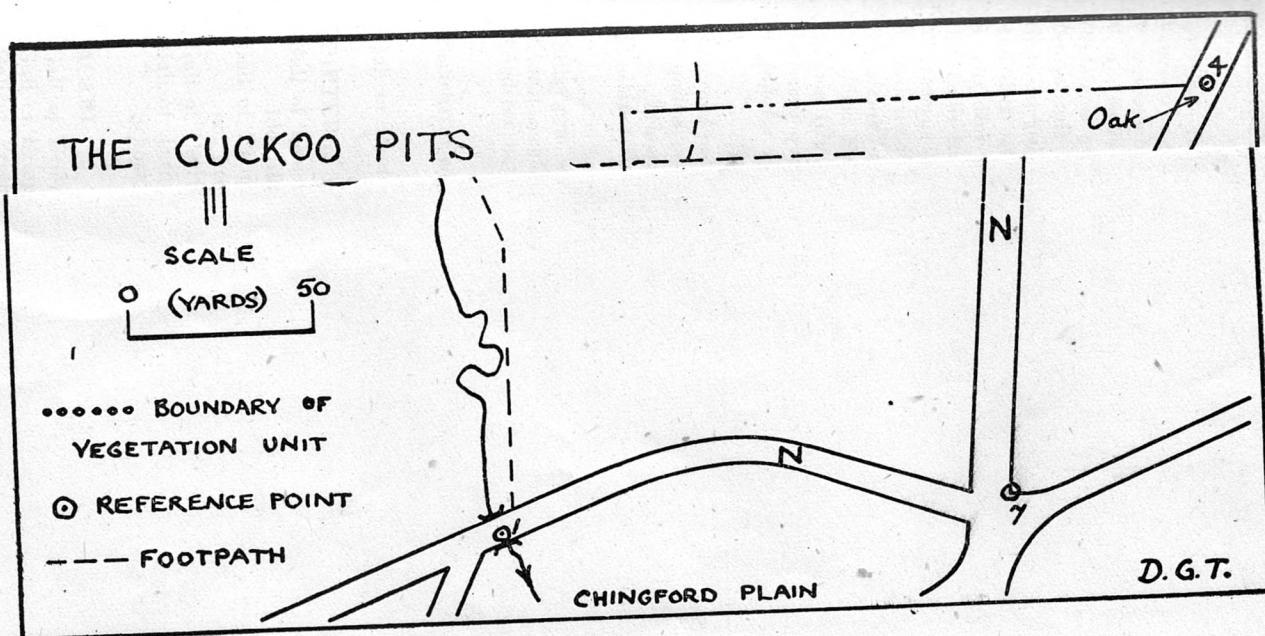
Hymenopterous flies that cause galls on oaks by oviposition are frequently of alternating generations, one generation being sexual and the other agamic; this is the reason for using the term "form" in the appended list. If galls of one generation of a fly are found it is fairly safe to deduce that the galls of the succeeding generation will occur in due course, but in an area like that which has been under survey it does not follow that the galls of the succeeding generation will be easily found.

It is of interest that some galls that were observed in the area (or close to it) in years prior to the commencement of the survey have not been seen there since the survey began. Such are *Andricus foecundatrix* Hartig, form *pilosus* Adler, F; *A. inflator* Hartig, N; *A. solitarius* Fonscolombe, M; and *A. quercus ramuli* L., near M. Galls of *Andricus occultus* Tschek (which, it is highly probable, is the alternate generation of *A. solitarius*) are rarely found in Epping Forest, but two flies identified as this species were captured on an oak tree on Pear Tree Plain on April 30, 1944.

TABLE 7. LEPIDOPTERA (NYMPHALIDAE TO HESPERIDAE).

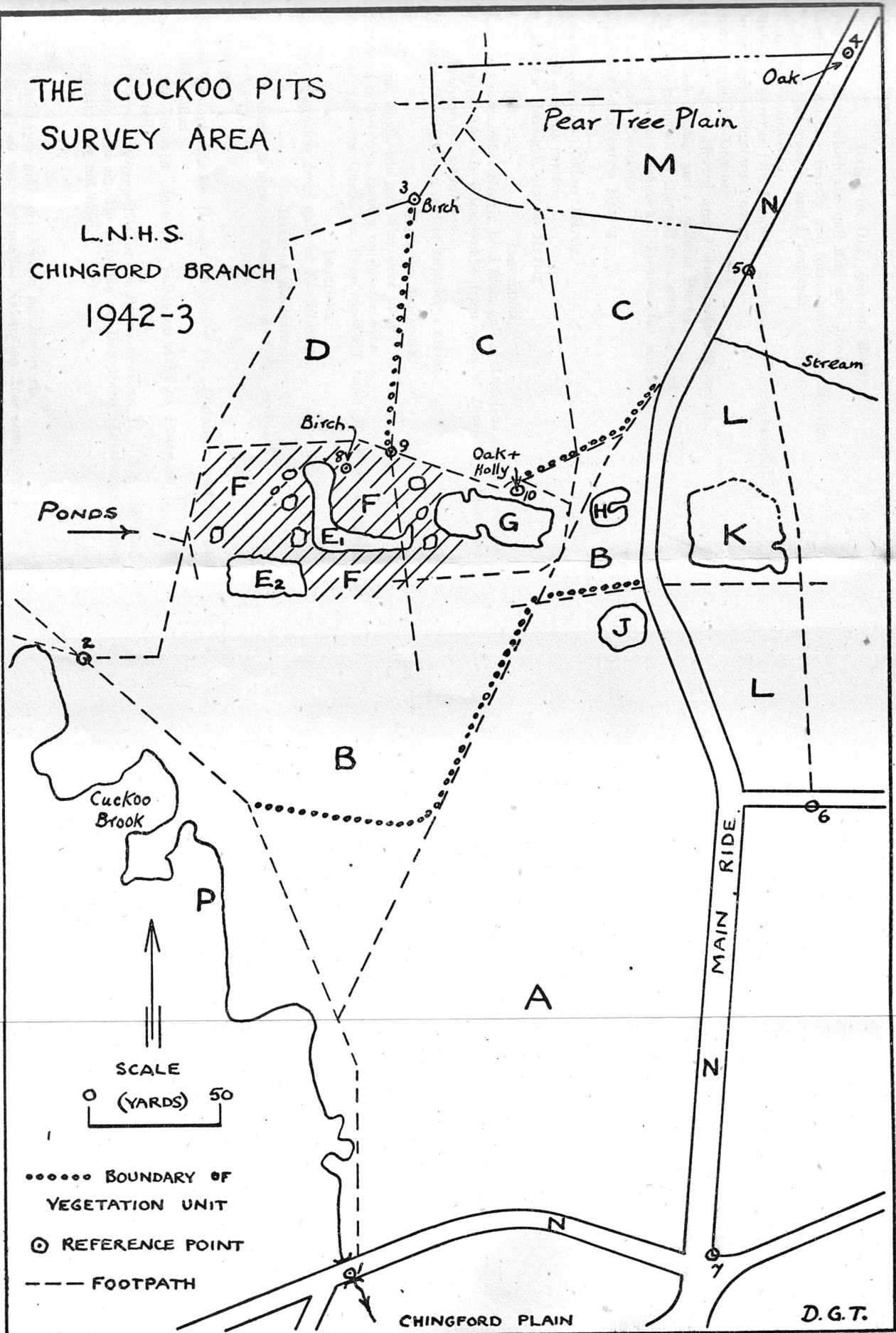
Species.	Relative abundance.	Area.	Normal Food Plants.	General Data.	
				Considerable seasonal variation in numbers.	General Data.
<i>Pararge megera</i> L.	F	Open Spots	Various grasses, e.g. <i>Dactylis glomerata</i> , <i>Poa annua</i> , etc.	Considerable seasonal variation in numbers.	Frequent each year; breeds.
The Wall Butterfly					
<i>Mantola jurtina</i> L.	F	M	<i>Poa. pratensis</i> , but other meadow grasses are eaten.	Frequent each year; breeds.	Frequent each year; breeds.
The Meadow Brown					
<i>Coenonympha pamphilus</i> L.	A	M	<i>Poa annua</i> , <i>Nardus stricta</i> and possibly other grasses.	Migrant; big variations from season to season.	Migrant; big variations from season to season.
The Small Heath					
<i>Vanessa atalanta</i> L.	F	Open Spots	<i>Urtica dioica</i> .	A purely migratory species; a possible Summer brood in some seasons.	A purely migratory species; a possible Summer brood in some seasons.
The Red Admiral					
<i>Vanessa cardui</i> L.	O	M	Most species of thistle, also nettle.	Larvae often found in large numbers.	Larvae often found in large numbers.
The Painted Lady					
<i>Aglais urticae</i> L.	A	All Open Spots	<i>Urtica dioica</i> .	Breeds in outer area and possibly at area M.	Breeds in outer area and possibly at area M.
The Small Tortoiseshell					
<i>Nymphalis io</i> L.	F	M	<i>Urtica dioica</i> .	Breeds in outer area; increasing in numbers.	Breeds; status in some years F.
The Peacock					
<i>Polygonia c-album</i> L.	O	M and Marsh	<i>Urtica dioica</i> .		
The Comma					
<i>Limenitis camilla</i> L.	O	Marsh Paths and rides	<i>Lonicera Periclymenum</i> .		
The White Admiral					
<i>Polyommatus icarus</i> Rott.	O	M	<i>Trifolium</i> spp. <i>perpusillus</i> .		
The Common Blue					
<i>Celastrina argiolus</i> L.	O	—	<i>Hedera helix</i> , <i>Ilex aquifolium</i> .	Probably breeds in Holly belt.	Probably breeds in Holly belt.
The Holly Blue					
<i>Lycæna phlaeas</i> L.	F	M	<i>Rumex</i> spp., also <i>Senecio jacobaea</i> .	Probably breeds at M.	Probably breeds at M.
The Small Copper					
<i>Pieris brassicae</i> L.	O	M and Marsh	<i>Brassica</i> spp.	Migrant; breeds in gardens but may feed on wild plants.	Migrant; breeds in gardens but may feed on wild plants.
The Large White					
<i>Pieris rapae</i> L.	F	M and Marsh	<i>Brassica</i> spp.	Migrant; more constant in status than <i>P. brassicae</i> .	Migrant; more constant in status than <i>P. brassicae</i> .
The Small White					

Species.	Relative abundance.	Area.	Normal Food Plants.	General Data.
<i>Pieris napi</i> L.	F	Well Dist.	<i>Barbarea vulgaris</i> , <i>Cardamine pratensis</i> , etc.	Fairly constant in status; breeds.
The Green Veined White				
<i>Colias croceus</i> Fourc.	R	M	<i>Trifolium</i> spp., etc.	Rare migrant.
The Clouded Yellow				
<i>Gonepteryx rhamni</i> L.	F	Well Dist.	<i>Rhamnus</i> spp.	Breeds in outer area.
The Brimstone				
<i>Erynnis tages</i> L.	O	M	<i>Lotus corniculatus</i> .	
The Dingy Skipper				
<i>Pyrgus malvae</i> L.	F	M and Marsh	<i>Potentilla</i> spp., <i>Rubus</i> spp.	Breeds, area M.
The Grizzled Skipper				
<i>Thymelicus sylvestris</i> Poda ...	O	M and Rides	<i>Holcus lanatus</i> , <i>Brachypodium sylvaticum</i> .	Breeds, areas M and N.
The Small Skipper				
<i>Ochlodes venata</i> Bremer	F	Well Dist.	<i>Dactylis glomerata</i> , <i>Brachypodium sylvaticum</i> , <i>Holcus lanatus</i> .	Breeds.
The Large Skipper				



THE CUCKOO PITS SURVEY AREA

L.N.H.S.
CHINGFORD BRANCH
1942-3



HYMENOPTERA.

GALLS ON OAK, *Quercus Robur* L.

- (a) Galls from which the gall flies were bred.
Neuroterus tricolor Hartig and form *fumipennis* Hartig.
N. quercus baccarum L. and f. *lenticularis* Giraud.
N. aprilius Giraud.
Diplolepis quercus folii L. and f. *taschenbergi* Schlechtendal.
Trigonaspis megaptera Panzer.
Biorhiza pallida Olivier.
Andricus ostrea Hartig, and f. *furunculus* Beyerinck.
A. curvator Hartig and f. *collaris* Hartig.
 (b) Galls from which the gall flies were not bred.
Neuroterus albipes Schenck f. *laeviusculus* Schenck.
N. numismalis Fourcroy.
Diplolepis longiventris Hartig.
D. divisa Hartig.
Adleria (Cynips) Kollari Hartig.
Andricus quercus corticis L.
A. inflator Hartig f. *globuli* Hartig.

INQUILINES.

- Synergus incrassatus* Hartig bred from gall of *Andricus quercus corticis*.
S. gallae pomiformis Fonscolombe from galls of *Biorhiza pallida* and
Trigonaspis megaptera.
S. albipes Hartig from gall of *Diplolepis divisa*.

GALLS ON ROSACEAE.

- Galls from which the gall flies were bred.
Rhodites eglanteriae Hartig on *Rosa canina* L.
Rhodites nervosus Curtis on *Rosa canina* L. and *R. arvensis* Huds.

INQUILINE.

- Perichlistus caninae* from galls of *Rhodites* sp

GALL ON SALICACEAE.

- Gall of *Pontania bridgmani* Cameron on *Salix caprea* L.

DIPTERA.

- Gall of *Lasioptera rubi* Heeger on *Rubus* sp. Dipteran bred but not identified.
 Gall of *Rhopalomyia ptarmicae* Vallot on *Achillea Ptarmica* L. Fly not bred.
 Gall of *Perrisia flicina* Kieffer on *Pteris aquilina* L. Fly not bred.
 Gall of *Anthomyia signata* Brischke on *Dryopteris (Lastrea) Filix-mas* Schott. Fly not bred.

ACARI.

- Gall of *Eriophyes gibbosus* Nalepa on *Rubus* sp.
 Gall of *Eriophyes macrorrhynchus* Nalepa on *Acer campestre* L.
 Gall of *Eriophyes similis* Nalepa on *Prunus spinosa* L.