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LONDON NATURAL HISTORY SOCIETY

A HAND LIST OF THE PLANTS OF THE LONDON AREA

Compiled by
DOUGLAS H. KENT and J. EDWARD LOUSLEY

1951-57

Supplement to London Naturalist, 30-36

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ERRATA

p. 16, line 19 : *For* AUBRETIA *read* AUBRIETA.
p. 17, line 4 up: *For* Gilib. *read* Usteri.
p. 24, line 7 up: *After* Alien *add* Europe, including parts of Britain.
p. 51, line 1 : *Delete* O. FLORIBUNDA Lehm.
p. 69, line 20 : *For* PURPURASCENS *read* SUBPURPURASCENS.
p. 71, line 17 : *After* Green Street Green *add* near Farnborough: *H.M.P.*
p. 134, line 18 up: *Before* Bombed sites *add* V.-c. 21.
p. 153, line 6 : *For* 21 *read* 20.
line 7 : *Before* Hackney *add* V.-c. 21.
p. 179, line 12 up: *Delete* casual.
p. 206, line 1 up: *After* at *add* Hone; F. R. Mount's Wood, Swanscombe, 1952: *H.M.P.*
p. 207, line 1 : *Before* little *add* V.-c. 17.
p. 208 : *Delete* line 1.
p. 259, line 10 up: *For* CILODENDRON *read* CALODENDRON.
p. 265, line 8 : *For A.P.S. read A.E.E.*
p. 290, line 20 up: *For* S. CARICIS read SCIRPUS CARICIS.
p. 303, line 7 : *For* Esher *read* Ewell.
line 13 up: *For* C. E. Hubbard *read* F. T. Hubbard.
p. 313, line 1 up: *For L.H.B. read L.B.H.*

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In this work there are represented 130 families, 651 genera, 1835 species (including 260 microspecies of *Capsella*, *Viola*, *Rubus* and *Hieracium*), 19 subspecies, 268 varieties, 33 forms and 113 hybrids. The records and determinations have been contributed by 392 helpers.

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NATURAL HISTORY

THE LONDON NATURALIST

The Journal of the

LONDON NATURAL HISTORY SOCIETY

No. 37 for **1957**

PRICE TEN SHILLINGS

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BRITISH MUSEUM NATURAL HISTORY

THE LONDON NATURALIST
No. 37 for the year 1957

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** Reprints are available of these articles*

The Society 1858 to 1957

THE history of our Society was surveyed in the two Presidential Addresses of the late L. G. Payne, "The Story of our Society," delivered in 1947 and 1948*. In the present issue we have attempted to cover the ground in a different way, with contributions from four of our members who have each played a prominent part in guiding the Society's affairs. We begin with the first part of the Presidential Address delivered by Mr. C. P. Castell on the occasion of the Society's centenary meeting at Church House on March 11, 1958. Then follow some personal reminiscences of the early days contributed by Mr. L. J. Tremayne—who was President of our North London parent society as long ago as 1899, and of the L.N.H.S. in 1930-1—and by Mr. C. L. Collenette, President in 1937-8. Finally Mr. L. Parmenter, President in 1949-51, deals with the last thirty years of the Society.

*Available as reprint No. 55, price 6d.

The Society's First Sixty Years

By C. P. Castell, B.Sc., F.G.S.

The London Natural History Society arose from the union, in 1913, of the City of London Entomological and Natural History Society and the North London Natural History Society, but this year we are celebrating the Centenary of the founding of the parental Haggerstone Entomological Society.

In April, 1856, the first number of the *Entomologists' Weekly Intelligencer* appeared, price 1d., evidence of the existence of considerable interest in entomology at that time. Two years later, a letter from Henry Aris appeared in the issue for April 12, 1858; it stated that "As many entomologists reside in the N. of London, I think a local society might be formed. I am ready to assist in the construction if anyone will step forward and make a beginning." On June 10, 1858, the original convening meeting was held, with seven entomologists present. The formal inauguration of the Society of 20 members took place on June 17.

By the end of the year the membership had grown to 35 and Edward Newman had become a prominent member. The subscription was a penny a week and members met every Thursday evening from 9 till 10.30 at the Carpenter's Arms, Martha Street, Haggerstone. In the first year, the Society started a Library, spending 19s. on books in the first quarter and in the second 30s. for Wood's *Index Entomologicus* in four volumes, with supplement, 1839. This original purchase is still in our library.

Nine months later the Society took over a large room above the Brownlow Arms, Brownlow Street, Haggerstone (now Dalston), which remained its home for nearly 30 years (Plate 1). In apparent deference to the views of some of the members who would have preferred to hold the meetings in a private house, the Society's address was given as No. 10 Brownlow Street, the actual number of the public house.

By 1860 membership exceeded 60 and not only was a library being built up but a collection too, for in that year a 40-drawer cabinet was acquired. By 1867 the Society possessed 200 entomological and botanical books and 2,000 specimens, and in the following year the Society even

paid part of the expenses of a member to collect in Scotland on its behalf and also held its first Annual Exhibition. By 1870 the Exhibition was so popular that visitors queued outside before opening time and a report stated that " the Exhibition passed off in a most quiet and orderly manner and not an insect received the slightest injury." Membership exceeded 100 by 1874.

In his Presidential Address of 1908, A. W. Mera remembered going as a visitor in about 1878 to one of the meetings in a spacious room over the bar at the Brownlow Arms, " each member being provided with a long clay pipe, while the necessary refreshments were provided from below, under which soothing influences the science of Entomology was keenly pursued. . . . Now things have changed and for many years we have been fortunate in being able to hold our meetings in surroundings more appropriate if less convivial." These were the palmy days of the Society when its room was the meeting place of almost all the best-known entomologists such as Doubleday, Stainton, E. Newman and S. Stevens.

In 1887 a combined agitation among members to get away from licensed premises and to a more central position resulted in the removal to Albion Hall, London Wall, and the new title of the City of London Entomological and Natural History Society.

1891 was an important year, marking the first appearance of the Society's *Transactions*. Before this date, accounts of the meetings and some of the papers read were published in various entomological journals. In volume 1, we learn that there were 80 members, the annual subscription had gone up to 5s., and meetings took place on the first and third Tuesday of each month from 8 till 10 p.m. at 33 Finsbury Square. The *Transactions* were mostly the proceedings of the meetings, with details of exhibits, short papers and discussions. In that year Dr. Buckell read a paper on " The Lepidoptera of a London Garden " and called attention to the need for the compilation of a list of the fauna of the London District. Early in 1892 the Council was appealing for records made since 1880 and defined the London District to mean within 10 miles of Charing Cross, including South London. Although the Society was overwhelmingly lepidopterist, yet there were members interested in other branches of natural history, giving a little justification for the title Entomological *and* Natural History Society. The President, Dr. J. A. Clarke, was appointed recorder for Birds, F. J. Buckell for Lepidoptera and H. Heasler for Coleoptera. The Society was now meeting at the London Institution, thanks to the friendly offices of Lord Avebury.

In 1893 Dr. J. A. Clarke gave as his Presidential Address a review of the list of London Birds compiled for the Society's London Fauna Lists, but it does not appear to have been published.

A conversazione was held in 1895 and " the hum of conversation was pleasantly interrupted at intervals by vocal and instrumental selections arranged by the organist of St. Andrew's, Plaistow." One member exhibited *twenty* drawers of " Micros " which were " universally admired." Mr. F. J. Hanbury provided " rare and extinct " (or should it have been exterminated ?) dried British plants, chiefly orchids. There were stuffed birds, nests and eggs and a fine display of 20 microscopes. In contrast to this enthusiasm, we are reminded in the Annual Report that the Society, for the first time for many years, had " paid its expenses entirely out of its own pocket without accepting generosity at the hands of its worthy Treasurer, whose purse strings have been found to be loosely tied when

the needs of the Society became very pressing." But the Society still owed him £5 10s. on account of previous deficits. A MS. list of records of Coleoptera of the London Area was placed in the Society's library and represented more than half the total number of British species.

1896 is recorded as " memorable for the Society's debt to the Treasurer of £16 5s. 8d." The Society was " wallowing in financial mire " and the Treasurer had resigned, but " not without a crowning act of benevolence. The Treasurer at one fell swoop, actually, but not morally, annihilated that part of the debt due to him by paying £5 of it for life membership and presenting the balance of £1 11s. 2d. as a donation. What can be said of generosity like this ? " We gained our first life member, but there was still £9 14s. 6d. due to the Secretary.

The Conversazione of 1897 was enlivened not only by a demonstration of X-rays and an address by Lord Walsingham, but by songs, pianoforte solos and trombone solos. The Council complains that " our young men are afraid they cannot write anything to which it would be worth the Society's while to listen " and that " if a man has reached the age of 40 without reading a paper it is pretty certain he will never read one." Membership is down to 63 and the subscription up to 7s. 6d.

The President, J. W. Tutt, drew attention in 1898 to the existence of a rival natural history society north of the Thames and recommends an immediate union, adding that " the present condition is scientifically deplorable." His advice was apparently ignored. This was the year of publication of the first part of the " Lepidoptera of the London District " by J. F. Buckell and L. B. Prout.

In spite of the patronage of Lord Walsingham, Sir John Lubbock and H. T. Stainton and the presidency of such eminent entomologists as J. W. Tutt, L. B. Prout, Dr. J. A. Clarke and A. W. Mera, the Society continued for the next fourteen years as a society of Lepidopterists with its membership stagnating between 70 and 80 before dropping to 67 in 1913. In 1906, the Secretary had complained that " for some occult reason it is apparently impossible for the Society to secure more than 70-75 members." There were repeated complaints in the annual reports that visitors were rarely seen at the meetings. It is clear from the *Transactions* that the meetings were run by a small body of enthusiastic and a few very eminent lepidopterists. The scientific value of their work and of the papers in the *Transactions* was remarkable for such a small band of workers ; but that, by itself, was insufficient to maintain the Society.

We must now turn to the Society which had become such a serious rival in 1898, and go back to 1886 when four boys at the Grocers' Company's School at Hackney formed the Clapton Naturalists' Field Club, holding meetings at the members' houses. The frontispiece of the *London Naturalist* for 1929 shows a party of these and other boys, aged about 15 to 17, on a day's excursion at Folkestone in May, 1888. The four founder members continued a life-long membership of the Society. Later in 1888, a meeting room was offered at the school and the title was changed to the Grocers' Company's School Science Club, and the President was J. W. Gregory who became an eminent professor of geology.

The Society grew rapidly and at about this time S. Austin, A. Bacot, M. Culpin, R. W. Robbins and L. J. Tremayne joined, all serving in later years as Presidents. Mr. Tremayne is the only survivor, and until recent years he served the Society continuously, holding at one time or another almost every office both of the Society and of its sections.

In 1892 the Society began meeting at the North East London Institution, Dalston Lane, and changed its name to the North London Natural History Society, the eminent botanist F. J. Hanbury being its first President and Tremayne its Secretary.

The North London Society had from the start much wider interests than the City of London Society, all branches of natural history, including astronomy, meteorology and geology finding a place in its programme. There were monthly field meetings, an evening meeting twice a month and a debate every six months. It is interesting to note that a Miss Nicholson gave a description of her summer holiday in 1893, when " persons desiring to become members could obtain full particulars from the Secretary." Next year we see the word " persons " replaced by " ladies and gentlemen " and Miss E. L. Simmons was giving some notes on *her* holiday. She was on the Council the following year and had married the curator, Mr. R. W. Robbins, in 1897. Last year her sister presented the portrait of Mr. Robbins which hangs in our Library. Was this welcome to ladies, combined of course with the equally broadminded natural history outlook, one of the secrets of the Society's success ? Its rival waited until 1910 before admitting a lady member and then apparently only because her husband joined as well.

One of our oldest members is our Hon. Vice-President, Mr. Oliver G. Pike, the famous bird photographer, who joined in 1897 and gave a lantern lecture entitled " Notes on the nesting habits of birds." I was surprised to find that, in 1902, Mr. Pike lectured on " The Haunts of our Rarer Birds," illustrated by lantern and *cinematograph*, and Mr. T. Jessop lectured on " Colour Photography " with lantern illustrations, presumably also in colour.

What appears to be the first publication of the North London Society other than its programme, is the slim Annual Report for 1904, which continued in that form until 1914.

The Society was now meeting on the second and fourth Tuesdays at 7.45 at the Hackney Technical Institute. The meeting room, with the library and collections, was open every Tuesday evening from 7 till 10. The subscription was 5s. and membership 78. There was now a Research Section, with four Research Committees—Botany, Biology, Lepidoptera and Protection (the preservation of Fauna and Flora, Footpaths, etc.). Here we see the origin of some of our present sections. We also see the first definition of the Society's area, as within 20 miles of St. Paul's, North of the Thames, and the adoption of 12 divisions for recording purposes.

In 1907 our Hon. Vice-President, Mr. C. L. Collenette, joined the Society and gave a lantern lecture on " Observations on Birds in the neighbourhood of Epping Forest." The following year he was on the Council and had initiated an Ornithological Research Committee and so, 50 years ago, arose our Ornithological Section, which must now be the largest local ornithological society in the country, if not in the world.

It was now the turn of the North London Society to face the occult restrictive influence on its membership, which persisted at about 100. It was decided to combat this by moving headquarters to the City and, in 1909, a room was engaged in Salisbury House, Finsbury Circus. The same year also saw the formation of the Archaeological Committee, with Tremayne as Secretary, and the inauguration of the Chingford Branch. By the end of the following year, membership had jumped to 143. The

Ornithological Committee was already co-operating with the Bird Ringing Scheme just initiated by the *British Birds* journal, and had ringed 155 birds of 16 species. One is startled, however, to read that the type collection of British birds' *eyes* is growing until we see that an oological cabinet is being purchased to house them.

In 1911, the Chingford Branch had the remarkable number of 600-700 visitors to its Exhibition. So Mr. Collenette, not to be outdone by Chingford, formed a Woodford Branch which in 1912 had an audience of more than 120 to hear Oliver Pike's lecture "In Birdland." The Society's membership was now 211.

1913 was a sad year for many members of the City of London Society, when it was decided to merge with its stronger rival. Both societies were now meeting in Hall 20, Salisbury House, on alternate Tuesdays, but on November 4 they met together and sanctioned amalgamation to form the London Natural History Society. Neither of the societies' finances was flourishing and the new one started 1914 with £15 joint Life Composition Funds and balances of £1 8s. 9d. from the City of London Society and 5d. from the North London Society. The 20 mile radius for the Society's area was immediately extended South of the Thames.

An interesting experiment was started in 1913 in the setting up of a bird sanctuary by arrangement with the owner of a piece of woodland, Hatch Grove, at Chingford. Nesting boxes were set up and nestlings ringed, but by the end of 1914 a new owner cancelled the arrangement and the Society had to abandon the scheme. The effects were sold and realized enough to buy Vols. 1 and 2 of *British Birds* for our library.

The Woodford Branch became a war casualty in 1916, but surprisingly enough, the height of the war saw the inauguration of the present system of sections in 1917 in place of the Research Committee, i.e. Archaeological, Botanical, Lepidoptera, Ornithological and a new Plant Gall Section. In 1920 the Society moved its headquarters to Winchester House, Old Broad Street, where it remained until the transfer to the London School of Hygiene and Tropical Medicine in 1930. Up till now meetings had been held for many years on the first and third Tuesday in each month, but from 1931, except for the war years, weekly meetings have been held.

Until 1921 the Society's publication was in the form of *Transactions* which included the proceedings of the meetings, but in that year they ceased to appear and the title was changed to *The London Naturalist*.

The North London Society in 1892 and onwards

By L. J. Tremayne

The charm of the original Grocers' Club was its schoolboy friendships and butterfly-collecting. We were few, but we knew one another more or less intimately. The original syllabus I think was slight—only a few meetings and fewer excursions. But there was a great deal besides that. There were rowing excursions up the Lea. There were even bathing excursions in the Lea, the thought of which still makes me shudder. Based as we inevitably were upon Epping Forest, some of us were always likely to be prowling about there every week-end, and were always liable to meet others of us on the same prowl. I did not take part in all these outings, because I lived on the other side of London. But I was often at Clive Smith's house, and took part in many of them. Nor were we confined to Epping Forest. We had an annual excursion to the New

Forest at Whitsun, which for some of us was the greatest event of the year. And we had plenty of excursions elsewhere.

Even after we were turned out of the School and became the North London Natural History Society the same conditions still obtained. The men who now joined the schoolboys—Louis Prout, Arthur Battley, Charley Nicholson and others—no doubt brought with them a more scientific interest in the study of Lepidoptera. No one could associate Prout, for instance, with anything but entomology of the most serious kind. But he was a thoroughly good fellow and a pleasant companion. And so were they all. We remained a local body united by friendship and common interests.

We held an annual Exhibition, somewhere about Christmas, which half the town came to see.

On a walking tour in the Chilterns in 1904, led by Arthur Bacot, I first made the acquaintance of Edmund Browne Bishop, who had recently joined the Society, an acquaintance which quickly ripened into a lifelong friendship, and has given me some of the happiest days of my life.

Meanwhile the Society was slowly and imperceptibly changing and expanding. The lady members, I think, were a pretty early development. They were not brought in without a certain amount of opposition, and one promising young member indignantly resigned in disgust. But they soon made good and prospered.

Then there were the inevitable gains and losses. Arthur Battley died young. Charley Nicholson in time retired to the depths and wilds of Cornwall. Prout retired into the Museum, gave up his life to the Lepidoptera and became a world specialist on the Geometridae. Jim Simes (one of the schoolboys) left us early, became a Public Messenger to the Post Office, and an authority on the butterflies of Europe. He rejoined the Society many years later.

But before Prout retired he prevailed upon the Council to institute four private committees for research work in entomology, botany, biology and protection (spoliation). Note that there was no committee for ornithology.

On the other hand new members were constantly coming in, some of great importance. Such were John Oldham Braithwaite, the chemist, who founded the Chingford branch, and Cyril Collenette, who later brought in the Woodford branch, and recently completed fifty years of valuable service to the Society. Collenette came to us as an ornithologist, and repaired Prout's omission by forming an ornithological research committee, a work in which I had the privilege of assisting him. But perhaps our greatest acquisition was that powerful personality Charles Smith Nicholson, F.L.S., who ultimately became President, and our presiding genius for some years.

But all this time the Society had not remained at the Hackney Institute. From there we moved to the Sigdon Road Board School, and when we had to leave that, came the great change. After a great deal of hesitation and deliberation we moved to the City. I fancy C. S. Nicholson was largely instrumental in this. I had been advocating it for some time.

Equally slowly, but surely, the character of the Society must have been altering all this time.

Any extension of our interests must at first, I think, have been based upon Randolph William Robbins, one of the greatest members the Society ever had, who spent his whole life, from his school days until he

retired into Devon shortly before his death, in the Society's close service. Robbins was one of the few among us who had other interests than lepidoptera. He was always a keen botanist. But he was interested in nearly all sciences, and many other things as well. C. S. Nicholson was a botanist pure and simple. Austin took up ornithology and archaeology. Bishop brought in a warm interest in botany, as well as a general love of natural history. Collenette gave a great impetus to ornithology, and later diverged into other branches.

In 1915 we gained a most important new member in Harold Burkill, who brought in the study of plant galls, hitherto untouched by us. He quickly threw himself into the Society's work, soon became an official, and remained a most devoted, loyal and valuable servant of the Society for many years practically up to the time of his death.

With the move to the City the character of the Society changed. We were no longer a local body, appealing only to N.E. London. We were now the *London* N.H.S., appealing to everyone within reach of London. The change took a little time to get going, but the effect was certain, and we presently began to attract members from all points of the compass.

Then came the crash, the 1914-1918 War, scattering us in all directions. Many were on service, many others in civilian jobs. The Society, naturally, got into a bad way. It did manage to survive, but not by much.

By way of resuscitation, the sections were formed just before the end of the war. Prout's research committees were thrown open to all members. The scheme was only carried after great opposition, but it was sound, and it worked, though it took some time to work. The election of J. P. Hardiman in 1921 gave a great impetus to the Ornithological Section, which for a time carried the Society on its back.

The North London Society in 1907

By C. L. Collenette

Fifty years ago the North London Natural History Society, as it then was, numbered 70 full members, with 28 associates, the latter living too far from London to attend meetings.

At the present time, the young naturalist can acquire or borrow well illustrated text-books on any subject, scan more periodicals than he can read and hear of more meetings than he can possibly attend. Half a century ago it was perhaps not so easy. The writer searched for his wild flowers in John's *Flowers of the Field*, which had no adequate illustrations ; the Lepidoptera in Furneaux's *Butterflies and Moths*, which gave only a small selection of the smaller moths ; and birds from the then very exciting and beautifully illustrated books by Richard Kearton and Oliver Pike. The weekly *Country-side*, first published in 1905, and *British Birds*, which appeared in 1907, opened a new world. Then, at last, one heard of a Society where one could meet, once a fortnight, people who really thought natural history a most absorbing occupation, and did not smile in a superior fashion if one was seen with a butterfly net or occupied a corner of the garden with wild plants. There was a very friendly and welcoming spirit at these meetings, and perhaps owing to the late hour of starting, many came early to talk and compare notes.

We met at the Amherst Club, Stoke Newington, with two meetings a month, for which members paid an annual subscription of five shillings. Meetings commenced at 8 p.m., illustrating the fact that hours of business

were long and that some members lived close enough to walk to the meetings. There were few evening attractions in those days, and the more prominent members attended every meeting irrespective of subject. The average attendance reached one-third of the membership. Exhibits were sometimes surprisingly numerous, with the emphasis on botany, and with the insects a good second. This did not prevent ornithology from providing the most popular meeting of 1907—a slide lecture by Oliver Pike —which filled the small room to overflowing. Meetings finished late, and the writer vividly remembers his unlighted walk in winter past the lake in Highams Park and across the Woodford Golf Links.

Official excursions were not numerous, and the Society virtually closed down in July and August, in deference to the almost universal custom of seaside holidays in those months. In the winter months, Mr. and Mrs. Clive Smith of Highgate ran a club known as the Chingford Plain Hockey Club, which appeared in no official report, but was supported exclusively by Society members. Arthur Bacot was a very efficient back, and Dr. and Mrs. Greenwood played, the latter in goal, where her long skirt was very useful. Some of the members walked in Epping Forest during the morning and returned for the game, and we won several of our matches, particularly on our own ground, which was somewhat rough. After two or three seasons it became more difficult to raise a team and play ceased.

In 1907 the Society's accounts showed a deficit of £4, or nearly one-fifth of the total income, and there was talk of raising the annual subscription. "Sending round the hat" was vetoed by the Council, although this method was employed in other cases—for an insect cabinet, and, somewhat later, for a cabinet to house the Society's collection of birds' eggs and again for fencing and nesting boxes for the new bird sanctuary. In this case, with the unofficial approval of the younger members of Council, a subscription dance was held in aid of the funds, in the Morley Hall, Leytonstone, organized by S. W. Bradley and the writer. It was well attended and a great success in every way but one, as the Society benefited to the extent of only five shillings.

The Years 1927 to 1957

By L. Parmenter

In 1927, the Society had its first big jump in the numbers of new members enrolled. Twenty-seven had been elected in 1926, but in 1927, 65 joined. Lord Grey of Falloden, K.G., P.C., became our first Honorary President and Messrs. F. J. Hanbury and L. B. Prout, members since 1892 and 1906 respectively, our first Honorary Vice-Presidents. New rules and a new type of Programme were produced. The membership of the Society consisted of 279 members and associates. The sectional rolls were :—Archaeology 50, Botany 61, Entomology and Plant Galls 53, Ornithology 98, Ramblers 35 and Chingford Branch 42.

A Society's growth, influence and strength depends partly on the personalities of its members (and particularly of its officers) and on the amount of time, energy, knowledge and money they can devote to the Society's activities ; and partly to external influences. By 1927, few of the old City of London Entomological Society were left. They included the Rev. C. N. Burrows, Dr. E. A. Cockayne and Messrs. R. Adkin and C. H. Williams. However, from the other parent society, the North London Natural History Society, were several who had become important

in the Society's ranks—Messrs. S. Austin, E. B. Bishop, C. L. Collenette, F. G. Dell, A. B. Hornblower, L. B. Prout, R. W. Robbins and L. J. Tremayne.

It seemed that at last the effects of the 1914-1918 War had been overcome and expansion was in the air. The depression was to come, also transport strikes and, far greater and more disturbing, another war. The Society has emerged through all these troubles with increasing strength. The difficulties tended to discourage the non-enthusiastic but gave greater freedom to the enthusiast.

Individuals join a Society for a variety of reasons and this has been our experience. Not all find fulfilment of their hopes or aims, but their reward to a large extent has depended on the amount and quality of their own work and co-operation in the Society's activities. Thus the virility of the various Sections and the success and number of their indoor and outdoor meetings, etc., has depended on the individuals who have been able to co-operate and on the amount and quality of that co-operation. Twenty-five of us are left out of the 279 of the Society of 1927. Of those who have died during the intervening period, the man whose influence in the Society was greatest during his lifetime, and is still evident in the Society's organization and research work, was R. W. Robbins. In the *London Naturalist* for 1941, a volume whose slimness was due to the war, there is a tribute to his work and character. One of the original schoolboy founders of the Clapton Naturalists' Field Club, in time to be the North London Natural History Society, he was an all-round amateur naturalist. Among his official duties in the Society he had been its President, and Secretary and Chairman of three sections—Botany, Ecology and Entomology. He read 56 papers to the Society over 50 years. There have been many others who have given excellent service to the Society, many that are still with us, but his contribution remains outstanding. His wisdom in Council, ability in the field and his charm as host at Limpsfield will be remembered always by those privileged to have known him.

In 1927, when the member's subscription was only 7s. 6d., the Society was operating at a cost of 13s. per head, the *London Naturalist* being published as a result of donations. In the volume for that year we see the commencement of a list of Plants of the London Area with R. W. Robbins as one of the three editors. This publication increased the keenness and numbers in the Botanical Section. The other sections had recording schemes—Archaeology its Church inspection reports, Entomology and Plant Galls lists of interesting discoveries, and Ornithology its annual list of the birds in the London area and reports on uncommon species. The Ramblers' Section had only been formed a year before but had commenced holding long week-end outings in addition to the regular all-day meetings every month. R. W. Robbins became Chairman of the reformed Entomology Section in 1928 when it separated from the Plant Galls Section.

In 1928 W. E. Glegg became President after serving as Secretary to the Society for several years. He was becoming known throughout the country as a competent ornithologist, preparing his *History of the Birds of Essex* of 1929 to be followed in 1935 by his *History of the Birds of Middlesex*. He inspired the Ornithological Section which was expanding steadily. In this year, the first *List of the Birds of the London Area* was produced, summarizing the Society's records. The Entomology Section brought out its first report on British Butterflies. The publications

of these two sections and the appearance of a further part of the botanical list undoubtedly increased interest in the Society and in these three sections in particular. Taking over the duties of recorder to the Ornithological Section and helping to produce the 1928 list, assisted by Messrs. S. Austin and C. S. Bayne, made me realize that most members wanted to help in some research project, however simple, and wished to make some contribution to the furtherance of the study of natural history. From a small local group our members were becoming known over a widening area as their contributions to the national publications were accepted, and as a result experienced naturalists joined our ranks.

In December 1948, L. G. Payne continued his history of the Society as his Presidential address, dealing with the period from 1914, the year of the amalgamation of the City of London Entomological and Natural History Society with the North London Natural History Society, up to 1945, the end of the Second World War. In his account he mentioned the effects of the two wars, the general strike, the world-wide depression and the transport strikes : all set-backs to the Society's progress but successfully overcome. Membership rose steadily. The 279 of 1927 has now grown to 1550. Newcomers in the period have totalled 3,596, 320 joining in 1957. From a Society small enough for all the active members to know each other we have become more specialized, and although the Ornithological Section outnumbers the other sections so completely, the average member is interested in other wild things as well as birds. The many all-round naturalists who have served on the Council and particularly as Presidents have helped to keep the broad viewpoint.

The growth during the period has brought changes in the meeting-places. In 1927 we were meeting in the basement of Winchester House, Old Broad Street, in the City. As the evening approached closing-time, lights were dimmed by the caretaker and at times an over-enthusiastic and eloquent speaker concluded his lecture in the dark. The library was hidden behind frosted glass doors panelling two sides of the room and the books were rarely borrowed. In 1930, our numbers had expanded to such an extent as to require new quarters and we were fortunate to be allowed to use the lecture rooms of the new London School of Hygiene and Tropical Medicine. The library installed in the basement was accessible, and became a focal point before and after meetings for more social chats than were possible in the formal atmosphere of the lecture rooms. The epidiascope was an improvement on our old equipment and with the occasional use of the film projector, the success of the lectures brought a flow of new members. Later, the Art Workers' Guildhall was used for many meetings and more recently we have been permitted to use the rooms of the Linnean Society at Burlington House, Piccadilly. The removal of the library and collections to the basement of 25 Eccleston Square, brought problems but also gave an opportunity to the sections to hold informal meetings and demonstrations, widening the scope of the indoor programme. There is still a need, however, for accommodation for the library and collections in the same building as that in which the weekly lectures can be given.

Prior to the 1939-45 War, the Society had held well-attended exhibitions each year, organized by Mr. C. L. Collenette, and the annual dinners of the Ramblers' Section had become the Society's Dinner. They enabled old friends to meet and potential members to sample the Society's organization and friendly atmosphere : busy days for the Secretary who

from 1926 to 1928 was Mr. J. P. Hardiman, a keen ornithologist and bird protectionist. He handed over to Mr. A. B. Hornblower, who continued as Secretary until Mr. H. A. Toombs took over in 1945 to be followed by Mrs. Small in 1956. To them and the two who served so long in their offices, F. G. Dell as Treasurer and H. J. Burkill as Minuting Secretary and the others of the 308 ladies and gentlemen who have served the Society as its Officers, Council or members of Sectional Committees, a great debt is due.

The two parent Societies, the City of London and the North London, were both started by entomologists. In the 1890's, research was the aim of the leaders of these Societies. Louis Prout and A. W. Bacot were becoming outstanding among British entomologists. They had able supporters in R. W. Robbins and L. J. Tremayne, the latter having served as Secretary during J. W. Tutt's Presidency of the City of London Society. Tutt, a great figure in British entomology, urged the amalgamation of the two societies in 1898 but this did not come into effect until 1914. By then, Research Committees were functioning and in 1917 these were reorganized as Sections.

It is this organization of research which Robbins and Tremayne fostered throughout the years and which became the backbone of the sections' activities. The evidence is in the pages of the *London Naturalist* and in the *London Bird Report* (which was first published separately in 1936 when the Society had passed the 500 membership mark). During the years 1927 to 1957, there have been 164 authors of papers in the *London Naturalist*, whilst in the shorter period the *London Bird Report* has had 33 authors. These journals, however, recorded the research work of a much larger number of members and friends. Although we have always had eminent taxonomists and biologists in our ranks, the bulk of our numbers have joined with little knowledge, aiming to acquire more and to assist in simple observational work in their first years with the Society. From the observations of members made in their spare time, the sections have organized comprehensive reports annually, from time to time summarizing the results. The same trend has been seen throughout the country and gave rise to the formation of the British Trust for Ornithology.

The Botanists commenced publishing in 1927, as previously mentioned, a List of Plants of the London Area, in the *London Naturalist*. In 1957, a second and greatly enlarged list, edited by D. H. Kent and J. E. Lousley, has been completed. The recorders numbered 393. The collection and publication of the data forming these lists has stimulated many botanists in and around London. The annual reports of the Ornithological Section were first summarized in 1928 and a steady increase in observers followed. By 1957, 1417 members and friends had sent in records. The standard of recording had risen during the years. The ecological viewpoint has been encouraged and with up to 336 recorders in a year the Area has been well covered. The culmination of the work was the publication of the *Birds of the London Area* in 1957 under the authorship of R. C. Homes and his Committee—Miss C. M. Acland and Messrs. C. B. Ashby, C. L. Collenette, R. S. R. Fitter, E. R. Parrinder and B. A. Richards. The co-operative studies during the period have been many. Among the outstanding were the Heron Census, Great Crested Grebe Census, Duck Counts, Starling Enquiry, Gravel Pit Enquiry and the Beddington Sewage Farm Survey. The 1928 list of birds totalled 192 species, but as many as 190 have since been seen in a single year and the total number of species is now 245.

Other sections have also secured co-operation among their members ; the Entomologists have had records from 322, whilst a Grey Squirrel report was based on the work of 131 observers. Even the more specialized work of the Geologists on Temporary Sections secured the support of 17 recorders. Again, among the Ornithologists, nearly 150 have joined in the Ornithological Section's bird-ringing schemes and up to and including 1957 had ringed almost 47,000 birds of over 150 species and secured many recoveries of great interest. The rising importance of the Society's ringing station at Beddington Sewage Farm is illustrated by their 1956 ringing total of 3,666 birds of 57 species.

In 1936, the increasing interest in ecology caused the formation of an Ecological Section under the chairmanship of R. W. Robbins. The surveys organized by the section at Limpsfield Common, Bookham Common, Cripplegate bombed site and at Coulsdon secured the co-operation in the field of many specialists. Before bombing stopped attendance at Limpsfield Common, over one hundred had joined in the work and a dozen published the results of studies made there. At Bookham Common, the numbers have been much larger ; even in 1945 over 50 visitors were present. The 31 authors of papers forming the annual survey reports for the Bookham Survey are based on the observations of many observers and Dr. G. Beven has recorded that 35 assisted him in his more recent bird studies there. The value of the papers has secured grants for publication from the Royal Society.

The Entomologists have been able to publish summaries of the status of certain orders of insects known to occur in the London Area. But the large number of species involved will prevent a rapid survey of all the London insect fauna.

During the period the sections have maintained a regular and varied programme of lectures and field excursions catering for both the expert and the beginner. Visitors have approved and have become members. But outside events have also influenced the growth of the Society.

Archaeology of the early twentieth century was based in most local societies on visits to churches and old buildings. With the influence of television and the excavations for new buildings, a trend has become evident towards more active field-work.

Botany has been favoured with a steady flow of illustrated books and progress in taxonomy. In schools, the emphasis has been on function and ecology with less attention being paid to the family characteristics by teachers who were more experienced in field work than those of the previous century. In addition, we have been fortunate in numbering amongst our sectional officials several of the leading botanists in the country, who also serve as officials in the Botanical Society of the British Isles. They have raised our standard of recording considerably.

Ecology has become a normal subject of study in many schools. It has also appealed to the many visitors to the various Field Study Centres.

Entomology has been aided by the need for increasing the number of specialists for work on pests during the wars, and by the consequent expansion in education for the greater number of posts abroad. The Royal Entomological Society, with an increasing world-wide membership, has grown greatly in usefulness during the period. Our Society has been fortunate in having had members who have become officials and Council members of the senior society. In fact the membership of so many

national and local societies by our own members has kept this Society well informed as to the present trends in the science.

The Ornithologists have particularly benefited by the programmes of the B.B.C. on radio and television. They have also gained several interesting sheets of water—the new reservoirs—the haunts of waders when under construction, of ducks and gulls when completed.

The Geologists have had opportunities for study created by the building boom after the wars. Excavations for building materials and on the building sites themselves have enabled original studies to be undertaken in and around the centre of London.

The Ramblers, at first concentrating on the field paths in our Area, have widened their interests, visiting famous houses, museums and factories that use natural resources.

The restrictions in travel during the thirty years imposed by war conditions and by transport strikes have been overcome, but they hindered the carrying out of the programmes. Plans have had to be revised as fares rose, but the Ramblers' excursion trains and the use of more motor coaches have enabled the sections to combine long trips with local visits. At Hounslow, the formation of a South West Middlesex Group has given those living in the neighbourhood the opportunity to organize lectures and excursions without having to spare time and money to join in the main society's functions.

The war of 1939-1945 possibly had the greatest effect on the Society's growth. L. G. Payne dealt with some of the life of the Society during the six years so vital to this island. With him I helped to move the library from the corridor at Keppel Street at the very hour when war was declared. Dr. A. Landsborough Thomson joined us in the corridor at that moment with a couple of his staff. Payne and I shared with other members another Sunday, during the early days of the war when our little British Expeditionary Force was retreating to the Channel. We stood on the ridge of the heath overlooking Oxshott station, listening to the thud of the guns thundering all day, thinking of D. A. T. Morgan and others of our members whom we believed to be in the midst of the shelling. Behind us and over us came a group of mixed aircraft setting forth for rescue work—Dunkirk Sunday. At first, the absence of the younger members was felt most, but when the bombing of London commenced, both field and indoor meetings were cancelled because of the blackout conditions. But we decided to hold a few meetings as soon as possible and at these we became closer knit, exchanging tales of the bomb damage to our homes or places of work and on travel conditions. The enjoyment of the few hours together in the field, or at the meetings which those of us in the Services were able to share with L. G. Payne, J. B. Foster, R. S. R. Fitter and others who were keeping the Society going, gave promise of a strong revival in due time.

In those years the surveys of the ecologists became the backbone of the outdoor programme for they brought the members of the various sections together. In those years also, the all-round naturalists commenced their planning for the days of peace. The wartime loss of several favourite haunts of our members encouraged the consideration of nature reserves and of conservation generally. C. P. Castell commenced his valuable studies preparing the reports for the Government. His work, so admirably supported by Miss C. E. Longfield, was helped by many members and has saved several areas from obliteration by building.

R. S. R. Fitter was writing his *London's Natural History* which when published in 1945 brought us many new members, a recruitment service he has continued with his later books and lectures.

But plans were also made by the Servicemen, and as they returned they took over tasks with a keenness and ability greater for their war experiences. Enthusiasm was catching and the rapid growth in the Society commenced. By 1949 we had passed the 1,000 mark. The projected Birds of London book was under way. The Baron de Worms produced a *List of Butterflies of the London Area*, fifty years after L. B. Prout and Dr. F. J. Buckell had published one for the City of London Society, then using an area with a radius of only 10 miles from the centre.

In 1950, a new list of plants was begun and an exhibition, the first since 1939, was held at the British Museum (Natural History). In the *London Naturalist* for the year, P. W. E. Currie wrote an editorial, probably the best we have ever had, full of suggestions for increasing the value of the journal and of the co-operative work of our members.

The following year, there came the move to the Linnean Society's rooms and by the next year the increasing interest in insects and mammals had emphasized the need for continuing the *London Naturalist* at 200 pages or so. It brought about an increase in subscriptions but no decrease in membership.

In 1953, the closer working with the University of London led to a series of lectures being arranged on our behalf. Dealing with subjects selected by the Council of the Society and often by lecturers proposed by the Society, the University since then has provided a number of lecture series of high standard and related to the amateur work that our members have been able to tackle.

In the remaining years we have seen the completion of the summaries on the status of our birds, plants and moths. New local surveys have been started. The study of mammals has increased. During the past thirty years we have seen a growing interest in conservation and ecology. Castell's reports on conservation in the Area and J. H. G. Peterken's and Dr. F. Rose's papers on the habitats in the London Area have shown the variety of opportunity for studies still available to those who live or work in London. During these thirty years we have seen beginners join the Society, gain tuition and encouragement, and emerge as leaders of the nation's naturalists, the writers and lecturers whose names are known throughout Britain ; and many have achieved world-wide recognition. Our Honorary Presidents—Lord Grey, Professor Gowland Hopkins, Professor Major Greenwood and particularly Professor H. Munro Fox, have encouraged and helped the Society.

We have come a long way from the two small groups of collectors of lepidoptera, the working men of Haggerston and the schoolboys of Clapton. Our future as a local natural history society, probably the largest local natural history society in the world, is assured. The Society's adaptability has been proven time and time again. Its usefulness will depend on the co-operation of its members and the encouragement given to them. The fauna and flora of London and its countryside is forever changing, and constantly needs preserving from spoliation. Of the hundreds of its insects that affect the lives of the plants and form the food of the birds little is known of their life histories, so that the scope for further discoveries remains open. In our area we have the encouragement of London University, the facilities of Kew, South Kensington and the other

research establishments, the best of the science libraries and the homes of the national scientific societies : an excellent habitat for a natural history society.

In the years to come, the Society's role in the education of new naturalists will continue at lectures, discussions and in the field. The flora and fauna will be studied more intensively. May the Society long continue to enable Londoners to enjoy the beauty of the living countryside, and to encourage the growth of their friendships made as they observe and study the plants and animals sharing the open spaces in and around the City and County of London.

The Presidents of the London Natural History Society

1914	L. B. Prout, F.E.S. (dec.)
1915–19	E. A. Cockayne, M.A., D.M., F.R.C.P., F.R.E.S. (dec.)
1920	R. W. Robbins (dec.)
1921–4	E. B. Bishop (dec.)
1925–7	S. Austin, F.Z.S. (dec.)
1928–9	W. E. Glegg, F.Z.S. M.B.O.U. (dec.)
1930–1	L. J. Tremayne, F.Z.S.
1932–3	Miss C. E. Longfield, F.R.G.S., F.R.E.S., F.Z.S., M.B.O.U.
1934–6	J. E. S. Dallas (dec.)
1937–8	C. L. Collenette, F.R.G.S., F.R.E.S.
1939–45	J. B. Foster, B.A.
1946-8	L. G. Payne, F.Z.S. (dec.)
1949–51	L. Parmenter, F.R.E.S.
1952–4	J. H. G. Peterken, F.L.S.
1955-6	R. C. Homes, M.B.O.U.
1957–	C. P. Castell, B.Sc., F.G.S.

General Secretaries

The office was created in 1919.

1919–1925	W. E. Glegg, F.Z.S., M.B.O.U. (dec.)
1926–1928	J. P. Hardiman, C.B.E., B.A. (dec.)
1929–1945	A. B. Hornblower (dec.)
1945–1955	H. A. Toombs
1956–	Mrs. L. M. P. Small

Photo by Joan Small

PLATE 1

" The Brownlow Arms."

Headquarters from 1859 to 1887.

The Role of the Amateur Naturalist

By C. Diver, C.B., C.B.E.

AS the word " amateur " has different shades of meaning, some complimentary, some less so, it is as well to clarify what is meant by it in this note. By derivation, an amateur is a person who does something for the love of it and, by implication, not with the hope of material reward ; the urge may be so strong that he can hardly help himself. But because for the majority what is done for the love of it is often no more than a pastime—an activity treated lightly as a relaxation from the more serious business of life—a secondary and slightly derogatory meaning has come into use. This is best exemplified by the adjective " amateurish," indicating work that is imperfect or defective by professional standards. Here, I am applying " amateur " solely in its simple, primary meaning to persons who, however well- or ill-qualified, devote much of their spare time to an activity purely for the interest and pleasure of so doing. The fact that they may have been given, rather than giving themselves, a biological education is immaterial. The quality of their serious work is related, just as it is in the professional field, to personal ability.

What goes on around us is a perennial source of interest to the alert mind. If such a mind is equipped also with the power to observe, to recognize the finest differences, and to record accurately, and if it displays mental honesty, judgment, a persistent desire to know and, above all, patience and humility, it has the qualities essential to the making of a naturalist. For the absence of these qualities no professional training in methods and techniques will compensate.

It is not the subject matter of his, or her, formal education that may put the amateur naturalist at a disadvantage in comparison with the professional biologist. On the contrary, the fact that the amateur has usually been taught subjects other than science and has worked in other professions is likely to broaden the basis of experience against which judgments must be tested. Having avoided the possible danger that early specialization has grooved his mind with the lines of current orthodoxy (for, in spite of the strong emphasis on a critical approach, there are fashions in science as in other human activities), his chances of breaking new ground or making an original approach are at least as good as those of the student who has had the normal vocational training. Given a little determination and the ready help of those with the same interests, it is quite possible for him to find out for himself what he must know about past and current work within the subject of his choice, and to pick up the simpler techniques needed in the field and in the study. But where he is liable to suffer a handicap is in the lack of time and material equipment, particularly of the more expensive kinds. This difficulty has, unfortunately, increased since the heyday of the great naturalists and shows few signs of diminishing again in the future.

But what does this mean ? Surely, no more than that the amount of work the amateur can do and the nature of the enquiries he is able to undertake are to some extent limited ; certainly not that the quality of the work need be in any way sub-standard.

Most of the people who belong to natural history societies do so because, having an interest in nature, they derive pleasure from going out, looking at, and hearing about, living plants and animals. They do

not set out to do " work," amateurishly or otherwise, nor do they aim at making any personal addition to the sum of natural knowledge. There is nothing whatever to disparage in this attitude. By their support they help to sustain the framework of the society within which a few active workers can make contributions to science ; by their influence they can help in the preservation of those few parts of this much-populated country where nature can still be enjoyed more or less undisturbed ; and by spreading among their friends and acquaintances a better appreciation of natural values they can do much to educate public opinion. Within the limits of their interest and of their other commitments, they may be willing to lend a hand to some corporate enterprise ; but it is unrealistic and unfair to expect them to convert what is to them a pleasing relaxation into just another job of work. These considerations hardly apply to the few who merit the honoured designation of " naturalist." From them have come, and will continue to come, the advances in knowledge that have so distinguished the amateur tradition in this country.

Until the last century, scientific research was, as Haldane (1927) reminded us in his essay on " Scientific Research for Amateurs," almost entirely the work of men who earned their living by some other methods or had private means. Even at the beginning of the present century, the possibilities of a naturalist being able to pursue his interests as a means of livelihood were still very limited. Those in the few appropriate academic or teaching posts, or in charge of the national collections, were seldom able to devote much of their professional time to the study of the British flora and fauna—though in this respect botanists were more fortunate than entomologists. By far the greater part, therefore, of what we know about our own plants and animals, as well as much of our knowledge about those living in other parts of the world, has been the result of amateur work—and this has been going on quietly but steadily throughout the hundred years of this Society's life.

During the last few decades, scientific research has received constantly increasing recognition. Government expenditure on " civil research," which includes industry and communications, fisheries, medicine, agriculture, forestry, meteorology, and most recently nature conservation, is to-day more than seven times what it was in 1939. The number and size of research institutes and units have greatly increased ; and a wide variety of research careers is now open to the young scientist at home and abroad. The question is : How have these changed conditions affected the importance of maintaining the flow of amateur effort ? In the biological field the answer is simple : the need has increased.

The work of the amateur in biology has naturally tended to centre, not so much upon the basic problems presented by living matter, as upon the species in most of its aspects—morphology, systematics and taxonomy, distribution and dispersal, behaviour, ecology, variation in natural populations (including the simpler genetic relationships), phylogeny and evolution. Where the amateur is hampered, owing to lack of equipment, laboratory facilities, skilled assistance and time, is in the detailed analysis of physiological requirements, chemical make-up and physical reactions.

As the boundaries of our ignorance are forced back, the winning of further knowledge tends to become more difficult ; greater complexities are revealed ; greater precision and closer analysis are needed ; and further advances on that front begin to pass out of the scope of the enquirer with limited time and facilities. But along great lengths of the

boundary that stage is nowhere in sight. Of the many hundreds of thousands of species that make up the world's living flora and fauna there is not one, man included, that cannot still usefully be studied from some aspect by a keen and able amateur. In this country alone there are over 20,000 species of insects, apart from all the other invertebrate groups, and as many species again of fungi and algae ; and there is still a great deal to learn about the distribution, behaviour and requirements of even the commonest of these. The scope of the amateur of palaeontology is no less wide. In short, the opportunities for further work by amateurs are, for practical purposes, inexhaustible.

The increasing need for such work is attributable to three main causes—the new policy of nature conservation ; the economic pressure to improve biological productivity and the health of plants, animals and man ; and the trend of academic research towards more general problems as opposed to particular studies of species.

In spite of the many new jobs arising from the first two developments and the increase in university research posts, the number of professional biologists working on species is, and is certain to remain, totally inadequate. The field force of amateurs needed to supplement this deficiency can readily absorb every reliable worker.

The rapid advances made during the last hundred years in the physical and chemical sciences have provided a wealth of new " tools " for the detailed examination of the functioning and general behaviour of living matter under controlled conditions. This has played a large part in shaping the fashion in present-day biological research. The professional ecologist, for example, may nowadays spend much of his time not in the field but with ovens and flame photometers, in constant temperature rooms, or among gadgets for the exact control of light, humidity and air movement. He may be more concerned with the physico-chemical analyses of various backgrounds and their modification as the result of occupation by particular populations than with the limitations a particular background imposes on the population spread of a given species. Radioactive substances can now be used to measure the passage of time through millennia or the movement of an insect over a distance of a few feet.

Ecology has reached the stage at which it is possible in certain circumstances to make a fair guess why species A lives in one place and not in another, or why species B and C usually live in the same place while D and E practically never do, or to indicate some of the effects produced when species F dominates a given site. But it is not possible, for instance, to state in full what lives in any given place—a set of facts that is fundamental to planning the scientific management or control, whether for conservational or economic reasons, of any natural or semi-natural community ; the meaning of " what " here is both qualitative and quantitative, embracing all the different kinds of life present, from unicellular organisms upwards, and at least the approximate numbers of each kind. Until we know these facts, we have not fully described the background of any one of the component species ; any inferences we may draw can be no better than approximations that fail to take into account an unknown number of unknowns whose individual and combined effects upon the habitat are equally unknown.

In very limiting conditions, such as may be found in deserts, or in closely circumscribed minor habitats, such as a single fallen log, it may be possible by a concentrated attack and with the help of the right specialists

to get fairly close to the full answer at a given time. But in any normal habitat in a reserve, or in a crop, we can hardly begin to assemble an answer beyond the more obvious and easily recognized species. In the plants, admittedly, these are probably responsible for most of the grosser ecological effects ; while the animals noted are likely to include only those that are more or less static, those that we know how to look for, and those that if found happen to be in a recognizable stage of their development at the time of the observations.

We still do not know the salient facts in the life cycle of many common species—the seasonal sequence of events, the periods spent in each stage and their habitat requirements, what the various stages feed on or otherwise make use of, and what they supply for others in the way of food or shelter when living or dead. In many species we do not know the early stages at all. There is a vast range of fascinating enquiries open to the amateur in this bionomical field alone, some of which may yield information of economic value as well as of scientific interest.

In recent decades studies of this kind have become of increasing importance in their application to the control of destructive or disease-carrying pests. This is essentially a species problem ; and it is not likely that effective protection will be achieved unless the whole complex of relationships between the species that do, or can, occupy the habitat in question is appreciated and until a good working knowledge is available of the bionomics, dispersal and distribution, not only of the pest species itself, but also of those connected with the pest and what the pest attacks, or even with the general habitat. Because of this ignorance of the ordinary behaviour and relationships of so many of the species likely to be involved in these specialized enquiries, much time (and money) may be lost in the pursuit of profitless lines, and more has to be set aside for the slow process of making *ad hoc* studies of background species belonging to a number of different groups outside the previous experience of the biologist allotted to the job.

Bionomical observations can readily be associated with the recording of distributions. The valuable census of the British non-marine Mollusca has been run for more than eighty years entirely on an amateur basis under the aegis of the Conchological Society, and is a model of what such a census should be. The more ambitious new census of vascular plants undertaken by the Botanical Society of the British Isles on the basis of ten-kilometre grid squares instead of Watsonian vice-counties will depend, not only for its original construction but also for its continuation, upon wide-spread amateur effort. The need has long been felt for distributional censuses on the conchological model for at least the more popular groups of insects.

Now that two amateurs (Locket and Millidge, 1951, 1953) have produced a workable handbook on British spiders, it is to be hoped that others will rapidly expand our knowledge of this ecologically important but too often neglected group—though, as Dr. Bristowe claims on page 1 of his introductory chapter, our knowledge of the British fauna in all probability compares favourably with that of any other country in the world ; and he goes on to say :

> " This is a remarkable achievement when it is realized that we owe our present knowledge almost entirely to the spare-time enthusiasm of a series of clergymen, doctors, schoolmasters and business men,

a tradition in which the authors of this book and the writer of this chapter are proud to follow."

In this context must also be mentioned the amount of work regularly put in by amateurs, as helpers of the permanent staff, on the upkeep and systematic study of the national collections.

Though it is useful for distributional records to have a list of the species found in a reasonably circumscribed area, it is more useful if the type of habitat they occupied is also recorded ; and the greater the accuracy with which this is defined the greater will be the value of the record. This applies to records from any part of the country and not merely to those made in relation to a local survey, like that being conducted by the Society on Bookham Common. For, provided that the habitat descriptions are clear, sufficient and understandable to others, these records help to outline the ecology of the species to which they refer. Furthermore, no opportunity should be lost of recording any special aspect of behaviour that may come to notice, since what an animal does, or wants to do, can bear an important relationship to the sort of place in which it likes to be.

Much, though by no means all, of the experimental side of the study of animal behaviour may need facilities not readily available to the amateur ; but observations under natural conditions can be made by any naturalist who has the necessary high degree of patience and accuracy and can make the time for the exercise of these qualities. It is insufficiently realized that opportunities for these studies are to be found almost everywhere, from the few square yards of a London back-garden to the wilds of the mountains. Such studies can have great value in building up the picture, not only of the autecology of the species observed, but also of the background as lived in by associated plants and animals.

The setting-up of the Nature Conservancy, with its responsibility for establishing and maintaining national nature reserves, so as to preserve their special flora and fauna, and for doing all it can to safeguard particularly interesting species and places elsewhere, has thrown into sharp focus, for those who are not myopic, the vast gaps in our knowledge. We seldom know the field necessities of common species, much less of those that are rare. Even when the scientific staff of the Conservancy has been brought up to the numbers regarded as the bare minimum by the pioneers of this development—and there seems little chance of this primitive stage being reached for some time yet—the main brunt of the advance will still have to be borne by amateurs.

Though the declaration of reserves and the scheduling of other places of special interest provide new opportunities, as well as urgent needs, for the work of the field naturalist who is able to visit these places, it must again be stressed that reliable field observations anywhere, so long as they are made available by publication or otherwise to those in charge of reserves and special sites, all help to build up the detailed net-work of knowledge without which successful biological " management " is impossible. The need to bring all available information together is one of real urgency. No past experience of " management " for purely biological purposes can be called in aid. In the absence of this expertise, there is real danger of irreparable damage being done by falling back on the orthodox methods of the land agent, the forester and the gardener ; these can be generalized—if somewhat unfairly—as a wish to replace what is living naturally in a place by something that can only be made to maintain its existence in an acceptable condition by constant human

interference and care. Within the reserves and special sites great help can be given to the hard-pressed regional officers of the Conservancy by active amateurs who are able and willing to apply their special knowledge of particular groups to determining and recording what species are present and how they are behaving in these places.

Although the amateur of to-day has many advantages over his predecessors in previous generations, and not least in the availability of rapid transport for himself and his improved field equipment, he suffers one serious drawback. Spare time is increasingly at a premium under the growing pressure of things that have to be done in the modern state ; but to the really determined man or woman with a true interest in nature, the field is still, and will long remain, wide open.

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Changes in the Bird Life of the London Area since 1900

By R. C. Homes

THIS paper is based on a Presidential Address to the London Natural History Society in 1955, before the publication of *The Birds of the London Area since 1900*. The book having now appeared, and with the lapse of a few more years, some modifications have become necessary though these relate more to the winter visitors than to the resident species. In particular, the intensive observations that were made during the unusually severe weather in February, 1956, have added appreciably to our records of aquatic birds, while the post-war years have seen the first recorded occurrence in our Area during this century of no fewer than 31 species. The object then of the present paper is to sum up the major changes that have taken place in a way that was impossible for reasons of space in the book itself. Some repetition in the description of the changing environment has been inevitable, and I hope that a concise summary of the changes will be of sufficient interest to have made this justifiable.

It is perhaps obvious to the keener observers that little is too insignificant to put down in their personal records, but it is only too true that all of us tend not to bother about the familiar, and it is for this reason that we are so often left wondering when this or that change really did begin. The shortage of resident bird-watchers with a really thorough knowledge of what has taken place in one district over a long period of years is always one of the great difficulties facing the bird historian. We owe much, for example, to such as T. L. Bartlett, Howard Bentham, Col. McCulloch, H. E. Pounds, Professor E. H. Warmington and the late Bertram Lloyd. It is one of the greatest mistakes to imagine you know all there is to know about the status of your local birds, for their numbers may and do fluctuate from year to year with variations in weather conditions and breeding success, with the result that longer-term trends can readily be obscured in the short-term

fluctuations if there is not a continuous record for reference. For this reason alone the censuses of great crested grebes and herons in the breeding season have tremendous value to the student of population dynamics, as they provide our first opportunity of studying the problem on a large scale.

I should like to stress this problem of fluctuations, because a Londoner should not be content with glibly attributing long-term changes to the consequences of the spread of London, for these consequences are themselves of great diversity. What then are these developments ? Not so very long ago London was the centre of a built-up area not necessarily regular in its outline but reasonably compact ; outside, the open country was unbroken except for small country towns and villages which were themselves tidy units and did not isolate large sections of the countryside like rural counterparts of the town park. Since those days, however, that curse of the present age, ribbon development, has followed the course of the new arterial roads and linked up the scattered communities fringing London, to be followed by a gradual expansion outwards from the road until the intervening spaces have been gradually filled in. It is true we have the Green Belt, and all honour is due to those who sponsored its conception, but from an ornithological point of view there is a limit below which you cannot compress the size of a habitat and still hope to preserve a stock of some of the more local species. A small community is always liable to sudden extinction if there should be exceptional losses on migration or from a hard winter.

To repeat a quotation in the Society's book from Professor Abercrombie's *Greater London Plan*, 1944 : " Heaths and commons require equal care ; they are much affected by intensity of use—but let their wildness be trampled underfoot and no chance given to regeneration and they become dreary wastes like Mitcham Common." This is in some respects unfair to the example chosen, but the moral is clear and that, I am afraid, is that the increased use by the public of the open commons and heaths around London, stemming perhaps from the hiking movement of the early thirties, is one of the factors most detrimental to the prosperity of ground-nesting birds.

It is not building alone therefore that is responsible for some birds being driven ever further from the centre, but the general disturbance from public use of the land that follows the spread of population. Before we turn to the more encouraging forms of development, from an ornithological point of view, there are three other major changes in the environment to take into account. One is the propensity of local councils for eliminating as much undergrowth as possible from the open spaces under their control, with the result that small birds such as warblers have no hope of breeding successfully. The second is the regeneration of agriculture, with such consequences as the drainage of marginal land beloved of snipe, redshank and many ground-nesting species, the elimination of overgrown hedges that provided nest sites for numbers of our commoner birds, and the conversion to arable in the last two decades of large areas of pasture and commonland—a process which has drastically altered the character of Epsom Common and Walton Heath, for example. The third important change for the worse was particularly marked in the thirties, when probably as a result of careless picnickers in dry weather a succession of heath fires raged on many of our Surrey commons. Large tracts of heather and gorse were destroyed, to be replaced by birch scrub

and wildernesses of bracken. A contributory factor in this spread of bracken and scrub is almost certainly in some localities the falling into disuse of commoners' rights, with the consequent cessation of grazing. Conspicuous examples are Bookham Common and Epping Forest.

So much for the unfavourable developments. Turning to the more beneficial results—to the bird—of London's expansion, the most striking is undoubtedly the creation of a vast new series of watery habitats that have in some ways more than compensated for the losses due to improved drainage. It is no longer possible to provide a substitute for the marshes along the Thames as they existed early in the last century when London had at its doorstep an avifauna similar to that of the sanctuaries of East Anglia, but since 1900 the acreage of reservoirs in our Area has grown from some 500 to over 3,000. It is well to remember, however, that these are in no sense equivalent to natural lowland lakes, for rather over three-quarters of the surface area has a normal depth of 28 feet or over and only 500 acres or so are less than 20 feet deep. In most of the reservoirs also the banks are much too steep to support much rooted plant life. On the other hand, the reservoirs, deriving their water from fertile, calcareous soils possess a vastly richer animal life than would be found in the deep, mountain waters of, for example, the Lake District. They are thus rich in food for diving ducks.

Other artificial lakes have been created by excavation for gravel, (especially in the valleys of the Thames, Lea and Colne) and for clay, principally along the south bank of the Thames in the Dartford district. There are now well over a hundred gravel pits, some being actively worked but many disused and flooded. In this condition they provide a habitat for great-crested grebes, reed and sedge warblers, reed buntings, yellow wagtails, snipe, coot, mallard, tufted ducks and occasionally pochard, while the weed-covered surroundings are patronized by flocks of finches. The machinery and buildings attract nesting house and tree sparrows and pied wagtails. It is hardly necessary to add that those pits possessing sandy or muddy edges are responsible for the success of the little ringed plover around London. While the gravel pits thus compensate in no small measure for the loss of natural marsh, they are essentially ephemeral and many are already in course of being filled in. It seems unlikely that their recent large-scale expansion can continue indefinitely. The drier types of pit where sand is the material are sometimes colonized by sand martins within less than a year of the beginning of excavation.

Some replacement for natural marshland has also come from the numerous small sewage farms that have grown in number and activity with the expansion of London, and they have encouraged much the same birds as the gravel pits, if we exclude the grebes and the diving ducks, but like the gravel pits they are not necessarily a permanent feature of the landscape. More modern methods of sewage disposal are resulting in the gradual closing down of the smaller, old-fashioned farms and in concentration on a few modern works which possess relatively little attraction for birds. It is an anomaly that at what has been our most famous farm, ornithologically, the old and new methods exist side by side, with the results known to all habitués of Perry Oaks. No fewer than 33 different species of waders have occurred there since the last war, including four American species.

A few other miscellaneous factors remain to be considered. The agricultural regeneration already mentioned has extended to the fruit

farmers, and no longer can one find the old, neglected orchards, full of holes suitable for nesting tits, woodpeckers, owls, etc., such as are still a feature of the West Country. Well-tended orchards with little dead wood provide no sites for these species, though they may still attract goldfinches, hawfinches and magpies. In general, there has been a great shift of emphasis in farming. Thus, in Middlesex, while sheep have fallen in numbers in fifty years to a tenth of their former strength, cattle have only declined to a third and grass and crops combined to a quarter. At the same time there has been a very large increase in market gardening.

In the older suburbs trees and shrubs have grown up since early in the century, providing much more cover for birds normally associated with woodland and almost certainly smoothing the way for the invasion of the suburbs by greater spotted woodpeckers, jays and wood pigeons. Downland has probably suffered as much as any habitat from suburban development.

To turn from this brief review of environmental changes to changes in the status of the birds themselves, we have seen how species associated with water have benefited most, and the great-crested grebe (*Podiceps cristatus*) is one of the most conspicuous examples. In 1900 only three sites were occupied, yet by 1931 there were 68 pairs, and in the peak post-war year, in 1953, 627 grebes were counted in the summer census, over 2½ times the number in 1931, when the first national census of this species was made. The reason for its increase in the first place was of course better protection, but the rise of London to being one of the chief centres of its population in the country is unquestionably due to the gravel pits which accounted in 1953, for example, for just under half the number of grebes—and over half of those actually proved to breed. The only other grebe whose status has clearly altered is the black-necked (*Podiceps caspicus*). Here a digression is necessary. Before 1922 the reservoirs were not watched with any regularity, and such observations as were made earlier were often separated by many years with no notes at all. Obviously a comparison of status between the mid-twenties and the early part of the century is impossible for those species which are at the best only irregular and erratic in their appearances, as are many of the aquatic species. Even in the thirties, however, when a few were being seen annually at Staines, the black-necked grebe was still occurring in very small numbers only. The real increase at these reservoirs seems to have started about 1939, and by 1945 double figures had become almost normal in the late summer and early autumn. Elsewhere, this grebe is much more erratic, as are the Slavonian (*Podiceps auritus*) and the red-necked (*Podiceps griseigena*).

Cormorants (*Phalacrocorax carbo*) before the thirties were occasional visitors only, and even in 1935 Glegg described them as annual and irregular visitors to Middlesex. Now they are resident every winter on Syon Marsh and at the reservoirs of Molesey, Littleton and Staines, and some forty or more spend the winter in that part of the Thames valley, flying to the Colne valley to roost. This change in status has no obvious connection with any change in the environment. Though the buoys in the new King George VI reservoir were at once adopted as perches, this attraction hardly seems an adequate reason for parties of forty or so at Littleton and Molesey !

Increases in the three species so far mentioned have been clearly substantiated, but information about the ducks is much more difficult to

assess owing to the complete absence of comparative data for most of the first twenty or thirty years. That the winter numbers of most or all of the ducks have increased since 1900 is almost certain in view of the huge increase in the number and size of the reservoirs, and gravel pits, but it cannot be proved in all cases. Mallard (*Anas platyrhynchos*) have colonized London with great success through their adaptability in using barges, water tanks, window boxes and other unnatural sites for nesting. The flocks on the reservoirs are at times very great, but we have no means of knowing how they compare with 1900. In the last five years or so numbers have increased, even allowing for the inevitable variations with differences in weather conditions from year to year, both in the breeding season through the effect on rearing success and in the winter when duck movements may depend enormously on the severity of the weather. Certainly there seems to be no sign of a decline in the winter flocks, and it was as recently as the winter of 1956-57 when the largest post-war numbers were recorded, some 6,000 being found on the principal waters alone. Among the less common species garganey (*Anas querquedula*) have increased on passage, as elsewhere in the country, and they may even breed regularly, though this has yet to be proved. Gadwall (*Anas strepera*) have established themselves at one locality, but unquestionably this can be attributed to escapes from St. James's Park. Shoveler (*Spatula clypeata*), previously known mainly as passage migrants, especially in autumn, have wintered at Staines since 1937-38. They have also bred erratically in small numbers since the thirties. Other ducks which have bred for the first time in recent years are the mandarin (*Aix galericulata*) and the shelduck (*Tadorna tadorna*).

It is among the diving ducks that the real changes have taken place. In the severe weather of early 1956 there were probably over 6,000 tufted duck (*Aythya fuligula*) and 3,000 pochard (*Aythya ferina*) in the whole Area, a striking commentary on the value of the artificial London waters as wildfowl refuges in winter. Early in the century flocks of twenty tufted ducks were noteworthy, whereas gatherings of many hundreds are now commonplace, and an average winter total for the Area is in the region of 2,500. Pochard also have increased as winter visitors, probably starting in the mid-twenties when they became regular at this season on the Round Pond. A further large increase dates from 1933. Unlike the tufted duck, which has become a normal breeding species in small numbers in quite a few localities, the pochard, which first bred in 1927, has in this respect remained erratic, though in the last few years it has nested in both Battersea and Regent's Parks.

Before 1922 goosander (*Mergus merganser*) and smew (*Mergus albellus*) were both virtually unknown, although the appearance of 60 goosander at Staines in that year does suggest strongly a lack of previous observation. They showed a tendency to increase in the thirties, when in most years there was at least one count of over a hundred, but except in severe winters there has been no great change since. Smew also increased in 1933-34 and again in 1938-39 when the first gathering of over a hundred on one group of reservoirs was seen. The larger numbers of ducks in our Area have obviously been made possible by the increased number of reservoirs, which act as virtual sanctuaries and are clearly recognized as such by the birds. Many people hold the view that in general surface-feeding ducks are decreasing in this country, and it is an open question to what extent the various types of artificial waters created in modern

times compensate for increased drainage of natural marshland in the country as a whole. Certainly there are less ducks where they can be shot, but how far have their total winter numbers in this country changed ?

Records of geese are scattered at random over the period and almost certainly reflect varying intensity of observation as much as any other factor. In recent years, however, there are a number of records in March of movement with an easterly component in its direction. There is evidence that some of these flocks originate from the New Grounds, on the Severn estuary, while there is conclusive proof from recoveries of ringed birds that in spring much of the movement of white-fronted geese (*Anser albifrons*) is eastwards rather than northwards in its early stages. Flocks may of course be seen flying north also, as was one of about 475 " grey geese " in the Lea valley on March 14, 1955.

Mute swans (*Cygnus olor*) increased fairly steadily on the Thames from 1921 to 1938, then dropped in numbers during the war owing to persecution and deliberate restriction of the number of young reared. In 1951 there was a very pronounced rise in numbers between Waterloo and Putney, a state of affairs not unconnected with the bounty of visitors to the Festival of Britain. Between Putney and Staines there were nearly 500 swans at the time of the annual swan-upping in 1954, and in the Area as a whole there were at least 183 breeding pairs and 950 non-breeding birds in 1956 (Cramp, 1957). Though conclusive evidence is lacking, it seems that the breeding population also may have increased appreciably during the half century.

One definite loss is that of the corncrake (*Crex crex*), of which there were probably still a few breeding at the end of the First World War in the country bordering the North Downs. In the 1890's corncrakes were summer residents on Streatham Common, probably as good an illustration as any of the changes that there must have been in the nature of these inner open spaces. In north-west Middlesex corncrakes continued to breed up to 1926 since when there has been only one record of nesting in the Area.

The moorhen (*Gallinula chloropus*), once a summer visitor only to Inner London, became a resident in the late nineteenth century and is now also a winter visitor. The coot (*Fulica atra*) may have increased generally in the second quarter of the century and has certainly done so in Inner London, where it first bred in 1926 after the introduction of pinioned birds. It has also become a much commoner winter visitor. There has recently been at least one certain record of the breeding of water rail (*Rallus aquaticus*), which is often suspected but seldom proved.

The problem of migrant waders is one of our most difficult. Early records come from birds shot and not birds observed. Knowledge of field characteristics of the waders and the standard of optical equipment were comparatively poor, and sight records of the rarer species would have been viewed with grave suspicion. It was not until some of the reservoirs were drained that records began to accumulate—at Staines in 1927, Brent reservoir in 1928 and at the King George V reservoir in 1929 and 1933. Yet in the nineteenth century Harting recorded many waders at the Brent—by shooting them—and in 1930 Harrisson was able to quote Professor Warmington as regularly hearing waders passing over Mill Hill at night. Moreover, when attention was focused on sewage farms in the thirties—by Hollom at Brooklands, by Fossey at Romford, and by Hopkins and others at Watford—the waders were there. There are five reasons, therefore, for the increase of records—drainage of reser-

voirs providing better feeding grounds, realization of the potentialities of sewage farms, increase in the number of observers, greatly improved knowledge of field identification and better field glasses and telescopes. A genuine increase of wader reports from the concrete-banked reservoirs, although these *were* well watched in the late twenties, may be due to adjacent sewage farms becoming more attractive to passing migrants as the population of London increased faster than the improvements of the farms themselves. While there may be real reasons for more waders *alighting* now than previously, the extreme paucity of early records is suspicious and I cannot help feeling that some of the waders were much overlooked in the past.

To turn to the breeding of waders, we find that lapwings (*Vanellus vanellus*) have suffered greatly from building development. For example, they last bred at Harrow in 1922, at Mitcham in 1926, at Eastcote in 1927 and so on. They also seem to have declined in numbers in the more rural parts, presumably in consequence of earlier cropping, the use of synthetic manures, the drainage of marginal land and the ploughing-up of pastures. While the lapwing hastens to nest on newly-ploughed land it seldom now does so successfully owing to the hazards from mechanical harrowing in spring. On pasture and marginal land disturbance was much less. Nesting snipe and redshank have both suffered from drainage, and the latter are now confined mainly to sewage farms and the remnants in our Area of the Thames marshes. I can find no real evidence of any falling-off in the numbers of snipe in winter, and far more jack snipe (*Lymnocryptes minimus*) are now recorded at the sewage farms, though here again I think our old friend, intensity of observation, is the real explanation. As a quite new breeding species since 1944, we have the little ringed plover (*Charadrius dubius*), but its spread has been so well documented that it is hardly necessary to stress how much we owe to the gravel pits for this very welcome gain. The breeding of common sandpiper (*Tringa hypoleucos*) at a gravel pit in Hertfordshire, apparently for several years running, is probably an isolated case, as there have been other similar records in the south of England in the past.

That there has been an all-round increase of gulls is well known. In early 1953 and 1954 close on 100,000 were found to be roosting in the Area in mid-winter (Homes, 1955), but we have no idea how many did so in 1900, though there were probably many less. We do know that they were mainly the smaller gulls. At that time even Hudson admitted to difficulty in separating immature black-headed (*Larus ridibundus*) and common gulls (*Larus canus*) and since we can be far from certain also to what extent common gulls and kittiwakes (*Rissa tridactyla*) were confused it is not possible to be more specific. It was not until 1924 that the first sizeable flock of herring gulls (*Larus argentatus*) was reported ; there was a rapid increase about 1929 and the first roosting gathering of over 1,000 was noticed in 1936. The total numbers roosting in 1953 and 1954 were about 10,000, but in some years there are undoubtedly many more. Autumn passage of lesser black-backed gulls (*Larus fuscus*) was first found to be increasing in 1925, and the process has continued, gatherings of 500 or so being now observed at the reservoirs at roosting-time after the end of the breeding season. In the last few years British lesser black-backed gulls have started wintering regularly, a habit previously confined to a few odd birds only, and this change in habit has also been noticed in other parts of the country.

The greater black-backed gull (*Larus marinus*) was the last of the five common species of gulls to increase inland. A few have been seen in most years since the end of the twenties, but the really significant increase has only come in the last ten years or so, and several hundreds are now to be found spread out along the Thames by day and gathered on Walton reservoirs at night to roost. From central London eastwards, however, most of the gulls fly out to the estuary at night. Over the last twenty years the larger gulls have also spread more by day over the countryside away from the Thames, mainly frequenting rubbish-dumps, as at Shepperton and in the Darent valley, and sewage farms. Records of little gulls (*Larus minutus*) have increased, but so have the skill and number of observers ; the increase of glaucous gulls, on the other hand, has come at a time when this species has been appearing more frequently in other parts of eastern Britain as well. While the same may be true of the little gulls the evidence is not so clear.

There were so few observations of terns in earlier years that it is profitless to attempt a comparison with the present day, but much larger numbers of black (*Chlidonias niger*) and common terns (*Sterna hirundo*) have been seen in some recent years than were ever recorded in the thirties.

Among the pigeons, the main increase of the woodpigeon (*Columba palumbus*) was in the 80's and 90's of last century, but it spread to the suburbs rather later and this was still the subject of comment in the early part of this century. It is impossible to say more about any change of status, if we ignore short-term fluctuations due to wartime persecution. The wood pigeon has developed only quite recently, however, the habit of nesting on buildings in central London, where its cousin, the stock dove (*Columba oenas*) has also shown a marked tendency to increase its range in the last few years.

Building has pushed out the cuckoo (*Cuculus canorus*), which to prosper needs a large supply of potential fosterers of its normal host species, a state of affairs incompatible with London suburban development. The nightjar too (*Camprimulgus europaeus*) has receded from the centre and no longer nests at Wembley, Highgate, Hampstead, Elmley, Bromley and Kew Gardens, in all of which it used to breed not so very long ago. The reason is obvious and in the last few years there have been signs of a decrease on some of the outer commons or open birch woods, which are ever becoming more disturbed by building encroachment and increased public use.

The woodpeckers have changed greatly in relative abundance. The greater spotted woodpecker (*Dendrocopos major*) began to increase in the 1890's, but did not become generally widespread in our Area until about 1920. Fitter (1949) has suggested that its success in the suburbs may be due to the growing-up of trees in the many new gardens dating from the early part of the century, synchronizing more or less with the dying-out of the habit of keeping brightly coloured birds stuffed in glass cases. The basic cause is probably of wider origin, but be this as it may the greater spotted woodpecker is now far commoner than the lesser spotted (*Dendrocopos minor*) which was once at least equally as common. The apparently growing tendency of green woodpeckers (*Picus viridis*) to feed on the ground as much as on trees may well have helped them to gain a footing in the suburbs, where they are far from an unusual sight on the close-cropped lawns.

The wryneck (*Jynx torquilla*) has not shared the fortune of its relatives. Once nesting commonly all round London, it is now reduced to a mere handful of pairs at the most. The only apparent cause applying throughout south-eastern England is the replacement of old neglected orchards with an abudndance of holes by orderly rows of well-tended trees where dead wood is quickly removed.

House martins (*Delichon urbica*), not being dependent for nest sites on farm buildings as are swallows (*Hirundo rustica*) in most places, have had more success in retaining a hold in suburbs where the swallow is now a rarity except on passage. The enormous decline in the amount of stock around London and consequently in farm buildings is probably sufficient to account for a reduction in the range and number of swallows. Sand martins (*Riparia riparia*), on the other hand, though there are natural sites in river banks, have successfully made use of drainpipes—a habit not peculiar to London of course—and they are quick to exploit new sand pits or the over-burden of chalk pits.

It is among the Corvidae and predatory birds that some of the greatest changes have taken place, a common factor being the decline of game-keeping due to the break-up of big estates for building and accentuated by the effects on manpower of the two world wars. Shortage of cartridges in wartime has also helped this group of birds. Carrion crows (*Corvus corone*) were resident in London itself in 1900 but were extremely scarce in the surrounding country. Their increase after 1918 was slow and patchy, and it was not until the thirties that it became really rapid, helped of course after 1939 by the falling-off of persecution. The magpie (*Pica pica*) was described earlier by one observer as one of our rarest breeding birds. With the easing of persecution its increase, like that of the carrion crow, was gaining momentum in the thirties and was similarly helped on by the war. Even now, however, when it is a common bird on the outskirts of the built-up areas it still tends to avoid open spaces entirely surrounded by building—unlike the jay (*Garrulus glandarius*) which was never so reduced in numbers and has now penetrated the parks and some of the squares of Inner London. It is perhaps significant that the magpie normally feeds a lot on open pasture whereas the jay is more at home in woodland and scrub, with the result that it is able to feed in comparative seclusion even when the degree of disturbance would be too great for the magpie. In the outlying suburbs, however, the magpie is quite a frequent visitor to the more rural types of garden. The tameness in London and the suburbs of some of the birds which are among the wariest among rural conditions is one of the most striking aspects of the changes which we are considering. The decline in persecution has also resulted in a very pronounced increase of sparrow hawks (*Accipiter nisus*) and kestrels (*Falco tinnunculus*), the latter being now well-established in the built-up areas, a development which confounds the predictions of our ancestors.

Decreases close to London of rooks (*Corvus frugilegus*) and jackdaws (*Corvus monedula*) are hardly surprising in view of the shortage of open feeding-grounds, and it is this rather than absence of nest sites that is the most probable explanation, for colonies of rooks persist in many towns which are not so divorced from the countryside. Wiring up of church belfries has been suggested as a contributory handicap to the jackdaw, but knowing the ingenuity of this species I think the first explanation is the more important. Hooded crows (*Corvus cornix*), once quite common

visitors to the North Downs, have become much scarcer as in other parts of southern England.

There is little definite that can be said about any change of status of the nuthatch (*Sitta europaea*) or the tits. A few pairs of treecreepers (*Certhia familiaris*) bred until the last few years in Kensington Gardens where in 1935 they were said to be occasional visitors only.

Among the thrushes there has been considerable change. Song thrushes (*Turdus ericetorum*) were much commoner in 1900 in Inner London than they are now, but there seems to have been a general decline of this species and a more than corresponding increase of blackbirds (*Turdus merula*). The reason is obscure, but the blackbird is a much hardier species and more adapted to feeding in shrubberies and the relatively enclosed conditions in suburban gardens, whereas the thrush feeds more in the open and may have suffered from the conversion of pasture to private and market gardens. Its nests are also possibly more conspicuous than those of the blackbird, a source of danger with the increasing population of humans, cats and grey squirrels. Mistle thrushes (*Turdus viscivorus*) have increased greatly in London since the twenties, attributed not unreasonably to the extermination of the grey squirrel in the inner zone. In the last few years their nests have been found in a variety of unusual sites.

The group which has suffered most is the chats. The wheatear (*Oenanthe oenanthe*) was never really common, but it was a regular, though local, breeder in parts of Kent and Surrey, especially on the North Downs —and until 1908 in Richmond Park. Wheatears disappeared, however, long before the greatest increase in population and building, and there is no obvious cause. It is hard to believe that whinchats (*Saxicola rubetra*) could be described by Lodge in 1901 as " quite one of our commonest birds, a pair or two being in every field or meadow." Their decline has been variously attributed to building, tidying-up of embankments and the ploughing-up of pastures, but there may well be some wider explanation as the change is not confined to our part of south-east England. Stonechats (*Saxicola torquata*) remained on the Surrey commons until just before the last war, though they had already declined elsewhere. They have suffered from the general disturbance to heathland already discussed, and a series of hard winters commencing in 1938-39 resulted in only one pair remaining in 1947. The decrease is not confined to the London Area, but so far there has been no recovery as in some other districts where the heaths have been less disturbed.

Another species which has dwindled remarkably in numbers in E., S.E. and Central England is the redstart (*Phoenicurus phoenicurus*), which in earlier years even bred in town gardens in Bromley in such sites as a robin (*Erithacus rubecula*) might choose. Housing development and the disappearance of old, neglected orchards are contributory factors in a situation which must have had a much wider origin. No one knows why black redstarts (*Phoenicurus ochruros*) first came to breed in Wembley between 1926 and 1941, and for single years at Woolwich Arsenal and on Westminster Abbey, but as is well known their subsequent spread in Inner London must have been due in very large part to the abundance of nest sites provided by the blitz and to the rapid colonization of the bombed sites by plant and animal life. The nightingale (*Luscinia megarhynchos*) has receded from the centre—it last bred at Hampstead in 1899—and

here the passion of local councils for clearing undergrowth is probably one of the chief factors.

Of the rarer warblers, the grasshopper warbler (*Locustella naevia*) suffered first from drainage and the increased public use of commonland, and later ploughing-up in the forties of large parts of its main stronghold on Epsom and Ashtead Commons resulted in 15-20 pairs decreasing to four in a period of ten years. This species is still regular in two other localities not very far away. The Dartford warbler (*Sylvia undata*) may not have been breeding in the Area in 1900, and its re-appearance, or perhaps we should say recorded re-appearance, in the thirties was brief-lived owing to a series of hard winters and the ploughing-up of its chief haunt. Among the commoner warblers, the willow warbler (*Phylloscopus trochilus*), blackcap (*Sylvia atricapilla*) and to a lesser extent, the chiffchaff (*Phylloscopus collybita*) will tolerate the middle suburbs in reasonably large gardens if sufficiently free from disturbance, and they will come much closer in when derelict or neglected sites provide some simulation of their natural habitat. The garden warbler (*Sylvia borin*) seems to demand something more akin to natural woodland, and disappeared a few years ago even from Hampstead Heath and Ken Wood where the blackcap still flourishes.

In 1909 Dixon said that it would be impossible to mention all the places in the more rural suburbs where the meadow pipit (*Anthus pratensis*) nested. Details and any support for this statement are lacking, and in some districts according to other sources it was unknown. Only in Surrey is there substantiation that it was anywhere common. Though it is now only a local nesting species along parts of the Colne, Lea and Thames, on some sewage farms, on a few commons and on reservoir banks, it is difficult to say to what extent there has been any real change. Another bird which has exploited the grassy verges of the reservoirs is the yellow wagtail (*Motacilla flava*), which also makes good use of gravel pits, sewage farms and the beds of reservoirs under construction. It even bred in Regent's Park when one part was cordoned off during the war, and it has also nested as close in to the centre as Wormwood Scrubs. With this species a ready acceptance of artificial conditions compensates for the loss of natural marshland.

Of the shrikes, the great grey (*Lanius excubitor*) is now recorded much more frequently than earlier in the century, and there are grounds for thinking in this case that it is not merely a reflection of the increase in the number of observers. The red-backed shrike (*Lanius collurio*) was undoubtedly more widespread at one time, and bred as near London as Barnes, Dulwich, the Brent valley and Hampstead Heath. Building, increased disturbance and latterly the ploughing-up of commonland have shared in hastening a decline that is noticeable in other parts of the country. Even so, this species shows great site tenacity and quite a good sprinkling of pairs remain.

We come finally among the resident birds to the finches and buntings. Greenfinches (*Chloris chloris*) have shown a great liking for the suburbs, in some of which they are summer residents, disappearing in winter. Goldfinches (*Carduelis carduelis*) also, following their widespread increase about the first decade of the century, have become well-established in the built-up areas. Both have successfully extended their penetration into Inner London. The linnet (*Carduelis cannabina*) is said to have benefited early in the century in the same way as the goldfinch from the Wild Bird

Protection Act, but it is not a suburban bird and has since disappeared from most of the land within ten miles of London. It is still common, however, along the lower Thames. Redpolls (*Carduelis flammea*) increased about the same time and presumably for the same reason.

All the buntings seem to have gone down in strength during the half century. The yellowhammer (*Emberiza citrinella*) bred on Wandsworth Common, for example, at the end of the nineteenth century, while the corn bunting (*Emberiza calandra*) was common in the Wandle valley after the First World War. It is possible that the yellowhammer may be increasing again with the intensification of agriculture, and although the corn bunting has almost gone from the Surrey sector of our Area it is definitely on the increase on parts of the Thames marshes and is spreading inland on the Essex side.

In London itself the house sparrow (*Passer domesticus*) is said to have decreased, as has horse traffic, but while the connection is obvious there may well be other causes.

I doubt if anyone will dispute that the total mass of our avifauna must be much less than it was in 1900, but it is instructive to consider briefly its composition even though some of the opinions must be tentative when so much earlier status is uncertain and there is little quantative data for comparison. However, to take the certain or more probable changes in breeding status, 22 species have been recorded breeding for the first time or have increased as breeders since 1900. Of these there is one grebe, the great crested, six ducks, of which two owe their success to escapes from captivity—the gadwall and the mandarin—while three others have increased generally in the country—the shoveler, tufted duck and pochard—and lastly there is the shelduck which has prospered elsewhere and was recorded breeding in our Area for the first time in 1954. Four other species are associated with water—the mute swan, coot, little ringed plover and grey wagtail (*Motacilla cinerea*). Seven of the 22 are mainly birds of the woodlands or agricultural districts—the greater spotted woodpecker, carrion crow, jay, magpie, sparrow hawk, kestrel and blackbird. Of the remaining three, the goldfinch and redpoll owe their increase in part at least to bird protection, and lastly there is the black redstart.

The species which have unquestionably decreased as residents or summer visitors are the corncrake, lapwing, wryneck, wheatear, whinchat, stonechat, redstart, grasshopper warbler, red-backed shrike and corn bunting, most of them ground-nesting birds. Among birds which have probably decreased are the swallow, song thrush and yellowhammer, while the position of meadow pipit is uncertain.

Many other species have either colonized the suburbs or been pushed further out with the expansion of London, but where there is no good evidence of any change in status in their remaining natural habitats I have not considered them here. The chief changes then are increases of water birds and of those which formerly suffered most from the game-keeper, and the decline of heathland and ground-nesting species.

Among the visitors there have been definite increases of black-necked grebe, cormorant, garganey, shoveler, goosander, smew and all the larger gulls, while there may well have been an increase also of the smaller gulls, the various terns and the great grey shrike. Only the hooded crow, among regular visitors in the past, has clearly decreased.

So far I have not touched on the vagrants or rare winter visitors. Between 1945 and 1956 no fewer than 31 species were recorded with certainty in the Area for the first time this century, and a few of these have been seen several times, as for example the ortolan (*Emberiza hortulana*), pectoral sandpiper (*Calidris melanotos*) and dotterel (*Charadrius morinellus*). The full list is of interest, for although some may of course have come and gone unrecorded in the past their variety is remarkable so near the metropolis. Apart from the three already mentioned they are :—

Storm petrel	*Hydrobates pelagicus*
Fulmar	*Fulmaris glacialis*
Purple heron	*Ardea purpurea*
Little egret	*Egretta garzetta*
Little bittern	*Ixobrychus minutus*
Rough-legged buzzard	*Buteo lagopus*
Goshawk	*Accipiter gentilis*
Kite	*Milvus milvus*
Honey buzzard	*Pernis apivorus*
Marsh harrier	*Circus aeruginosus*
Spotted crake	*Porzana porzana*
Kentish plover	*Charadrius alexandrinus*
Lesser yellowlegs	*Tringa flavipes*
Baird's sandpiper	*Calidris bairdii*
Buff-breasted sandpiper	*Tringites subruficollis*
Red-necked phalarope	*Phalaropus lobatus*
Pomarine skua	*Stercorarius pomarinus*
Sabine's gull	*Xema sabini*
Roseate tern	*Sterna dougallii*
Bee-eater	*Merops apiaster*
White-winged lark	*Melanocorypha leucoptera*
Crested lark	*Galerida cristata*
Black-eared wheatear	*Oenanthe hispanica*
Red-breasted flycatcher	*Muscicapa parva*
Richard's pipit	*Anthus richardi*
Tawny pipit	*Anthus campestris*
Lesser grey shrike	*Lanius minor*
Little bunting	*Emberiza pusilla*

This takes no account of the many species only erratically recorded in the earlier years of the century which have been proved to be annual or almost annual in small numbers, nor can I do more here than mention the wealth and variety of aquatic birds that appear when winters are unusually severe, the best example of this having been in February, 1956, when whooper and Bewick's swans (*Cygnus cygnus* and *Bewickii*), red-breasted merganser (*Mergus serrator*), some other ducks and several species of waders were seen in exceptional numbers (Homes, 1957). Divers and grebes too have proved on occasion to be far more frequent than would ever have been dreamt of thirty years ago.

Problematic though it may be in some cases, I have given this only too sketchy summary of the changes in order to stress that in variety the avifauna has been improved rather than restricted in spite of the enormous expansion of London. Many of the more interesting small resident birds and summer visitors have undeniably suffered in the course of the years from the various adverse factors outlined earlier, but the tale is by no means

entirely gloomy, and the gains, though they may be more obvious through familiarity, are none the less satisfying. The urgent need is to guard zealously against any encroachment on such commonland as we have left and to try to preserve some freedom from excessive disturbance for the many additions to our waterfowl.

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Changes in the Flora of the London Area since 1858

By J. Edward Lousley

IT is appropriate that in the year in which we are celebrating our centenary we should review the changes which have taken place in the flora of the London Area during the history of our Society. The purpose of this paper is to offer a general comparison between the plants available to botanists in 1858 and those which can be seen to-day.

At first sight this seems likely to be a depressing subject—a record of districts built over by the relentless advance of the metropolis, of the drainage of ponds, bogs and marshes, of the disappearance of attractive rarities. It is losses such as these which remain prominent in our minds and make it difficult to take a balanced view. The gains from new habitats created, discovered, or rendered accessible are equally important. The collection of information about the flora of 1858 for this paper has left me with a feeling of relief that so many habitats have survived, that so many new opportunities have been opened up, and that so many changes taking place to-day are similar to those of a century ago which have left us so much. This paper will *not* be a tale of botanical woe !

The first of the Societies which, by amalgamation, became the large and flourishing organization of which we are members was founded as the Haggerstone Entomological Society and, as the title implies, its objects did not include the study of botany. But entomologists are compelled to take some interest in plants, and with Edward Newman, an authority on ferns, a member from the first year, 1858, we can be sure that botany was not entirely neglected.* The other branch, which after change of name fused to form our present Society, originated as the Clapton Naturalists' Field Club. Of this, R. W. Robbins was an early member, L. J. Tremayne joined a little later, and F. J. Hanbury was in the chair in 1892 : to these, with E. B. Bishop, C. S. Nicholson, and H. Spooner, we owe the foundation of our botanical work. It is unfortunate that unlike the Holmesdale Natural History Club founded in 1857, and the Birmingham Natural

* At a (special) General Meeting of the Haggerstone Entomological Society convened for May 14, 1859, at the written request of five members it was agreed that steps should be taken to establish an independent Botanical Society. The Secretary was instructed to convene another meeting when he had collected the names of 20 members interested in the proposal, but no further developments are recorded.

History Society, founded like us in 1858, which provided botanical records from the first, our own botanical recording did not commence until 1900 and even then was restricted to north of the Thames. It was not until 1914 that the Area was defined as a complete circle of twenty miles radius from St. Paul's Cathedral, which forms our present boundary.

For the present time the printed records of the Society provide adequate coverage. Publication of *A Hand List of the Plants of the London Area* was completed last year and the 380 pages of this book cover 1835 species, 19 sub-species, 268 varieties, 33 forms and 113 hybrids. Over 12,000 individual records of the less common plants are included and these are only a fraction of those contributed by nearly 400 helpers to support the summarized statements about distribution. This is a record of which any Society might be proud.

For 1858 information is relatively meagre and must be obtained from external sources. The account of the flora as known at this period which follows is based almost entirely on the issues from 1855 to 1862 of a chatty monthly periodical called *The Phytologist*. This was edited at the time by Alexander Irvine, a discursive writer resident at Chelsea, who spent much of his time botanizing in and round London. To his verbose style, and habit of including references to London plants and habitats in articles on apparently unrelated subjects, I am grateful for many useful facts which would not otherwise be available. Thus, for example, in a paper on a Buckinghamshire habitat he tells us that in 1860 a bog on Wimbledon Common was drained for the erection of butts and that marsh lousewort (*Pedicularis palustris*), and doubtless other interesting bog plants, disappeared from the ravine. In a paper on Enfield Chase we learn of the felling of Hainault Forest and the " suburbanization " of Dulwich.

The plan I have adopted of endeavouring to compare the flora of 1858 with that of 1957 offers serious dangers of misinterpretation which should be made clear from the outset. Attention has already been drawn to inequality of recording at the two ends of the period, but an even greater risk is that we may lose sight of the fact that the selection of dates is arbitrary and that rapid changes were taking place at the beginning of the century just as they are now. Many habitats have changed many times in the course of a hundred years and it is sheer chance what state they happened to be in on the significant dates. Many readers will be familiar with certain chalky fields in the Chipstead Valley which are the home of cut-leaved germander (*Teucrium botrys*), ground pine (*Ajuga chamaepitys*) and other interesting plants. The soil here does not justify regular cultivation but even within my memory the fields have been cleared and ploughed in two world wars and twice reverted to scrub and downland turf. This may have happened on other occasions also during the century, and descriptions of the flora would be very different according to the years chosen. The list of species present in the London Area changes every year and any date selected is merely a stage in a series of changes.

The London Area in 1858

From *Davies' Map of the Environs of London*, published in 1858 (which I have checked against other maps published in 1856 and 1860) considerable information can be gained about the extent to which the metropolis then extended. At that time the land within four miles of Charing Cross was almost continuously built up with the exception of the open spaces which still exist to-day. From this core of bricks and mortar (which

coincides very approximately with the rectangle marked as " Inner London " on the Society's current map) extensions of congested building spread out to Hammersmith, Tottenham, Upper and Lower Clapton, Bow, Poplar, Deptford and Greenwich, Norwood, Balham and Wandsworth. Beyond this, open country spread to the bounds of our Area, with the exception, of course, of towns and villages which were then much smaller than they are to-day.

Our forerunners thus had a great area of real country open to them—and parts of this they could reach easily (and cheaply) by rail, though many branch lines to complete the railway network as we know it had yet to be constructed. Examples of large areas without buildings included Wimbledon Park with the Common, Putney Heath, Combe Wood and Bettywad Wood ; Claygate, Cobham, Stoke, Leatherhead, Ashtead and Epsom Commons which were almost continuous; Banstead Downs, which extended north and east far beyond the present bounds ; the clay country round the Yeading Brook south of Ickenham, Ruislip, Eastcote and Pinner across to Northolt ; and Hainault Forest which then extended four miles from east to west. Over these and other parts it was possible to walk without a house in sight, but the botanist did not have it all his own way. Large tracts of land were enclosed for parks or preserved for game and permission to enter was very difficult to obtain. The conditions described by Irvine for Harefield were by no means unusual :

" The fear of poachers has shut up every wood in this neighbourhood. Every place where a pheasant breeds or feeds is carefully *tabooed* ; notices are nailed up, and the gentle fraternity, who would no more disturb a pheasant than they would wantonly destroy a rare plant, are treated as wilful trespassers, and threatened with all the pains and penalties made and provided. The London botanist who visits Harefield in search of simples, has need of " silver in his pocket, or have silk on his tongue " ; if he be unprovided with one or both of these requisites, he should content himself with such botanizing as he can get on Hampstead Heath, Barnes Common, Battersea fields, or such open places."

Inner London

It is significant that of the three habitats specifically mentioned by Irvine, only the last was within the built-up " inner London " area, and this was very near its end as an attraction for botanists. Battersea fields, intersected by ditches and creeks, had long been a famous hunting ground and many of its glories were faithfully recorded by William Curtis (Lousley, 1946), but a million cubic yards of soil from the excavation of the docks were used to build up the level and, on the site of the ditches, Battersea Park was opened to the public in 1858. Four years later the editor of *The Phytologist* put on record that bistort (*Polygonum bistorta*) " may still be in what was called Battersea fields ; but its ancient station was destroyed when the park was formed," while various marsh plants were no longer " in Battersea where ditches are scarce." There was " a large crop of small brick houses " in a spot which was once part of the fields. A few water plants lingered on for a short time " in Letchmere, near the Wandsworth road " but by 1860 they were " gradually perishing by the want of pure water "—sewage was the immediate threat here. *Scirpus triquetrus* disappeared from the river shore between Battersea and Nine Elms about 1855.

As a fleeting solace for the loss of so many fine native plants the botanists of a century ago interested themselves in the alien species which appeared on the dumped material. No doubt they regarded the exchange as a poor one, as we did the dumping on Mitcham Common and resulting aliens of the last few years, but they made the best of it. On the soil used to raise the level for Battersea Park, and on waste ground between Watney's brewery and the steamboat pier at Wandsworth, many strange and interesting species from the Mediterranean and elsewhere were collected between 1851 and 1859 (Irvine, 1859).

Just across the Thames from Wandsworth it was still possible to botanize about Parson's Green and Walham Green, in places too wet for the builder. Eelbrook Common was then a marshy meadow with the very rare sedge *Cyperus fuscus* growing on the sides of the ditches with *Polygonum minus* and marsh dock (*Rumex palustris*). Strawberry clover (*Trifolium fragiferum*) and fool's watercress (*Apium nodiflorum*) were also there. In 1864 or 1865 the meadow was drained, and is now a public open space. In the place of rare marsh plants, shepherd's purse (*Capsella bursa-pastoris*), annual meadow grass (*Poa annua*), dandelions (*Taraxacum officinale*) and rye-grass (*Lolium perenne*) have colonized its bare, dusty and unlovely patches (D. H. Kent). Tothill Fields near Westminster, which also had marsh plants, was built over ten years or more before our Society was founded, but Hammersmith Marshes were still unspoilt. They extended from Addison Road Station west to Shepherds Bush Road, bounded by Blythe Road (then " Lane ") to the south, and were osier beds " intersected with dikes, full of reeds and bullrushes " and there was a large pond. A. W. Mera gave a first-hand description of these marshes in his Presidential Address of 1906, but although they were much visited by entomologists and ornithologists, little is known of the plants which grew there. Hyde Park and Kensington Gardens produced some flowers of interest (they still do), and the " Site of the Exhibition of 1862 " at South Kensington was the source of many records a little later, but apart from the places mentioned the botanists of 1858 had to travel outside the built-up four-mile radius for most of their work.

The Fringe of the Built-up Area of 1858

Wandsworth Common was one of their favourite haunts just beyond this radius. Here the construction of the railway a little earlier had caused great disturbance and created new habitats and led to the remarkable appearance in 1856 of three rare bog plants. These were found in " wet, heathy turf " at the bottom and on the sides of a deep cutting of the London and South-Western Railway opposite the New Surrey Jail (now Wandsworth Prison). Round-leaved sundew (*Drosera rotundifolia*), and marsh clubmoss (*Lycopodium inundatum*), persisted until 1861 or later, but a young botanist dug up and removed the royal fern (*Osmunda regalis*), of which apparently there was only one root. It seems remarkable that conditions suitable for the growth of these bog plants could develop so soon after the construction of the railway and that the seeds of the sundew could reach the spot—the arrival of the wind-carried spores of the clubmoss and fern is easier to understand. The botanists of 1858 rightly regarded the new railway banks and cuttings as artificial habitats, and treated the plants which appeared on them as " suspected aliens " : these three bog plants of undoubted " British birth " caused much argument about their

status. Wandsworth Common was still wild and more or less covered with furze, bracken and ling, with ponds, and pits where gravel had been excavated. Even to-day there are parts of it where native plants can grow, and as recently as 1942 I found lesser broomrape (*Orobanche minor*) there.

Barnes Common has suffered less, as was shown in a recent account in the *London Naturalist* (Whitehouse, 1952). A century ago it was much wetter than now and aquatic species, such as frogbit (*Hydrocharis morsus-ranae*), and some marsh plants, have disappeared. Of the plants of drier places recorded in *The Phytologist*, we no longer have subterranean clover (*Trifolium subterraneum*) and Teesdalia (*Teesdalia nudicaulis*), but it is still an extremely interesting place. There is still plenty of burnet rose (*Rosa pimpinellifolia*), known there since 1666, and a clump of a very rare hybrid of this species (*Rosa* x *glabra* W.-Dod), fiddle dock (*Rumex pulcher*) and many heath plants. Even in Irvine's day the " rejectamenta of gardens " were becoming established : one welcome recent newcomer found established in 1948 is doab grass (*Cynodon dactylon*), but many other aliens there to-day are of hortal origin.

South of Barnes, there is still a fine open area extending from the remaining part of Putney Heath across Wimbledon Common—and west through Richmond Park. In 1858, as already mentioned, this area was far more extensive. Smooth rock-cress (*Turritis glabra*) was very plentiful on one bank, mousetail (*Myosurus minimus*) abundant in a field and adder's tongue (*Ophioglossum vulgatum*), burnet rose (*Rosa pimpinellifolia*) and climbing corydalis (*Corydalis claviculata*) were also abundant. By 1862 E. B. Penfold was recording the loss of royal fern (*Osmunda regalis*), and said that only one plant of mountain buckler fern (*Thelypteris oreopteris*) remained. Of the last, and of adder's tongue, we have recent records from Richmond Park, while corydalis is quite plentiful. Wimbledon Common has changed greatly during the past century through drainage, fires, lack of grazing, trampling and other causes, but it still remains an extremely interesting place to botanists and capable of producing surprises. With so many native plants to concern him it is strange that the editor of *The Phytologist* devoted nearly a page in 1855 to blue anemone (*Anemone apennina*), a garden plant established in the gardens and shrubberies of Wimbledon Park. Here it grew with winter aconite (*Eranthis hyemalis*), tulip (*Tulipa sylvestris*), drooping star of Bethlehem (*Ornithogalum nutans*) —at the Natural History Museum there is a specimen of this collected the same year by our member F. J. Hanbury—and tuberous comfrey (*Symphytum tuberosum*). Although the blue anemone had been known here since 1724, it was unknown " anywhere about Wimbledon Park, except within the garden-fence, the private pleasure-grounds of the noble occupier of this noble seat." It survived until 1904.

Copse bindweed (*Polygonum dumetorum*) is a native plant of greater interest, if less beauty. It was first found in Britain in 1834 near Wimbledon, and the locality variously described as Pettywood (=Bettywad) and Copse Hill. An erratic species, abundant in some years, it has been seen in the old station as recently as 1954. The bogs of Wimbledon Common are more overgrown and shaded than they were even when I first knew them 35 years ago, but they still produce species which are uncommon in our area.

Between Mortlake and Kew Bridge, snake's head (*Fritillaria meleagris*) had been known in a damp meadow since 1762, but the botanists of a

century ago were anxious about it. In June, 1862, *The Phytologist* published a note that it had not appeared for some years, but this evoked a reply that two fine plants had been picked at Mortlake in the previous month. It seems to have lingered on in this Surrey locality for a few more years—from other counties in our Area there are recent records.

We must now turn to the places on the fringe of the built-up area on the south-east side. At Sydenham, the Crystal Palace had been re-erected in 1852 after removal from the Great Exhibition in Hyde Park, and no doubt this, and easy transport, was the excuse for many visits of botanists from the metropolis. Lawrie Park had a number of established aliens, amongst which a clover, *Trifolium resupinatum*, recorded in 1859, had spread so much by the following year that it threatened to reach the top of Sydenham Hill. White mullein (*Verbascum lychnitis* var. *album*) was at Sydenham on shingle-mounds, while two stonecrops, *Sedum sexangulare* and *S. album*, grew there on an old brick wall. In the Ravensbourne, Canadian water-weed (*Elodea canadensis*) had recently appeared, and wood club-rush (*Scirpus sylvaticus*) grew by the stream. Publication in 1857 by J. F. Young of a list of 117 species he had found at Forest Hill a quarter of a century earlier, with remark that this once rural spot had completely changed, suggests that little was left of the " Oak of Honour Woods " so well known to the older botanists.

Eltham and Chislehurst were still unspoiled, as is shown by the list of plants John Stuart Mill found in flower in November and December, 1857, and the rare species which another correspondent had reported in 1856. *Hornungia petraea* was well in flower on March 14, 1858, only three days after the " breaking of the frost "—like *Centranthus calcitrapa* it grew on the wall of Eltham churchyard. Both plants had been known there since early in the century, and the last persisted until 1884, or perhaps later. The wall was pulled down in 1893. Pennyroyal (*Mentha pulegium*) flourished round a small pool on the eastern edge of Chislehurst Common —it lingered until at least 1885 when F. J. Hanbury collected it.

Blackheath still produced good plants but was threatened by trampling and building. Autumn squill (*Scilla autumnalis*) was there, and this persisted into the present century—the last botanist to record it was Mrs. G. Foggitt. Knotted hedge-parsley (*Torilis nodosa*), knotted trefoil (*Trifolium striatum*), and bird's-foot Fenugreek (*Trigonella ornithopodioides*) were mentioned in a note published by Mill in 1857, and although these, like round-leaved crane's-bill (*Geranium rotundifolium*), are no longer to be found on Blackheath, we still have them elsewhere in north Kent. By 1877 the heath was " nothing but a grassy common, trodden by thousands of persons, and enclosed on all sides, but the park, by suburban villas of recent construction " (De Crespigny) ; it is of very little interest now.

The Thames marshes near Woolwich were the scene of some exceptionally interesting discoveries " within half an hour's journey from the Metropolis " a century ago. In 1857 writers in *The Phytologist* were bemoaning the loss of marsh sowthistle (*Sonchus palustris*), which early botanists had known from the banks of the Thames at Blackwall and Greenwich, and summer snowflake (*Leucojum aestivum*), which had been recorded from between Greenwich and Woolwich. When the following note appeared dated May 17, 1858, over the initials of John Stuart Mill, it was as though part of their prayer had been answered :—" I have seldom enjoyed a greater botanical pleasure than in finding yesterday, for the first time, the *Leucojum* in the Plumstead Marshes. . . . I was delighted

to see that in two different swamps, both already well known to me, this beautiful plant exists in such profusion that all the botanists in England would scarcely exhaust it ; and as both places are within the practising-ground of the Arsenal, they are not likely to be drained and built over."

But Mill had done better than he knew, and it was not until July, 1860, that the full riches of these swamps were discovered. He then found that in the reed-beds between the river bank and the flood, marsh sowthistle was also abundant " just overtopping the tall reeds, or appearing between them." On the bank was least lettuce (*Lactuca saligna*). All three species persisted until about 1885, but since the ground was enclosed as part of Woolwich Arsenal, modern botanists have had no opportunity of investigating the site. Near the Practice Butts on Woolwich Marshes grew two rare grasses, *Polypogon monspeliensis* and *Agropogon littoralis*, and many other salt-marsh plants grew near the river.

It is now time to turn to the fringe of the built-up area north of the Thames, but to this there are few references in *The Phytologist* for the years under consideration. We know from later sources that it was still possible to start botanizing at say Willesden and Brondesbury and work out to Neasden and the Brent Reservoir—the latter, the Welsh Harp, is still an excellent place for plants. Or to the east, Tottenham and Edmonton and the Lea Canal were worth visiting—as the canals still are—but the correspondents of *The Phytologist* showed most interest in Hampstead Heath and Ken Wood. With Bishop's Wood and Highgate Wood these could still produce a good flora. " The great bog behind Jack Straw's Castle " yielded abundance of bog-bean (*Menyanthes trifoliata*), round-leaved sundew (*Drosera rotundifolia*), bog violet (*Viola palustris*), and several uncommon bog sedges. A few years later, in 1866, the lord of the manor claimed the right to build upon the Heath, and if his plans had not been defeated there would have been no chance of survival for even those relics of the native flora which still remain.

Bishop's Wood also had moisture-loving plants such as golden saxifrage (*Chrysosplenium oppositifolium*), wood horsetail (*Equisetum sylvaticum*), and wood club-rush (*Scirpus sylvaticus*), together with guelder rose (*Viburnum opulus*) and service tree (*Sorbus torminalis*)—the last was common in many woods in the district. But as at Wimbledon it was a plant of doubtful status which attracted most attention. This was May lily (*Maianthemum bifolium*), which had been discovered in Ken Wood by Hunter in 1814, and the discoverer of " this rare gem of Flora's diadem " writing in 1861 gave directions for finding it in front of a summer-house after the necessary permission had been obtained from the gardener ! It persisted until 1924, and was replanted in the wood in 1933. Lily-of-the-valley (*Convallaria majalis*) disappeared from Hampstead Heath about 1855, but at the date of foundation of our Society it was still in Bishop's Wood and abundant in Ken Wood, where it still grows but rarely flowers.

The Outer Area

We have now reviewed the few localities which remained in 1858 in inner London, and those just outside the four mile built-up radius : we can now turn to what was then mostly unspoilt country. Here the choice for day excursions from the metropolis was much more limited by transport facilities than it is to-day. Places on the railway lines which then existed could be reached almost as easily as they can now—the

journey to Dartford, for example, took less than an hour—but in between the railways were big gaps, and cross-country walks of 20 or 25 miles left little time for detailed research or covering the ground adequately. The influence of the railways, and improved agriculture, were beginning to make changes—an example is the statement reported in *The Phytologist* in 1860 that the country round Walton-on-Thames had been " much altered by drainage, enclosures, plantations, cultivations and buildings."

In Surrey the districts most thoroughly worked at the time were those about Esher and Reigate. From the former H. C. Watson recorded many rare species which no longer grow there. An example is the marsh gentian (*Gentiana pneumonanthe*), which grew on Arbrook Common from 1856 to 1862. Others, like thrumwort (*Damasonium alisma*) and small fleabane (*Pulicaria vulgaris*) by a pond on West End Common, Esher, could be found up to a few years ago, but are now apparently lost. Littleworth Common and Weston Green remained of considerable interest until about 25 years ago, but have gradually deteriorated through trampling and the absence of grazing by horses, cattle and geese and the encroachment of shrubs and coarse vegetation. Nevertheless much good ground, including bogs, remains on Esher, West End, Fairmile and Arbrook Commons, and Oxshott Heath.

For Reigate, J. A. Brewer published a new *Flora* in 1856, and the foundation of the Holmesdale Natural History Club the following year stimulated sustained botanical investigation of the district. Of the favourite habitats of a century ago Wray Common has been lost, but on Reigate Heath our present members can produce almost as good a list as Brewer, while the chalk escarpment still has an excellent flora. Medlar (*Mespilus germanica*) still grows on Redstone Hill where John Stuart Mill discovered it in 1831. The public had been given free access to Box Hill by the widow of a Mr. Hope, who bought the manor in 1831, but it was a very different place from the area we know to-day. Some of the flat-topped spurs were cultivated, and cultivation extended much higher up some of the slopes than now. Turf-covered sheep walks of a century ago are wooded to-day, and elsewhere what were then young plantations have grown up (Hutchings, 1952). On balance the naturalist is no worse, and perhaps better off, here than he was in 1858.

Nearer London, mention must be made of Mitcham Common. Although little interest in this part of Surrey was shown in the pages of *The Phytologist*, the Common must have been a delightful place at the time. When I first knew it the ground was mostly still very wet with abundant aquatic and marsh plants in the ponds and ditches. Thrumwort I have seen in at least three places and it was a paradise for water starworts and water crowfoots of various species. *Juncus subnodulosus* and *Carex divisa* were other rarities ; I saw green-winged orchid (*Orchis morio*) as recently as 1937, while pennyroyal (*Mentha pulegium*) and *Oenanthe lachenalii* were still there last summer (see p. 183). Continuance of the present policy of tipping household and other refuse on Mitcham Common will soon bring to an end the interest of this fascinating place.

From the pages of Brewer's *Flora of Surrey* published in 1863 it is clear that knowledge of the part of the county within our Area was patchy, and that little was known about the Chipstead Valley and other places away from the railway system as then developed. The Caterham line was open, and this may have provided transport for W. Robinson of Croydon when he discovered rough-podded vetchling (*Lathyrus hirsutus*)

on Hallelu Farm near Warlingham in 1858. This was to be seen at intervals until quite recently and it is one of the plants we would like to see confirmed.

In Kent, Hayes and Keston Commons were easy to reach from the railway at Bromley. Many of the plants recorded are still to be found and perhaps the changes in the drier parts, where birches and scrub have greatly increased within my own memory, following cessation of grazing, are greater than those in the bog. The species recorded in 1860 and 1877 from Keston Bog are set out in Table A with the modern records. The most serious losses are bog pimpinel (*Anagallis tenella*) and ivy-leaved bellflower (*Wahlenbergia hederacea*), which are two of the most beautiful species in the British flora, but although the extent of the wet ground is less, and some of the species known to-day were no doubt present but

TABLE A.

UNCOMMON SPECIES RECORDED FROM KESTON BOG AND NEARBY

	Phytologist 1860-61	De Crespigny 1877	Kent and Lousley 1957
Anagallis tenella (L.) L.	—	X	—
Blechnum spicant (L.) Roth... ...	X	X	X
Cirsium dissectum (L.) Hill	X	X	X
Carex echinata Murr.	X	X	X
C. panicea L.	X	X	X
Drosera rotundifolia L.	X	X	X
Eleocharis multicaulis (Sm.) Sm. ...	X	X	X
Erica tetralix L.	—	X	X
Eriophorum angustifolium Honck. ...	X	—	X
Hypericum elodes L.	X	X	X
Juncus squarrosus L.	X	—	X
Lycopodium inundatum L.	X	X	X
Nardus stricta L.	X	X	X
Narthecium ossifragum (L.) Huds. ...	X	X	X
Myrica gale L.	—	—	X
Dactylorchis maculata ssp. *ericetorum* (E. F. Linton) Vermeul.	—	X	X
Osmunda regalis L.	—	—	X
Peplis portula L.	X	—	—
Potamogeton polygonifolius Pourr. ...	—	X	X
Radiola linoides Roth.	X	?	—
Ranunculus hederaceus L.	X	—	X
Salix repens L.	X	—	X
Scirpus fluitans L.	—	X	X
Scutellaria minor Huds.	X	X	X
Sieglingia decumbens (L.) Bernh. ...	X	—	X
Thelypteris palustris Schott	?	—	—
Vaccinium myrtillus L.	—	X	X
Veronica scutellata L.	X	X	X
Wahlenbergia hederacea (L.) Reichb.	X	—	—
Bog and heath species recorded...	21	19	24

This table includes only species which grow in bog or heath habitats. The record of *Thelypteris palustris* is doubtful, and was not accepted by W. W. Reeves, who knew Keston Bog thoroughly about 1884 and who was the last to record *Anagallis tenella*. Reference should be made to Lovis (1951) for a recent general account of the flora.

unrecorded a century ago, we have here little to regret. Just beyond Keston there is even to-day fine unspoiled country round Downe. It was here that Darwin lived when he was working on his book on the fertilization of orchids, which was published in 1862, and the bank which is believed to be the one on which he made some of his observations is still an excellent place for orchids.

Dartford, Greenhithe and Swanscombe were also well known to the correspondents of *The Phytologist*. In spite of extensive quarrying of the chalk, drainage of the marshes, embankment of the Thames, and building, the area is hardly less rich now than it was then. The walk taken by M. H. Wilkin along " the old Roman road " (i.e. Watling Street) east of Dartford would no longer be as pleasant to-day as it was on July 28, 1857, but nearly all the plants he mentions are still to be seen by making slight detours.

On the other side of the Thames, the marshes at Blackwall and the Isle of Dogs were destroyed, or in course of destruction, by 1858, but an almost unbroken series of unspoilt marshland extended along the Essex bank from East Ham level to Grays. It happens that the contributors to *The Phytologist* for the period under consideration had little to say about these marshes, but they must have been an area of very great interest. Even to-day, saltmarsh plants can be seen up to as near London as Creekmouth and a century ago there was much ground inundated at high tide, and prior to drainage very wet conditions may have developed locally, as they did at Tilbury just beyond the limits of our Area.

Inland, the Essex localities which attracted most interest were the forests of Epping and Hainault. The latter was described in 1862 as " . . . now under the woodman's axe, i.e. undergoing the process of disforestment." Its conversion into arable had been authorized by Parliament in 1851 and it is said that the contractor who undertook to drag the old oaks, including the famous Fairlop Oak, out by the roots by using steam ploughs completed the operation in six weeks ! By 1877 only detached bits of scrub and underwood about Chigwell Row and Crabtree Wood were left and this seems to be just about what we have left to-day. The banks of the Roding were good for marsh and aquatic plants, and still have a useful flora.

Epping Forest, fortunately, was saved from such a fate, but only after a great struggle. In 1850 the Forest comprised almost exactly 6,000 acres, and during the ensuing twenty years almost half this area was enclosed, and some of it built upon. Our own forerunner, the Haggerstone Entomological Society, gave active support to the opposition to this process of attrition in such ways as, for example, arranging a petition presented to the House of Commons in 1863. It was not until 1878 that the Act was passed under which control of the Forest passed to the Corporation of London as Conservators and restoring most of the enclosures. Some 5,542 acres were preserved to the public and various relatively small areas have been added to this since. Epping Forest was the venue of much of the early botanical work of the Society and we published a good general account by R. W. Robbins in 1916. Of the 436 species reported in E. N. Buxton's list, Robbins had failed to find 70 (including some long extinct, or never actually found, and some critical plants which he may have failed to recognize) and added 25. That Robbins and his fellow workers knew about 380 species suggests that the losses had not been very heavy up to that date. In recent years the bogs have shrunk, and changes

have occurred in other parts of the Forest, but it seems fair to say that we are not seriously worse off than the botanists of a century ago. Ivy-leaved bellflower is the most regrettable loss. This was mentioned in the pages of *The Phytologist*, and known until at least 1920 (or perhaps 1946 or 1947) but it seems to have gone.

Middlesex is the county which has suffered most during the life of our Society, and particularly during the last 30 years, but even here the work of D. H. Kent has shown how much is still to be found. Of the ancient haunts of botanists, for example, Hampton Court still produces a good list, including autumn squill, while Hounslow Heath, though diminished in area and threatened with further loss from the extraction of gravel, still has interesting plants including dog violet (*Viola canina*), bladderwort (*Utricularia vulgaris*), and perhaps *Teesdalia nudicaulis*. Harrow was one of the districts receiving most attention about the time of the foundation of our Society. Long lists by W. M. Hind published in the *Harrow Gazette* and reprinted in *The Phytologist* for 1860 and 1861 gave a total of about 530 species and varieties, while Melvill's *Flora of Harrow*, which appeared in 1864, included additional plants. Both writers covered a wide area extending out beyond Pinner, while *Flowers and Ferns of Harrow* by R. M. Harley, which appeared in 1953, included little more than the school grounds and Northwick Park Golf Course ; yet even in this restricted ground 362 species were found. We have lost the green-winged orchid (*Orchis morio*) and fritillary has been seen recently at Pinner only in an old orchard, but considering the vast building estates that now cover much of the country, it is surprising how little of outstanding value has gone.

Harefield has already been mentioned, and here also there have been many changes since Irvine walked there from West Drayton station in May, 1855. No longer do cowslips (*Primula veris*) and cuckoo flower (*Cardamine pratensis*) occur in such abundance in the meadows between Uxbridge and Harefield, and it is no longer true that in Old Park Wood, coral root (*Dentaria bulbifera*) " abounds, so much so, that cartloads would scarcely be missed . . ."—but it is still there in quantity. Much of the surface of Harefield Moor has been skimmed away by the excavations for gravel, and in place of the meadows where *Carex appropinquata* and grass of parnassus (*Parnassia palustris*) grew, we now have an area with new lakes and scars in course of recolonization. Time is needed for this to acquire new botanical interest. Other big changes in the Harefield flora have been caused by the quarrying away of chalk. Nearly the whole of the part of Garret Wood where chalk was at the surface has gone—and this was the part where military orchid (*Orchis militaris*) grew. This was last seen there in 1900. The down where *Gentianella germanica* grows is almost quarried away, and although this lovely blue-flowered gentian is still there it may not last much longer. Nevertheless it is surprising how many of the old Harefield plants are still to be seen—such, for example, as toothwort (*Lathraea squamaria*) and calamint (*Calamintha ascendens*) which Blackstone recorded in 1737, or wild tulip (*Tulipa sylvestris*) which dates from 1853.

An account of a visit to Totteridge Green near Barnet appeared in *The Phytologist* in 1856. The plants listed for the ponds include sweet sedge (*Acorus calamus*), greater spearwort (*Ranunculus lingua*), buckbean (*Menyanthes trifoliata*), fringed waterlily (*Nymphoides peltata*) and water-violet (*Hottonia palustris*). Some of these are still there but the ponds have been tidied up and made " ornamental," and lost much of their

charm in the process. From Finchley Common east to the Essex border, and north into Hertfordshire, the ancient forest of Enfield Chase extended until it was disforested by Act of Parliament in 1777. By 1862, when it was the subject of a paper in *The Phytologist*, much of this area had been brought under the plough, and a great deal more was enclosed in large estates. Lesser periwinkle (*Vinca minor*) " carpeted almost every wood or coppice near Enfield, and it was equally plentiful about Southgate " ; it was also common about Totteridge and Epping Forest. Our records in the *Hand List* show that some of the localities known to us to-day, such as Whitewebbs Park, are relics of the former wide distribution over Enfield Chase and beyond. Danewort (*Sambucus ebulus*) was another of the plants found in the Chase. Since 1862, Southgate, Enfield, and Barnet have extended considerably, but north of these places there is still a lot of country not yet built over and there are several large estates which have not been examined for plants in recent years. In June, 1856, a correspondent of *The Phytologist* spent a few hours botanizing " about North Mims, Hertfordshire and Middlesex." The plants he found included giant bellflower (*Campanula latifolia*), hoary cinquefoil (*Potentilla argentea*), crosswort (*Galium cruciata*), subterranean clover (*Trifolium subterraneum*) and soft trefoil (*T. striatum*). The *Hand List* includes records of all these from the same area though it is possible that the bellflower, at least, has now gone.

Conservation, Agriculture and Aliens

Having reviewed the localities as recorded in the pages of *The Phytologist*, it is now time to turn to more general aspects of the flora of the London Area as they concern the botanists of a century ago and ourselves. The first is antagonism to changes and fear of the imminent loss of interesting plants. In reading these old accounts one is left with the impression that whatever differences there may be in our flora now, the spirit of conservation is much older than most people realize. Our forerunners were deeply concerned about threats to habitats in which they were interested and expressed their concern very freely, but it was only in a very few cases (such as Epping Forest) that any useful action could be taken. In view of all the commercial interests involved during the past century in and around the expanding metropolis it is surprising that so much is left. London botanists in 1858 took a very pessimistic view of the future and our chances to-day in an age with more enlightened public opinion, and with the support of the Nature Conservancy, would seem much brighter by comparison.

The second general aspect which merits attention is that of changes in agriculture. In 1858 the weeds of arable land were far more interesting than they are to-day and although, as they pointed out, " clean culture is detrimental to the botanist " such plants as pheasant's eye (*Adonis annua*) and hare's ear (*Bupleurum rotundifolium*) were still to be found in the cornfields. Improved cultivation aided by modern machinery and cleaner seed has now led to the virtual disappearance of attractive weeds like corncockle (*Agrostemma githago*) and cornflower (*Centaurea cyanus*), and selective weed killers are likely to eliminate those that remain. The policy of taking the plough round the farm is rapidly destroying old pastures and any interesting plants which grow in them, and two world wars have involved ploughing up chalk grassland and other ground which

might otherwise have been left. To this must be added drainage for agricultural reasons, increased run-off from the land consequent on the construction of roads and paths, and covering them with tar or other waterproof surfaces, and the digging of cuttings for railways and roads. As a result many parts of the London Area are much drier than they were a century ago. Changes of this kind during the period have been far greater than they were earlier in botanical history.

The third general aspect which has impressed me in re-reading the pages of *The Phytologist* concerns the importance of studying the spread of alien plants. Some species then recorded with glee as rarities are now common and of considerable ecological significance ; others have failed to spread, while some then regarded as frequent have remained static, or decreased. No botanist at the time could have forecast the future and no doubt many of the records which are now of the greatest value in enabling us to trace the spread of aliens must have seemed very unimportant at the time they were made.

Examples of species which have not exhibited any great spread during the century include rose of sharon (*Hypericum calycinum*) and purple toadflax (*Linaria purpurea*). These received frequent mention and are still to be found in some of the same places. Of *Lepidium ruderale*, John Stuart Mill wrote " . . . so many-seeded a plant having found a locality propitious to it, has every chance of remaining there till the botanist's crack of doom, ' a trowel ticking against a brick '." What he intended by the quotation I do not pretend to know, but his words written in 1859 had a prophetic ring, as this species which was then rare in the London Area is now common and no doubt owes much of its success to the abundant seed production.

Rosebay (*Chamaenerion angustifolium*) was one of the plants recorded with glee a century ago though it was spreading quite rapidly. By 1863 it was well distributed in the Surrey part of our Area, but in Essex and Middlesex it was much rarer, and many years were to pass before it could be described as common in any district. Orange Balsam (*Impatiens capensis*), had first been recorded in Britain in 1822, when John Stuart Mill noticed it as an escape from Albury Park gardens. From here, the seeds were water-borne along the Tillingbourne and Wey and into the Thames—spreading into many Surrey localities and soon afterwards up the Middlesex streams. Writing in 1859, Irvine bemoaned that although the plant was well known its existence " was ignored for many years " and used it as an example to encourage his readers to give more attention to aliens. By then it was plentiful in many places in Surrey and Irvine thought that it had ceased to increase : he was not aware that it already had a foothold in Middlesex. In fact this beautiful American introduction has continued to extend its distribution right up to the present time, but the initial spectacular intrusion into our Area had lost momentum at the time he wrote.

Beaked Hawk's-beard (*Crepis vesicaria* subsp. *taraxacifolia*) is now abundant throughout our Area, but it was hardly known to the botanists of a century ago. It is mentioned twice in the pages of *The Phytologist*—from Northfleet in Kent in 1861, and from near Dorking in 1857—but there are older records from nearer London. It seems that after a long period of rarity and confusion with allied species, the plant suddenly increased extremely rapidly in the second half of the nineteenth century

until it attained the abundance in which we now know it. Canadian water-weed (*Elodea canadensis*) was first recorded from Britain in 1842 and soon increased and spread in a most spectacular manner. By the time our Society was founded, scattered localities within our Area were known in Kent, Surrey, Middlesex, and probably Essex, and occurrences in the Ravensbourne, at Wandsworth and at Horton were mentioned in *The Phytologist*. Readers must have received this news with some alarm as in 1857 a paper by W. Marshall had described the amazing growth of this New World alien and the threat to navigation and drainage which it had caused in the Fens, and damage to amenities of ornamental ponds elsewhere. It continued to spread round London but its aggressiveness diminished and little is heard to-day of its damaging tendencies. At the present time we have repeated introductions by aquarists of the allied *Elodea callitrichoides* and *Lagarosiphon major* which can choke a pond or ditch in a very short period, and their spread is being watched with interest.

In this paper an attempt has been made to compare the state of the flora of the London Area in 1858 with that of a century later, and in the case of individual species and localities it has not proved difficult to draw limited comparisons. The task as a whole has, however, proved an impossible one. Both at the beginning and the end of the period—and, indeed, in every year in between—our flora has been in a state of very rapid change. There is probably no other area of comparable size in Britain where the flora changes so rapidly, and emphasis is on the lack of any sort of stability rather than on the gradual trends which are the subject of most ecological studies and are so often the case elsewhere. All our habitats are subject to constant human interference and the changes are often sudden and drastic. It is common for completely new habitats to be opened up by, for example, the removal of gravel or sand over many acres, or the quarrying of chalk, or the building of embankments or excavation of cuttings. In such cases invasion by plants is rapid, and sometimes of an unusual nature. The rapidity with which bombed sites were recolonized during the war is fresh in our memories, and it will be remembered that in the City alone, the most densely built-up square mile, 269 species were found on the debris (Lousley, in Fitter and Lousley, 1953). The same vectors which brought so many seeds and spores to the City in so short a time, bring them to new habitats exposed elsewhere.

On account of this exceptionally rapid rate of change, and the very wide range of different types of habitat available in our Area, it is particularly dangerous to assert that species are extinct. Hardly a year passes without important new habitats being found to replace those that are lost. A century ago the pages of *The Phytologist* had many examples of species stated to be extinct which were reported again almost as soon as the statements had appeared—the summer snowflake and marsh sowthistle have been mentioned above. Even when restricted to a single county such statements have proved just as misleading. For example, Nicholson in 1916, and Salisbury in 1927, gave lists of species supposed to be extinct in Middlesex but, as Table B shows, these lists proved hopelessly misleading. The flora of the London Area has a remarkable resilience which seems to defy human attempts to destroy it. *Plus ça change, plus c'est la même chose.*

TABLE B.

ANALYSIS OF LISTS OF SPECIES REPORTED AS EXTINCT IN MIDDLESEX.

	Trimen and Dyer 1869	Nicholson 1916	Salisbury 1927
Errors, or never more than casuals...	4	4	4
Still survive	18	18	17
May survive	3	3	3
Still regarded as probably extinct ...	32	33	30
Totals listed by each author ...	57	58	54

The list given by Trimen and Dyer in 1869 was used as a basis by the later writers who introduced only minor modifications. Recent work has shown that more than a third of these species have survived, but some other species not included in the lists have not been recorded for a number of years.

There is a remarkable similarity between the opportunities, difficulties and anxieties of the botanists of a century ago and our own. Although the built-up core and the suburban fringe now extend farther from the centre of London, there are compensations in the ease with which modern transport enables us to reach places which were almost inaccessible to the founders of our Society. The study of the flora of the London Area has never been of greater interest than it is to-day.

[I am deeply indebted to D. H. Kent for allowing me to draw freely on his unique knowledge of the flora of Middlesex and for other help in connection with the preparation of this paper.]

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Some Reminiscences of the City

By W. C. Cocksedge

I ENTERED the City as a junior clerk about the turn of the century. The fact that the South African War was still in progress will indicate the date sufficiently.

At that time, the great Victorian improvements had been completed, the Embankment had been constructed, the Holborn Viaduct improvements carried out and Queen Victoria Street had been cut through the City from Blackfriars to the Mansion House. Henceforth, the only alterations had been the ceaseless demolition of old buildings and the erection of modernized premises. The uniform rows of brick-fronted buildings which are familiar to us in byegone prints of London had almost completely disappeared, although there was still a considerable number of the small, low red brick buildings which had been erected under Acts prescribing the rebuilding of the City after the Great Fire. These were mainly in side streets and in my own recollection have almost completely disappeared. There is a good specimen in Wormwood Street and Turner's hat shop in Gresham Street is familiar to most people. There were also considerable remains of the stuccoed uniform terraces built in Moorgate Street and King William Street early in the nineteenth century, although they had lost their regularity by the erection of modern premises, here and there, giving them a mournful and bizarre effect. Of really old houses, there were practically none left ; only in Cloth Fair, Smithfields and Bishopsgate Street Without, quarters which had escaped the Great Fire, were a few crazy old buildings awaiting demolition. Paul Pindar's house in the latter street had recently been pulled down and the front removed to the Victoria and Albert Museum.

My daily walk for many years extended from Holborn Viaduct Station to Liverpool Street, along Newgate Street and Cheapside and thence by Broad Street or Bishopsgate to my office. The station had then a spacious hotel above its frontage, at which visitors, chiefly foreigners, actually stayed. Turning into Newgate Street, Dance's grim old Newgate was on the right. It looked a prison and it was a prison, thus fulfilling the highest canons of architecture. It came down, however, and the present fine but scarcely monumental Courts were erected in its place. When they were nearly completed, a high ecclesiastic was approached for a suitable legend over the portal. Probably without much thought he suggested the text " Defend the Children of the Poor and punish the Wrongdoer." In due course the scaffolding was removed and a terrible outcry arose over the offending inscription. The authorities however, refused to alter it and the controversy now is as completely forgotten as that over the Epstein statues in the Strand.

Opposite, Christ's Hospital stood for a little while and through the tall railings I used to see the boys scampering about in the playground before the 9 a.m. roll-call. A few yards further on, in St. Martin's Le Grand, stood Smirke's G.P.O., a gloomy building with a fine lofty portico. It is a great pity that it was pulled down and new buildings erected in King Edward Street nearby, which are, architecturally, negligible. At the top of Cheapside, the roadway was divided by the statue of Sir Robert Peel on a bulky plinth with flower-girls and their baskets on the steps. It was certainly an obstruction but it was fine to see the way

the buses swirled round its base when the road was clear. During my time there have been various changes among the City statues. Peel has gone to the Police College at Hendon. Rowland Hill was moved more than once to new positions around the Royal Exchange. It is now in front of the G.P.O., the famous legend " He gave us Penny Postage " having been discreetly altered. The massive statue of King William IV has migrated from its commanding site near London Bridge and may now be found on the lawn of the National Maritime Museum at Greenwich where it looks strangely small. Until near the last, it had no inscription on its plinth and it is said that country visitors took it to be the figure of one Nixon, the sculptor's name being very prominent at the foot of the statue.

Cheapside might have been regarded before the late war as an epitome of the way in which the City was slowly but ceaselessly changing. During the many years I frequented it, one-half the buildings must have come down and been replaced, and yet alterations were so gradual and haphazard that one barely marked the change. It still remained the welter of inconsistencies which gave the City an individuality, unshared by any other Capital in the world.

At the foot of Cheapside, the ageless Mansion House defied Time but the steps in front have been altered and made more convenient. I stood before them on that memorable day when a telegram was read, announcing that the Queen was passing to her Eternal Rest and the hushed crowds thought blankly of the morrow. The Mansion House never changed but alas ! Soame's charming and restrained façade of the Bank has suffered the unspeakable indignity of having a colossal jumble of buildings erected. over and behind it. I suppose it was necessary but what a tragedy ! The open space, round about, has not been sensibly improved by the huddle of utilitarian tube entrances.

From the Bank, I usually proceeded through Threadneedle Street to Bishopsgate, in order to avoid the crowds surging along Broad Street from Liverpool Street Station. On entering Bishopsgate, I passed the monumental headquarters of the National Provincial Bank, one of the few fine buildings erected by a private concern in late Victorian times. On the right, still stood Crosby Hall, concealed from the street by an ornamental quasi-Gothic building with steep gables. This was of no great age but sufficiently picturesque and was occupied as a restaurant. At a later date, strenuous efforts were made to save Crosby Hall but banking pockets were too deep. It was fortunately, however, found possible to remove it to Chelsea. A little further on came St. Helen's Place, now entirely rebuilt, a sort of Liberty similar to Ely Place in Holborn. It was separated from the street by railings and had a porter's lodge. On either side of the Place was a uniform range of tall brick buildings with the Leathersellers' Hall at the end. Still further on stood, and still stands, the Church of St. Ethelburga with two picturesque squat shops in front, impinging on the pavement. A few years ago, it was decided that the shops must be removed and, although there were many protests, it was admitted that they caused inconvenience to the foot traffic. When the shops were demolished, the cement front of the church was removed also and disclosed the rough rubble of the medieval wall. That was again covered with regular courses of smooth stone and surmounted by a narrow coping, perfectly straight and proper. Shortly afterwards, at whose instigation I do not know, the stone casing was

taken down, built up again in a more irregular manner, the stone picked out with a hammer and the coping replaced with a slightly wavy contour. Architectural purists might protest but the result was certainly more pleasing and actually truer to the character of the building.

Outside St. Ethelburga's was a cab-stand and on the opposite side of the street was the Four Swans Inn, an ancient foundation, I believe, but rebuilt. It has since ceased to be licensed. On a low stool outside this inn sat all day long one of the last " watermen " left in the City. He was a fresh old man, shaved carefully round the mouth, and wore a large clean linen apron. The stool was gaily painted with his name " Old Joe " embellished with sprigs of gay flowers. Alas ! came a day when taxis appeared instead of the cabs and he found asylum elsewhere.

Now and again I hazarded the Broad Street route and soon passed on my left the grimiest, most dismal-looking old church in the City, St. Peter le poer. Being later than Wren, it had no friends and was soon demolished to make way for a fine office building. The church had been circular in plan and the building had apparently to conform, more or less, to this arrangement. Subsequent tenants of the building, unaware of this fact, have never ceased to wonder at the tortuous corridors and weirdly shaped rooms which it contains.

In this part of the City one finds, or found, many large buildings erected towards the end of Queen Victoria's reign, to house firms who required spacious offices but did not wish to erect a building of their own. When I started work in the City, two vast buildings were actually being erected on the south side of Finsbury Circus, viz., Salisbury House and London Wall Buildings, replacing tall plain brick houses which in some cases had recently been private residences. Few of these buildings had any pretension to architectural merit. One of the best known of them was Mansion House Chambers in Bucklersbury, rumoured to be—but rumour is a lying jade—the especial venue of "bucket-shops." the many entrances serving as convenient exits for fleeing Directors pursued by angry shareholders. Little these Directors recked that within a few yards was the buried Temple of Mithras, dedicated to secret cults and deep mysteries which not inaptly described their shady offices.

The traffic was naturally entirely horse-drawn but vehicles, especially buses, moved at a greater speed than might be thought. At the Bank, however, there was often great congestion and delay and the " jam " on London Bridge was proverbial. The buses had few regular stopping places but were supposed to draw up when a fare wished to alight. This they often failed to do and passengers were carried, protesting, some distance along the street.

The cleaning of the chief streets was effected by numerous Street Orderly boys, regular employees of the Corporation who wore distinctive white jackets. It is impossible to describe the jaunty manner in which these boys waved their pans and brushes as they darted about amongst the traffic, returning every minute or so to deposit the manure in tall iron receptacles on the kerb. Nevertheless, at the end of a sultry day, the fumes of ammonia were powerful enough to annoy the squeamish. The main streets were paved with Australian jarrah wood blocks but they became rather " knobbly " in use and were superseded by creosoted soft wood blocks. The side streets were largely macadamized, and during a wet day the mud was squeezed into pools of liquid abomination along the kerbs, leaving spaces for wayfarers to cross the road. Carts very

frequently splashed this semi-liquid mud over the pavements. There were very few women about, however, and men accepted the mud on their clothes with resignation. In fact, the office clothes brush was an institution.

Late at night, the main streets were invaded by gangs of men who cleansed the roadway with veritable floods of water, paying little heed to the comfort of the infrequent foot passengers. During the day, the crowds in the streets were predominantly male as the shorthand typist was, literally, still in her infancy. It was some years before women employees became numerous and our office was entirely masculine. We had, in fact, a clumsy typewriter but it was rarely used for letters, these still being written in copying ink, copies being made in a hefty hand-operated press. The damping of the tissue required nice judgment and if the Chairman's letter was smudged, a position of some delicacy was created. Even typewritten letters were usually copied in the same manner, carbon copies being regarded as having doubtful legal value.

Some old customs still lingered in the City. In our office was a poor old clerk who had seen better days. His sight being bad, he wore large goggles and strongly resembled a magnified edition of the immortal Pickwick but unlike that worthy, I imagine, his waistcoat was often smeared with bacon fat and egg. He was accustomed to buy his chop or piece of steak of a butcher and take it into a small public house to have it cooked on the strength of imbibing a glass or two of beer. I frequently met him in Bishopsgate with the meat in his hand, scarcely concealed by a scrap of newspaper.

Those who could afford, dined in taverns or fairly expensive restaurants, but the tea-shops, nearly all A.B.C. or B.T.T. (for Lyons was not yet) were more numerous than at present although usually smaller. Their prices were amazingly low. I have often eaten a poached egg on toast, cost threepence (or was it fourpence ?—I know that two eggs on toast cost sixpence). There were even some vegetarian restaurants which offered three dishes for sixpence. In Bishopsgate were two or three old-fashioned comfortable coffee shops where a chop or steak could be obtained for a few pence.

At first the tea-shops were sombre with male garb, but gradually the growing army of women typists and clerks filtered in, adding a diversity of colour and at length a lingerie shop was opened, I think in Broad Street, and men realized that another citadel had fallen.

During the mid-day break I frequently took a stroll, often in Leadenhall Market, nearby. In those days, the poulterers' shops usually had a few interesting birds suspended on cords in front of their premises—herons, bitterns, a smew in full plumage and even owls, green woodpeckers and kingfishers. On the fishmongers' slabs too was often exhibited some uncommon fish, an opah or a large sturgeon. This is all a thing of the past. Once, a consignment of frozen wallabies was exhibited in like manner. These marsupials never appeared again and I fancy that, in common parlance, they did " not catch on."

As a footnote, I might refer to the increased cleanliness and salubrity of the City. At the turn of the century, all offices were bedevilled by grime and soot, scarcely conceivable nowadays. The thousands of open coal fires and the belching ventilation shafts of the Underground (the present Inner Circle lines) made it impossible to keep anything clean, and the management in our office actually supplied special slips of paper to

cover our starched cuffs. Collars, of course, had to be changed daily. I have stood on Blackfriars Station when the opposite platform was barely visible. There was little or no tiling in the stations and the bare brick walls were encrusted with grime. Where an attempt had been made to whitewash patches of brickwork, it was soon a dirty grey and everything was sooty. There was also a prevailing odour of sulphur from the engines. The carriages were remarkably uncomfortable, having wooden backs and seats without covering, but when I was a boy there was one compensation. Before entering a station, a click was heard and upon looking up, one saw a card flicker round and display the name of the station. Who says that we have progressed !

Nature Conservancy in the London Area

Report on the Activities of the Nature Conservancy, 1957

By O. E. Balme (Mrs. Young) and W. A. Macfadyen

IT is pleasant to report that there have been no outstanding threats to proposed Reserves or Sites of Special Scientific Interest in the London Region during the past year. The Conservancy's main activities have been directed towards first, preparing management plans for the declared National Nature Reserves and, secondly, reviewing the lists of Sites of Special Scientific Interest to bring up to date the schedules and maps for inclusion in the revised County Development Plans. In most counties these revisions must be submitted during 1958 and the London Natural History Society are invited to assist by putting forward suggestions for revision of existing S.S.S.I. boundaries, additions to the schedule and possible deletions where recent development has reduced the original value. In several cases it is felt that sites are too large and unwieldy for conservation purposes.

Geological sites

A survey of all geological sites of Special Scientific Interest that have been notified in the Society's area shows little activity to report for 1957.

Swanscombe Skull Site Reserve, Kent. M.R.51/598743

Excavation of the Upper Middle Gravel by Mr. John Wymer and Mr. and Mrs. B. O. Wymer has continued throughout the year.

No further human remains have been found, but a number of interesting finds have been made, including a large flake showing undeniable evidence of the use of Levallois technique, the first definite specimen ever recorded from the Swanscombe Middle Gravels. One or two of the 33 hand axes found are finer than anything recorded in the Swanscombe Committee's Report (1938). Specks of charcoal were again occasionally encountered, and one charcoal fragment an inch long lay alongside a bison vertebra and a mint flint flake. One flint with a well-calcined face was found, but no charred bones.

Other finds of interest include two species of non-marine mollusca, *Sphaerium rivicola* (Lamarck) and *Unio cantianus* (Kennard and Woodward) from the base of the Lower Middle Gravel. The former confirms an earlier record, and both are of interest as indicating Rhenish affinities.

The dig will be continued by the Wymers during 1958, again with the help of a grant from the Wenner-Gren Foundation of New York.

A Management Plan for this reserve is under preparation, and it is hoped that its implementation will gradually lead to improvement in the amenity of this most difficult site.

Two problems are of special moment. Firstly, it is required to educate the public so that they may learn to appreciate the interest and value of the outstandingly important treasure in their midst ; to respect it and refrain from damaging the fences, notice boards, buildings, and sections of strata exposed. These have suffered wanton damage in the past.

The second problem is the simple one of removing rubbish from the reserve, with the more difficult one of stopping future deposition of more rubbish. An active Warden who can devote considerable time to these duties would contribute largely to the solution of these problems, and the assistance of the Honorary Wardens will also be valuable.

Surrounded on all sides by both official and unofficial rubbish, the reserve now lacks that amenity of site and surroundings befitting its scientific importance. Continued effort and collaboration between the Conservancy, the Local Authority, and surrounding owners will be necessary before the ideal is attained.

During the year a new independent Geological Conservation Council representative of geological opinion has been in process of formation. It will maintain close liaison with the Nature Conservancy in the geological and physiographical fields, and will focus public opinion on the importance of the conservation of outstandingly important sites of this nature in Great Britain. Some of the sites indeed are of international importance, for they preserve evidence upon which the science of geology itself was built. It is for our generation to protect such sites for the present and future generations. The Nature Conservancy who were given duties and powers for the purpose in their Royal Charter and in the National Parks and Access to the Countryside Act, 1949, cannot successfully defend all that needs defending without vigilant and vigorous support.

It is hoped that the new Council will aid and strengthen conservation in these fields in the way that is done by other bodies already established for botany and archaeology.

At present the Geological Conservation Council consists of sixteen members, geologists (in the widest sense) of eminence, most of them representing geological and allied societies or University Departments of Geology throughout Great Britain. The President is Dr. R. G. S. Hudson, and the Secretary Dr. J. F. Kirkaldy, Department of Geology, Queen Mary College, University of London, Mile End Road, London, E.1.

The Survey of Bookham Common

SIXTEENTH YEAR

Progress Report

VEGETATION. (Report by C. P. Castell and A. W. Jones)

A survey of the distribution of *Mercurialis perennis* (Dog's Mercury) showed that it was confined to the north edge of the Common in a strip not more than 15 yards wide, extending from Hundred Pound Bridge Wood (just off the Common) in the west intermittently along the margins of Hill House Wood and Kelsey's Wood almost to Kelsey's Farm. An isolated easternmost patch occurred in Stents Wood East, just S. of Lady Chewton's Wood.

A burnt area near Isle of Wight Pond had been cleared at the beginning of the year and planted with Cherry, Beech, Sycamore, Hornbeam, Laburnum and Alder and then fenced with a strand of wire. The flora of this area was listed and general observations made. Notes were also made on Station Copse and of the relative abundance of species colonizing an area of dead grass near Five Halls. Four 3-ft. square quadrats were mapped in a deturfed area in W. Plain (ref. 465) and percentage cover of the flora estimated. The resurveying of the Short Grass Quadrats was continued. *Riccia fluitans* was again found to be dominant on Sheepbell Pond in November, when it was also observed in Lower Eastern Pond.

MAMMALS. (Report by G. Beven.)

It is evident that the Rabbit is increasing again since it was laid low by myxomatosis in 1954. One was seen on farmland adjacent to the common in March, 1955, and several have been observed there since then (1956-7). In February, 1957, fresh droppings and recently used burrows were found in the copse by Bayfield Pond (ref. 763) and during the year there was similar evidence of occupation of eight burrows in Lady Chewton's Wood, one rabbit being seen in South-east Wood (ref. 86) in April and fresh droppings were noted in Station Copse (ref. 88) and Eastern Wood in December.

BIRDS. (Report by G. Beven.)

The small but enthusiastic group of ornithologists continued to do regular census work during the year on Chesmore and Kelsey's Farms and on Western and Isle of Wight Plains. The investigation into the feeding niches of birds in dense oakwood (Eastern Wood) is yielding interesting results. For example, it has been demonstrated that the various species of tits each spend a different proportion of their feeding time in the ground vegetation and in branches and twigs of the trees and shrubs. The Wren feeds almost exclusively below the canopy. The Tree Creeper lives mostly on the tree-trunks, whereas the Nuthatch feeds much more on the branches, even reaching the twigs to pick off the nuts. However, more information is required and this work will be continued.

The Woodcock, *Scolopax rusticola*, is not mentioned in the check-list of birds for the Common (Carrington, L. I., Castell, C. P., and Wilton, A. R., *L.N.* for 1943, pp. 23-29). In May, 1945, however, two were observed in display flight and " roding " has been noted subsequently, in 1950 (one), 1956 (one) and 1957 (two). One observer considered that

there were four pairs present in June, 1955, and Woodcock were seen during May in both 1953 and 1954. Therefore it seems likely that this species has at least attempted to breed annually in recent years. It has also occurred there in most recent winters, certainly since 1946.

DIPTERA. (Report by L. Parmenter.)

Among the Agromyzidae collected or bred from puparia that he has found on Bookham Common, Mr. K. A. Spencer has described four species as new to science, one being named after our veteran member Mr. M. Niblett :—

Melanagromyza nibletti (Spencer), bred from puparia from stems of *Silaum silaus* (L.) (Schinz and Thell), collected November, 1956, emerged April 3, 1957. (*Proc. R. Ent. Soc. Lond., A.*, **26**, 180).

Melanagromyza sativae (Spencer), bred from stems of *Pastinaca sativa* L., 1956 (*op. cit.*, 181-2).

Melanagromyza torilidis (Spencer), bred from stems of *Torilis japonica* (Houtt.) D.C., May, 1956 (*op cit.*, 182).

Ophiomyia heracleivora (Spencer), bred from puparia in the base of rotting leaves of *Heracleum sphondylium* L., collected November 17, 1956, emerged February 8, 1957 (*Proc. R. Ent. Soc. Lond., B.*, **26**, 162-4).

CRUSTACEA.

Visits were made to the Common on February 13 and April 18, 1949, and from September 2-7, 1957, by Mr. W. A. Smith of The British Museum (Natural History). The collections made on February 13, 1949, were taken from below ice. The identifications were either by, or checked by, Dr. J. P. Harding. A selection from the material has been preserved in the museum. Mr. Smith's records are combined below and a few records by C. P. Castell and P. H. Holway added.

The following abbreviations are used : P., Pond ; B., Bayfield Crater ; B.S., Bookham Stream, nr. Bank's Pond ; Cr., Crater ; E.U.E., Eastern End of Upper Eastern ; I.O.W., Isle of Wight ; L.E., Lower Eastern ; W.U.E., Ditch at W. end of Upper Eastern Pond ; 100 P.B., Stream, S. side of Hundred Pound Bridge.

AMPHIPODA. *Gammarus* (?) *pulex* (Linn.), I.O.W.P.9/57 ; W.U.E.P.9/57.

ISOPODA. *Asellus meridianus* Racovitza, ♂ only, W.U.E.P.9/57.
(above determinations by R. W. Ingle)

OSTRACODA. *Cyclocypris ovum* (Jurine), Cr.P.2/49 ; I.O.W.P.9/57 ; W.U.E.P.9/57.
Cypria ophthalmica (Jurine), B.P.2/49 ; E.U.E.P.9/57.
Cypricercus affinis (Fischer), I.O.W.P.4/49.
Cypridopsis vidua (O. F. Müller), W.U.E.P.9/57.
Eucypris sp., B.P.2/49 (juv.).
Notodromas monachus (O. F. Müller), I.O.W.P.9/57.

COPEPODA. *Acanthocyclops bicuspidatus* Claus, L.E.P.2/49 ; W.U.E.P. 9/57 ; B.P. 1♀, 2/49.
A. gigas (Claus), I.O.W.P.2/49.
A. vernalis (Fischer), abundant, with eggs, in temporary pool nr. Bookham Stream (ref.45) (13.3.55, C. P. Castell), " seems to be *A. vernalis*, but if so, your specimens are

unusually large. *A. vernalis* is a very common species in ditches or small pools, but never in lakes or open waters." J. P. Harding.

A. viridis (Jurine), I.O.W.P.4/49 ; W.U.E.P.9/57.

A. sp., I.O.W.P., juv., 4/49.

Diaptomus castor (Jurine), I.O.W.P.2/49, 4/49 ; B.P. 1♂, 2/49.

Eucyclops agilis (Koch), I.O.W.P.9/57 ; E.U.E.P.9/57 ; B.S.9/57 ; 100 P.B.9/57.

Macrocyclops fuscus (Jurine), E.U.E.P.9/57.

CLADOCERA. *Alonella excisa* (Fischer), I.O.W.P.9/57.

Chydorus sphaericus (O. F. Müller), W.U.E.P.9/57 ; I.O.W.P.9/57.

Ceriodaphnia megalops Sars, I.O.W.P.9/57.

C. reticulata serrata (Jurine), I.O.W.P.9/57.

Daphnia pulex (de Geer), I.O.W.P.9/57 ; W.U.E.P.9/57 ; L.E.P.4/55 and B.P.4/55, P. H. Holway.

Simocephalus exspinosus (Koch), W.U.E.P.9/57 ; I.O.W.P. 9/57.

S. vetulus (O. F. Müller), I.O.W.P.4/49 and 9/57 ; W.U.E.P.9/57 ; U.E.P.5/54, P. H. Holway.

Scapholeberis mucronata (O. F. Müller), I.O.W.P.9/57.

C. P. CASTELL.

Notes on the Vegetation of Eastern Plain

By C. P. CASTELL and A. W. JONES

Eastern Plain is, botanically, one of the most interesting areas of Bookham Common, as the systematic list at the end of this paper will show. It is a somewhat irregular area about 400 yards long from E.-W. and from 80-170 yards from N.-S., sloping gently from 145 ft. O.D. in the S.E. to about 125 ft. in the N.W. The ground continues to rise in the S.E., reaching 160 ft. in South East Wood at the railway tunnel and drops in the N. to the Hollows at about 125 ft. There is a sharp drop, to the S.W., to about 120 ft. in Central Plain.

Although the area is mapped as London Clay by the Geological Survey, over most of it several feet of pebbly sandy loam, or even of sand, have to be penetrated before clay is reached. The London Clay, therefore, appears to be covered by a downwash from the sandy gravel capping the higher ground to the S.E. The soil reaction is, consequently, rather acid (pH *c.* 5·5), sufficiently so to support a local and very small area of *Sphagnum* (Bog-moss).

The Plain is almost entirely surrounded by oakwood. " Common Road " and " Tunnel Path," running near the W. and E. borders respectively, provide habitats for a number of plants not found elsewhere on the Common. The Gun-pits, dug in 1943-4, provide interesting examples of colonization. (Bangerter and Castell, 1949, 1951, Bensley 1955, Castell 1955.)

Three main types of vegetation may be recognized.

1. MOLINIA CAERULEA (Purple Melic) GRASSLAND, boggy in places and drained by Eastern Ditch.

2. Areas dominated by PTERIDIUM AQUILINUM (Bracken).

3. SCRUB, mostly Birch, Aspen and Willows.

The distribution of these in 1948 is shown in the accompanying sketch-map (Fig. 1, from Bangerter and Castell, 1949).

THE MOLINIA GRASSLAND (MOLINIETUM)

This is by far the largest area of *Molinia* on the Common, where it is dominant in a narrow belt about 20 yards wide bordering Eastern Ditch in the central part of the Plain, but it also forms extensive areas at the E. and W. ends. *Molinia* is, however, to be found everywhere under the bracken, which covers most of the rest of the Plain, although it is sometimes in very poor condition. It occurs also in the extreme N.W. corner of S.E. Wood and in the tall scrub and woodland a little to the N. It would seem very clear that *Molinia* once covered, and was probably dominant over the whole of Eastern Plain, in which bracken has advanced and is still advancing (Plate 3, Fig. 2). Probably *Molinia* also extended originally over all but the most southern part of the area bounded by Common Road South in the E. and by Central Ditch in the W. This is now chiefly occupied by woodland and bracken, where *Molinia* in poor condition is still to be found. A more or less pure fringe of *Molinia* occurs some distance to the E. of Central Ditch and along Eastern Ditch. A small isolated area occupies part of the higher ground of the western part of Bayfield Plain (see map in Jones, 1954).

Among the abundant, or locally abundant, plants in this community are : *Genista anglica*, *Ulex minor*, *Potentilla erecta*, *Populus tremula* (occasional elsewhere), *Calluna vulgaris* (rare elsewhere), *Galium uliginosum*, *Succisa pratensis*, *Cirsium palustre*, *Cirsium dissectum* (practically confined to this area), *Festuca rubra*, *Deschampsia caespitosa*, *Agrostis stolonifera* and *Nardus stricta* (not known elsewhere). *Deschampsia flexuosa* (local) and *Carex panicea* (l. freq.) are both known from only one other site and *Orchis ericetorum*, *Carex pilulifera* and the mosses *Sphagnum subsecundum* var *auriculatum* (Schp.) and *Aulacomnium palustre* (Hedw.) appear to be restricted to the area. The little bog supporting these mosses is the only one on the Common.

EASTERN DITCH. This ditch merely contains local drainage and there appears to be little flow of water, the ditch drying up during the summer months. The flora differs little from that of the wetter parts of the Molinietum. *Hydrocotyle vulgaris* is perhaps the characteristic plant, being abundant to locally dominant. Abundant species are *Ranunculus flammula*, *Juncus articulatus*, *Carex hirta* and *C. nigra*. *Mentha aquatica* and *M. sativa* occur where the ditch crosses Common Road.

The following species are not known elsewhere on the Plain, except, in some cases, in the gun-pits : *Lychnis flos-cuculi*, *Sagina procumbens*, *Trifolium repens*, *Scutellaria minor*, *Eleocharis palustris* and *Carex flava*

THE BRACKEN AREA (PTERIDETUM)

All the species recorded with, or under, bracken also occur in the Molinietum, but usually with greatly reduced frequencies. *Molinia caerulea* is frequent throughout, although often in poor condition. *Hydrocotyle vulgaris* and *Lonicera periclymenum* are both also frequent throughout and the latter may even be locally abundant, being the most successful species in its toleration of the adverse conditions under bracken.

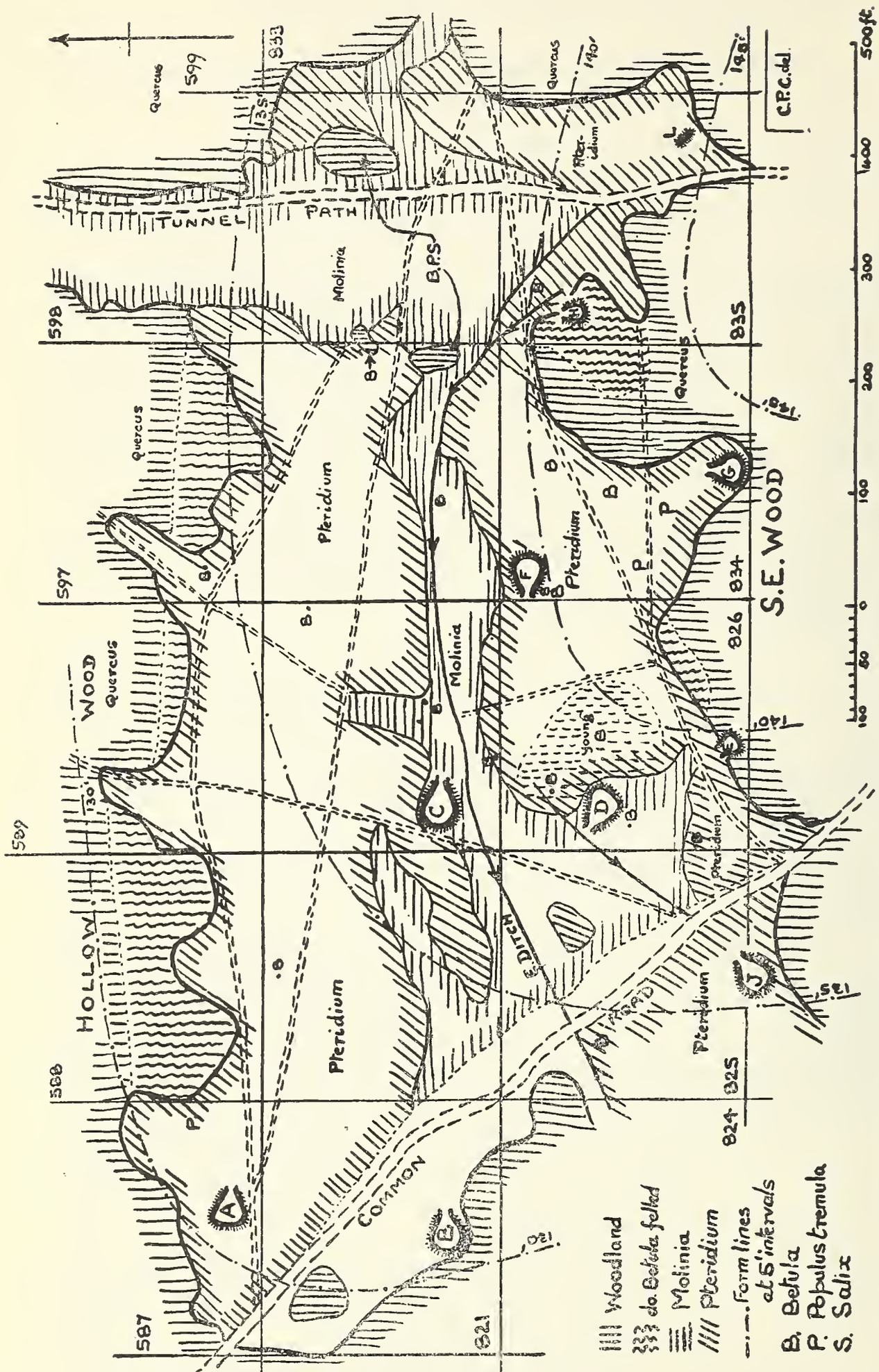

Fig. 1. Vegetation Map of Eastern Plain, Bookham Common, showing Position of Gun-pits A-J (1948).

Stachys officinalis, *Potentilla erecta* and *Populus tremula* are locally frequent, while other local plants are *Juncus effusus*, *Deschampsia caespitosa* and *Calluna vulgaris*, the latter in large isolated clumps. There is thus ample evidence that Eastern Plain was formerly wetter than it is now, probably a boggy heath, and this drying out of the Plain may have been the principal factor contributing to the spread of the bracken. Several extensive fires have occurred in the Plain since the survey started; these take place in the early spring when the bracken and *Molinia* litter are dry and vulnerable. Bracken rhizomes, being underground, are quite unaffected and competition from other plants is thus weakened and even eliminated. The fires, although often extensive, are quite superficial. In May, 1956 (after this paper had been prepared) there was, however, a fire which burnt the whole of the Plain, spreading to the fringe of Central Plain and across the eastern part of E. Hollow. The effects of this fire have not yet been investigated but it appears to have done rather more damage to the scrub than previous fires.

It is not known if cattle formerly grazed this area, as they did the lower lying plains to the west, but the grazing is unlikely to have been on anything like the same scale and the trampling unlikely to have inhibited the spread of the bracken. Since 1948, when the map was prepared, the bracken has become much thicker. The cart track shown running from the N.W. corner to the S.S.E. and several of the footpaths have been obliterated.

Scrub.

Scrub appears to be more strongly developed among bracken than in the Molinietum, partly because the drier areas favour both and partly because the scrub is, in many cases, spreading from the woodland from which the bracken has, doubtless, already spread.

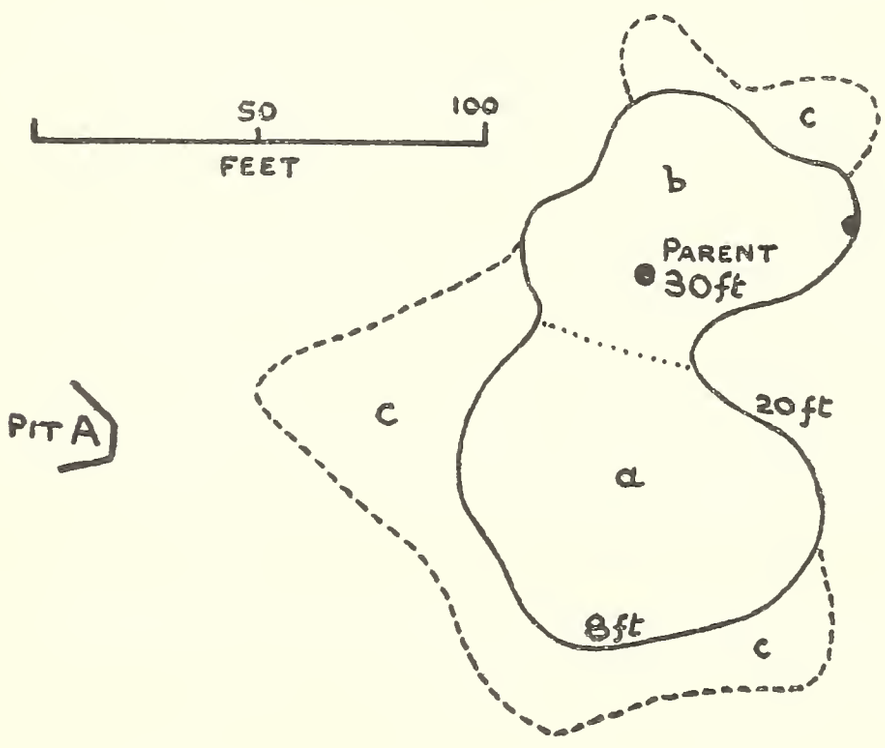

Fig. 2. The Spread of Aspen.

Aspen (Populus Tremula) (Fig. 2). The spread of the Aspen from the edge of the woods has been one of the most conspicuous features in Eastern Plain during the last ten years. An area in the N.W. corner of the Plain was investigated in April, 1954. The dense growth of young saplings proved to be the result of root suckering. Horizontal roots are sent out for considerable distances at a depth of only an inch or two below the soil surface and suckers arise from these at frequent intervals.

It was not found possible to trace the sources of all the suckers, but those from one male tree, 30 ft. high, on the margin of Hollow Wood were examined. The dense area of the suckers was about 75 ft. E. of pit A, figure of 8 in shape, and was 120 ft. long (N.-S.) by 80 ft. (E.-W.) at its widest. In the southern half, approximately 300 stems, one inch or more in diameter, were counted and there were at least as many smaller; their heights ranged from 20 ft. in the N.E. to 8 ft. in the south (Plate 2, Fig. 1). In addition, there was a marginal area (*c*), with occasional small suckers, about 15 ft. wide in the south and as much as 50 ft. in the west. The line of demarcation between these two areas was most marked. The southern half (*a*) was in the open, outside the shade of Hollow Wood, and bracken appeared to be the only plant competitor; the northern half (*b*) was enclosed on three sides by Hollow Wood. All the plants were male, like the parent. Fibrous roots were few on the suckering roots, even under the suckers themselves, which were often quite free from the soil and could be lifted easily. One sucker 20ft. high was unattached to the soil by fibrous roots and it was possible to lift it an inch or two. A neighbouring colony was wholly female and one on the south side of the Plain was of trees 30 ft. high and obviously originated in a similar manner.

Birches. (Mostly *Betula verrucosa*, with some *B. pubescens*).

Birches occur all over Eastern Plain and form dense thickets in places (Plate 2, Fig. 2). Several plants were examined, but no evidence of suckering was found in the thickets, although Rollings (1939) records suckering from the roots of adult trees on Wimbledon Common.

Willows. (*Salix atrocinerea.*) Willows occur in and around the gun-pits and along Common Road South and have increased considerably in size and numbers in the last ten years. No evidence of suckering was found in the plants along the road.

The Gun-Pits

No detailed work has been done on the vegetation of the nine gun-pits since Bangerter and Castell (1950). They have become considerably overgrown and are developing into more or less closed communities. *Juncus bulbosus* was not recorded in 1950, but is now dominant over parts of three pits. Several of the pits have parapets [(P) in systematic list] now covered with short turf; this may be due to human treading and, possibly, partly due to rabbit grazing, as rabbit droppings were always to be seen and were still to be seen in 1955.

Roadsides

The sides of Common Road and of Tunnel Path support a relatively rich flora, of which the following are the most abundant or most interesting species :

Potentilla anserina and *Festuca ovina* ssp. *tenuifolia* are locally dominant, while *Ranunculus repens*, *Odontites verna* and *Holcus lanatus* are abundant. Among the locally abundant species are : *Ulex nanus*, *Mentha sativa*,

Prunella vulgaris, *Succisa pratensis*, *Cirsium arvense* and *Juncus inflexus*. The following are frequent : *Trifolium fragiferum*, *Stellaria graminea*, *Salix atrocinerea*, *Plantago lanceolata*, *Lotus uliginosus*, *Cirsium palustre*, *Carex hirta and Anthoxanthum odoratum*. Among the more interesting but occasional species are : *Ranunculus ficaria* (a few plants near S.E. Wood), *Polygala vulgaris* (rare on the Common and the only site on the Plain), *Hypericum humifusum* (also in several of the gun-pits), *Trifolium dubium* (also in two of the gun-pits), *Lathyrus montanus*, *Fragaria vesca* (not observed elsewhere on the Plain), *Pedicularis sylvatica*, *Glechoma hederacea* (the only site on the Plain), *Gnaphalium uliginosum* and *Juncus bulbosus* (both in ruts on the road).

SYSTEMATIC LIST OF THE PLANTS OF EASTERN PLAIN

Equisetum arvense. Occasional along ditch ; rare in Molinietum ; pit C & C(P).
Pteridium acquilinum. See main areas of dominance on map, frequent elsewhere ; pits A(P), B(P), C(P), E.
Pinus sylvestris. One young sapling in south-central bracken area.
Ranunculis acris. Molinietum, very rare.
R. repens. Thinly distributed along ditch and in Molinietum, but abundant along road ; pits B, B(P), C, C(P), J.
R. flammula. Frequent along ditch ; pits A, B, C, F, J.
R. ficaria. A few plants by road in south.
Cardamine pratensis. Molinietum, rare, occasional along ditch.
C. hirsuta agg. Pit J(P)
Viola riviniana. Pits A, A(P), E, G.
V. canina. Molinietum, very rare.
Polygala vulgaris. Side of Tunnel Path.
Hypericum humifusum. Rare in ditch and by side of Tunnel Path ; pits B, E, F, G, J.
H. pulchrum. Edge of wood in S.W. ; Molinietum (centre of Plain).
Lychnis flos-cuculi. Rare along ditch.
Cerastium vulgatum. Molinietum, rare.
Stellaria graminea. Frequent in Molinietum, Pteridetum, among *Deschampsia caespitosa* and by road ; pits B(P), C(P).
S. holostea. Under bracken ; pit B(P).
Sagina procumbens. Rare by ditch ; pits B, J.
Montia sp. By ditch.
Genista anglica. Very frequent in Molinietum, much less common among bracken or by ditch.
Ulex europaeus. Molinietum, very rare ; by pit F.
U. minor. Molinietum, very frequent ; Pteridetum, occasional ; frequent by road ; pits A, D.
Trifolium medium. Molinietum, very rare.
T. repens. Ditch ; pit B.
T. fragiferum. Frequent on E. side of road.
T. dubium. Side of Tunnel Path ; pits B, J.
Lotus corniculatus. Molinietum, rare ; pit C(P).
L. uliginosus. Bog ; frequent by boggy part of road and occasional both in pure Molinietum and when latter mixed with *Deschampsia caespitosa* ; pits B, C, E.
Vicia tetrasperma. Very rare (ref. 5896).
Lathyrus montanus. By road ; Molinietum, rare.
Rubus fruticosus agg. Occasional in Molinietum and Pteridetum ; pits A(P), G.
Potentilla anserina. Very frequent by road and on it ; ditch ; pit B.
P. erecta. Abundant in Molinietum and amongst *Deschampsia caespitosa* ; occasional in Pteridetum ; all pits and pit A(P).
P. anglica. Pit C(P).
P. reptans. Molinietum, scarce ; pit C(P).
Fragaria vesca. Side of Tunnel Path.
Rosa canina and *R. arvensis*. Scattered bushes.
Prunus spinosa. Molinietum, rare.
Crataegus monogyna. Small plants, rare in Molinietum and Pteridetum and along road ; pit C(P).
Malus sylvestris. Molinietum, very rare.
Ribes nigrum. One plant in Pteridetum.
Epilobium hirsutum. Amongst *Deschampsia caespitosa*.
E. montanum. Molinietum, very rare.
Epilobium sp. Rare by ditch.
Chamaenerion angustifolium. Scattered in Molinietum and Pteridetum and by ditch ; pits A(P), D.
Callitriche sp. Pit B.
Hydrocotyle vulgaris. Very frequent in Molinietum and Pteridetum, abundant along ditch pits B, C, D, E, F, J.
Torilis japonica. Very rare.
Silaum silaus. Molinietum, rare.
Angelica sylvestris. Molinietum, locally frequent.
Heracleum sphondylium. Molinietum, rare.

Rumex acetosella. Pit J.
R. acetosa. Molinietum, frequent ; Pteridetum, rare ; pits A(P), B(P), C(P).
R. conglomeratus. Rare by ditch ; amongst *Deschampsia caespitosa.*
Betula verrucosa. See vegetation notes ; pits B(P), C(P), D. E. G, H.
B. pubescens. See vegetation notes.
Quercus robur. Scattered seedlings and saplings ; pit D.
Populus tremula. See vegetation notes. One sucker in Pit G.
Salix caprea. Molinietum, occasional ; by road.
S. atrocinerea. Molinietum, occasional ; frequent by road ; pits A, B(P), C.
Salix sp. Pits D, E, H, J.
Calluna vulgaris. Widely distributed both in pure Molinietum and when latter mixed with bracken, often forming isolated bushy clumps. Pits A, B, D, E.
Centunculus minimus. Pit B.
Solanum dulcamara. Pit A.
Digitalis purpurea. Pit A(P).
Veronica officinalis. Side of Tunnel Path.
V. chamaedrys. Molinietum, very rare.
Pedicularis sylvatica. Bog ; by Tunnel Path, probably forming at one time part of a larger colony, which was separated by the growth of S.E. Wood towards U.E. Pond, isolating the rest of the colony at 914/5.
Odontites verna. Abundant along road ; pit J.
Mentha spp. These species have not been properly worked on the Plain. By ditch and along road and abundantly at their junction ; pits B, J.
M. arvensis. Pit C. *M. aquatica* and *M. sativa* recorded for the Plain.
Lycopus europaeus. Pit A.
Prunella vulgaris. Frequent along road ; Molinietum ; by ditch ; Pit C(P).
Stachys officinalis. Locally frequent in Molinietum and Pteridetum.
Glechoma hederacea. By road.
Scutellaria minor. Ditch.
Plantago lanceolata. Frequent by road, Pit C(P).
Campanula rotundifolia. Very rare.
Galium mollugo. Molinietum, very rare.
G. hercynicum. Molinietum, locally frequent ; Pteridetum, rare ; pits D, E, H.
G. palustre. Amongst *Deschampsia caespitosa* in wet ground. Pits A, C, G, H, J.
G. uliginosum. Occasional along ditch and in Molinietum ; Pits B, J.
Lonicera periclymenum. Pteridetum, very frequent ; Molinietum, occasional ; flowering well in one spot, where it sprawls on the ground. Pit A, A(P).
Succisa pratensis. Frequent both in pure Molinietum, and when latter mixed with *Deschampsia caespitosa* and by road ; occasional in Pteridetum ; pits A, B, C(P), E.
Senecio jacobaea. Pit B(P), very rare.
S. viscosus. One plant, parapet of a pit (1945).
Pulicaria dysenterica. Amongst *Deschampsia caespitosa* in N.W. of Plain ; bog.
Gnaphalium uliginosum. Ruts of road ; pits B. J.
Achillea ptarmica. Molinietum, frequent ; along ditch ; scattered in Pteridetum.
Cirsium vulgare. Pit C(P).
C. palustre. Frequent along road ; Molinietum, occasional ; Pteridetum, rare ; pits A, B, B(P), C(P), D, E, G, H, J.
C. arvense. Frequent along road ; rare in Molinietum and amongst *Deschampsia caespitosa ;* Pit C(P).
C. dissectum. Locally abundant, but confined to Molinietum, being at its best where there is least bracken ; pit F.
Centaurea nigra. Very rare.
Serratula tinctoria. Boggy part of Molinietum by pit C.
Hypochaeris radicata. Rare in Molinietum, Pteridetum and amongst *Deschampsia ceaspitosa ;* pits B, B(P), C, C(P), F, J.
Hieracium pilosella. Pit F, very rare.
Taraxacum spp. Rare in Molinietum, Pteridetum and by road ; pits A(P), C(P).
Alisma plantago-aquatica. Pit C, first noted in 1951.
Juncus tenuis. Pit B, not seen since 1952.
J. bufonius. Cart-ruts of road.
J. inflexus. Frequent by road ; Molinietum.
J. effusus. Molinietum, frequent ; Pteridetum and amongst *Deschampsia caespitosa ;* in all the pits.
J. conglomeratus. As above ; pits A, C, C(P), D, E, G, H, J.
J. acutiflorus. Molinietum, scarce ; by ditch ; pits C, E, C(P), J.
J. articulatus. Frequent by ditch ; pits A, B, C, E, F, J.
J. bulbosus. Pits A, B, C, D, E, F, J, abundant and rapidly becoming dominant.
Luzula campestris. Very rare, pit C(P).
L. multiflora. Molinietum, rare.
Listera ovata. Middle of Plain.
Orchis fuchsii. Bog.
O. ericetorum. Molinietum, a few plants in S.W., not seen since 1952.
Eleocharis palustris. Local by ditch ; pit C, abundant since 1950.
Isolepis setacea. Pit J.
Carex flava agg. Frequent along ditch ; pit C.
C. panicea. Molinietum, occasional.
C. flacca. Molinietum, occasional in and amongst *Deschampsia caespitosa ;* pit C(P),
C. pilulifera. Molinietum. occasional.

Photo : C. P. Castell.

PLATE 2.

Fig. 1. Eastern Plain, Bookham Common. Aspen suckers invading bracken, July, 1954.

Photo : C. P. Castell.

PLATE 2.

Fig. 2. Eastern Plain, Bookham Common. Dense thicket of adult and seedling birches in Molinietum, near Pit D, April, 1954.

PLATE 3.

Fig. 1. Old bullfinch's nest showing the centre full with skins and empty seeds of rose hips.

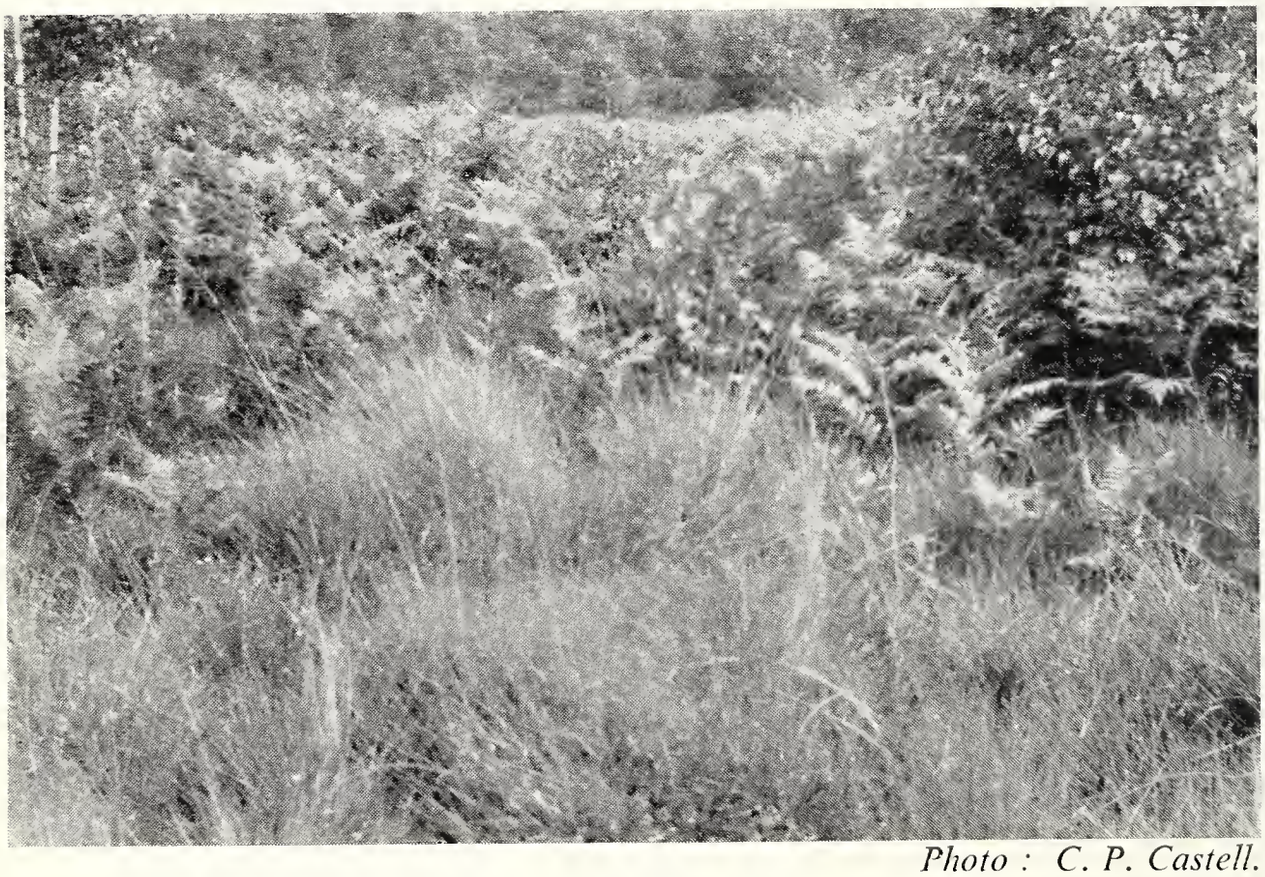

Photo : C. P. Castell.

PLATE 3.

Fig. 2. Eastern Plain, Bookham Common. Bracken invading Molinietum, July, 1951.

C. hirta. Occasional in Molinietum and Pteridetum, frequent along ditch by road ; pits B, C, C(P), D, E, F.
C. nigra. Frequent in Molinietum and along ditch ; pit C & C(P).
C. ovalis. Occasional in Molinietum and along ditch ; pit J (P).
Molinia caerulea. See main areas of dominance on map ; pits B, C, D, E, J, & (P).
Sieglingia decumbens. Molinietum, occasional, especially by, and on, paths ; pit J & (P).
Glyceria fluitans. Pit A.
Festuca rubra. Locally abundant in Molinietum and along road.
F. ovina. Molinietum, occasional ; pit C(P).
Festuca sp. Pit J.
Arrhenatherum elatius. Very rare.
Holcus lanatus. Frequent in Molinietum, abundant along road ; pits A, B(P), C(P), E, J.
Deschampsia caespitosa. Molinietum, locally frequent to locally dominant ; Pteridetum, local ; pits B(P), C(P).
D. flexuosa. Very rare.
Agrostis canina. Molinietum, occasional ; pits B, C, C(P), D, E, G, H, J.
A. tenuis. Molinietum, occasional ; pits B, E, G.
A. stolonifera. Both in pure Molinietum and when mixed with *Deschampsia caespitosa* ; pit C(P).
Agrostis sp. Pits B(P), J.
Anthoxanthum odoratum. Molinietum, frequent ; Pteridetum, rare ; pit C(P).
Nardus stricta. Molinietum, frequent.

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A Bird's Nest Feeding Site of the Long-tailed Field Mouse

By E. W. Groves

Whilst working on a short turf area marked out for ecological study on Central Plain, Bookham Common, Surrey, on February 10, 1952, a bright red splash of colour nearby arrested my attention. I walked through the surrounding scrub hawthorn to where there was a solitary rose bush (Square 867). In the fork of a branch 2½ ft. from the ground was an old bullfinch's nest full to the brim with macerated hip fruits (Plate 3, Fig. 1). The fruit material on the top could not have been there for very long as the skins were quite fresh and were still their characteristic scarlet colour. Close inspection showed that along with the skins were many hundreds of hip seeds each bitten in half and with the kernel removed. Under a hand lens minute teeth marks were visible suggesting the work of a mouse, and this was confirmed on further examination of the material by finding several mouse excreta pellets. On the ground beneath the bush was an additional pile of chewed hips also in a comparatively fresh state. I am of the opinion that both of these feeding-sites were of the Long-tailed Field Mouse, *Apodemus sylvaticus* (Linn.,) a species occurring not infrequently on the plains at Bookham Common (Harrison, 1956).

Sanders (1944) mentions that the Long-tailed Field Mouse sometimes uses the old nest of a bird as a winter food store. In the case at Bookham the nest appears to have been used as a feeding-site with the fresh hips gathered from nearby twigs and brought down to the nest ; these being

consumed on the residue of the last meal. The layer of debris at the bottom (i.e. the lowest and oldest) consisted of skins shrivelled and quite dry.

The hip skins on top of the nest and those on the ground appeared to be of equal freshness but it was not possible to say whether they were used by the same mouse repeatedly or by several mice from the same nest. Matthews (1952) states that several *Apodemus* adults are often found in the same nest though the species ranges but a short distance from home, certainly within a limit of 200 yards.

Frequent searching since, both in the same site and others similar on Central Plain, whilst showing evidence of mice being present, has so far revealed no further interesting example of a mouse " mess-table."

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The Lichen Vegetation of Bookham Common

By J. R. Laundon

INTRODUCTION

Bookham Common, lying twenty miles to the south-west of St. Pauls, has the unusually rich lichen flora of 73 species for an area so near London. This paper is an attempt to explain and record this flora in detail, in the hope that workers will be able to note any changes that take place in the future. All the records for the Common were made between 1953 and 1956.

The Common is situated mostly on acid London Clay. The annual rainfall is about 27 in. Over half the area is covered with semi-natural woodland, with the pedunculate-oak (*Quercus robur* L.) dominant ; birch (*Betula* spp.), blackthorn (*Prunus spinosa* L.), bramble (*Rubus* spp.), hawthorn (*Crataegus* spp.), hazel (*Corylus avellana* L.) and holly (*Ilex aquifolium* L.) are abundant. The rest of the Common is damp acid grassland (the Plains) dominated mostly by *Deschampsia cespitosa* (L.) Beauv. and locally by *Molinia caerulea* (L.) Moench. This grassland is being invaded by bracken (*Pteridium aquilinum* (L.) Kuhn) and by birch and hawthorn scrub. There are several ponds and some small streams and ditches crossed by brick bridges. There are no outcrops of rock.

GENERAL AND HISTORICAL

The whole of Bookham Common at some time past would have been covered in woodland not very dissimilar from that present to-day. It is probable, however, that the lichen flora of the trees has undergone a number of changes, especially since the early nineteenth century. To judge from old records, e.g. Abbot (1798), Sowter (1950), it appears that a number of macrolichens have disappeared from south-east and midland England since that time, while whole communities of crustaceous lichens have gone (see below). Even in the past fifty years several species of *Ramalina* have become extinct in the Midlands though formerly abundant (see Sowter, 1950). Doubtless Bookham Common, like many

other areas, has undergone changes in its lichen flora but there are unfortunately no old lichen records for the Common.

The Plains are chiefly the result of felling and grazing. Terricolous* lichens occur in the poorly developed grassland on and about Western Plain, areas which probably owe their existence to the acid quality of the soil and until recently the grazing of rabbits and, more locally, chickens. On Bank's Plain *Cladonia coniocraea* (Flörke) Spreng., *C. fimbriata* (L.) Fr., *C. furcata* (Huds.) Schrad., *C. pyxidata* (L.) Hoffm. and *Peltigera polydactyla* (Neck.) Hoffm. are locally common amongst a community of *Agrostis tenuis* Sibth., *Aira praecox* L., *Festuca rubra* L., *Hieracium pilosella* L., *Hypochoeris radicata* L., *Lotus corniculatus* L. and the mosses *Pseudosleropodium purum* (Hedw.) Fleisch. and *Polytrichum juniperinum* Hedw. In my experience *Cladonia furcata* and *Peltigera polydactyla* are generally confined to grass-heaths in this country, the latter species especially in damp hollows. Unfortunately most parts of the Plains are now too overgrown for many lichens to be present, for they can survive only in comparatively open communities. No terricolous lichens have been found on Eastern Plain although there may have been some present at one time, for according to Spreadbury (1957), the area was almost entirely covered with heather (*Calluna vulgaris* (L.) Hull) and dwarf gorse (*Ulex minor* Roth). To-day lichens characteristic of heathland (e.g. *Cornicularia aculeata* (Schreb.) Ach., *Cladonia impexa* Harm., *C. uncialis* (L.) Weber) are absent from the Common. Eastern Plain is now largely covered with hummocks of *Molinia*, much of which is being invaded by birch and bracken. Terricolous lichens are also absent from the damp clay floor of the woods ; in Surrey they occur only in woods on light sandy soils.

The presence of grazing animals (e.g. cattle and horses) on the Plains in the past (Spreadbury, 1957) has affected the corticolous lichen flora. The willow trees (*Salix fragilis* L.) around Bayfield Pond and two of the elms (*Ulmus procera* Salisb.) in Station Copse have different species upon their boles from those found in the woods : they are nitrophilous lichens. The latter owe their presence mostly to the excreta produced by the grazing animals, and are more common on elm and willow because the bark of these trees has a higher pH value than that of birch and oak (see Du Rietz, 1945). For a similar reason the brick footbridges over the streams are also covered chiefly by nitrophilous species.

The railway from Leatherhead to Guildford runs along the southern edge of the Common, under a short tunnel and then under the Little Bookham Road Bridge. The walls of both bridge and tunnel have sandstone corner-posts and on these grow a number of lichens (e.g. *Acarospora fuscata* (Schreb.) Th.Fr., *Lecanora polytropa* (Ehrh.) Schaer.), some still undetermined, which are not found elsewhere on the Common. These species are frequent on outcrops and walls of acid rock in northern Britain but in the Midlands and south are almost confined to railway bridges, and to a lesser extent acid gravestones in churchyards. Thus Britain's railway network has helped the spread of some lichens, as well as some ferns and flowering plants.

The presence of a heap of chalk in area M provided yet another example of a man-made habitat, and it was here that Mr. A. H. Norkett found the calcicole *Collema cristatum* (L.) Weber.

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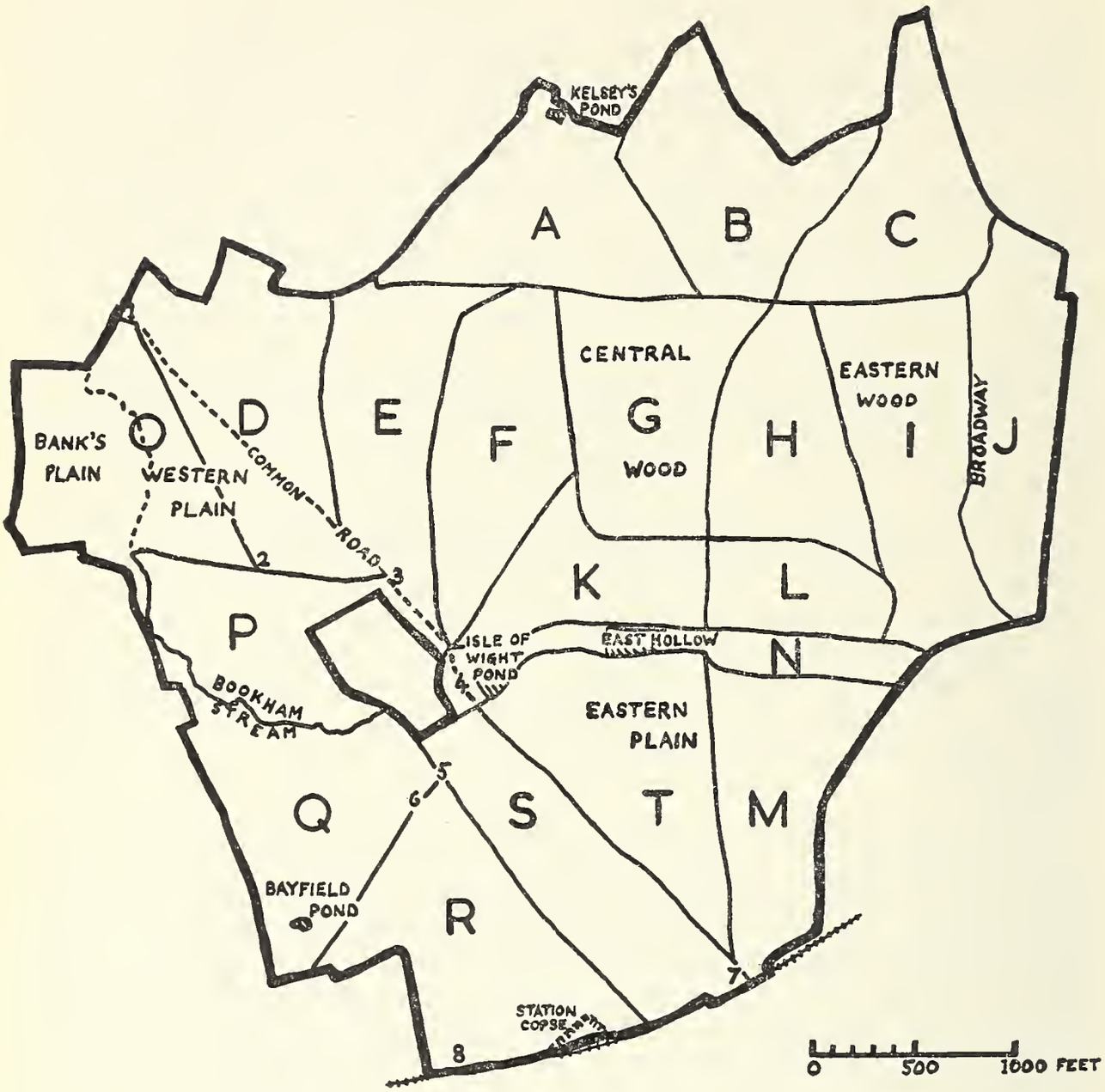
* A glossary of ecological terms appears on page 70.



KEY TO MAP.

Areas A - M are chiefly woods.

Area N is a hollow with ponds.

Areas O - T are chiefly Plains.

BRIDGES

1. Hundred Pound Bridge.
2. Western Ditch Bridge.
3. Common Road Bridge.
4. Isle-of-Wight Pond Bridge.
5. Central Ditch Bridge.
6. Isle-of-Wight Ditch Bridge.
7. Tunnel Bridge.
8. Little Bookham Road Bridge.

SOCIOLOGY

(*a*) *Introduction*

Lichens growing on various substrata such as bark, wood and rock occur in definite communities. The communities have been given names and grouped so as to show their affinities and relationships. The Uppsala nomenclature (see Du Rietz 1936 and 1945 ; Almborn 1948 and 1955) is the most practical and satisfactory to use, and applies only to synusiae or one-layered communities. The federation (designated by attaching the suffix -ion) is the most important unit, this being approximately equivalent to the alliance of the Braun-Blanquet (Zürich-Montpellier) system and in part to the " epido " of Hosokawa, Omura and Nishihara. Each federation is readily identified by certain constant species, some of which will be exclusive, i.e. confined to a particular federation. Each federation has a well-defined world distribution controlled by historical factors (e.g. the drifting and disintegration of land masses), climate and atmospheric pollution, and occurs within its geographical area only where certain conditions of illumination, humidity, acidity, etc., are fulfilled. The federation consists of one or more unions (designated by attaching the suffix -etum) and each union comprises one or more societies (no suffix), the society being the smallest unit, normally with one dominant species only.

Schematic arrangement of one-layered communities (=synusiae).

DU RIETZ	BRAUN-BLANQUET
Federation	Alliance
↑	↑
Union	Association
↑	↑
Society	Sociation (little used to-day)

The Braun-Blanquet system of terminology is used for both one and many-layered communities.

As an example I quote *Leprarion*, which is represented at Bookham by the following communities :

FEDERATION ←	UNIONS ←	SOCIETIES
Leprarion	*Chaenothecetum*	*Chaenotheca melanophaea* soc.
	Leprarietum	*Lepraria aeruginosa* soc. *Lepraria candelaris* soc.

As there is little written on British lichen sociology it is here proposed to enumerate all the federations known by the author to occur on trees in Britain so that the federations present at Bookham can be seen in their proper perspective. The distributions of the federations are based largely on my own observations in various parts of England, Wales, Scotland and Eire as well as on the available literature, especially Abbot (1798), Baxter (1825), Knowles (1929), Lamb (1942) and Sowter (1950).

(*b*) *Key to British Corticolous Lichen Federations*

1a. Community of foliose or fruticose lichens 2
1b. Community of crustaceous lichens 6
2a. *Cladonia coniocraea* dominant. *Cladonion coniocraeae*
2b. *Cladonia* spp. scarce or absent 3

3a. *Xanthoria* spp., *Physcia* spp., or *Buellia canescens* abundant. *Xanthorion*
3b. The above species absent 4
4a. Community on mossy trunks with *Lobaria*, *Sticta*, *Pannaria* or *Nephromium*. *Lobarion.*
4b. Community without the above lichens and often without mosses ; *Evernia*, *Parmelia* or *Usnea* present 5
5a. *Parmelia trichotera* abundant *Trichoterion.*
5b. *Parmelia trichotera* absent or scarce ; *P. physodes*, *P. sulcata*, *Evernia* or *Alectoria* abundant. *Physodion.*
6a. Community dominated by greenish or greyish sorediose or leprose lichens forming a continuous crust on tree-boles .. 7
6b. Community dominated by non-sorediose lichens which form a " network " over tree-boles 8
7a. *Lecanora conizaeoides* abundant. *Conizaeoidion.*
7b. *Lepraria* spp. abundant or frequent. *Leprarion.*
8a. *Graphis* or *Pyrenula* present. *Graphidion.*
8b. *Graphis* and *Pyrenula* absent ; *Lecidea olivacea* abundant. *Olivaceion.*

Work on the delimitation of unions and on lignicolous and saxicolous federations is not sufficiently advanced in this country to merit detailed consideration here.

(*c*) *Glossary of Ecological Terms*

Acidiphilous. Living on an acid substratum.
Alliance. Associations which show floristic and sociological affinities between themselves form an alliance ; more or less equivalent to the term " Federation."
Association. Used by continental botanists to denote a plant community characterized by its essential uniform floristic composition, at least as regards the dominant species ; more or less equivalent to the term " Union."
Calcicolous. Living on a calcareous substratum.
Community. " A general term used to designate sociological units of all degrees from the simplest (as an unrooted mat of algae) to the most complex phytocenosis (as a multistoried rain-forest)."
Corticolous. Living on the bark of trees.
Eutrophic. Rich in nutrients.
Exclusive. Species nearly always confined to a particular community.
Federation. Unions which show floristic and sociological affinities between themselves form a federation.
Hygrophilous. Living under humid conditions.
Lignicolous. Living on dead wood.
Nitrophilous. Living in habitats rich in nitrogenous compounds.
Nitrophobous. Living in habitats poor in nitrogenous compounds.
Oligotrophic. Poor in nutrients.
Photophilous. Living in illuminated situations.
Photophobous. Living in shaded situations.
Phytocoenosis. The total plant population of a given habitat.
Saxicolous. Living on rocks.
Society. A synusium with essentially uniform species composition, i.e. with frequently one or more constant dominants.

Sociology. The science of organic communities.
Synusium. The elementary one-layered community (e.g. the field-layer in an oakwood).
Terricolous. Living on the ground.
Toxiphilous. Living in an impure atmosphere.
Toxiphobous. Very sensitive to air impurities.
Union. Societies which show floristic and sociological affinities between themselves form a union.

(*d*) *Corticolous Federations in the British Isles*

Under each federation the first paragraph deals with the community in general, and the second with its distribution and composition at Bookham.

Cladonion coniocraeae (Duvigneaud 1942 ; Laundon 1956)

An acidiphilous federation confined to tree-bases, stumps and acid peat, and very common in eastern Britain. *Cladonia coniocraea* is the constant and exclusive species.

At Bookham this federation is common at the base of trees and on decayed stumps, *C. coniocraea* being generally abundant with *C. fimbriata* and *Lecidea granulosa* (Ehrh.) Ach. sometimes also present. A decorticated trunk in area I in the Broadway had *Calicium subtile* Pers., *Cladonia coniocraea*, *C. fimbriata*, *Lecidea granulosa* and *L. scalaris* Ach. on its rotting wood while another in area S had been colonized by *Cladonia macilenta* Hoffm., *Lecanora conizaeoides* Nyl. ex Cromb., *Lecidea flexuosa* (Fr.) Nyl., *L. granulosa*, *L. scalaris* and *L. uliginosa* (Schrad.) Ach.

Conizaeoidion (Laundon 1956)

A toxiphilous federation with *Lecanora conizaeoides* constant and exclusive. The federation is found only where the atmosphere is polluted with smoke from industrial areas and can also withstand pollution more than any other corticolous federation (Jones, 1952). In Britain *Conizaeoidion* is abundant over almost the whole of England except southern and western coastal districts, extending to about as far north as Perth in Scotland but very local beyond (e.g. in the Cairngorm-Monadhliath area of Inverness-shire it occurs only on birch-trees immediately to the north-east of the railway shunting yard at Aviemore.) Absent from parts of Wales away from industrialization, and almost all north Scotland and Ireland, although in the latter recorded from around Dublin (Knowles, 1929) and may occur in other scattered localities near towns.

At Bookham the federation is abundant, especially on shrubs and young trees ; as the trees mature *Physodion* often replaces the *Conizaeoidion*. *Lecanora chlarona* (Ach.) Cromb., *L. expallens* (Pers.) Ach. and *Catillaria griffithii* (Sm.) Malme are frequent in the federation on the Common.

Graphidion (Ochsner, 1928 ; Duvigneaud, 1942 ; Almborn, 1948 and 1955)

A nitrophobous, photophobous federation on smooth bark with *Graphis* spp. constant and exclusive. *Enterographa crassa* (DC.) Fée, *Pertusaria leioplaca* (Ach.) Schaer., *P. wulfenii* DC. and *Pyrenula nitida* (Weigel) Ach. are often abundant and confined to this federation, while *Lecanora chlarotera* f. *crassula* (A. H. Magnusson) Poelt, *L. chlarotera* f. *rugosella* (Zahlbr.) Poelt and *Opegrapha atra* Pers. commonly also occur

but are not exclusive. In Britain *Graphidion* occurs in south and west England and Wales, south-west Scotland and throughout Ireland. It is absent or rare in much of north and east Scotland (probably the climate is too severe there) and east and midland England, but was formerly present and indeed was perhaps common in the Midlands to judge from the old records in Abbot (1798) and Sowter (1950), where it appears to have survived until about 1900. Atmospheric pollution has probably caused the federation to become extinct over much of England for habitats suitable for *Graphidion* are now occupied by the toxiphilous *Conizaeoidion*.

The federation is absent from Bookham but possibly it once occurred there as a single specimen of *Graphis elegans* (Borr.) Ach. has been found in area G, and the community still persists in scattered localities in Surrey (e.g. on old beeches between Headley and Wentworth Hall and around Bagden Farm near Polesden Lacy and on various trees at Abinger Common and Hurt Wood).

Leprarion (Almborn, 1948 and 1955 ; Laundon, 1956)

A nitrophobous, photophobous federation occurring on rough bark with *Lepraria* spp. constant and exclusive.

At Bookham two unions are present : *Leprarietum* (Almborn, 1955), in which the blue-grey leprose *Lepraria aeruginosa* (Wigg.) Sm. or the yellow *L. candelaris* (L.) Fr. are dominant and *Chaenothecetum* nom. nov. which is dominated by *Chaenotheca melanophaea* (Ach.) Zwack. Other species are only occasionally met with, but in addition *Catillaria griffithii* and *Phlyctis argena* (Ach.) Koerb. occur in the *Leprarion* at Bookham. The *Leprarietum* appears to be fairly common throughout most parts of the British Isles : at Bookham it is especially abundant on the old hawthorn bushes in Eastern Wood and on old oak branches. The *Chaenothecetum* is mostly confined to east Britain and is common at Bookham on the shaded north side of old oak boles throughout the woods.

Lobarion (Ochsner, 1928 ; Almborn, 1955)

A nitrophobous federation occurring on moss-covered tree-trunks in sheltered woods. Species of *Lobaria*, *Nephromium*, *Pannaria* and *Sticta* are exclusive. The federation is now confined to west Britain and scattered localities in Ireland (especially the south-west), generally near the coast. Relict species, possibly relicts from the Atlantic period when the federation was probably more widespread than it is at present, survived in scattered localities throughout Britain until the early nineteenth century. Thus in Buddon Wood, Leicestershire, *Lobaria laetevirens* (Leight.) Zahlbr., *L. pulmonaria* (L.) Hoffm., and *L. scrobiculata* (Scop.) Gaertn., were found in the late eighteenth century (Sowter, 1950), but to-day all trace of the federation has disappeared from east and central England.

Lobarion is absent from Bookham Common.

Olivaceion nom. nov. (*Lecanorion subfuscae*, Ochsner, 1928, p.p.)

A photophilous federation on smooth bark, especially ash. *Lecidea olivacea* (Hoffm.) Mass. (*L. parasema* Ach.) is constant and exclusive, usually as the form *elaeochroma* (Ach.) Vain. *Arthonia radiata* (Pers.) Ach., *Arthopyrenia punctiformis* (Pers.) Arn., *Lecanora chlarotera* f. *crassula*, *L. confusa* Almb. (*L. expallens* var. *lutescens* (DC.) Nyl.) and *Opegrapha atra* are often abundant constituents. Common in south and west coastal districts of Great Britain, at low altitudes in parts of north Scotland, and abundant throughout Ireland. *Olivaceion* is usually

replaced by *Graphidion* in shaded situations, but occupies quite shaded habitats in areas from which *Graphidion* is absent owing to unsuitable climatic conditions, as in the beech plantations near Rothiemurchus, Inverness-shire. In localities where the atmosphere is polluted (as in most parts of England) the federation is replaced by *Conizaeoidion*. However, the *Olivaceion* was probably formerly common in most parts of Britain to judge from the old records, and Baxter (1825) speaks of *Lecidea olivacea* as being on " trunks and branches of trees. Very common " in the vicinity of Oxford and *Arthonia radiata :* " on the smooth bark of trees. Very common " in the same district. Smoke pollution appears to have been responsible for the extinction of *Olivaceion* over large areas, but even to-day relicts still persist in the Midlands.

The *Olivaceion* is not found on Bookham Common, although a lone specimen of *Lecidea olivacea* was found on Eastern Plain in 1953.

Physodion (Du Rietz, 1945 ; Almborn, 1948 and 1955 ; Laundon, 1956).
[*Usneion* (Ochsner, 1928 ; Barkman, 1954)]

A photophilous, nitrophobous federation with *Parmelia physodes* (L.) Ach. constant and exclusive. The federation is very variable in composition and a number of unions have been described (Barkman, 1954 ; Almborn, 1955). *Evernia prunastri* (L.) Ach., *Parmelia caperata* (L.) Ach., *P. physodes*, *P. sulcata* Tayl., *Pertusaria amara* (Ach.) Nyl. and *P. pertusa* (L.) Tuck. are often abundant in *Physodion* in England, whereas in the Scottish Highlands *Alectoria jubata* (L.) Ach., *Evernia prunastri*, *Parmelia furfuracea* (L.) Ach., *P. physodes*, *P. sulcata*, *Parmeliopsis* spp. and *Usnea comosa* (Ach.) Röhl. are normally the most abundant constituents. Occasionally species of *Cetraria* and *Ramalina* occur in quantity. Abundant throughout most of Great Britain but replaced by *Trichoterion* in southern and south-western oceanic districts. Distribution uncertain in Ireland but absent from the Sligo area.

At Bookham *Physodion* is common on boles and on branches in the woods, being especially well developed in the south-west part of Central Wood. Here *Evernia prunastri*, *Parmelia caperata*, *P. physodes* and *Pertusaria amara* clothe the trunks while *Parmelia physodes* and *P. sulcata* are abundant on the larger branches. The lichen floras of the boles and branches are fairly distinct from each other. Thus *Evernia prunastri*, *Parmelia caperata*, *P. revoluta* Flörke and *Pertusaria* spp. occur on the oak trunks but are absent or rare on the branches, whilst *Cetraria glauca* (L.) Ach., *Parmelia saxatilis* (L.) Ach. and *P. tubulosa* (Schaer.) Bitt. have been found on branches but not on the boles. Generally speaking the lichen flora of the oak branches bears a close resemblance to that of the sallows and willows around the woodland ponds. *Parmelia physodes* is usually present in quantity on the bark of sheltered birch trees in the woods, but no other species characteristic of *Physodion* occurs.

Trichoterion nom. nov.

This federation is distinguished by the abundance of the exclusive species *Parmelia trichotera* Hue (*P. perlata* auct. angl.) which is often co-dominant with *P. caperata*. Species of *Ramalina* and *Usnea* sometimes occur in addition but often the two species of *Parmelia* are the only lichens present, apparently crowding out all others. *Trichoterion* is abundant on exposed boles and branches, especially on smooth bark, in southern and western coastal districts of England and Wales and apparently throughout

most of Ireland. It is not recorded for Scotland but may possibly occur in the south-west.

The federation is absent from Bookham Common.

Xanthorion (Ochsner, 1928 ; Du Rietz, 1945 ; Almborn, 1948 ; Laundon, 1956)

All the federations mentioned above are nitrophobous although *Conizaeoidion* and *Olivaceion* appear to be equally common on both eutrophic and oligotrophic bark. However, *Xanthorion* is distinctly nitrophilous and *Xanthoria* spp., *Physica* spp., *Caloplaca* spp., *Buellia canescens* (Dicks.) De Not. and *B. myriocarpa* (DC.) De Not. are exclusive. *Xanthorion* occurs on bark, wood and rock and is abundant in maritime situations but inland is chiefly confined to the vicinity of villages, farms, meadows and roadsides, and is therefore abundant in cultivated districts but absent from large areas of moor and mountain in the north and west, although reported from bird-perching stones in the Cairngorms by Mr. P. W. James.

At Bookham the federation is confined to the Plains where it occurs on tree-boles, brick bridges and on the concrete posts by the railway in area M and by the road in area R. On the willow trees around Bayfield Pond *Buellia canescens*, *B. myriocarpa*, *Physcia adscendens* (Th. Fr.) Oliv. sensu Bitt. and *P. tribacia* (Ach.) Nyl. are common together with the nitrophobous *Parmelia fuliginosa* Nyl and *P. sulcata*. On two elm trees in Station Copse *Physcia grisea* (Lam.) Zahlbr. was abundant and *P. tenella* (Scop.) DC. frequent ; the other elms were covered mostly in *Leprarion* and algae. *Caloplaca citrina* (Hoffm.) Th. Fr., *Lecanora campestris* (Schaer.) Hue, *L. dispersa* (Pers.) Röhl. and *Squamaria muralis* (Schreb.) Elenk. are the most common species on the low bridges, while Hundred Pound Bridge, the south face of which is dominated by *Lecanora atra* (Huds.) Ach., has a very rich flora, including several species not occurring elsewhere on the Common.

Algae and Moss Communities

Communities of algae and bryophytes occur also on the trees at Bookham. The green algae, usually known as *Pleurococcus vulgaris*, forms a distinct community (*Pleurococcetum vulgaris* Ochsner, 1928) on shaded bark, possibly in less humid situations and on smoother bark than the *Leprarion*. A bryophyte community is often present at the base of trees to the exclusion of the *Cladonion coniocraeae*. This community is generally dominated by *Hypnum cupressiforme* Hedw. while *Lophocolea heterophylla* (Schrad.) Dum. is frequent and *Dicranum scoparium* Hedw. occasional. *Dicranoweissia cirrata* (Hedw.) Lindb. often dominates large horizontal branches to the exclusion of lichens.

SPECIES LIST

Normally the ecology of each species over the whole country is given first, followed by the frequency index for the whole Common, then by the detailed distribution on the Common. Corticolous species are often also lignicolous.

Usnea comosa (Ach.) Röhl.— Corticolous, photophilous. Rare. On oak, area G ; on sallow, Eastern Hollow, area N. Specimens very small.

Evernia prunastri (L.) Ach.— Corticolous, nitrophobous, photophilous. Frequent on oak boles, especially in Central Wood.

Parmelia caperata (L.) Ach.—Corticolous and saxicolous, nitrophobous ,photophilous. Frequent on lower part of oak boles especially in Central Wood.

P. subaurifera Nyl.— Corticolous, especially on bark of high pH, nitrophobous, photophilous. Occasional on oak boles and on sallow in the woods.

P. fuliginosa Nyl. var. *laetevirens* (Flot.) Kichz.— This variety is most commonly corticolous, especially on bark of high pH, nitrophobous, photophilous. Scarce. On sallow, Bayfield and Kelsey's Ponds.

P. revoluta Flörke—Corticolous and saxicolous, nitrophobous, photophilous. Local. Occasional amongst mosses at the base of old oaks, area F.

P. saxatilis (L.) Ach.—Corticolous and saxicolous, nitrophobous, photophilous. Scarce. On moss-covered branch, area B.

P. sulcata Tayl.— Generally corticolous but sometimes saxicolous, nitrophobous (except the f. *pruinosa* (Harm.) Maas G. which appears to be nitrophilous), photophilous. Abundant on oak boles at the margin of the woods, scarce in the interior ; frequent on oak branches and on sallow ; rare, Central Ditch Bridge.

P. dubia (Wulf.) Schaer.— Chiefly corticolous, nitrophobous, photophilous. Scarce. Sallow, Kelsey's Pond, area A ; moss-covered branch, area B ; oak, area E ; elm, Station Copse, area R.

P. physodes (L.) Ach.—Most commonly corticolous but also saxicolous and terricolous, nitrophobous, photophilous. Abundant on oak boles and branches in Central Wood, occasional elsewhere. Common on sheltered birch and on sallow.

P. tubulosa (Schaer.) Bitt.— Corticolous, sometimes saxicolous, nitrophobous, photophilous, hygrophilous. Rare. Sallow, Kelsey's Pond, area A ; oak branch, area F.

Cetraria glauca (L.) Ach.—Corticolous, saxicolous and terricolous, nitrophobous, photophilous. Scarce. Decayed oak branches, areas F and K ; sallow in Eastern Hollow, area N.

Squamaria muralis (Schreb.) Elenk.— Chiefly saxicolous but sometimes lignicolous, acidiphilous, nitrophilous, photophilous, hygrophilous. Occasional. Abundant, Isle-of-Wight Ditch Br. and Central Ditch Br. Frequent, Isle-of-Wight Pond Br. Scarce, Western Ditch Br., Tunnel Br., and concrete posts by railway in area M.

Lecanora dispersa (Pers.) Röhl., Deutschl. Fl. 3, 2 : 91 (1813).

I have made numerous observations of this species in the field and herbarium and I am convinced that it is very polymorphic, with several entities regarded by other workers as species falling within the range of variation of the plant. The corticolous and lignicolous "*L. hageni*" is often identical with forms of the saxicolous *L. dispersa*, so that the former can, in my opinion, no longer be regarded as a distinct species. The following key includes the main forms recognized in Britain and two closely related species with which *L. dispersa* might be confused :

1a. Apothecia discs silvery-grey pruinose ; margin crenulate or radiatly cracked. On calcareous rock.
L. crenulata (Dicks.) Hook.

1b. Apothecia discs brownish or brownish-green, often translucent but never pruinose ; margin entire or crenulate. 2

2a. *C + red. Thallus immersed ; apothecia to 1·5 mm. diam. with yellowish-grey or grey margins and pale brown discs. On acid rock ; rare.
L. fugiens Nyl.

2b. C—. Thallus very variable but apothecia generally with a whitish or greyish margin, and rarely exceeding 1mm. diam. On acid and calcareous rock, bark, wood, etc. Common.

3a. Thallus sooty-black. On calcareous rock in industrial areas.
L. dispersa f. *dissipata* (Nyl.) **comb. nov.**
[*L. galactina* ssp. *dissipata* Nyl. in Bull. Soc. Bot. France **13** : 368 (1866)]

3b. Thallus grey, white or immersed. 4

4a. Thallus verrucose, very white. Maritime : on calcareous rock above high-tide level. *L. dispersa* f. *verrucosa* (Leight.) **comb nov.**
[*L. galactina* f. *verrucosa* Leight., Lich—Flora Great Brit., edit. 3 : 190 (1879)]

4b. Thallus more or less plane, white or grey. Rarely maritime 5

5a. Thallus with small lobes at the circumference (use lens). Chiefly rough calcareous rock. *L. dispersa* f. *albescens* (Hoffm.) **comb. nov.**

5b. Thallus crustaceous, most often immersed. Apothecia crowded or scattered. On nearly smooth acid and calcareous rock, bark, wood and *Zostera*.
L. dispersa f. *dispersa*.

* a red reaction with Calcium hypochlorite.

f. *dispersa*
Lichen dispersus Pers. in Neue Annal. der Bot., 7 : 27 (1794).
Lecanora galactina subsp. *dispersa* (Pers.) Nyl. ex Cromb. in Grevillea **18** : 68 (1890) —A. L. Sm., Monogr. Brit. Lich. 1 : 289 (1918).
L. hageni var. *umbrina* Ach., Lichenogr. Univers : 368 (1810).
L. umbrina (Ach.) Röhl., Deutschl. Flora 3, 2 ; 75 (1813).
L. hageni auct. angl.
L. umbrina auct. angl.

Corticolous, lignicolous, saxicolous. Abundant on cement and concrete on the bridges and posts. On wooden plank across Bookham Stream, area O. Scarce on willow at Bayfield Pond, area Q.

f. *albescens* (Hoffm.) **comb. nov.**
Psora albescens Hoffm., Deutschl. Flora : 165 (1796).
Lecanora albescens (Hoffm.) Flörke in Flora **11** : 633 (1828).
L. galactina Ach., Lichenogr. Univers : 424 (1810)—A. L. Sm., Monogr. Brit. Lich. **1** : 287 (1918).
L. urbana Nyl. in Bull. Soc. Bot. France **13** : 368 (1866)—A. L. Sm., Monogr. Brit. Lich. **1** : 289 (1918).
Abundant on brick and mortar of Hundred Pound Br. and occasional on cement elsewhere.

L. chlarona (Ach.) Cromb.—Corticolous, especially on smooth bark and lignicolous, nitrophobous, photophilous. Occasional on young ash, birch and oak throughout the woods. Rare on old oaks.

L. chlarotera Nyl. f. *rugosella* (Zahlbr.) Poelt (*L. rugosa* (Pers.) Nyl. non Ach.)—Corticolous. This form is nitrophobous and photophobous. Rare. On oak, area K.

L. campestris (Schaer.) Hue.—Saxicolous, calcicolous, nitrophilous, photophilous. Local. Abundant on Isel-of-Wight Ditch Br., frequent on Central Ditch Br., occasional on Hundred Pound Br. and on concrete posts by railway, area M.

L. atra (Huds.) Ach.—Normally saxicolous but sometimes corticolous, acidiphilous, nitrophilous, photophilous. Local. Abundant on brick on south face of Hundred Pound Br.

L. polytropa (Ehrh.) Schaer.—Saxicolous, acidiphilous, photophilous. Local. Common on sandstone corner posts of Lt. Bookham Rd. Br. and Tunnel Br.

L. expallens (Pers.) Ach. s. str.—Corticolous. Common on trees, especially immature ash and old oaks.

L. conizaeoides Nyl. ex Cromb. (*L. conizaea* auct. angl. ; *L. pityrea* Erichs.).—Corticolous and saxicolous (acidiphilous when on rock), toxiphilous. Abundant on trees and shrubs, occurring on most species. Also on decorticated stumps and on sandstone corner-posts of Lt. Bookham Rd. Br. (scarce) and Tunnel Br. (abundant).

Ochrolechia turneri (Sm.) **comb. nov.**
Lichen turneri Sm. in Sowerb. and Sm., Engl. Bot. 12 : tab. 857 (1801).
Lecanora turneri (Sm.) Ach., Lichenogr. Univers : 373 (1810).
L. parella var. *turneri* (Sm.) Nyl. in Memoir. Soc. Imp. Scienc. Natur. Cherbourg **5** : 113 (1857) — A. L. Sm., Monogr. Brit. Lich. **1** : 313 (1918).
Ochrolechia microstictoides Räs., Lich. Fenn. Exsicc., Sched, ad fasc. 4-7 : 26 (1936) — Almborn in Bot. Notiser 1952 : 247 and 254 (1952).
Pertusaria silvatica A. H. Magnusson in Bot. Notiser 1942 : 16 (1942).
Corticolous. Rare. On willow by Bayfield Pond. Fertile.

O. subviridis (Hoeg) Erichs. in Verhandl. Bot. Ver. Prov. Brandenburg 72 : 3 (1930).—Almborn in Bot. Notiser 1952 : 243 and 254 (1952).
Pertusaria subviridis Hoeg in Saertryk av Nyt Magazin for Natarvidenskaberne **61** : 150 (1923).—Erichs, in Rabh., Kryptog. Flora 9, Abt. 5/1 : 546 (1936)—Almborn in Bot. Notiser Supplement Vol. 1, 2 : 77 (1948).
Corticolous, nitrophilous. Rare. On willow by Bayfield Pond. Sterile. New to Britain. I have found this plant also at Bythorn, Huntingdonshire, and at Fermyn Park near Brigstock, Hazel Wood near Corby and near Kelmarsh (confirmed by Dr. O. Almborn), Northamptonshire. Identified by the greyish crustaceous thallus covered in isidia which give an orange reaction with calcium hypochlorite.

Lecidea scalaris Ach. (*L. ostreata* (Hoffm.) Schaer.).—Corticolous and lignicolous, rarely saxicolous, acidiphilous, nitrophobous. Scarce. Decorticated trunks, areas I and S.

L. quernea (Dicks.) Ach.—Corticolous. Rare. On willow, Bayfield Pond.

L. flexuosa (Fr.) Nyl.—Lignicolous and terricolous, acidiphilous, nitrophobous. Rare. Decorticated trunk, area S.

L. granulosa (Ehrh.) Ach.—Corticolous, lignicolous and terricolous, acidiphilous, nitrophobous. Occasional. Base of birch, area G ; decorticated trunk, area I ; oak, area J ; decayed fence, area M ; decorticated trunk, area S.

L. uliginosa (Schrad.) Ach.—Lignicolous and terricolous, acidiphilous, nitrophobous. Scarce. Decayed fence, area M ; decorticated stump, area S.

L. olivacea (Hoffm.) Mass. (*L. parasema* Ach.).—Corticolous on smooth bark, rarely lignicolous, photophilous. Rare. Immature *Betula pubescens*, Eastern Plain, area M.

L. crustulata (Ach.) Koerb.—Saxicolous, acidiphilous. Scarce. On brick of Common Rd. Br., area E. On flints, areas M and O.

L. fuscoatra (L.) Ach.—Saxicolous, acidiphilous. Local. Abundant on brick of Central Ditch Br., and frequent on Isle-of-Wight Ditch Br.

Pertrusaria amara (Ach.) Nyl.—Generally corticolous, nitrophobous, photophilous. Occasional on oak boles, scarce on branches.

P. hemisphaerica (Flörke) Erichs.—Corticolous, nitrophobous, photophilous. Rare. On oak, area N.

P. pertusa (L.) Tuck.—Generally corticolous, nitrophobous, photophilous. Occasional on oak boles.

P. globulifera (Turn.) Massal. var. *corallina* Zahlbr. (*P. henrici* Erichs.).—Generally corticolous, often nitrophilous, photophilous. Rare. Oak, area K.

Acarospora fuscata (Schreb.) Th. Fr.—Saxicolous, acidiphilous. Local. Abundant on sandstone corner-posts of Lt. Bookham Rd. Br. and Tunnel Br.

Ramalina farinacea (L.) Ach.—Corticolous, especially on bark of high pH, photophilous. Rare. Scarce on willow, Bayfield Pond.

Catillaria griffithii (Sm.) Malme (*Biatorina griffithii* (Sm.) Massal.).—Corticolous, with a preference for shaded situations, nitrophobous. Occasional on oak throughout the woods but abundant in area I.

Bilimbia sabuletorum (Flörke) Arn.—On moss. Rare. Hundred Pound Br.

Xanthoria parietina (L.) Th. Fr.—Chiefly corticolous and saxicolous, nitrophilous, photophilous. Local. Frequent on Isle-of-Wight Ditch Br. Scarce on Isle-of-Wight Pond Br. and on posts by railway in area M.

X. candelaria (L.) Kickx (*X. lychnea* Th. Fr. p.p.).—Corticolous and saxicolous, nitrophilous, photophilous. Rare. At base of oak, Common Road, area D.

Caloplaca heppiana (Muell. Arg.) Zahlbr. (*Placodium callopismum* (Ach.) Mer. var. *plicatum* (Wedd.) Leight.).—Saxicolous, calcicolous, nitrophilous, photophilous. Scarce. Frequent on Hundred Pound Br.

C. teicholyta (Ach.) Steiner—Saxicolous. Local. Sterile forms resembling this species occur on the south face of Hundred Pound Br.

C. citrina (Hoffm.) Th. Fr.—Chiefly saxicolous, calcicolous, nitrophilous. Frequent. Abundant on Isle-of-Wight Pond Br. and Hundred Pound Br. Frequent on Isle-of-Wight Ditch Br. Occasional on Central Ditch Br. Scarce on Common Rd. Br. and Western Ditch Br.

C. aurantiaca (Lightf.) Th. Fr.—Saxicolous, calcicolous, nitrophilous. Rare. Occasional on south face of Hundred Pound Br.

C. pyracea (Ach.) Th. Fr.—Chiefly saxicolous, calcicolous. Occasional. Abundant on calcareous stone of Common Rd. Br. Frequent on mortar of Tunnel Br. Occasional, Hundred Pound Br. Scarce on concrete, Western Ditch Br.

Candelariella vitellina (Ehrh.) Muell. Arg.—Corticolous, lignicolous and saxicolous ; on both acid and calcareous substratum ; nitrophilous. Occasional. On concrete post, area D ; abundant on concrete posts by railway, area M ; occasional on sandstone corner-posts, Lt. Bookham Rd. Br. and Tunnel Br.

Physcia grisea (Lam.) Zahlbr.—Corticolous and saxicolous, nitrophilous, photophilous. Very local. Abundant on two elm trees in Station Copse.

P. adscendens (Th. Fr.) Oliv. sensu Bitt. (*P. tenella* auct. angl. p.p.). Corticolous and saxicolous, nitrophilous, photophilous. Local. Abundant on concrete posts by railway area M ; locally frequent on willow, Bayfield Pond ; occasional on stone, Isle-of-Wight Ditch Br. Scarce on moss, Hundred Pound Br.

P. tenella (Scop.) DC.—Corticolous and saxicolous, nitrophilous, photophilous. Rare. Frequent on elm, Station Copse.

P. caesia (Hoffm.) Nyl.—Saxicolous, calcicolous, nitrophilous, photophilous. Local. Scarce on Central Ditch Br., Isle-of-Wight Pond Br. and concrete posts, area R.

P. tribacia (Ach.) Nyl.—Corticolous and saxicolous, nitrophilous, photophilous. Local. Abundant on willow, Bayfield Pond ; occasional, Isle-of-Wight Ditch Br.

Rinodina demissa (Koerb.) Arn.—Saxicolous, occurring on both acid and calcareous substratum, nitrophilous. Local. Abundant on south face of Hundred Pound Br., Isle-of-Wight Pond Br., and Western Ditch Br. Scarce on concrete posts, areas D and M.

Buellia canescens (Dicks). De Not.—Corticolous and saxicolous, nitrophilous. Local. Abundant on willow, Bayfield Pond ; scarce on elm, Station Copse and one plant at base of oak near Tunnel Br. in area M.

B. myriocarpa (DC.) De Not.—Corticolous and saxicolous, nitrophilous, often photophobous. Local. Abundant on willow, Bayfield Pond ; scarce on elm, Station Copse and on oak by Common Rd., area D.

Diploschistes scruposus (L.) Norm.—Generally saxicolous, acidiphilous. Rare. Scarce on brick and moss, Hundred Pound Br.

Phlyctis argena (Ach.) Koerb.—Corticolous, remarkable in occurring on both eutrophic and oligotrophic bark in both illuminated and shaded situations. Local. On the north side of old oaks, areas E, I, and K. Scarce on elm, Station Copse. A specimen from area K was determined by Dr. O. Almborn.

Cladonia :

C. pyxidata s. lat. and *C. fimbriata* s. lat. have been split up into several species. The following key to the British spp. is included in the hope that it will help those who are not familiar with the species now recognized. Degrees of abundance refer to Gt. Britain :

1a. Podetia with broad cups 2
1b. Podetia with narrow cups, truncate or subulate 7

2a. Soredia farinose, at least in part 3
2b. Soredia granular or absent 5

3a. Podetia over 2 cm. tall. Cups 5-10 mm. broad.
C. fimbriata (L.) Fr. var. *major* (Hag.) A. H. Magnusson
3b. Podetia under 2 cm. tall. Cups 1-5 mm. broad 4

4a. Podetia tall and slender, gradually expanding into the cups, sorediate on lower part. Common on ground, stumps, rock, etc.
C. fimbriata var. *fimbriata.*
4b. Podetia short, abruptly expanding into cups, corticate on lower part. Local.
C. conista (Ach.) Robbins ex Allen

5a. Basal squamules forming a dense adnate brownish appressed crust over moss on limestone or calcareous soil. Often without podetia. Locally common.
C. pocillum (Ach.) Rich.
5b. Basal squamules free±erect and±greenish. On neutral or acid substratum ... 6

6a. Soredia absent. Local. *C. pyxidata* (L.) Hoffm. var. *pyxidata.*
6b. Soredia granulose. Common. *C. pyxidata* var. *chlorophaea* Flörke
(Forms which are Pd- are sometimes called *C. greyi* Merr. ex Sandst.)

7a. Podetia corticate on the lower part, usually over 4 cm. tall, mostly unbranched, apices subulate. Moors in Yorkshire and the Scottish Highlands.
C. cornuta (L.) Schaer.
7b. Podetia with soredia at the base or not corticate 8

8a. Podetia with grey soredia on the lower part, usually over 4 cm. tall, branched, apices subulate. Local.
C. cornutoradiata (Coem.) Sandst.
8b. Podetia with yellowish soredia on the lower part, usually under 4 cm. tall, generally unbranched 9

9a. Podetia exceeding 2 cm. tall, partly corticate, cups usually present 10
9b. Podetia under 2 cm. tall, almost wholly covered in soredia or squamules ... 11

10a. Podetia often branched. Pd + yellow-red. Heaths.
C. ochrochlora Flörke
10b. Podetia simple with narrow cups. Pd + yellow. Rare.
C. nemoxyna (Ach.) Nyl.

11a. Podetia subulate, sometimes with a few truncate podetia. Common, expecially at the base of trees and on stumps.
C. coniocraea (Flörke) Spreng.
11b. Podetia with narrow cups, often almost truncate, never subulate. Frequent, chiefly stumps and tree-bases.
C. fimbriata f. *macra* (Flörke) Cromb.

Cladonia pyxidata (L.) Hoffm. var. *chlorophaea* Flörke.—Chiefly on neutral and acid soils. Local. Scarce, area D ; common amongst short grass, area O.

C. fimbriata (L.) Fr. var. *fimbriata.*—Corticolous, lignicolous and terricolous. The type form is locally frequent on the ground in areas O and P. The f. *macra* (Flörke) Cromb. is scarce on trees and stumps in the woods.

C. coniocraea (Flörke) Spreng. (*C. ochrochlora* Flörke var. *ceratodes* Flörke).—Corticolous, lignicolous and terricolous. Frequent. Common at the base of trees, especially birch and oak. Occurs also on old moss-covered branches, stumps, and on the ground in a damp hollow in Central Wood (E. W. Groves) and in the grass-heath, areas D and O.

C. furcata (Huds.) Schrad.—Terricolous, rarely lignicolous, acidiphilous. Local. Scarce amongst gorse near Hundred Pound Br., area D. Frequent in grass-heath, area O.

C. macilenta Hoffm.—Chiefly lignicolous and terricolous, acidiphilous. Rare. Decorticated trunk, area S.

C. bacillaris Nyl.—Chiefly lignicolous and terricolous, acidiphilous. Rare. At base of oak, area F.

C. floerkeana (Fr.) Sommerf.—Normally terricolous, acidiphilous. Rare. On decayed *Peltigera* amongst gorse on sandy soil near Hundred Pound Br., area D.

Peltigera canina (L.) Willd.—Normally terricolous on both acid and calcareous soils. Rare. Amongst moss over concrete, area S. (A. H. Norkett.)

P. polydactyla (Neck.) Hoffm.—Terricolous, on both acid and calcareous soils. Local. Amongst gorse on sandy soil near Hundred Pound Br., area D. Occasional in grass-heath, area O.

Collema cristatum (L.) Weber (*C. granuliferum* Nyl.).—Saxicolous and terricolous, calcicolous. Rare. On heap of chalk, area M. (A. H. Norkett).

Graphis elegans (Borr.) Ach.—Corticolous on smooth bark, nitrophobous, photophobous. Rare. Young oak, area G.

Chaenotheca melanophaea (Ach.) Zwack.—Corticolous on rough bark, acidiphilous, nitrophobous, photophobous. Frequent, chiefly on the north side of old oaks.

Calicium viride Pers (*C. hyperellum* Ach.).—Corticolous, acidiphilous, nitrophobous, photophobous. Rare. On old oaks, areas E and F.

C. subtile Pers. (*C. debile* Turn. and Borr.).—Lignicolous, acidiphilous, nitrophobous. Rare. Decorticated trunk, Broadway, area I.

Lepraria aeruginosa (Wigg.) Sm.—Corticolous and saxicolous, nitrophobous, photophobous. Common on trunks and branches in shaded situations, especially on sheltered birch boles, elm boles, hawthorn, crevices in oak boles and the sides of oak branches. On moss on Hundred Pound Br.

L. candelaris (L.) Fr.—Corticolous, nitrophobous, photophobous. Local. Confined to crevices in old oak boles, areas A, I, K and N.

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The Fishes of the London Area

By A. C. Wheeler

FISHES are the only vertebrate group in the London area which as a whole have escaped the attention of the naturalist. Even where one might have expected a comprehensive account, as in the *Victoria County History* of the counties comprising the London area, the treatment is so generalized and undocumented as to be almost valueless, and beyond notes on the fishes of very restricted areas, as in Rigden (1955) and Horn (1923), and scattered references to individual species in various journals, little appears to have been published. Despite the sparseness of records from the naturalist's viewpoint there is an abundant literature on fish in London from the angling and to a lesser extent the economic aspects. It is by partly utilizing these sources that this present note is as full as it is ; but as angling literature is completely selective of the larger species most of the other fish have been but poorly recorded. I am sure that the distribution of many of these species is not accurately reflected by the records here given, and would stress that much could be done by the amateur naturalist to improve our knowledge of the distribution of many fish species in the London area.

The following list is an accumulation of personal records and notes from various friends and correspondents, supplemented by details from many published sources. As such it makes no claim to completeness, but will, I hope, serve as a basis for further observations. For common species the records are mainly of their present-day distribution, but with species which are either rare or extinct now in the area, although at one time occurring in numbers, I have included records and references to them by earlier authors. These in some cases are books published before the middle of the eighteenth century. General ecological considerations are discussed as a whole, rather than species by species.

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The nomenclature used in the list of fishes of the London area follows that of Norman (1935).

Lamprey. *Petromyzon marinus* L.

The lamprey lives mainly in the sea, and only migrates into fresh water at the end of winter or in spring, in order to breed (i.e. it is an anadromous fish). As an adult it is parasitic, attaching itself to fishes and rasping away their flesh with its toothed tongue. The first three or four years of its life are passed in fresh water, as a non-parasitic larval form.

This species does not seem to have been common in the Thames, or

in the London area generally, and has never been exploited in the manner of the large and famous Severn fishery. When Thames caught fish appeared on the London market, as reported by Buckland (1881), it was probably only in small numbers. Yarrell (1836) notes that " a few are caught in the Thames almost every year, up which river it travels . . .", and records single specimens taken in June, 1834, and 1835 in Church Deep at Sunbury Weir. The lamprey was stated to be very numerous in 1899 in the Lower Hope, near Gravesend, and there were numbers in the estuary near Southend in that year (Murie, 1903).

There do not appear to be any recent records in the London area.

Lampern. *Lampetra fluviatilis* (L.)

A species which usually spends part of its life at sea, entering the rivers in the autumn to spawn in fresh water in the spring. Like the lamprey the lampern as an adult parasitizes other fish, and the larvae obtain their food by filtering the water of edible particles. Another fresh water form was formerly considered to be distinct (brook lamprey, *L. planeri*), but some recent authors regard it as the same species.

Formerly the lampern was abundant in the Thames, and probably in all its tributaries in the area. The only recent records, however, seem to be of the Brook Lamprey, and are from the River Alderbourne, near Uxbridge (S.H.D.), and in a stream on Shooters Hill, Woolwich (Rigden, 1955), although it is likely to be more widely distributed than these records suggest. Earlier references testify to the extreme abundance of the lampern in the Thames, and Pennant (1791) instances the capture of 450,000 in one season between Battersea Reach and Taplow Mills, and states (1776) that vast numbers were taken about Mortlake. Yarrell (1836) also referred to this example, and mentioned that the Thames formerly supplied between 500,000 and 1,200,000 lamperns annually. He added, however, that they had been scarce of later years, although the river still contained them all year round and they abounded at certain seasons. Evidently this decline continued, for the capture of five or six near Windsor in 1867 was said to be the first for ten years there (Clark-Kennedy), and Cornish (1902) appears to have considered them noteworthy at Hammersmith. He also mentioned a heavy mortality *ca.* 1890 at Blackwall Point, when many lay dead on the mud there. Despite this evidence of decline, there was still a regular fishery at Teddington (and elsewhere) up to 1882 (F.) at which date the lampern was " alleged " to breed in the old piers and stones of Hampton Court Bridge. They were reported by Murie (1903) to be frequently taken about 1899 in the Thames estuary. Croft (1882) recorded it as present in rivers in Hertfordshire ; Laver (1898) mentioned it as occurring in Essex, and Boulenger (1902) " in rivers " in Surrey, although none cites a definite record.

The extensive fishery for lamperns in the Thames was apparently wholly devoted to the production of bait, mainly for the Dutch turbot fishing, although much was used by British long-liners in the North Sea. The fishery was of considerable value in its day. Pennant (1791) says that they sold at £2 per thousand ; Yarrell (1836) from £2 to £8; and around 1878, at times when supplies were limited the price reached £10 per thousand; fishing was then mainly at Teddington and was valued at £4,000 per annum (F. 1882). This exploitation of the lampern continued certainly until 1882, and probably after this, but at that date the methods

by which it was carried on were causing concern. Alterations at Teddington Weir had both deepened the basin beneath and raised the weir level, and the fish, if not actually prevented from ascending the river by the weir, were forced to spend so long in the basin as to render them very vulnerable to the fishermen, who by mid-January of that year had captured at least 120,000. The upstream fishery (at Chertsey) was ruined as a result of this.

Sturgeon. *Acipenser sturio* (L.)

An anadromous species, which enters rivers to spawn, although it does not breed in British waters. Evidently the sturgeon occurred with moderate regularity in the Thames up to the early nineteenth century, but had severely declined by the end of that century. Although his seaward boundary extended past that of the twenty-mile radius of the London area, Binell (1785) was able to write, " oftentimes caught in this river about the time that Shads come therein . . .". It was recorded as " taken occasionally but rarely " in the Thames near Blackheath (Collingwood, 1859), and a specimen was caught two or three miles below Kew in 1832 (Day, 1884). A seven pound Thames fish was mentioned in August, 1879, at the same time as a much larger specimen was killed in the Medway above Maidstone Bridge (Russell, 1879). About this time there were a number of occurrences which are cited by Murie (1903) as follows : one near Westminster Bridge, May, 1867, a young fish at Charlton, June, 1880, and Erith, July, 1883. Murie added " many Thames fish of 5, 6 and 7 feet have been noted." Two Thames specimens caught before 1855 are in the national Collection ; a large fish was taken at Chertsey *ca.* 1769 (A.T.).

I have no recent records of the sturgeon in the area.

Whitebait. Juv. *Clupea sprattus* (L.) and juv. *C. harengus* (L.)

The young stages of these two familiar species, the sprat and the herring, not only occurred in the Thames within the Society's area, but were the subject of a considerable fishery there. Both species, while young, form large, mixed shoals in inshore waters, and are particularly common in estuarine conditions. The Thames estuary to-day still supports an appreciable whitebait industry. The identity of the fishes which were sold under this name long remained in question, and Pennant (1776) took them to be the fry of the fresh water bleak, Donovan (1808) considered them to be young shad, and Yarrell (1836) and others said they were a distinct species (*Clupea alba*). In fact, the proportions of the two main component species vary considerably ; in winter and spring sprats predominate, and during the summer months young herring become common, and may sometimes even outnumber the sprats (Ewart and Mathews, 1886).

The fishery in the Thames seems to have been of some antiquity, and when Pennant wrote it was obviously well established, even if its product found a different market from that of to-day ! He wrote, they " occasion, during the season, a vast resort of the lower order of epicures to the taverns contiguous to the places they are taken at." At this time during July the fishing was carried on at Blackwall and Greenwich, and Yarrell told of whitebait caught in considerable quantity every flood tide as high up river as Woolwich and Blackwall. Buckland and Walpole (1879) record that it had disappeared from that area, and had been told that although there were about forty whitebait fishermen at Greenwich, there

were now only three at Gravesend, who all now had to fish well out into the estuary. One of the witnesses in giving evidence had said that the fish had slowly fallen off downstream from Blackwall and Woolwich to Erith, then to Greenhithe, Grays, Gravesend, to the Lower Hope and Southend.

At the same time as the whitebait was decreasing, the fishing for sprats off Gravesend had fallen off by 75 per cent, which was locally attributed to over-fishing of the young, and even the estuarine winter fishery for sprats was unprofitable. Herring, except as young in the summer shoals of whitebait, seem to have always been uncommon. Yarrell noted that a few were occasionally caught " in Dagenham Breach," and a retired fisherman told Buckland and Walpole that there had been no herring shoals off the Thames " in his time," and few were caught with the sprats. A reference in Cornish (1902) to the " reappearance " of whitebait at Gravesend in 1892, followed in 1895 by a return to Greenwich, was attributed to the improvement in the treatment of London sewage at that time. There seem to be no records after Cornish wrote, and I have no recent note of either it or the adult sprat occurring in the London area.

Allis Shad. *Alosa alosa* (L.)

A species which visits the fresh water in order to spawn ; it was formerly encountered in the Thames in early spring, although it seems to have been a rare fish. The only two records I have are from Yarrell, one above Putney Bridge, 1831, and one opposite Hampton Court Palace, June, 1833. Small specimens may have been confused with the more common twaite shad, but there is no reason to doubt its rarity, and Murie who studied the Thames estuary in detail had not seen it taken there. No recent records.

Twaite Shad. *Alosa finta* (Cuvier)

An anadromous fish which breeds mainly in estuarine water, and thus does not migrate so far upstream as the allis shad. Formerly, this was a very common fish in the tidal reaches of the Thames, reaching upstream to Teddington, and probably much beyond this before the construction of the weir there. When Yarrell (1836) wrote, they were " in abundance " for a mile below Greenwich and great numbers were taken every season, although at that date they had decreased in quantity and did not ascend so far upstream. Formerly, he added, quantities had been caught at Millbank (Westminster) and above Putney Bridge, although they still bred in the Thames regularly. There was thus some justification for Donovan's (1808) contention that whitebait were young shad, as when he wrote, young shad would have been present in the later whitebait shoals.

The decline in numbers evidently continued, for in 1877 a Gravesend whitebait fisherman quoted in Buckland and Walpole (1879) mentioned that only a few shad were caught, and they had decreased. Murie, who obtained most of his information in the later years of the nineteenth century, however, regarded them as undiminished in the estuary, and mentioned fish of two inches in length, as well as a record (only doubtfully accepted) of newly hatched shad caught near the Yantlet. There seem to be no later records for this shad, except that Boulenger (1902) mentioned a few having been found in the Thames, although it is doubtful if this was from knowledge of contemporary captures. It seems unlikely that the shad enters the Thames to-day ; there are no recent records.

Fitter (1945) implies that the shad disappeared from the Thames around 1833, but as we have seen it was common long after that ; his suggestion that on account of its abundance it gave its name to Shadwell is not substantiated by Ekwall (1936), who derives the place-name through Shaldewell (1316), meaning shallow stream.

Pilchard. *Sardina pilchardus* (Walbaum)

Recorded by Yarrell (1859) who obtained one in the Thames, May, 1838. This species apparently used to occur in numbers on the east coast, but is now rarely caught north of the Channel.

Anchovy. *Engraulis encrasicolus* (L.)

Included solely on the authority of Yarrell (1859) who said it was reported to inhabit Dagenham Breach, and who recorded one from the Thames, May, 1838. Murie (1903), however, showed that it occurred occasionally in the Thames estuary.

Salmon. *Salmo salar* (L.)

A fish which was formerly common in the Thames, the Lea and possibly other tributaries, now absent and apparently not definitely recorded in the London area since 1833. By virtue of its economic and angling value, there is a vast literature relating to the salmon in our rivers of which the note below is merely a brief summary.

The salmon is an anadromous fish which ascends more or less all the year round such rivers as are not unfitted by pollution ; it spawns in the upper reaches in autumn. It was present in the Thames, to which most of my records refer, in considerable numbers and at one time was the subject of a fishery of some importance. A detailed list of captures at Boulter's Weir, near Taplow (Bucks), covering the years 1794 to 1821 has been published (Senior, 1898), in which the peak years were 1801 and 1804 when 66 and 64 salmon were captured ; over this period of twenty-eight years 483 fish were taken. The same source contains references to an eye-witness account of twenty fish taken in one haul in Chelsea Reach. The later years in which records were kept at Boulter's Weir showed a steady decrease in numbers of fish caught ; by the time Yarrell (1836) wrote they occurred but seldom, the last of which he was aware being taken in June, 1833. The River Lea also held salmon until this date ; Laver (1898) quoted a record at Waltham Abbey about 1820, and occurrences in 1816, 1825 and 1833. There do not appear to be any later records of salmon in the London area, although Collingwood (1859) wrote " sometimes . . . found in the Thames, and now less commonly than before," and Blakey (1898) referred to salmon having been taken at Battersea Bridge, although it remains a matter of doubt whether these authors referred to actual records, or were generalizing from some years before.

The species lingered on in the Thames estuary for many years. Cornish (1902) specially referred to a grilse (December, 1901) in the estuary, although Murie (1903) stated that some were usually taken each year in the fixed nets at Foulness Island, and listed a number of captures between 1864 and 1891 (e.g. Southend, Leigh-on-Sea, Canvey Spit, Long Reach, etc.), which suggests that salmon occurred with regularity. A complicating factor in the records of this species is the numerous nineteenth century attempts to reintroduce it to the Thames. There was a salmon hatchery

on the Lea in 1863, and as part of a restocking operation between the years 1861 and 1865, forty-eight thousand young fish were liberated in the Thames (Murie, 1903). There was another prolonged attempt at the beginning of the present century (Senior, 1898, Boulenger, 1902). It remains a possibility that some of these fish survived their journey through the polluted water to the sea, to be later captured in the estuary, but no increase of salmon in the upper reaches of the Thames resulted from these introductions.

Trout. *Salmo trutta* (L.)

This species is recognized as being differentiated into two forms, one migratory, breeding in fresh water after returning from the sea, and the other, the non-migratory brown trout, spending all its life in rivers. The sea-trout no longer occurs in the London area. Early records seem, however, to be sparse ; Yarrell (1836) only mentioned a young fish from above Putney Bridge, and Murie (1903) recorded two between Hungerford and Waterloo bridges in February, 1880. Croft (1882) doubtfully accepted a record of one in the River Lea at Edmonton in 1856. Buckland (1879) mentions that almost every year he received young sea-trout from the estuary of the Thames and Medway, and Murie found it not infrequently in the estuary (Southend and Leigh), the last of his records being in March, 1899. The difficulty in distinguishing between the two forms while the sea-trout is in fresh water may have led to this sparse recording, although there is no evidence to show that it was ever particularly common.

The non-migratory form still occurs, although less widely distributed than formerly. A brief review of references to brown trout in various localities, and some recent records of its occurrence follow.

Thames and Lea. Yarrell (1836) listed as the best Thames localities, Kingston, Hampton Court Bridge and Weir, and Shepperton and Chertsey Weirs. Other records are the Thames, near Blackheath (Collingwood, 1859) ; a large specimen from Chertsey Weir (Buckland, 1881) ; ninety-seven caught in one week between Chertsey and Kingston (Senior, 1884) ; rarely, at Battersea Bridge (Blakey, 1898) ; also Brentford, Teddington, Hampton Court, Sunbury and Staines (Blakey). A small specimen was recorded by Horn (1923) at the entrance to the docks at Shadwell. In the Lea, Blakey (1898) noted trout as scarce at Temple Mills, occurring at Lea Bridge and Waltham Abbey, and Laver (1898) recorded it at Sewardstone ; Davies (1900) regarded it as numerous in the upper waters of the Lea. Other records from Dobbs Weir, 1881 (Croft), and Hoddesdon, 1900 (K.M.). To-day, the trout is distributed in the Thames as far down as Kingston (P.T.), and Hampton Court (R.A.M.), but is very local ; a few have been caught below Teddington (Sutton). In the Lea it is rare, and not reported below Dobbs Weir (Sutton) where it was fairly common *ca.* 1944 (A.C.W.), possibly sparsely distributed above.

Kent. Noted as " traditional " from the River Darent (Senior, 1884), where it became rare but has now been restocked (P.H.W.).

Surrey. " Generally distributed " (Boulenger, 1902) ; River Wandle at Carshalton and Mitcham (Brookes, 1749) ; Queen's Mere, Wimbledon Common, introduced (Johnson, 1912) ; Blakey (1898) noted it as occurring in the Wey and the Mole. To-day, it is recorded from these two rivers only (Sutton), and an ornamental pond at Beddington (E.W.G.).

MIDDLESEX and BUCKS. River Colne at Denham (Blakey, 1898), and at West Drayton after restocking (P.H.W.) ; the Wraysbury and Colne Brook streams, occasional (P.H.W.) ; the Colne Brook was periodically restocked up till 1954 (R.A.M.).

HERTS. Rivers Gade and Chess, Rickmansworth (Luscombe, 1951).

ESSEX. Dagenham Lake (Hilliar, 1892) ; River Roding at High Ongar, introduced 1957, and although outside the area, some will probably move downstream (A.C.W.). Low Maynard, Walthamstow Reservoirs (Heaverman, 1955).

Owing to the favour that the trout finds amongst anglers, it is widely introduced. There is a record (Carrington, 1876) of introductions in the Thames at Chertsey, and Laver (1898) notes a stocking of the River Roding in 1881.

Rainbow Trout. *Salmo irideus* (Gibbons)

A North American species frequently introduced for its sporting qualities. Recorded,

KENT. River Darent, Eynsford 1947 (K.H.H.).

BUCKS. Colne Brook, near Iver, till 1954 (R.A.M.).

ESSEX. Copped Hall Estate Pond, Epping (Sutton).

Brook Trout. *Salvelinus fontinalis* (Mitchell)

Another North American species which is occasionally introduced. Carrington (1876) noted that numbers were liberated into the Thames near Chertsey ; Boulenger (1902) that they were liberated near Guildford.

Grayling. *Thymallus thymallus* (L.)

A well-known sporting fish, which is locally distributed in northern and midland rivers, although introduced elsewhere. It seems unlikely that it occurs naturally anywhere in the London area, even though Binnell (1785) listed it as occurring in the River Thames, and Fitter (1945) quoted a reference to it in the Middlesex Thames in 1819. It was, however, introduced into the Lea below Hatfield (Croft, 1882), and above Hertford in 1863 or 1864 (Day, 1884, Davies, 1900). Because of these or later introductions it may be established there, as there is a recent record from Ware in 1957 (A.T.). Another recent record which, like the last, is just outside the London area, is from the River Wey (Farnham to Godalming) (A.T.).

Smelt. *Osmerus eperlanus* (L.)

A fish which lives mainly in estuarine conditions, ascending rivers to spawn in late winter and early spring. There was at one time a considerable movement of these fish up the Thames, sufficient at least to provide a fishery for thirty boats (Yarrell, 1836). When Brookes (1749) and Binnell (1785) wrote, the smelt moved upstream as far as Mortlake and Richmond in spring and to Greenwich in autumn, and Yarrell noted that the river between Wandsworth and Hammersmith formerly contained smelt abundantly, but added that few were taken there then. Fitter (1945) quoted an 1848 report that smelt could be taken near London Bridge, and as late as 1878 (Brougham) smelt were taken by netting below Richmond Bridge. The number of fish evidently decreased in the Thames, and it became a rare fish. Later records include three at Teddington, and others

near Kew Bridge, March, 1868, September, 1882, at Chiswick, and another at Hammersmith (Day, 1884) ; 1898—Richmond, 1899—Westminster, 1900—beyond Blackwall (Murie, 1903) ; 1900—Putney, Kew and Teddington (Cornish, 1902).

Pike. *Esox lucius* (L.)

Widespread throughout the rivers, and introduced into many waters in the London area.

THAMES and LEA. Fitter quoting Hofland (1848) said pike were numerous in the tidal reaches from Battersea Bridge upwards ; Blakey (1898) mentioned pike in the East and West India docks, and Horn (1923) recorded it in the London docks in 1921 and 1922. To-day, it is fairly common above the tidal reaches of the Thames, but rare below Teddington, although a dead specimen was found near Richmond in 1956 (P.H.W.). Well distributed in the River Lea (Sutton, A.C.W.). Blakey (1898) recorded it at Hackney Marshes and Lea Bridge, and Hofland (1848) said that it abounded between Lea Bridge and Stratford, but I have no recent records below Ponders End.

KENT. Crystal Palace Lakes (P.T.) ; Elliman's Pond, Dartford ; Keston ponds (Sutton).

SURREY. Beverley Brook, Wimbledon Common (Johnson, 1912) ; Wandsworth Common Pond ; Hersham gravel pit (Sutton) ; River Wey Navigation Canal (A.T.) ; River Wey, Barn Elms Reservoir ; Pen Ponds, Richmond Park ; River Mole at Esher ; the Emberbrook (R.A.M.).

MIDDLESEX and BUCKS. Longwater, Willow Pond, Boating Pool, Wall Pond, Hampton Court Park ; Diana Pond, Leg of Mutton Pond, Bushy Park (R.A.M.) ; Hampstead Heath Pond ; Victoria Park Pond ; Grovelands Park, Winchmore Hill ; Little Britain Lake, Cowley ; Upper Halliford Halt Lake, Shepperton ; Shepperton Range gravel pits ; Thorpe gravel pit, Staines ; Staines Reservoir ; Thorney Weir gravel pit ; River Colne at West Drayton (Sutton) ; Colnbrook (Civil Service Fishery) Lake ; Colne Brook and Wraysbury streams (P.H.W.) ; Moor Lane Fishery, Staines ; gravel pits at Wraysbury (A.T.), and at Colnbrook ; River Colne, near Slough (R.A.M.) ; Ruislip Reservoir (Luscombe, 1951).

HERTS. River Colne ; Elstree Reservoirs ; Grand Union Canal (near Tring) ; gravel pits at Cheshunt ; Rickmansworth Lakes (Sutton) ; Lake on Hadley Green (Lansbury, 1956).

ESSEX. River Stort; Raphael Park Lake, Romford; Warren Pond, Chingford ; Berwick Ponds, Rainham ; Wanstead Park Lake (Sutton) ; Walthamstow and King George V Reservoirs ; Wake Valley Pond, Strawberry Hill Pond, Loughton (A.C.W.) ; River Roding (Hesse, 1901), at Loughton (G.F.N., A.C.W.).

Bitterling. *Rhodeus amarus* (Bloch)

A central European fish introduced and established in Lancashire and recorded in the London area from a pond on Hadley Green, Herts. (Lansbury, 1956).

Carp. *Cyprinus carpio* (L.)

This freshwater fish is an old introduction to the British Isles ; it is now widely distributed in the London area.

THAMES and LEA. Frequent but widely scattered in both rivers ; occurs in tidal water at Teddington (Sutton), and upstream frequently at Kingston (R.A.M.) ; it was recorded at Hampton Court (Brookes, 1749, Binnell, 1785). In the Lea it seems very sparse (A.C.W., Davies, 1900) ; recorded near Ponders End (Sutton), and between Waltham Abbey and Broxbourne (B.C.).

KENT. Crystal Palace Lakes (Sutton, R.W.I.) ; Stone gravel pits, Dartford, Keston Ponds (Sutton) ; New Eltham (Rigden, 1955).

SURREY. Wimbledon Common Ponds (Johnson, 1910) ; River Mole ; Battersea Park Lake ; Tooting Common Pond ; Wandsworth Common Pond ; Cannon Hill Lake, Merton ; Wey Navigation Canal ; Bay Pond, Godstone ; Hersham gravel pit (Sutton) ; Pen Ponds, Richmond Park ; River Mole at Esher (R.A.M.).

MIDDLESEX and BUCKS. Little Britain Lake, Cowley ; Thorpe gravel pit, Staines (Sutton) ; Ruislip Reservoir (Luscombe, 1951) ; Serpentine, Hyde Park ; Barn Elms Reservoir ; Longwater and Wall Ponds, Hampton Court Park ; Diana Pond, Bushy Park (R.A.M.) ; Colnbrook (Civil Service Fishery) Lake (P.H.W.) ; Moor Lane Fishery gravel pits, Staines (A.T.).

HERTS. Gravel pit at Cheshunt; Rickmansworth Lakes (Sutton); ponds at Hadley Green, Beech Hill, Dyrham Park and Wrotham Park (Lansbury, 1956).

ESSEX. Hainault Forest Lake; Copped Hall Estate Pond, Epping; Raphael Park, Romford ; Wake Valley Pond, Loughton (Sutton) ; Warren Pond, Chingford (Sutton, Ward, 1951) ; Berwick Ponds, Rainham ; Wanstead Park Lake (Sutton) ; Dagenham Lake (Hilliar, 1892) ; Walthamstow Reservoirs, No. 1 (Heaverman, 1955).

Crucian Carp. *Carassius carassius* (L.)

Less widely distributed than the common carp, this species is poorly recorded in the area. It is probably an introduction.

THAMES and LEA. " Very common " in the vicinity of the Thames (Day, 1884) ; near Tottenham (Laver, 1898).

KENT. Pond at Kidbrook (Collingwood, 1859).

HERTS. Cheshunt 1915 (B.M.(N.H.)) ; Totteridge Long Pond (P.H.W.).

ESSEX. Copped Hall Estate Pond (Sutton) ; Goldings Hill and Fairmead Bottom Ponds, Loughton (A.C.W.).

Goldfish. *Carassius auratus* (L.)

An Asiatic species, introduced by the liberation of aquarium and pond-kept fish. Wild fish which revert to the natural olive-green coloration are now probably widespread in the London area, although only recorded as follows. The Docks (Horn, 1923) ; the Serpentine, Hyde Park ; the Round Pond, Kensington Gardens (R.A.M., A.C.W.).

Barbel. *Barbus barbus* (L.)

This species, which appears to be less common than formerly, is mainly restricted to the Thames and the Lea. It appears to prefer either swift parts of streams, or well oxygenated water such as is found below the weirs in those rivers.

THAMES and LEA. Possibly more common than it is to-day as Yarrell (1836) mentioned the capture of 150 lbs. of barbel in five hours between Shepperton and Walton and large catches were frequent at that time. Brookes (1749) gave as localities for this species, Kingston, Hampton, Walton, Shepperton, and Chertsey, which localities figure in many later accounts. Barbel were, and still are caught in the tidal reaches below Teddington, and Blakey (1898) recorded it at Battersea Bridge, Brentford, Richmond, Twickenham and Teddington Lock where it was abundant, and Day (1884) wrote that it was common at Hammersmith in 1880. Recent (1957) captures in tidal water have been noted (A.T.), and it is occasionally taken at Richmond (P.H.W.). Above Teddington, recorded from Datchet Weir pool, Shepperton (P.H.W.), Teddington, Hampton Court Weir, and Sunbury Weir (R.A.M.). In the Lea it was recorded at Temple Mills and Lea Bridge (Blakey, 1898), and Davies (1900) mentioned great numbers below Kings Weir and at Sewardstone. It is not apparently found to-day below Waltham Abbey, where it occurs (A.T.) ; occasional between Waltham Abbey and Broxbourne (B.C.) ; not infrequent at Dobbs Weir (Sutton).

SURREY. River Wey, occurs, but less common than formerly (Sutton); River Mole in last weir before the Thames (R.A.M.) ; Walton Reservoirs occasional (Sutton).

MIDDLESEX. A large specimen in the British Museum (Natural History) is reported to have been taken in the Serpentine in 1844. It has not been recorded from that lake recently.

ESSEX. Walthamstow Reservoirs, High and Low Maynard (Heaverman, 1951) ; Laver's (1898) record from Dagenham Lake was disputed by Hesse (1901) ; it seems an unlikely locality for this fish.

Gudgeon. *Gobio gobio* (L.)

Widely distributed; this fish is common in all rivers and most streams. Introduced to many enclosed waters. As this is a small species and of little value to the angler it is very poorly recorded, and the notes below give only an incomplete impression of its distribution.

THAMES and LEA. Common above Teddington and in the tidal reaches of the Thames as far downstream as Richmond, below which it occurs less commonly (P.H.W., R.A.M.). Blakey (1898) recorded it at Brentford, Richmond, Teddington, Hampton Court, Sunbury and Staines. The British record fish was taken at Datchet in 1935 (P.T.). Horn (1923) recorded a number of gudgeon in the Docks. Croft (1882) and Davies (1900) reported it as common in the River Lea and it is so from Waltham Abbey down to Ponders End (A.C.W.), although no recent records seem to exist from below that point. Blakey, however, recorded it at Temple Mills. Very common Waltham Abbey to Broxbourne (B.C.).

KENT. River Darent at Eynsford (K.H.H.) ; the Ravensbourne (Collingwood, 1859).

SURREY. River Wey near Wisley, and the Wey Navigation Canal ; the Emberbrook (R.A.M.) ; River Wandle a few (Brookes, 1749) ; Queen's Mere, Wimbledon Common (Johnson, 1912).

MIDDLESEX and BUCKS. Finsbury Park Lake ; Victoria Park ; Grovelands Park, Winchmore Hill (Sutton) ; Osterley Park Lake (R.T.) ; Longwater, Hampton Court Park (R.A.M.) ; New River, two miles from

Islington (Blakey, 1898) ; Colnbrook (Civil Service Fishery) Lake (P.H.W.) ; the Colne Brook, and the River Colne near Colnbrook (P.H.W., R.A.M.), and at Denham (K.M.).

HERTS. Pond on Hadley Green (Lansbury, 1956).

ESSEX. River Roding (Hesse, 1901), at Abridge (K.M.) ; Loughton to Abridge (A.C.W., G.F.N.) ; River Stort (Laver, 1898) ; Walthamstow Reservoirs (Sutton) ; Connaught Water, Chingford (A.C.W., Sutton).

Tench. *Tinca tinca* (L.)

A rather uncommon species, although it is widely distributed in the area.

THAMES and LEA. Occasional in the tidal reaches of the Thames, at Twickenham and Teddington Weir pool (Sutton); more common above Teddington, and has been reported from Kingswood Creek, near Wraysbury (A.T.), and Kingston (R.A.M.). Noted as common (Croft, 1882) in the Lea, it is less so now, and only seems to be taken occasionally; reported particularly between Enfield Lock and Rommey Marsh Lock, Carthaginia Lock and Dobbs Weir Lock (Sutton).

KENT. Ravensbourne (Collingwood, 1859).

SURREY. Wandsworth Common Lake; Bay Pond, Godstone; Hersham gravel pit (Sutton) ; Grantham Pond, Wimbledon Common (Johnson, 1912) ; Gatton Park (B.M.(N.H.)) ; Barn Elms Reservoir ; River Mole at Esher, and the Emberbrook ; River Wey at Wisley (R.A.M.) ; Wey Navigation Canal (A.T.).

MIDDLESEX and BUCKS. Hampton Court Park, Longwater (Sutton, R.A.M.), Willow Pond and Wall Pond ; Bushy Park, Diana and Leg of Mutton Ponds (R.A.M.) ; Hampstead Heath Pond ; Keston Ponds; Little Britain Lake, Cowley; Thorpe gravel pit, near Staines (Sutton) ; Ruislip Reservoir (Luscombe, 1951) ; River Colne and the Colne Brook near Colnbrook (R.A.M.) ; Farlow's Lake, Iver ; Thorney Weir Fishery gravel pit (Sutton) ; Colnbrook (Civil Service Fishery) Lake (P.H.W.).

HERTS. Grand Union Canal, near Tring ; gravel pits, near Cheshunt; Northmet Pit, Wormley ; Rickmansworth Lakes (Sutton) ; Totteridge Long Pond (P.H.W.).

ESSEX. Walthamstow Reservoirs ; Hainault Forest Lake ; Raphael Park Lake, Romford ; Warren Pond, Chingford ; Weald Park, South Weald ; Berwick Ponds, Rainham (Sutton) ; Dagenham Lake (Hilliar, 1892) ; Goldings Hill Pond, Loughton (A.C.W.).

Minnow. *Phoxinus phoxinus* (L.)

Abundant where present, but owing to its small size it is frequently overlooked and but poorly recorded. Uncommon in still waters.

THAMES and LEA. Not apparently recorded in the Thames, very common in the Lea (Croft, 1882, Davies, 1900), between Broxbourne and Waltham Abbey (B.C., A.C.W.). Three recorded from Docks (Horn, 1923).

KENT. Ravensbourne (Collingwood, 1859) ; River Darent at Eynsford (K.H.H.), at North Cray (Rigden, 1955).

SURREY. River Mole, near Dorking (A.T.) ; River Wandle—a few (Brookes, 1749), at Beddington (E.W.G.) ; River Wey, near Wisley, and in the Emberbrook (R.A.M.).

MIDDLESEX and BUCKS. Colne Brook and Wraysbury streams (P.H.W., R.A.M.).

ESSEX. River Roding (Hesse, 1901), near Abridge (R.W.I.), near Loughton (G.H.N., A.C.W.).

Chub. *Squalius cephalus* (L.)

Widely distributed, although this fish is not common ; mainly found in rivers and streams.

THAMES and LEA. Occurs frequently above Teddington (P.H.W.), but rarely in the tidal parts, one recorded in 1957 (A.T.), although Blakey (1898) knew it " some years ago " at Battersea Bridge. This author regarded it as common at Walton and Staines, where it still occurs (A.T.) ; between Sunbury and Shepperton (A.T.), Hampton Court, 1956 (P.T.) where it is common (R.A.M.). Horn (1923) recorded one adult and several young in the Stepney Docks. In the Lea it is widely distributed but not common (A.C.W., Sutton). Croft (1882) said it abounded and Blakey (1898) recorded it at Temple Mills and Lea Bridge, as did Hofland (1848) from Lea Bridge to Stratford. Occurs between Waltham Abbey and Broxbourne, but not common (B.C.).

KENT. Ravensbourne (Collingwood, 1859).

SURREY. River Mole (Sutton), near Dorking (A.T.) ; River Wey (Sutton), near Wisley, Wey Navigation Canal ; the Emberbrook (R.A.M.).

MIDDLESEX and BUCKS. Colne Brook and Wraysbury streams (P.H.W.), near Colnbrook and the River Colne (R.A.M.) ; recently introduced to, and established in a lake near Colnbrook (P.H.W.).

ESSEX. River Roding (Hesse, 1901), near Loughton (G.F.N., A.C.W.).

Chub X. Bleak hybrid

A specimen of this uncommon hybrid from the River Mole, Surrey (B.M.(N.H.)).

Dace. *Leuciscus leuciscus* (L.)

This fish is common and widely distributed in probably all the rivers and streams of the area, although poorly recorded.

THAMES and LEA. Common in the Thames (P.H.W.) above tidal limits, and very common at Hampton Court and Sunbury (R.A.M.), Staines and Shepperton (A.T.). Frequently occurs below Teddington, as for instance at Richmond and Chiswick Bridge, 1957 (R.A.M.). It was formerly common in the tidal reaches and Cornish (1902) recorded it at Westminster and London Bridge in 1890, and commonly above Putney ; Senior (1884) refers to catches of 35, 26 and 25 lbs. of dace at Richmond and Twickenham and Blakey (1898) knew it some years before at Battersea Bridge.

In the River Lea it was common between Lea Bridge and Stratford (Hofland, 1848) ; recorded by Croft (1882) and Davies (1900), it is still quite common (Sutton), above Enfield (A.C.W.), and above Waltham Abbey (B.C.)

KENT. Recorded from the Ravensbourne (Collingwood, 1859), it probably occurs in both the Cray and the Darent.

SURREY. River Mole (Sutton), near Dorking (A.T.) ; River Wey Navigation Canal (A.T.), Hersham gravel pit (Sutton) ; the Emberbrook (R.A.M.) ; Pen Ponds, Richmond Park 1940 (Fitter, 1945) ; Beverley Brook, Wimbledon Common (Johnson, 1912).

MIDDLESEX and BUCKS. Colne Brook and Wraysbury streams (P.H.W.) ; River Colne near Colnbrook (R.A.M.) ; New River, two miles from Islington (Blakey, 1898) ; Colnbrook (Civil Service Fishery) Lake, established after recent introduction (P.H.W.)

HERTS. River Colne, Rickmansworth ; New River, Ware (P.H.W.).

ESSEX. River Roding (Hesse, 1901), near Loughton (G.F.N.).

Roach *Rutilus rutilus* (L.)

This fish is common throughout almost all rivers, lakes and ponds ; owing to its popularity with anglers it is introduced abundantly.

THAMES and LEA. Common in the Thames including the tidal reaches (Sutton, P.H.W.). Formerly occurring at Westminster, London Bridge and commonly at Putney about 1895, at Woolwich, 1900 (Cornish, 1902), and at Battersea Bridge (Blakey, 1898) ; recently recorded at Chiswick Bridge (R.A.M.). Common above Teddington (Sutton, P.H.W., R.A.M., P.T.). In the Lea, it was recorded by Croft (1882) and Davies (1900), at Temple Mills by Blakey (1898), at Hoddesdon (Chearney, 1875) ; it is common above Waltham Abbey (A.C.W.), and is recorded by Sutton from Picketts Lock upwards. Recorded commonly by Horn (1923) from the Stepney Docks.

KENT. Crystal Palace Lake (Sutton, R.W.I.) ; Elliman's Pond and gravel pits near Stone, Dartford (Sutton) ; River Darent, a few (Luscombe, 1951) ; the Ravensbourne (Collingwood, 1859).

SURREY. River Mole (Sutton, A.T.) ; Barn Elms Reservoir (Sutton, R.A.M.) ; West Molesey Reservoir ; Battersea Park Lake (Sutton) ; Richmond Park, Pen Ponds (Sutton, R.A.M.) ; ponds at Wimbledon Common (Johnson, 1912) ; Wandsworth Common Ponds ; Cannon Hill Pond, Merton Common ; Bay Pond, Godstone ; Hersham gravel pit (Sutton) ; Ham pits, Richmond ; River Wey Navigation canal (A.T.) ; the Emberbrook (R.A.M.).

MIDDLESEX and BUCKS. Hampton Court Park, Longwater, Boating Pool (Sutton, R.A.M.), Wall Pond ; Bushy Park, Leg of Mutton Pond (R.A.M.) ; Serpentine, Hyde Park (Sutton, R.A.M., P.T., A.C.W.) ; St. James's Park Lake (A.C.W.) ; Finsbury Park Lake ; Hampstead Heath Pond ; Grovelands Park, Winchmore Hill ; Little Britain Lake, Cowley ; Shepperton Range gravel pits ; Thorpe gravel pits, near Staines (Sutton) ; Colnbrook (Civil Service Fishery) Lake (P.H.W.) ; Colne Brook and Wraysbury Streams (P.H.W., R.A.M.) ; Ruislip Reservoirs (P.H.W.); Osterley Park Lake (R.E.T.); Staines Reservoirs, Queen Mary Reservoir, Littleton (P.T.) ; River Colne near Colnbrook ; Colnbrook gravel pits near Iver (R.A.M.).

HERTS. Elstree Reservoir ; Grand Union Canal, near Tring ; Northmet Pit, Wormley ; Rickmansworth Lakes ; gravel pits near Cheshunt (Sutton) ; Woodside House Lake, Whetstone (P.H.W.) ; ponds at Hadley Green and Beech Hill Lake (near Barnet) (Lansbury, 1956).

ESSEX. Walthamstow Reservoirs (Sutton, K.M.) ; Connaught Water, Chingford (A.C.W., Sutton) ; Raphael Park, Romford ; Warren Pond,

Chingford ; Berwick Ponds, Rainham; Wanstead Park Lake (Sutton); Highams Park Lake (A.C.W.) ; Wake Valley pond, Epping Forest (K.M.); River Roding (Hesse 1901), at Loughton (G.F.N., A.C.W.) ; George V Reservoir, Chingford (P.T.) ; Dagenham Lake (Hilliar, 1892).

Roach X Bream hybrid

Recorded, as common in the Docks (Horn, 1923) ; Thames at Richmond, 1957 (P.H.W.) ; Dagenham Lake (Hilliar, 1892).

Rudd. *Scardinius erythrophthalmus* (L.)

A species of local distribution in the British Isles, it is not common in the London area. Young specimens are often confused with the roach.

THAMES and LEA. Apparently only recorded from the Thames by Yarrell (1836). In the Lea recorded by Croft (1882), Davies (1900), and recently, as occasional between Waltham Abbey and Broxbourne (B.C.).

KENT. Stone Pond, Brooklands Lake, Dartford (Sutton), Keston Ponds (P.H.W.).

SURREY. Richmond Park, Pen Ponds (R.A.M.)

MIDDLESEX and BUCKS. Hampton Court Park, Longwater, Boating Pool, Wall Pond (R.A.M.) ; Osterley Park Lake ; Grovelands Park, Winchmore Hill (Sutton) ; Moor Lane Fishery, Staines (A.T.) ; Ruislip Reservoir (Luscombe, 1951) ; Colnbrook (Civil Service Fishery) Lake (P.H.W.) ; Colne Brook at Colnbrook ; Colnbrook gravel pits near Iver (R.A.M.).

HERTS. A pond near Barnet, Hyde Crete Lake, Maple Cross (P.H.W.).

ESSEX. Hainault Forest Lake, River Roding (P.H.W.).

Silver Bream. *Blicca bjoerkna* (L.)

This species is frequently confused with young bronze bream, and reported occurrences should be carefully verified. It is not certain that the silver bream occurs in the London area, as none of the following records can be verified, but it may have been introduced.

THAMES and LEA. Recorded in the Thames in tidal water (A.T.) ; in the Lea recorded doubtfully by Croft (1882) at Sewardstone. Elsewhere reported from River Darent (K.H.H.) ; Hampstead Heath Pond (P.H.W.); Dagenham Lake (Hilliar, 1892) ; No. 1, Walthamstow Reservoirs (Heaverman, 1955).

Bronze Bream. *Abramis brama* (L.)

A common fish which is much favoured by anglers and hence introduced into many waters.

THAMES and LEA. Well distributed in the Thames (Sutton, P.H.W.) ; down as far as Richmond (P.H.W., R.A.M.) in tidal water. In the Lea, Davies (1900) noted it as not uncommon, and there is a specimen in the Essex Museum of Natural History from Angel Road, Edmonton (K.M.). It occurs at Waltham Abbey (A.T.), and Sutton records it from Picketts Lock, Ponders End, to Hardmeade Lock, above Broxbourne. Horn (1923) recorded this species in the Stepney Docks between 1921 and 1922, and Blakey (1898) in the East and West India Docks.

KENT. Gravel pits at Stone, near Dartford (Sutton) ; Ravensbourne (Collingwood, 1859).

SURREY. River Wey (Sutton, R.A.M.) ; River Wey Navigation Canal (R.A.M.) ; River Mole (Luscombe, 1951), where it was mentioned by Brookes (1749) as exceptionally abundant ; West Molesey Reservoirs (Sutton) ; Barn Elms Reservoir ; Ham gravel pits ; Pen Ponds, Richmond (R.A.M.); Scio Pond and King's Mere, Wimbledon Common (Johnson, 1912).

MIDDLESEX and BUCKS. Osterley Park Lake (Sutton) ; Bushy Park, Diana Pond (R.A.M.); Hampstead Heath Lake; Little Britain Lake, Cowley ; Shepperton Range gravel pits ; Thorpe gravel pit, near Staines (Sutton) ; Ruislip Reservoir (P.H.W.) ; Regents' Park Canal (Yarrell, 1836); Colnbrook gravel pits, near Iver (R.A.M.); River Colne and the Colne Brook near Colnbrook (R.A.M.).

HERTS. Elstree Reservoirs ; Rickmansworth Lakes (Sutton).

ESSEX. Walthamstow Reservoirs ; Connaught Water and Warren Pond, Chingford ; Wanstead Park Lake (Sutton) ; Dagenham Lake (Laver, 1898, Hilliar, 1892).

Bleak. *Alburnus alburnus* (L.)

A small, abundant fish, which is probably widespread in rivers throughout the area although very poorly recorded on account of its size.

THAMES and LEA. Very abundant in the Thames (Sutton, P.H.W.), Kingston Bridge to Sunbury Lock (R.A.M., A.T.). Cornish (1902) recorded bleak in the tidal reaches at Chiswick Eyot (*ca.* 1895), and from 1890 to *ca.* 1900 above Putney, and before that at Kew. Its present status in these reaches is unknown, but it occurs below Richmond half lock (P.H.W.). Horn (1923) found it abundant in the Stepney Docks. In the Lea it is recorded as common (Croft, 1882) and abundant (Davies, 1900) ; it is abundant at Waltham Abbey (A.C.W.). Recorded elsewhere in the area :

SURREY. River Wey at Weybridge (B.M.(N.H.)), at Wisley (R.A.M.).

MIDDLESEX and BUCKS. Hampton Court Park, Longwater (R.A.M.); Colnbrook (Civil Service Fishery) Lake (P.H.W.).

ESSEX. River Roding (Hesse, 1901) ; Walthamstow Reservoirs (P.H.W.).

Stone Loach. *Nemacheilus barbatula* (L.)

Probably a common fish in shallows of all streams in the area, but little recorded owing to its small size and almost entirely nocturnal activity.

RIVER LEA. " Great quantities " (Davies, 1900) ; common, Broxbourne to Waltham Abbey (B.C.)

KENT. Common Ravensbourne (Collingwood, 1859) ; Plumstead Marshes (Rigden, 1955).

SURREY. Beverley Brook, near Barnes (Johnson, 1912).

MIDDLESEX. River Colne at West Drayton (S.H.D.).

ESSEX. River Roding, recorded near Ongar by Broughton (1950), who confused it with the rare and local spined loach; very common between Abridge and Loughton (G.F.N., A.C.W.).

Eel. *Anguilla anguilla* (L.)

Apparently the eel is fairly common throughout the area although very little recorded. This is probably the only species to pass regularly through the polluted lower Thames. It spends some years in fresh water before returning to the sea to spawn.

THAMES and LEA. Well distributed in the Thames including the tidal reaches (Sutton, P.H.W.), recorded from the river at Chelsea, Richmond and Hampton Court (R.A.M.) ; Cornish (1902) noted it between Hammersmith and Kew, also commonly off Mortlake. Buckland and Walpole (1879) noted its occurrence at London Bridge, and Blakey (1898) at Battersea Bridge. Although from the seventeenth century eels were supplied to the London market by Dutch boats, this only indicated that no fishery existed for them in the Thames, and there is no reason to doubt that they have always been present in that river.

In the Lea it was quite common (Davies, 1900), and it still occurs between Broxbourne and Waltham Abbey (B.C.), and probably elsewhere. Horn (1923) recorded several in the Stepney Docks.

KENT. Plumstead and Abbey Wood Marshes (Rigden, 1955) ; Keston Ponds (P.H.W.).

SURREY. West Molesey Reservoir (Sutton) ; River Wey Navigation Canal (A.T.) ; Pen Ponds, Richmond Park (Fitter, 1945, R.A.M.) ; Ham gravel pits ; the Emberbrook (R.A.M.) ; Beverley Brook, Wimbledon Common (Johnson, 1912).

MIDDLESEX and BUCKS. The Serpentine, Hyde Park (Sutton, R.A.M.); Victoria Park Lake (P.H.W.) ; River Brent, at Brentford ; River Colne and the Colne Brook at Colnbrook ; Longwater and Wall Ponds, Hampton Court Park ; Diana Pond, Bushy Park ; Colnbrook gravel pit near Iver (R.A.M.).

ESSEX. King George V Reservoir (A.T.) ; River Roding (Hesse, 1901) ; Dagenham Lake (Hilliar, 1892).

Perch. *Perca fluviatilis* (L.)

The perch is abundant and very well distributed ; it has been introduced into numerous ponds and lakes.

THAMES and LEA. Well distributed ; common in the tidal reaches (P.H.W.), Richmond to Teddington (R.A.M.). Occurs commonly, Kingston Bridge to Shepperton (A.T.), Hampton Court and Sunbury (R.A.M.). In the Lea, common (Croft, 1882, Davies, 1900), between Lea Bridge and Stratford (Hofland 1848). Still common and well distributed in the Lea (Sutton, A.C.W.). Horn (1923) recorded numerous perch in the Stepney docks, and Blakey (1898) also mentioned it in the docks.

KENT. Crystal Palace Lakes (Sutton, R.W.I.); Keston Common Ponds ; Elliman's Pond, near Dartford (Sutton) ; River Darent (Luscombe, 1951).

SURREY. Barn Elms Reservoir (Sutton, R.A.M.) ; West Molesey Reservoirs (Sutton) ; Pen Ponds, Richmond Park (Sutton, R.A.M., Fitter, 1945) ; Battersea Park Lake ; Tooting Common ; Cannon Hill, Merton ; Bay Pond, Godstone ; Hersham gravel pit (Sutton) ; River Mole (P.H.W.) ; River Wey Navigation Canal ; the Emberbrook ; River

Wey, near Wisley (R.A.M.) ; Queen's Mere, Wimbledon Common (Johnson, 1912).

MIDDLESEX and BUCKS. Hampton Court Park, the Longwater (Sutton, R.A.M.), the Willow and Wall ponds (R.A.M.) ; the Serpentine, Hyde Park (Sutton, R.A.M.) ; gravel pit near Shepperton Range ; Thorpe gravel pit, near Staines (Sutton) ; Ruislip Reservoir (Luscombe, 1951) ; Bushy Park, Diana Pond, Leg of Mutton Pond (R.A.M.) ; Cranford gravel pit (P.T.) ; Grovelands Park, Winchmore Hill (Sutton) ; River Colne (P.H.W.), at Colnbrook (R.A.M.), and the Colne Brook (P.H.W., R.A.M.) and Wraysbury streams (P.H.W.) ; Grand Union Canal, near Tring ; Farlow's Lake, near Iver (Sutton) ; Colnbrook (Civil Service Fishery) Lake (P.H.W.) ; Colnbrook gravel pits, near Iver (R.A.M.).

HERTS. Elstree Reservoirs (Sutton) ; gravel pits at Cheshunt ; Northmet Pit, Wormley; Rickmansworth Lakes (Sutton) ; Woodside House Lake (P.H.W.); pond on Hadley Green, near Barnet (Lansbury, 1956).

ESSEX. Copped Hall Estate Pond ; Raphael Park, Romford ; Warren Pond, Chingford (Sutton) ; Connaught Water, King George V Reservoir, Chingford ; Strawberry Hill Ponds, Goldings Hill Pond, Loughton (A.C.W.); Berwick Ponds, Rainham; Wanstead Park Lake (Sutton) ; River Roding (Hesse, 1901), near Loughton (G.F.N.) ; Dagenham Lake (Laver, 1898, Hilliar, 1892) ; Walthamstow Reservoirs (Heaverman, 1955).

Ruffe. *Acerina cernua* (L.)

An uncommon species, the ruffe is apparently mainly confined to the larger rivers in the area. Little recorded, all occurrences are worth noting.

RIVER THAMES. Well distributed (P.H.W.), and common Yarrell, (1836); recorded from " above Richmond " (Boulenger, 1902), Walton (P.H.W.), and Hampton Court (R.A.M.). Blakey (1898) recorded it at Battersea Bridge. In the River Lea, mentioned only by Croft (1882) as scarce.

Elsewhere recorded from the London area :

KENT. River Darent, at Eynsford (K.H.H.).

SURREY. River Mole (Brookes, 1749) ; Barn Elms Reservoir (R.A.M.)

Bullhead. *Cottus gobio* (L.)

This fish probably occurs in all rivers in the area, but is particularly common in shallow, quickly flowing streams. Very poorly recorded.

THAMES. At Battersea, 1911 (Johnson, in Fitter, 1945). In the Lea, recorded by Croft (1882), and Davies (1900) as not uncommon ; common from Waltham Abbey to Broxbourne (B.C.).

KENT. Ravensbourne (Collingwood, 1859).

SURREY. Beverley Brook, Wimbledon Common (Johnson, 1912) ; the Emberbrook and River Wey, near Wisley (R.A.M.) ; River Wandle, Beddington, 1940 (E.W.G.).

BUCKS. A stream at Denham (S.H.D.).

HERTS. River Gade in Cassiobury Park, Watford (W.G.T.).

ESSEX. River Roding (Hesse, 1901) ; very common between Loughton and Abridge (A.C.W.).

Stickleback. *Gasterosteus aculeatus* (L.)

Abundant throughout the area, there can be very few waters which do not hold this species. Probably on this account few authors give definite localities for its occurrence ; it is more common than the following records suggest.

THAMES and LEA. At Richmond (P.H.W.). Common in the Lea (Croft, 1882, Davies, 1900). Abundant and breeding in the Stepney Docks (Horn, 1923).

KENT. " Many streams and pools throughout the borough " of Woolwich (Rigden, 1955) ; the Folly and Prince of Wales Ponds, Blackheath (R.E.T.) ; the Ravensbourne (Collingwood, 1859).

SURREY. Ponds and Beverley Brook, at Wimbledon Common (Johnson, 1912) ; Ham pits (P.H.W.) ; Pen Ponds, Richmond Park, the Emberbrook (R.A.M.) ; River Wandle (E.W.G.).

MIDDLESEX and BUCKS. Round Pond, the Serpentine, Hyde Park (A.C.W., R.A.M.) ; stream near Water House Plantation, Bushy Park (W.G.T.) ; Regents Park Canal (Buckland, 1881) ; streams at Denham (S.H.D.) ; Colne Brook and Wraysbury streams (P.H.W.).

HERTS. Ponds at Hadley Green, Dyrham Park, Wrotham Park, and Mimms Wash stream (Lansbury, 1956).

ESSEX. Many ponds in Epping Forest (including Connaught Water, Warren Pond, Highams Park Lake) ; River Ching at Chingford and Highams Park (A.C.W.) ; River Roding (Hesse, 1901), abundant near Loughton (A.C.W.).

" Ten-spined " Stickleback. *Pygosteus pungitius* (L.)

Much more locally distributed than the preceding species, probably rare in the London area. More information on the distribution of this species, both in this area and nationally, is required.

KENT. Ravensbourne, and around West Kent (Grinling *et al.*, 1909) ; marshes of the Thames estuary (Buckland, 1881) ; Danson Park, Plumstead Marshes (Rigden, 1955).

SURREY. At Battersea and Cobham (Boulenger, 1902).

HERTS. River Chess at Rickmansworth (B.M.Int.H.).

ESSEX. Thames estuary marshes (Buckland, 1881) ; River Roding (Hesse, 1901).

Flounder. *Platichthys flesus* (L.)

The only British flatfish that regularly ascends into fresh water. Its distribution to-day in the Thames is uncertain, but formerly it was common in the tidal reaches of the Thames and of the Lea (Croft, 1882). Yarrell (1836) recorded it at Teddington, Sunbury and near Hampton Court, and Collingwood (1859) knew of it above Deptford. In 1878, flounders were taken by netting below Richmond Bridge (Brougham), and a year later Buckland and Walpole noted them at Battersea, London

Bridge and Westminster. At Chiswick Eyot they were recorded in 1895, claimed as the first for twelve years by Cornish (1902). There is one unconfirmed record from near New Chiswick Bridge about twenty years ago, sent to me at second hand (1957) (R.A.M.).

ADDENDUM

The following marine species listed by Fitter (1945) as once occurring in the London area, turbot, sole, plaice, skate, halibut and haddock are omitted from the foregoing list. From general considerations of the normal distribution of these species it seems unlikely that any, except possibly the turbot, have naturally occurred in post-glacial times in the area. Some of these species may have been included from early authors, who, when writing of fishes in the London Thames naturally took as their seaward limit the ancient boundary of the City's jurisdiction, the Crowstone to Yantlet line, which includes some twenty miles of the estuary more than the present area, and which could considerably increase the number of species.

THE INFLUENCE OF LONDON ON ITS FISH FAUNA

Like all other animal and plant communities the original distribution and general ecology of the fish fauna has been grossly disturbed by the urban and industrial development of London. As fish are confined to a medium which is exploited in many different ways by man, the disturbance has been probably greater than in any other group. Causes such as pollution of rivers are obvious, but many other factors have been at work, although not all are so destructive or striking in their effects.

Pollution of rivers must, however, represent the first of the influences of London on its surroundings, and as the most severe effects of pollution are felt downstream, there exists below London and well out into the Thames estuary polluted water which either prevents or deters fish from ascending the river. It is significant that, of the species listed earlier, lampern, whitebait, twaite shad, salmon, smelt and flounder, although all at one time very common, have now ceased to exist in the Thames. Similarly, species such as the sea-trout, lamprey and sturgeon, even if never common in the river, also seem to have completely disappeared there. All these are fish which migrate up rivers from the sea, and it is this group which particularly illustrates the effects of the polluted water of the Thames. The only fish which ascends the Thames from the sea to-day is the eel, a species which is notoriously resistant to morbid factors. It seems that purely fresh-water fish have also been driven upstream by pollution in the Thames.

It is relevant here to note that various authors (e.g. Hofland, 1848, Senior, 1898) attributed the disappearance of Thames salmon partly to the establishment of gasworks. Certainly, gasworks produced poisonous effluents which were discharged into a river, but this was only one aspect of the general increase of industrialization during that period. The problem of the disposal of harmful industrial effluents was at the time not even recognized and therefore ignored. The same problem is as great to-day, and it is this which largely causes the toxic condition of the lower reaches of the Thames and Lea, as well as many smaller rivers in London. Industrial pollution, however, differs sharply from the effect of the disposal of domestic sewage, which for a population as large as London's

represents a vast undertaking. With modern methods and by achieving no more than a moderate standard of sewage effluent, there need be no adverse effect, under normal conditions, on the fish in streams receiving the effluent. Indeed, it seems that anglers frequently find fish attracted to the point of discharge, and Mills (*in litt.*) cites dace and roach congregating at a sewer exit near Chiswick Bridge.

It is, however, an over-simplification to attribute the decrease of fish solely to pollution, as other factors have been at work alongside it. One of these, the weirs and locks constructed in the larger rivers to promote their use as navigation canals, resulted in a series of obstacles across the path of migrating fish. As we have already seen, salmon still ran up the Thames long after the construction of the weirs but their effect on the shad, smelt and flounder has not been recorded. I would suggest that previous to these obstructions being placed in the Thames these fish occurred further up the river than Teddington. The shad, which Regan (1911) noted as formerly ascending the Severn some one hundred miles, into Montgomeryshire, probably migrated much further up the Thames than in the Severn, but with the construction of the weir at Teddington this fish, together with the smelt and flounder, was prevented from ascending beyond that point. It is further probable that the raising of this weir led indirectly to the decrease of the Thames lampern, and it is noteworthy that the previously mentioned captures of salmon at Taplow, were made at Boulter's Weir and in the adjacent river. These facts suggest that in addition to the physical barrier presented by weirs to shad and other species, they represented yet another hazard to species which could surmount the obstacle, in that while fish were below the weir, or were trying to ascend it, they were especially vulnerable to commercial fishery methods. Salmon, lampern and eels would all fall into this category.

In addition to the pollution caused by industrialization and a large population there are a number of other aspects by which London makes its presence felt. These vary in extent, but all have had a bearing on the general ecology of the Thames catchment, and thus on its fishes. Profound alterations in the condition of the Thames must have resulted from the channelling and embanking undertaken partly to provide deep waterways for shipping at all states of the tide, but also making available large areas of marshland for agriculture and later for building. From being a moderately shallow, very broad stretch of water, the Thames was narrowed and deepened, with fast flowing, scouring tides and river currents. The magnitude of the ecological changes produced is only appreciated when one considers that the Thames is confined by artificial banks throughout the estuary and almost to the further boundary of the London area. As a corollary to this alteration in the nature of the Thames the banking and dredging of lesser rivers in the area became necessary. As an example of this the River Roding may be cited. At its mouth and for some way upstream this river was dredged to provide a waterway for barge traffic. Above the limit of this traffic, the river flows through built-up areas as far as Loughton. Some of these houses stand on the old water meadows of the river which consequently had to be deepened and the banks raised still further to prevent flooding. Upstream also, the banks have been raised but flooding still occurs each winter. The gross effect of these operations as seen in the upper reaches has been a great reduction in the normal summer-time flow, leaving isolated and, in periods of drought, diminishing pools of water, each containing fish in numbers. The fauna and flora now

also suffer from the intense scouring which occurs after even moderate rainfall.

A further effect which London has had on its rivers, and thus on its fishes, is the development of the smaller streams as surface water drainage channels, and their subsequent culverting. Such streams as the Fleet, the Westbourne and the Wallbrook, to name only three, are bound to have been inhabited by fishes at one time. Their culverting has now removed them from any list of potential habitats for fish. Associated with these aspects of the development of rivers, one must also remember the likely effects of the general lowering of the water table over south-east England, and particularly in the built-up areas with their impervious surfaces and efficient drainage.

Turning now to consider developments caused by the presence of London which have had a beneficial effect on its fishes, the increase in the volume of still water is of prime importance. The construction of reservoirs for storage of London's water supply has resulted in a vast addition, about 3,300 acres (Homes, 1957), to the available habitats. Where reservoirs (as in the Lea Valley) have been constructed over the bed of a river, some of the river fish appear to have become adapted to life in static water, but in most of these waters fish have been introduced. As might be expected these habitats prove suitable for species such as the carp, roach, tench, bream, perch and pike, which frequently occur but chub, dace, minnow, barbel and trout, even if introduced, remain comparatively uncommon. The streams of the Lea Marshes over which the King George V Reservoir was built were inhabited by many fish, and my father, Mr. P. C. Wheeler, tells me that roach and perch were abundant, pike common, eel, dace, chub, bream, minnow, gudgeon, loach, stickleback all occurred, and rudd, barbel and tench had been reported. Of these, only the first four are known to inhabit the Reservoir to-day. The above remarks also apply where gravel pits have been excavated. The larger workings are in the terrace gravels of the Thames and its tributaries, often, as in the case of the Lea Valley, within a few feet of the river itself, hence there has been little obstruction to the colonization of these waters. In gravel diggings away from the terrace gravels, as on the Epping Forest ridge, introduction has been the instrument which has stocked these often small ponds.

Similarly, by the construction of waterways within London, and thence to other parts of the country, the volume of water available to fishes has been increased. These canals may also provide opportunities for species to spread from river to river, and it is possible that the silver bream (*Blicca bjoerkna*) which is not proven to be native to the Thames (Regan, 1911), may have immigrated in this way. This possibility should be borne in mind when the stocking of rivers with alien species is proposed.

Finally, the factor which has probably resulted in the greatest change in the fishes of the London area is their introduction by man. This has not been confined to endemic species, which are, however, frequently introduced into private ornamental waters, and repeatedly into rivers and lakes by angling organizations. Two aspects of the latter call for further comment ; firstly, restocking to improve the angling potentialities of a water, as when roach, tench and trout are concerned, and secondly, the casual release of fishes captured in one water and set free in another, or the liberation of unused " live-bait." It is believed that the latter is the cause of bleak occurring in the Longwater, Hampton Court Park (Mills *in litt.*),

and elsewhere. Alien species such as carp (introduced originally as a food fish some five centuries ago), brook and rainbow trout also enter the list of introductions for angling purposes. There are, in addition, sundry alien species released from ponds or aquaria which have become established. In the London area, the goldfish and the bitterling are in this category, but elsewhere in the British Isles, these, North American fresh water bass, and various other species have been found in small numbers.

In summary, therefore, it can be said that London's presence has affected the fish populations in many ways. Complete loss of some species and reductions in the numbers of others have resulted from pollution, industrial use and development of the main rivers. To some degree this has been counterbalanced by introductions of endemic and alien species, and by a great increase in available habitats.

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The Distribution of Grasshoppers and Allied Insects in the London Area

By R. M. Payne

THE large, attractive but strangely neglected insects formerly grouped in the single order Orthoptera (as in Lucas, 1920) are now generally regarded as forming *inter alia* the three orders Dictyoptera (Cockroaches), Orthoptera (Grasshoppers, Crickets, etc.) and Dermaptera (Earwigs). Collectively they are sometimes called by the convenient term Orthopteroids. This paper is concerned only with the undoubtedly native species, and not with those introduced ones, mainly cockroaches, crickets and earwigs, which maintain themselves in Britain only under artificial conditions ; still less with the army of casuals which turn up in crates of bananas and elsewhere.

In an attempt to make the paper more interesting and useful to the general naturalist, brief notes have been included on the identification of some of the species, with particular emphasis on stridulation since this is an invaluable character in determining grasshoppers and crickets and is not adequately dealt with in any of our text-books.

The London Area, as defined by the London Natural History Society, extends twenty miles from St. Paul's Cathedral in all directions and thus covers some 1,250 square miles. It is, of course, an arbitrarily defined area and moreover one which cuts across vice-comital boundaries ; nevertheless it has for half a century provided the framework of the Society's activities, and indeed the present paper is one of a series (of which several have already appeared in this journal) dealing with the distribution in the Area of various groups of animals and plants. It has been impracticable to adhere rigidly to the twenty-mile limit in one or two places on the fringe, notably Box Hill, where the precise localities of published records cannot be determined.

Distribution has been studied primarily on the basis of the Watsonian vice-counties, which are being increasingly used in work of this kind. The London Area comprises the whole of V.C.21 (Middlesex), and parts of V.C.s 16 (West Kent), 17 (Surrey), 18 (South Essex), 19 (North Essex), 20 (Herts) and 24 (Bucks). Whilst full account has been taken of early records, the paper deals mainly with the present distribution of these insects : I have throughout used the term " recent " with reference to the years since the end of the Second World War (1945 to date).

Can any general statements be made about the distribution of Orthopteroids in the London Area ? Of the 35 species native to the mainland of Britain, 25 have occurred in the Area, though one of these is certainly extinct (*Stethophyma grossum*) and the present status of two others (*Gryllotalpa gryllotalpa* and *Omocestus rufipes*) is obscure : it is remarkable that the number of extinctions is no higher, when we consider the changes that have taken place in the environs of London in the hundred years since active recording began. The remaining 22 species can perhaps be considered as falling, in the main, into four types of distribution :—

1. Ten species are widely distributed, though some of them are apparently uncommon, and some are more closely restricted to particular habitats than others.

Meconema thalassinum — *Chorthippus brunneus*
Leptophyes punctatissima — *C. parallelus*

Tetrix subulata — *Myrmeleotettix maculatus*
T. undulata — *Labia minor*
Omocestus viridulus — *Forficula auricularia*

2. Four species are found mainly or entirely on the Chalk hills of Surrey and West Kent.

Ectobius pallidus — *Gomphocerippus rufus*
Stenobothrus lineatus — *Forficula lesnei*

Pholidoptera griseoaptera, though widely distributed, is much commoner on the Chalk than elsewhere.

3. Four species are found mainly or entirely in a belt on either side of the Thames below Woolwich.

Tettigonia viridissima — *Conocephalus dorsalis*
Metrioptera roeseli — *Chorthippus albomarginatus*

4. Three species each appear to have a very local sporadic distribution.

Ectobius lapponicus — *Apterygida albipennis*
Metrioptera brachyptera

The Chalk downland is certainly the richest part of the London Area in Orthopteroids. As in other fields of natural history, Box Hill, in the present state of our knowledge, ranks ahead of any other locality round London, with no fewer than 17 species (though five of these have not been recorded recently). The Thames marshes are gradually disappearing under buildings of various kinds, especially on the Essex bank, so that here one has first to look for the undeveloped parts : Dartford and Stone Marshes, however, still support at least ten species.

But several other localities, not in either of these areas, equal or fall little short of these figures. At Oxshott thirteen species have been recorded at one time or another. Bookham Common has had twelve, Epping Forest eleven and Haileybury ten. These figures point to the importance (and the rewards) of careful field-work. The only obvious feature common to these places is that they have all been intensively worked by entomologists : none (except perhaps Oxshott, which has two of our very local species) is outstandingly rich in suitable habitats. Several species of Orthopteroids are now extremely localized in their distribution, so that until a district has been very thoroughly examined—at different times of year—it is impossible to be certain what species it supports. For example, *Pholidoptera* may occur in abundance in a bramble thicket 20 yards square, but nowhere else for a mile or so. Again, I have been working Epping Forest for grasshoppers over a number of years, but only recently I came across *Chorthippus albomarginatus* for the first time, in an apparently isolated colony in one of the most frequented and barren parts of the Forest.

Unfortunately there are at present only a handful of naturalists familiar with these fine insects, so that for large parts of our Area nothing whatever is known of the orthopterous fauna. For this reason, as well as the extreme localness of some species, I have been reluctant in this paper to make general statements (particularly negative ones) about the distribution of any of our Orthopteroids.

The precise habitats occupied by the insects in this group of orders are so diverse that no further generalizations can usefully be made ; but a comparison of the fauna of our seven vice-counties may be of interest. In considering the following table—which applies only to those parts of the V.C.s lying within the London Area as defined above—it is important

to bear in mind the unequal proportions of the Area which they cover. Thus in round figures Middlesex comprises 26% of the whole, Surrey 22%, South Essex 17%, West Kent 16%, Hertfordshire 15%, North Essex 2% and Bucks 2%. The predominance of Surrey and West Kent in the table is due firstly to the variety of soils and consequently of habitats which these two counties offer, and secondly to the extent of uncultivated land remaining in them—though at least in Surrey the density of entomologists over the years is a factor to be reckoned with. Middlesex has the highest number of apparent extinctions, a reflection of the enormous development of the county in recent years. Little significance can be attached to the showing of North Essex and Bucks, since they cover such a very small part of our Area : North Essex of course contains a portion of Epping Forest.

VICE-COMITAL DISTRIBUTION OF NATIVE ORTHOPTEROIDS IN THE LONDON AREA

	Vice-counties (London area only)	16	17	18	19	20	21	24
1.	*Ectobius lapponicus* ..		R	P				
2.	*Ectobius pallidus*	R	R				P	
3.	*Meconema thalassinum* ..	R	R	R	R	R	R	R
4.	*Tettigonia viridissima* ..	R	P	R			P	P
5.	*Pholidoptera griseoaptera* ..	R	R	R	R	R	P	
6.	*Metrioptera brachyptera* ..	P	R					
7.	*Metrioptera roeseli* ..	R	R	R			?P	
8.	*Conocephalus dorsalis* ..	R						
9.	*Leptophyes punctatissima* ..	R	R	R	R	R	R	R
10.	*Gryllotalpa gryllotalpa* ..		P					
11.	*Tetrix subulata*	R	R			R	R	P
12.	*Tetrix undulata*	R	R	R		R	R	
13.	*Stethophyma grossum* ..		?P				?P	
14.	*Stenobothrus lineatus* ..	R	R			R		R
15.	*Omocestus rufipes*	P	P					
16.	*Omocestus viridulus* ..	P	R	R	R	R	R	R
17.	*Chorthippus brunneus* ..	R	R	R	R	R	R	R
18.	*Chorthippus albomarginatus*	R	R	R			R	
19.	*Chorthippus parallelus* ..	R	R	R	R	R	R	R
20.	*Myrmeleotettix maculatus* ..	R	R	R			P	R
21.	*Gomphocerippus rufus* ..	R	R					
22.	*Labia minor*	R	R	R		R	P	
23.	*Forficula lesnei*		R					
24.	*Forficula auricularia* ..	R	R	R	R	R	R	R
25.	*Apterygida albipennis* ..	R	?R					

KEY

R = Known since the Second World War (1945 to date)

P = Recorded previously

It remains now to consider each species in turn. I have not attempted to give " English " names to all these insects, since in most cases the only ones available are the clever inventions of entomologists and in no sense popular names. Unless otherwise indicated all observations referred to are my own. But in the several years' work that has led up to this paper I have been fortunate in obtaining the co-operation of a number of entomologists, and I am specially grateful to the following for their ready assistance :—Dr. C. H. Andrewes, F.R.S., Messrs. R. B. Benson, E. S. Brown, J. F. Burton, G. B. Collins, P. W. E. Currie, A. E. Gardner, D. K. McE. Kevan, I. S. Menzies, Dr. D. R. Ragge, Messrs. R. G. Rigden, K. C. Side, J. A. Whellan. Many unpublished localities have been communicated to me by these and other observers, either orally or in correspondence, and where these localities are mentioned in the text the observer's name is added.

Most of the pre-1914 records cited have been taken from Lucas (1920), and to save space I have as a general rule omitted this reference in such cases.

Order Dictyoptera

Two species of native cockroaches (which are much smaller and lighter in colour than the familiar house-cockroach) occur in the London Area. They are elusive insects of woodland and scrub, little known even to entomologists. They are apt to turn up in coleopterists' sweeping-nets, or when dead leaves and grass tufts are being sifted for beetles, and since they are then usually dismissed as cockroaches without further differentiation, the distribution of the two species is not at all well known. Both may occur in many more places than the available records suggest.

Ectobius lapponicus (Linnaeus)

This insect has been taken in recent years at Oxshott, Bookham Common and Box Hill, where P. W. E. Currie has found it under leaves at the edges of woods and in grass tussocks ; I myself have beaten it from oak trees. An earlier Surrey record is that of C. A. Briggs from Leatherhead.

The only other known locality in our Area is Epping Forest, where according to W. Cole, writing at the turn of the century (see Lucas, 1920) it " often comes to ' sugar ' spread on trees to attract Noctuae." Unfortunately there appear to be no recent Essex specimens, but H. W. Forster and R. D. Weal tell me they have seen cockroaches in the Cuckoo Pits and " Wake Arms " areas of the Forest, so that it seems probable that this species still occurs there : the presence of the following species should not, however, be ruled out.

Ectobius pallidus (Olivier)

Sometimes known as *E. lividus* (F.), this uniformly pale-coloured cockroach has only been noticed (within our Area) in recent years from Surrey and Kent, where there are a very few records for Mickleham and Box Hill (P. W. E. Currie), and one for Shoreham (S. Wakely). In the nineteenth century T. A. Chapman found it at Reigate, J. F. Stephens at Darenth Wood and Birch Wood (Hockenden) in West Kent, and R. McLachlan at Ruislip in Middlesex.

[*Ectobius panzeri* Stephens

This species was erroneously recorded from Shoreham, West Kent, in the report of the field meeting of the South London Entomological and

Natural History Society held on August 26, 1956 (*Proc. S. Lond. ent. nat. Hist. Soc.*, 1956, 84). I have seen the specimen taken, which is *E. pallidus*.]

Order Orthoptera
Super-family Tettigonioidea

The long-horned grasshoppers, or bush crickets, are very large insects living generally amongst vegetation other than grass, and at once distinguished from the true grasshoppers by their very long antennae (and by prominent ovipositors in the females). The seven species of the London Area are each readily recognizable at sight or sound : some are heard more often than seen. Although most of them are diurnal in habit they are less dependent than the true grasshoppers on sunshine for their activity. They mature towards the end of summer and often live on well into the autumn months.

Meconema thalassinum (De Geer)

This pale green fully winged insect inhabits trees, and can most easily be found on mature oaks in woodland (though it has been recorded from other trees). It is nocturnal in habit, and sometimes flies to light. It is generally distributed, and is common in woods throughout the Area, though I have no recent records for places nearer London than Petts Wood (P. Freeman), Shirley (J. A. Whellan), Ewell (A. E. Gardner), Kew Gardens (A. E. Gardner), Osterley (J. Ranger), Mill Hill (C. H. Andrewes) and Loughton.

This is a late species to reach maturity : I have not found adult specimens before the first week of August.

Tettigonia viridissima Linnaeus

The Great Green Grasshopper, the largest of the British Orthoptera and one of our finest insects, is unmistakable in appearance (though it is surprising how often *Leptophyes* has been reported to me as this species). The stridulation, made up of five high-pitched notes a second and continuing for long periods, is very loud and penetrating, but despite this the insects are often remarkably difficult to find, since they stop singing at the approach of footsteps and they are generally far from conspicuous in the tangle of rough vegetation they inhabit. Thistles, brambles, reeds and low shrubs are favourite song-posts.

Round London, *Tettigonia* now appears to be confined to the vicinity of the Thames marshes. J. F. Burton has recently found it in numbers in reeds on Dartford, Belvedere and Abbey Wood marshes, and R. G. Rigden has taken it on waste ground at Plumstead—within nine miles of St. Paul's. On the Essex bank, K. C. Side has taken it on the fringe of our Area at Tilbury ; G. J. Ashby kindly informed me of a specimen sent to the Zoo in 1953 by L. G. Brice from a sand-pit at Grays ; and I came across a noisy colony on waste ground at the edge of the arterial road A.13 in Dagenham in August 1957.

In the nineteenth century it was recorded from Hertford by J. F. Stephens, near Watford (see Barrett, 1923) and even at Willesden (Klein) and Battersea Fields (J. F. Stephens). In 1918 a specimen was found by A. E. Tonge at Westcott, near Dorking, some three miles outside our Area (Lucas, 1919), and Lucas (1920) cites what is probably an earlier record from the same locality. As recently as 1935 J. L. Harrison (1936) recorded it from Hackhurst Downs, a mile or so farther out. Although

Tettigonia is generally much commoner near the sea, it still occurs in a number of inland localities in southern England, and there seems no good reason why it should have disappeared entirely from such localities round London. Its survival on waste ground at Plumstead and Dagenham suggests that it is not easily exterminated by the spread of the metropolis.

Pholidoptera griseoaptera (De Geer)

This brown wingless grasshopper, usually well hidden from view in a dense bramble thicket or nettle bed, can be recognized by its loud stridulation, a rough chirp made up of three separate notes in very quick succession, and repeated at intervals of *c.* six seconds. It appears to be widely distributed over the outer parts of our Area, though there are extensive districts where it has not been recorded. It is most plentiful on the North Downs, both in West Kent (where I have found it up to 600 feet) and in Surrey. In Surrey it also occurs, off the Chalk, at Ashtead (J. A. Whellan), Bookham Common (P. W. E. Currie, R. W. J. Uffen) and as near London as Surbiton (A. E. Gardner) ; while at the beginning of the century it was known near Wimbledon (F. W. Terry).

In Middlesex there are no certain records this century : old localities were Acton, 1885 (Winston) and Wormwood Scrubs (E. Shaw). There are no records for our small part of Bucks.

R. B. Benson tells me it was increasing in Hertfordshire up to 1949, where he has seen it within our Area at Bricket Wood. On the other side of the county E. S. Brown (1951) records a number of localities in the Haileybury district, and in a letter he says :—

> " In hedges between St. Margaret's and the Ware-Hoddesdon road, and between Charley Farm and Great Amwell, Oct. 7, 1939, and on subsequent dates. In 1940 it had apparently spread as far as Haileybury College, and by 1947 to Hoddesdon. Between Cole Green and Hertingfordbury, Sept. 20, 1947. It seemed to spread westward in this area during these years."

These remarks interestingly confirm Benson's view of the increase of *Pholidoptera* in Herts. in the 1940s.

I came across a colony at Essendon, Herts., in 1957.

Just across the Lea in North Essex it occurs at Fishers Green, but then there seems to be an unaccountable gap of some ten miles in its distribution, until it reappears at Greensted. Oddly enough, it has never been recorded from Epping Forest, though there is no lack of apparently suitable habitats here. It occurs commonly (but in isolated colonies) between Ongar and Doddinghurst, and is also generally but more thinly distributed over the remaining sector of South Essex, extending as far to the west as Hornchurch and Wennington.

Pholidoptera has a late season : I have not found the mature insect earlier than the first week of August, but it sometimes continues chirping into the first week of November.

Metrioptera brachyptera (Linnaeus)

An inhabitant of heathy ground (either wet or dry), this brown and green insect with abbreviated wings is usually first detected by its stridulation : a thin sound repeated at a constant pitch and pace (5-6 notes a second) and continuing for several minutes. It still occurs on Oxshott Heath (R. W. J. Uffen) and Esher Common (A. E. Gardner), and at a locality near Croydon where it was discovered by G. B. Collins ; and very

abundantly on Ockham and Wisley Commons, Surrey, on the fringe of our Area. In the early part of the last century J. F. Stephens took it at Coombe Wood, Surrey, and at Darenth Wood in Kent.

Paul Freeman (1938) records it from Burnham Beeches, Bucks, three miles outside our Area.

In August 1921 a female of the fully-winged form (f. *marginata* Thunb.) was taken in the vinery at Wisley Gardens (Lucas, 1922).

Metrioptera roeseli (Hagenbach)

This is probably the only Orthopteron which is much more widespread and plentiful in Essex than in any of the other counties in our Area. As late as the mid-1930s (Burr, 1937) it was thought to be almost exclusively coastal in its distribution, but in 1937 Paul Freeman investigated its range in Essex and, so far as the London Area is concerned, he reported it to be " fairly common . . . in an area enclosed by a line drawn from . . . four miles north of Brentwood to one mile east of Upminster, and to Canvey Island." (1938a). In the last two or three years I have followed up Freeman's work on this insect, and I have been able to extend its known range some miles nearer to London. It is in fact common, and fairly uniformly distributed, within a large sector of our Area bounded by Doddinghurst, Navestock Common, Havering, Hainault Forest, Collier Row, Harold Wood, and thence down the Ingrebourne and the Thames to Tilbury. Over the whole of this area it is found on roadsides and waste ground where the dominant vegetation is long grass, usually *Agropyron repens* (L.) Beauv. or *Arrhenatherum elatius* (L.) J. & C. Presl. : very often it occurs in such a habitat where only three or four feet of grass separates a busy road from a ploughed field. At Grays, however, it is abundant on chalk grassland merging into chalk scrub. The altitude of these Essex localities ranges from 20 ft. to 270 ft.

It does not apparently occur anywhere north of the Thames (within our Area) outside this sector of Essex, though in view of its occurrences in Surrey—see below— I see no reason to doubt Stephens' early nineteenth century record " in the vicinity of the Metropolis . . . I believe at Hampstead " cited by Lucas (1920).

South of the Thames it is found commonly along the reclaimed Thames marshes, in long grass, as far up as Abbey Wood, and it has been taken in the last year or two at Plumstead Common (R. G. Rigden) and Shooters Hill (J. F. Burton). There is also an arc of four localities in Surrey : Cheam (Menzies and Airy Shaw, 1947), Riddlesdown (R. W. J. Uffen), Sanderstead (G. B. Collins, D. R. Ragge) and Addington (Collins, 1949). At both Cheam and Addington it occurred in a habitat similar to its usual Essex habitat—long grass between a road and a cultivated field ; unfortunately it appears to have been exterminated at Cheam by building operations in 1947 (P. W. E. Currie), while the Addington locality was ploughed up in 1949 (G. B. Collins). The colonies at Sanderstead (alt. *c.* 500 ft.) and at nearby Riddlesdown are on chalk grassland merging into scrub—similar to the habitat at Grays.

What factor is common to all these localities ? It seems possible that *roeseli* may formerly have been widespread along the lower Thames valley, extending some way up the high ground on either bank ; and that the development of London has broken the continuity of its range towards the west. It is found much farther from the river in Essex than on the Kent side, because the valley is much wider on the north bank ; and where

it occurs on higher ground in Kent and Surrey it is on slopes facing the river valley. (It should be noted that Sanderstead and Riddlesdown, the southernmost Surrey localities, are nearer the Thames than Doddinghurst, the northernmost Essex locality in our Area). But on this theory I would expect the species still to occur elsewhere on the hills of north Surrey and Kent.

M. roeseli can be easily detected by its stridulation—a continuous reeling note lasting, with irregular short breaks, for several minutes. It is one of the earliest long-horns to mature and has a very long season : I have heard its familiar song from July 6 to November 2 in South Essex.

D. R. Ragge tells me that the fully-winged form (f. *diluta* Charp.) is known from the Sanderstead locality ; and it was also taken at Cheam in 1944 (Menzies and Airy Shaw, *loc. cit.*).

Conocephalus dorsalis (Latreille)

This slim emerald-green long-horn, conspicuously brown on the dorsal surface, inhabits marshy ground where it clings to the stems of rushes and tall grasses. It can often first be detected by its continuous faint reeling note. In the London Area it is apparently confined to the Thames marshes, where in September 1947 P. W. E. Currie and I found specimens on Stone and Dartford marshes, including a single male of the long-winged form (f. *burri* Ebner). It has not so far been noticed on the Essex side of the river within our Area, though it occurs plentifully lower down the estuary at Benfleet.

Leptophyes punctatissima (Bosc)

This plump green wingless insect, covered with minute dark dots, is probably the most numerous and commonly distributed of our long-horns. I have never heard it make any sound, but a very faint intermittent stridulation has been recorded by several observers. It occurs on trees and perhaps more often on the vegetation (particularly nettles) beneath them. I also have a number of records from gardens, in which Lupins and Michaelmas Daisies are specifically mentioned. Nymphs, which closely resemble the adult insect, can be easily recognized as early as the last week of May, while the species has been taken as late as mid-October at Bookham (E. W. Groves).

Leptophyes still occurs as near London as Plumstead (R. G. Rigden), Morden (V. E. August), Richmond Park (A. E. Gardner), Isleworth (J. Ranger) and Finchley (C. H. Andrewes).

Super-family GRYLLOIDEA

The native crickets are poorly represented in the London Area. Neither of the true crickets has ever been recorded—except for a casual Field-cricket (*Gryllus campestris* L.) taken at Rotherhithe in 1904 by H. Moore—and the curious Mole-cricket (*Gryllotalpa gryllotalpa* (L.)), a generally decreasing species in Britain, has not been seen for thirty years. The House-cricket (*Acheta domesticus* (L.)) is not, of course, a native insect, though it can maintain itself in the open in large rubbish dumps and is common in such places throughout the Area.

[*Gryllotalpa gryllotalpa* (Linnaeus)

The Mole-cricket is probably extinct in the London Area—indeed there are no records from any period that have clearly indicated the existence of a breeding colony. Apart from a specimen (presumably a casual) at

Deptford in 1904 (H. Moore), the sole record is that of the nymph surprisingly found on the hall floor of Tiffin Girls' School, Kingston, on December 21, 1927 (Lucas, 1928).

Gryllotalpa still occurs, however, in the sandy south-west of Surrey, and was seen in 1920 at Send, only about four miles from the boundary of our Area (Lucas, 1921).]

Super-family Acridoidea

The British short-horned grasshoppers fall into two families which are readily distinguished by their general appearance, habits and life history.

Family Tetrigidae

The small size and lack of stridulatory powers of these curious brown or grey grasshoppers—or ground-hoppers, as they have been called—make them much less noticeable than the true grasshoppers (Acrididae). Although the two species found in our Area are quite different from each other in appearance and in habitat, the family likeness is unmistakable : the sharp ridge extending along their dorsal surface is the most obvious feature. Moreover, unlike the true grasshoppers these insects hibernate, so that fully-grown specimens occur in the spring and early summer.

Tetrix subulata (Linnaeus)

This species, distinguished by its long slender body, is found in marshy pastures, on canal banks and lake margins and in other damp places. It appears to be very locally distributed throughout our rural areas, but it is an elusive insect and may well be less uncommon than the few records suggest.

In West Kent P. W. E. Currie and I have taken it on Stone and Swanscombe marshes. In Surrey it occurs on Bookham Common (the only recorded locality in our part of the county). In Bucks it was taken by P. Freeman at Colnbrook in 1937, and the short, stumpy form *bifasciata* (Herbst) by J. Waterston at Denham in 1926 (Kevan, 1952). In Middlesex the only recent record is from Osterley Park (J. Ranger), but there are earlier records for Uxbridge in 1926 (K. G. Blair) and Bayswater in 1916 (Brown, 1950). R. B. Benson tells me he has often swept it in Bricket Wood and Munden Park, Herts, and E. S. Brown (1950) has taken it in several places along the Lea Valley in Herts, from Hertford to Cheshunt. So far I have failed to find it on the Essex side of the Lea, though it occurs in the Stort valley only a few miles to the north.

Tetrix undulata (Sowerby)

This smaller species (often known as *T. vittata* (Zett.)) is much stouter in general build than *T. subulata*, and is usually found in bare, dry places where moss rather than grass is the principal vegetation. It is widely distributed in the outer parts of the Area, on a variety of soils, but I have no recent records for anywhere nearer London than Farningham (K. C. Side), Riddlesdown (C. P. Friedlander), Ashtead, Byfleet, Harefield (J. A. Whellan), Whippendell Wood (F. Bancroft), Bricket Wood (R. B. Benson), Hoddesdon (E. S. Brown), Epping, and Grays (W. B. Broughton).

There are no records for our parts of North Essex or Bucks.

Family Acrididae

Although the true grasshoppers are abundant and familiar insects, the individual species are less well-known than their size and conspicuousness

would suggest. Identification is not easy : their bright colours do not provide a reliable guide, and while stridulation is certainly the best field character to rely on it can only be used in favourable weather (and in comparative youth !).

These insects pass the winter in the egg stage : the young grasshoppers (nymphs) hatch out in the late spring and mature from the end of June onwards, dying off with the approach of winter.

Grasshoppers tend to be most plentiful on chalky or sandy ground exposed to the sun and with discontinuous vegetation (where there is not too much trampling), though each species has its habitat preferences. Of the ten British (mainland) species, all but one have been recorded in the London Area.

The remarks on stridulation below refer only to the normal song : some species have a mating song which is very different.

[*Stethophyma grossum* (Linnaeus)

This very large grasshopper of bogs and marshes (often known as *Mecostethus grossus* (L.)) has certainly been extinct in the London Area for a long time, but according to C. W. Dale (1895) it used to occur " in former years in the marshes close to London"—this would probably have been either in Surrey (e.g. Battersea) or Middlesex (e.g. Hammersmith).]

Stenobothrus lineatus (Panzer)

This species can be immediately detected by its unique stridulation, a continuous somewhat metallic sound strongly accented every three-quarter second and lasting for nearly half a minute. It is one of our local grasshoppers, but is well distributed and often abundant on the Chalk downs in Surrey and West Kent, right across our Area from Leatherhead to Shoreham and Eynsford. It seems to prefer areas of short grass with patches of bare soil ; and in such places it occurs also on Bookham Common—well away from the Chalk—while A. E. Gardner has a specimen taken very recently on Wisley Common by W. H. Spreadbury.

North of the Thames it is known so far only in two localities within our Area. E. S. Brown found a colony in Panshanger Park, Herts, in 1951, which I (in ignorance of his find) came across in 1955 : the flora here was markedly calcicolous (Payne, 1955). In 1957 I discovered a colony on grass heath in Langley Park, Bucks—the first record for the county (Payne, 1958).

Omocestus rufipes (Zetterstedt)

This rare grasshopper (often known as *O. ventralis* (Zett.)) has been recorded from only four places within the London Area, and has not been seen for the past 20 years. Lucas (1920) records it from Box Hill (M. Burr) and Bromley, Kent (E. Shaw). H. W. Andrews took a male " in a patch of marshy waste land outside some woods " at Paul's Cray, near Chislehurst, Kent, on September 9, 1923 (Lucas, 1924) ; and there is a specimen in the L.N.H.S. collection taken by K. M. Guichard at Oxshott on July 25, 1937.

Omocestus viridulus (Linnaeus)

One of the three common grasshoppers (but less numerous than either *Chorthippus brunneus* or *C. parallelus*), this species which is usually a rich green in colour may be recognized by its continuous pulsating stridulation, lasting up to 20 seconds. It is more often found on damp ground covered

with long grass than either of the other common species, though it is by no means restricted to this habitat : it tends therefore to be the commonest grasshopper in clay areas such as Epping Forest, whereas on the chalk at Box Hill, for instance, it is quite uncommon. It occurs throughout the London Area (though records from West Kent are very sparse), but it has not been noted in recent years any nearer the centre than Hampstead (C. H. Andrewes), Leytonstone, and Mitcham Common (G. B. Collins).

This is one of the earliest grasshoppers to mature, and I have heard it stridulating in Epping Forest from mid-June to the last week of September.

Chorthippus brunneus (Thunberg)

This almost ubiquitous grasshopper (known more generally as *C. bicolor* (Charp.)) is partial to dry ground where there are patches of bare soil. Its stridulation consists of a single short chirp, which is usually taken up by other males in the vicinity (the species is highly gregarious) so that the effect is of a series of chirps. It is variable in colour, though most often a dark brown.

C. brunneus is common throughout the Area. It even occurs in numbers on bombed sites in the City—the only grasshopper to do so—as well as in the less trampled parts of Kensington Gardens and Regent's Park. How it reached the bombed sites is not certain : it may perhaps have come in horses' nose-bags. Unfortunately there are no records of when it first appeared there, though it has certainly been present from 1946 to 1957. Rebuilding is now gradually destroying its habitats in the City.

I have found adults from the last week of June (Waltham Abbey) to the second week of November (Bookham).

Chorthippus albomarginatus (De Geer)

This local grasshopper is usually of a pale straw colour, with a white margin to the wing-cases, and can be told by the almost parallel side ridges of the thorax and the fully developed wings (the latter distinguishing it from *C. parallelus*). Its stridulation consists of a short series of chirps, each chirp lasting half a second and separated by intervals of half to two seconds.

C. albomarginatus has a distribution similar to that of *Metrioptera roeseli*. It is generally common, and often very abundant, on the reclaimed pasture of the Thames marshes in Kent and Essex, extending as far up the river as Woolwich on the south side and Rainham on the north. Like *M. roeseli* (though it seems to be less common) it ranges much farther from the Thames over the flatter South Essex hinterland, where I have taken it near Brentwood, at Hornchurch and in a grassy part of Epping Forest at Leytonstone.

In Surrey and Middlesex there are apparently isolated colonies at Shirley Hills (J. A. Whellan), Mitcham Common (1951) (G. B. Collins) and Scratch Wood, Edgware (C. H. Andrewes). There are very old records for Acton (Winston) and Wormwood Scrubs (E. Shaw), and also for Box Hill (West), where, however, it has not been noticed this century.

C. albomarginatus is usually found in long grass, and often on damp ground ; but at Grays it occurs in dry chalk grassland, and the sea wall (where it is usually abundant) is certainly a well-drained habitat.

I have found mature specimens in South Essex from the last week of June to the last week of September.

Chorthippus parallelus (Zetterstedt)

This very common and abundant insect seems to be intermediate in habitat preference between *C. brunneus* and *O. viridulus*, but probably occurs over a wider range of habitat than any other of our grasshoppers. It has not, however, been noticed nearer the City in recent years than Primrose Hill, Wanstead Flats, Plumstead (R. G. Rigden), Mitcham Common (G. B. Collins), and Wimbledon and Barnes Commons (A. E. Gardner). It is most easily recognized by its rudimentary wings, but its stridulation is also unmistakable : a rapid series of 10-12 chirps in two seconds, like a watch being wound. I have seen adults at Loughton from the fourth week of June, while J. A. Whellan once came across it as late as October 31 at Shirley Hills.

A form with fully developed wings is very rarely met with (f. *explicatus* Selys) : E. J. Clark (1942) has recorded it from Colley Hill and Kingswood, J. A. Whellan found a single specimen on West End Common, Esher, in 1945, and G. B. Collins tells me he has seen it at Woldingham in 1941, Addington Hills 1942, Mitcham Common 1947 and Riddlesdown 1950.

Myrmeleotettix maculatus (Thunberg)

This distinctive little insect, though very variable in colour, can readily be told by its small size, rather speckled appearance and slightly clubbed antennae. Its stridulation consists of a series of 18-24 chirps delivered at an even pace over 12-15 seconds.

This is a ground-loving species (like *C. brunneus*), usually found on heaths, and though by no means a common grasshopper it is well distributed over the sandy and heathy parts of Surrey, where it comes as far north as Wimbledon Common (J. A. Whellan). In Kent I have only seen it on Hosey Common, Westerham, but it should still occur on Dartford Heath where it was recorded by F. J. Killington in 1924 (Lucas, 1925). It occurs very locally on dry heathy ground in Epping Forest. There are no records for our part of Herts, and from Middlesex the only twentieth century specimens I can trace are those in my collection taken at Ruislip in 1939 by K. M. Guichard. I came across a colony in Langley Park, Bucks, in 1957 (Payne, 1958).

In Epping Forest *Myrmeleotettix* can be found in the adult state from the last week of June to the middle of October.

Gomphocerippus rufus (Linnaeus)

This grasshopper (formerly known as *Gomphocerus rufus*) also has clubbed antennae, but is larger than *M. maculatus* and almost always of a brownish colour. It has a continuous stridulation of a thick texture, lasting for 5-6 seconds and accented heavily 5-6 times each second.

It is of very localized distribution in our Area, where it has only been found south of the Thames. All recent records are from the Chalk hills of Surrey and West Kent, where it seems to prefer slopes with a luxuriant growth of tall grasses. Here it is frequent right across the Area from Mickleham to Shoreham. In some places, as on the steep south slope of Box Hill, I have found it the most numerous grasshopper present.

In the past, however, it has been recorded away from the Chalk, from Bookham Common (W. J. Lucas) and Oxshott (M. Burr), and in the early nineteenth century from Battersea Fields (Samouelle), from where there is a specimen in the Dale collection (Lucas, 1925a). It appears from the remarks in Lucas (1920) that it was present by one of the main series of ponds at Bookham at least up to about 1919, and it is surprising that it

has not been seen recently in this very well-worked spot. Possibly the "enormous increase" of sallow, birch and aspen noticed here by Spreadbury (1957) over the years since 1914 has caused the extinction of this grasshopper at Bookham.

This is one of the latest species to mature. At Box Hill even in the first week of September I have found a preponderance of nymphs, while the mature insect has been seen as late as November 21 on Riddlesdown (C. P. Friedlander).

Order Dermaptera

Although four of our five native earwigs occur in the London Area, only the common species is generally known.

Labia minor (Linnaeus)

This small earwig appears to be generally distributed throughout the more rural parts of the Area, though there are no records from North Essex or Bucks, and none from Middlesex since 1935, when K. M. Guichard took it at Mill Hill. In earlier days Hugh Main found it as near the centre as North Woolwich, W. J. Lucas at Kew Gardens (Burr, 1902) and H. J. Donisthorpe at Kensington. In 1930 it was taken by N. D. Riley at Barnes (Lucas, 1931).

It is sometimes taken on the wing, and there are several records of its flying to light at night. I have swept it from nettles on Dartford marshes.

Forficula lesnei Finot

Lucas (1920) cites several localities for this rare earwig, all on the Surrey Chalk, and Burr (1902) writes of it as "common at Box Hill and Reigate, and also close to Leatherhead"; but I can trace no subsequent record until 1946, when I. S. Menzies tells me he found it in some numbers on Buckland Hills, near Reigate, between the leaves and stems and about the flowering spikes of Mullein.

Forficula auricularia Linnaeus

The common earwig can fairly be said to be ubiquitous. Inner London records include Hyde Park (Collenette, 1939) and Cripplegate, where A. W. Jones dug up two specimens with eggs in 1947.

The macrolabious form (var. *forcipata* Stephens) has been found at Esher (Lucas, 1922 and A. E. Gardner), Haileybury (Brown, 1951) and Isleworth (J. Ranger).

Apterygida albipennis (Charpentier)

This very local earwig was taken by P. W. E. Currie from reed sheaths at the edges of ditches on Stone marshes on September 7, 1947. Previously it had been recorded a few miles away at Eynsford at a field meeting of the South London Entomological and Natural History Society in 1933.

W. B. Broughton and J. H. P. Sankey tell me that a few specimens were found in June 1955 under flints on one of the northern slopes of Box Hill: unfortunately no specimens were preserved. This would be a first record for Surrey, and it seems remarkable that the insect should have been overlooked by earlier collectors in such a well-worked district. On the other hand it may be confined to a small area—it is a wingless species. Lucas (1920) refers to "chalky valleys" as a characteristic habitat, so that the locality would appear to be a suitable one.

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Flies (Diptera) and their Relations with Plants

By L. Parmenter, F.R.E.S.

ALL naturalists are interested in plants. We have all been of interest to flies although most of us may have only been interested in their death. But not all flies torment us or are harmful to us or our crops. Many are small but colourful creatures, beautifully built and functioning better than any man-made engine. Most have four stages of life form :— egg, larva or grub, when they feed and grow—changing to a resting stage as a pupa—and emerging as a two-winged insect with a head with a sucking or piercing proboscis, a thorax carrying the pair of wings and a pair of halteres, and three pairs of legs and the abdomen with its apparatus for reproduction and for defecation.

As to numbers, in the 1944, *Check List of British Insects* of Kloet and Hincks, there are listed 75 families of 1,132 genera and 5,200 species. This total has been increasing steadily as further discoveries have been made. In plants, according to Clapham, Tutin and Warburg, there are 139 families of flowering plants and ferns with 1 to 59 genera in each and 1 to 77 species in each. Some authors claim many more species. Adding the thousands of species of fungi, mosses, lichens and algae, there must be a huge total of plants in Britain. One of the aims of our science of biology must be to ascertain the relationship between each animal and each plant. The task in this country alone is immense but a publication of some of the known facts has been commenced by the British Ecological Society in the Biological Flora.

Starting from our initial interest in plants or insects, we soon become bogged down in determinations—the naming of our finds—and tend to

restrict our work to these problems of identification. In attempting to acquire experience with as many species as possible we come to the study of distribution among the 152 vice-counties of the British Isles. Time and opportunity are factors which control our chances of gaining a greater appreciation of Nature by extending our interest to the ecology and habits —the bionomics and biology—of the plants and insects.

In this Society, most of us are town workers, living in town or its suburbs and merely visit the countryside. Thus time and opportunity for study is severely limited. But, in compensation, we can assist each other, numbering as we do many botanists of experience and several dipterists as well as other entomologists. Our studies must be influenced by the gradual expansion of building—upwards and outwards—the restriction of open areas and by the impact of man upon them. For example, our use of water in reservoirs, sewage farms, gravel pits, has altered the flora and fauna of the London Area. Rubbish dumps have attracted the attention of the botanists. Entomologists, however, have been slow in searching for the fauna associated with the adventive plants occurring on the dumps. Again, insecticides used in gardens, farm and on roadside vegetation have had an influence as yet unassessed.

Mr. Peterken in his Presidential address to us in 1952 (1953, *London Naturalist* 32 : 2-12), and more recently Mr. Homes and our ornithologists in their *Birds of the London Area*, have shown how varied is our area in habitats. Messrs. Kent and Lousley have shown what a large number of flowers are to be found in the area. Dr. Rose has written on the history of London's vegetation and environmental factors. But despite these works, we still have no comprehensive study of the habitats and their associated flora and fauna. The field is thus very wide and open to amateurs to assist in the work even if they have little experience. Original observation can be made by anyone for no plant, and certainly no species of fly, has been completely studied.

Now each habitat—wood, marsh, hedgerow, field—is composed of many species of plant of various life forms—tree, herb, fungus, moss, etc. Each habitat holds a population of flies in egg, larval, pupal and adult stage. All are affected and in part controlled by climatic conditions. The vegetation itself causes variation in the local climate. Both plant and animal are also affected by rhythms—annual—as the seasons change, and diurnal. In addition, each plant has its stages of growth. Certain insects are able to pierce only the young epidermis of leaves whilst others need the shelter of hard bark. Some even need the death of a plant before they are able to feed. Thus there is a succession in the fly visitors to plants.

The main association between plant and animal is for the latter's food and shelter. The fly is concerned with shelter in egg and pupal stages and with food and shelter in larval and adult stages. Eggs, if they are to survive until the larva is ready to emerge, must be laid so that they are safe from predators and parasites, where temperature and humidity are maintained within the limits that the species can tolerate, and free from disturbance that would affect the embryo. Birds, spiders, wasps as predators and Braconidae and other Hymenoptera as parasites, need to be guarded against for safe pupation.

The feeding larvae can tolerate a limited change in temperature and humidity and many are restricted in their type of food. They also need shelter from enemies. These needs are satisfied in numerous ways.

Mr. Niblett has shown that in the Trypetidae, egg, larva and pupa are protected in the galls caused on the plant, or in the mines channelled by the larva between the surfaces of a leaf or in the compact flowerhead of the Compositae. Other families of flies also have gall makers—in particular, the large family of tiny, dainty Cecidomyiidae. Others, especially the Agromyzidae, are found mining the leaves of plants.

There are Chironomidae, the non-biting gnats, that feed as larvae in stems of water plants, or feed on fragments of algae caught in the silken nets spun in a tunnel in the mud of lakes, ponds and reservoirs. Sapromyzidae larvae feed in dead and rotting leaves, and some Borboridae in rotting grass mowings. In the Syrphidae genera *Merodon* and *Eumerus* the larvae feed in bulbs—both wild and garden forms. In the Muscidae there are many species whose larvae make leafmines ; others feed in fungi and several in the heads of flowers.

Mr. Niblett has devoted most of his spare time throughout his life to the rearing of these plant-inhabiting larvae, discovering many new hosts and adding several species of Diptera to the British list. There are still plenty of further studies needed and the success Messrs. Spencer and Griffiths have had in rearing a large number of species of Agromyzidae new to this country, several new to science, in recent years together with their parasites, has proved what can be done in a few years of specialization. Another of our members, Mr. Basden, has reared Drosophilidae from fungi and experimented with scents to attract the adults. The late Professor Buxton became interested in the last few years before his death in breeding Diptera from fungi, to show by example, how a concentrated study on a particular problem in one's spare time could produce new scientific knowledge. The botanists of Kew Gardens named his fungi and the British Museum (Nat. Hist.) dipterists his flies, to secure the essential correctness in identification. A co-operative effort which could be copied within our Society.

In addition to those larvae that feed on plant tissue, there are others that are associated with plants as predators or parasites of plant feeders. The Tachinidae are well known as parasites of caterpillars of Lepidoptera, Hymenoptera, Hemiptera and Coleoptera that have plant-eating habits. The Syrphidae have species with larvae that kill aphides by sucking their juices and the larvae of Chamaemyidae feed on scale insects.

But most week-end naturalists cannot spare regular time for larvae rearing or prefer long tramps rather than concentrated searching. Thus they become more interested in the adult flies as they walk by hedges, through fields and woods, over commons, heaths and marshes. The most superficial observer will have noticed during these rambles the change in numbers of individuals, in numbers of species from month to month and the differences in the composition of the fly population as one habitat after another is traversed. It is obvious that the species of insect restricted to a certain species of host plant such as *Urophora cardui*, the Trypetid fly that galls the stems of Creeping Field Thistle, *Cnicus arvensis*, will tend to concentrate about those host plants. Those associated with herbivorous animals such as cows or caterpillars will be restricted to the feeding areas of the host animal to a greater or less degree. But there are other reasons for the location of individuals. Flies do not fly all the time and whether they breed in plants or in the ground or water, must rest from time to time. Their choice of resting site depends partly on the plants available. Tree trunks are the choice of species belonging to genera such as *Phaonia*,

Mesembrina, *Medetera*, *Neurigona*, *Tachypeza*, whereas, for example, *Xylota*, *Microchrysa*, *Chrysotus*, *Calobata*, *Platypalpus* prefer broad leaves.

A casual glance along the roadside herbage in the summer might show an asilid fly resting tilted to one side as if exposing its side to the sun for warmth. This may be the reason for its attitude but it may be using the plant really as an observation post. The body tilted to place an eye in the best position to notice passing flies on which it preys. *Scatophaga stercoraria* and other species in this genus of dung flies, breeding in cow pats, etc., at times feed on other flies and hunt them on the herbage. Some Empids use the foliage as a hunting ground—the species of *Platypalpus* running over leaves and capture aphides, etc. Larger empids, *Rhamphomyia* and *Empis* fly from foliage and branches at Bibionidae flying by or at species of *Fannia* that patrol beneath the branches of trees.

The habit of growth and form of the individual plant and vegetation unit affects the type of fly using it. Thus the fringe of trees of a wood is preferred to close canopy, broad leaves to narrow leaves. In the winter, flies are found at the bases of tufts of grass obviously sheltered from conditions lethal to them in the open. In summer, when the sun becomes too hot for certain species such as *Pachygaster* and *Seoptera*, they leave the upper side of the leaves to rest on the underside.

Variations in the vegetation appear to assist several species of flies in their courtship. *Merodon equestris* prefers the short turf paths between flowery herbage and *Eristalis pertinax*, *Bombylius major*, *Cheilosia grossa* and others the rides of woods, sunlit and sheltered from wind. Many of the Empididae like to use the outside shell of full-leaved trees whereas some of the Dolichopodidae prefer sunlit tree trunks. There are several species of *Syrphus* whose males hover in the shafts of sunlight that break through the canopy of woodland. Here they hover waiting for passing females. Other flies prefer the open grassland, such as *Dioctria baumhaueri* which displays the bars of silver plush on its side to the female, swinging from side to side in low flight as she rests in the long grass of the hay fields. The solitary bush or tree is often the gathering mark for the swarming clouds of Chironomidae. In courtship too, even portions of plants are used. Several species of *Hilara* collect small insects from the surface of water to wrap in silk and present to the female when mating. At times fallen petals have been seized from the tops of ponds and used in the presented bag.

But the feeding of the adult fly brings us to the main association of adult flies with plants—the visiting of the blossoms. This is a subject well known to botanists and applied botanists—gardeners and fruit growers—to whom pollination is often of great importance. A large number of plants are pollinated by insects and the entomologists at first became involved merely as identifiers of captured specimens. Most pollination studies have been effected by botanists, but the majority of the expert entomological systematists of the past have examined captures made at flowers.

The honey bee is the best known flower visitor but in the Hymenoptera most species of *Bombus*, *Andrena* and *Halictus* have been recorded visiting flowers. In Lepidoptera, all naturalists and most gardeners must be familiar with the Vanessids on *Buddleia*, *Plusia gamma* at Red Valerian and Sphingidae at Honeysuckle, etc. Coleoptera may be less well known but the general beetle collector is well aware of the presence of *Meligethes* in flowerheads, *Strangalia* and *Leptura* and other Cerambycidae at white

umbellifers, *Rhagonycha fulva* and other Cantharidae at various yellow and white Umbelliferae and may have seen *Cetonia aurata* and *Trichius fasciatus* among the Scarabaeidae visiting flowers. Of Hemiptera, the Capsid *Leptopterna dolabrata* is a flower visitor and in the lower orders the Thysanoptera are well-known in flower heads.

But of all insects, the Diptera appear to be the most numerous of the visitors, although the variety involved is still not nearly fully known owing to the amount of work necessary in identifying the specimens of this most varied and numerous order.

The carriage of pollen from one plant to another of the same species was probably realized for centuries, but until Linneaus produced his nomenclatural system 200 years ago recording could not commence. Kolreuter published his first pollination studies in 1761 and is regarded as the first author on the subject though bees had been recorded as pollinators before then. In Gilbert White's Journal for April 4, 1776, there is a note on a *Bombylius* " like an humble bee but with only two wings and a long straight beak with which it sucks the early flowers always appearing in March." In 1793, Sprengel produced his first volume showing a fine appreciation of the behaviour involved in pollination. In this country Darwin published several papers and books dealing with aspects of the subject from 1857 onwards and the study has been taken further by the Kew botanist I. H. Burkill and others.

It is to the latter's papers that a reference should be made to see how numerous are flies among the flower visitors. The paper by Willis and Burkill, based on holidays at Clova, Forfarshire, in 1894-99, records that over 17,000 insects were observed at flowers. The specimens were identified by Saunders, Dr. Sharp, Verrall and the other experts of those years.

Lepidoptera totalled		561	
Coleoptera	,, ..	1,314	
Hymenoptera	,, ..	2,350	
Diptera	,, ..	12,672	(only 711 Syrphidae, 556 Empididae)
Others	,, ..	409	
		17,306	

Fifty years later, in 1944, Burkill in a paper given to the Linnean Society on the visitors to *Tamus communis*, the Black Bryony, records his findings of :—

Lepidoptera .. 3 species
Hymenoptera .. 10 species including a Cynipid, a Braconid and a sawfly
Coleoptera .. 7 species including *Anaspis maculata*, abundant. *Panorpa communis*, a Scorpion fly
an anthocorid bug
Diptera .. 25 species, chiefly Empididae but including the Mycetophilid *Asindulum flavum* and two species of *Actia*—Tachinid parasites of micro lepidoptera.

I have had similar experiences myself. For example, of visitors to the Sea Aster, the honey bee was abundant but was the only hymenopteron noted.

Coleoptera .. 1 species—*Rhagonycha fulva*

Lepidoptera .. 3 species
but Diptera .. 34 species consisting of 151 individuals.
Again in the salt marsh buttercup, *Ranunculus sardous*, I found :—
Lepidoptera .. 3 species, 7 individuals
Coleoptera .. 1 species, 1 individual
Diptera .. 24 species, 123 individuals

Very little has been recorded for many species of flowers, for example, for the last species *Ranunculus sardous*, the honey bee had been noted in Holland, 4 Diptera and a sawfly in Belgium but nothing in this country.

Flies do not visit flowers to act as pollen bearers. They go for food and drink. This is obtained in the form of pollen and nectar. From pollen is obtained the protein necessary for muscle and tissue building. From nectar, the carbohydrates—cane sugars (compounds of glucose and fructose)—which have been proved to be the most readily available source of energy. Flies that soon die if given nothing will live an hour or so on plain water, but if given sugar dissolved in water they will revive and be full of energy for hours.

This " energy " food—carbohydrates—is stored in the fly as glycogen and *Drosophila funebris* when newly emerged from the pupal stage has lasted 26 minutes on this store collected when immature. After one week of normal feeding the adult *Drosophila* had stores of glycogen enabling it to last 4 to 5 hours without refuelling.

In the adult fly the storage in the form of glycogen has been found in the muscles and in the halteres as well as in the fat-body of the fly. It is formed chiefly from the carbohydrates taken in as nectar but Professor Wigglesworth has stated that much of the protein food is converted into carbohydrates and then to glycogen. However, to maintain flight, refuelling by nectar is necessary at frequent intervals although it has been stated that some of the biting flies have been able to fly 1,000 kilometres without refuelling. The importance of the need for the energy-giving nectar cannot be overstressed. Although not well known it seems true that the biting flies obtain their energy for flight almost exclusively from the nectar from flowers. The reason that it is not well known is probably because the collector is mostly paying attention to the females seeking his blood and also to the fact that most of the feeding is done at night, in the case of Culicidae, and in the early morning in the case of Tabanidae. For instance Mr. E. A. Ellis, of Norwich Museum, has found *Anopheles claviger* taking nectar between midnight and 1 a.m.

The need for energy is principally for flight whose lift force is provided as to one third from the action of the airflow over the wings and two thirds by the beating of the wings. Fuel consumption and storage is relative to the size of the creature. In insects size is mainly controlled by the respiratory system. As to the amount of fuel taken in, a fly's crop has been known to take up to 217 per cent of the basic weight of the fly, and of this nectar in the crop sugar has formed as much as 76 per cent.

Not all flies, however, feed entirely on nectar or pollen. In certain genera, blood is taken, some are more addicted to carrion, others take their sweets from dung. Their choice is relevant to the flowers that these species visit. Some in their immature stages can feed on cellulose matter in plants. In certain species such as Trypetidae, bacteria inhabit the midgut and appear to assist in digestion. The bacteria has been traced passing into the eggs and thus from one generation to another.

In studying the aids to digestion, biochemists have used the common blow fly *Calliphora erythrocephala*, being easily reared and a large species of fly. They have found various enzymes in the fly :—

Protease, used in the digestion of protein, an amino acid containing carbon.

The other and more active enzymes found were :—

Maltase, dealing with maltose, one molecule of which equals two of glucose and containing 12 carbon atoms.

Invertase, for the cane sugars—compounds of glucose and fructose also containing 12 carbon atoms.

Amylase, for starch grains which are broken down for carbohydrates.

How does the fly find its food ? The attraction appears to be by sight and/or scent. There are many flies with nocturnal habits. This may not be realized by Diptera collectors who are usually able to gather plenty of material in the daytime, by sweeping. But by a reference to Dr. C. B. Williams' records for the light traps at Rothamsted, one sees that he found Diptera to form 93 per cent of the catches. In June, 1935, he caught 169,594 Diptera but only 6,541 Lepidoptera in his nightly catches for the month. Surely these night fliers must find their food and drink by scent. The species I have found in light-trap collections include a high proportion of species that breed in dung. It is unlikely that they can see as efficiently at night as in daylight when most of them are also found on the wing.

Many scents of flowers are attractive to humans but there are other scents more attractive to certain flies than to us, some that to us smell like carrion for example. As an aid to the study of this habit, German students have suggested grouping the scents under their derivatives—ammonia, paraffin, benzol and turpentine. It would be useful to have an exact classification of the scents of all species of plants. Economic entomologists in America have experimented with a variety of scents to attract the Trypetidae that are a pest of citrus and mango fruits.

Attraction by sight is better known for all must have seen certain insects, if not flies, going directly to a flower. The flowers themselves suggest that sight is of great importance by the colours and their patterns that have evolved. Dr. Ilse and others suggest that yellow and white are more attractive to flies than other colours. During the war it will be recalled that the tree trunks of our suburban avenues were ringed with white bands. During the summer days, flies, mostly Muscidae and Calliphoridae, were almost always located on the white bands. Perhaps fruit growers who white-band their trees can confirm that the flies retain this habit. Again, in London, I have found hover-flies hovering over the yellow patches of paint on kerbsides and also over yellow William pears on a fruit barrow in Oxford Street. When collecting, this colour preference has been used by the spreading of a white sheet under a sallow in bloom and thereby attracting its visitors down to earth. Also when finding hover-flies hovering out of reach of the collector in a shaft of sunlight under trees, a white net held beneath them has brought them down until they actually alighted on the net.

From field observations it would appear that many species of flies will visit flowers of several colours. It may need many studies and experiments to show what preference each species has and whether it is spread over its entire range of distribution. I have found species of Syrphidae preferring different colours where the patches occurred side by side. The mauve

Knapweed *Centaurea nigra* was favoured by the honey bee and *Bombus lapidarius* and was visited by 24 *Helophilus trivittatus* and one *Eristalis arbustorum*, whilst 132 *E. arbustorum* and only 3 *H. trivittatus* visited the white Yarrow, *Achillea millefolium*, and 34 *E. arbustorum* and no *H. trivittatus* the yellow Long-rooted Cat's Ear, *Hypochaeris radicata*. In observing flower-visiting by flies use can be made of most pieces of ground, for weeds are to be seen on the waste ground and building sites in cities, at the edges of side roads and public parks, and the garden flowers themselves are of great use. The less common wild flowers need studying and supply a task for the wandering collector, botanist or entomologist. It seems to be a type of study suitable for town workers and those with little spare time or apparatus.

There are flowers such as Roses and Poppies that have pollen but lack nectar and we find these to be visited by a few flies, mostly Syrphidae. Others, on the contrary, have nectar freely accessible to visitors and these blooms are generally white or yellow in colour. They include the Umbelliferae, *Euphorbia*, etc. Another group of flowers have concealed nectaries such as the Globe flower, species of *Geranium*, *Myosotis*, *Orchis*, etc. Many labiates are more suited to bees with their long proboscis but many are visited by *Rhingia campestris*, a hover fly with a folded proboscis that can be extended to about 11mm.

Of the flowers apparently chiefly visited by flies, some can be classed as nauseous flowers with scents attractive to carrion and dung frequenters, others are specially adapted such as the Wild Arum or Lords and Ladies, *Arum maculatum*, trapping moth-flies, Psychodidae, until the pollen has been transferred to the stigmas and the hairs at the mouth of the tube have died. In the species of *Veronica* the stamens are situated so that the hover flies, their chief visitors, gather the bags of pollen beneath their abdomens as they alight to suck the nectar. Flying to the next flower, the stigma is first touched with the abdomen as the fly lets its legs down to alight on the petals and so completes the cross pollination. Other adaptations in plants are the prickles and bristly hairs. These seem to keep snails etc. away from the nectar stores and thus must be regarded as useful to flies. But not all prickles are friends of flies as it were. At times of high winds, I have more than once found flies impaled on prickles of thistles and others have found flies stuck on the tips of grasses. But usually flies found dead on grasses, bracken, etc., in the late summer or autumn have fungi sprouting between the abdominal plates or sclerites. Yet another relationship between fly and plant.

The bells of Foxglove and the Bindweeds appear to be used as shelters in showery weather and remind us of the Hymenoptera that sleep in Harebells. Flies also roost on flowers where it is said that the developing blossom gives off a warmth attractive to the resting fly. Small Muscidae have been noted roosting on petals bent under the weight of the dew-laden fly, but I do not know whether this is a regular custom. Better known is the use of cracks in the bark of trees by roosting Muscidae such as *Musca autumnalis* and the Calliphorid, *Pollenia rudis*.

Many flies alight to rest on the Sundews, and few escape. So quickly does the plant cover the fly with its sticky juices that one rarely has a chance to identify the victim but I have found *Rhagio scolopacea* trapped by *Drosera rotundifolia*.

Only a separate paper could do justice to the adaptations in flies in their development as larvae in plants, Trypetidae, Agromyzidae, Chloro-

pidae, Mycetophilidae, Muscidae, etc., whether living inside the plant as leaf miner, gall maker, stem miner, etc., or merely piercing the stems of water plants for oxygen as do *Taeniorhynchus richiardii* and *Chrysogaster hirtella*. In the adults a consideration of their heads may serve as an example. There are hairs on the eyes of some species, whilst others in the same genus and also visiting flowers may have bare eyes. This suggests a problem for some enterprising student, for it may be that certain species show evolution in this manner. The sensory organs for scent recognition are situated in the antennae. Flies have a bristle termed an arista on the outer third antennal joint which appears to serve as a warning to the fly and help to prevent the antennae from becoming damaged or maybe smothered or clogged with pollen. The proboscis is the means of taking the nectar and the pollen into the crop. The flaps of the proboscis are channelled, in some species the grains of pollen are squeezed in the flaps and digestive juices secreted on to the crushed pollen and the resultant fluid is carried through the tube of the proboscis into the crop. Most flies have fairly short proboscis, up to 2mm., and these are retractable. Some, especially Empididae, have long chitinised tubes and thus equipped are able to visit flowers with narrow tubes and corollas for nectar.

As we have noted, *Arum maculatum* is pollinated by a few species of Psychodidae. At the other extreme there are the flower tables provided by umbellifers such as *Heracleum* and *Angelica*. These attract many species of flies and are entertaining to watch and should be of interest to the biologist with a bias towards psychology. Large flies generally disturb smaller flies but some seem oblivious of the bustling. There is variation in the behaviour of individuals of a species. This disturbance affects the feeding flies and is partly due to the high metabolic rate at which they live. It may help them to escape the clutches of enemies, for example, crab spiders such as *Misumena calycina* which haunts these flowers and is a mimic of their colour. Besides the competition on a flower head there is also competition between the flowers. Those growing in masses and clumps appear to attract many more visitors than the solitary bloom.

There is a fascinating partnership between flies and flowers providing an interesting study for all who will use a pocket lens or reading glass and note their observations.

SUMMARY

1. The main associations of flies with plants are mentioned in a consideration of the method of living of various species of flies.
2. These associations relate to the feeding in both immature and adult stages, the safety of eggs and pupae, resting, courtship and mating.
3. Flower visiting and pollination is discussed to show how important a part flies play in flower pollination.
4. The reasons for flower visiting by flies are considered.
5. Adaptations of flies and flowers to aid pollination are mentioned.
6. Some simple studies suitable for London naturalists are suggested:
   (*a*) A study of the flies associated with a particular plant.
   (*b*) The plants associated with a particular species of fly.
   (*c*) A single aspect of one of these associations.
7. In a selected list of 91 references, there are 60 items by 33 past and present members of this Society.

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The Gall Wasps of the London Area

By M. Niblett, F.R.E.S.

THE following list of galls caused by Cynipidae has been compiled from records made by me since 1923 ; to these have been added a number from the lists of Mr. H. J. Burkill for Limpsfield Common, and of Mr. J. Ross for Epping Forest. The area is that within a 20 mile radius of St. Paul's Cathedral ; the majority of the records are from the Vice-county of Surrey S.17 ; there are also included others from Kent K.16, Essex E2.18, Hertfordshire H.20, and Middlesex M.21. Much work remains to be done in the area North of the Thames.

Roman numerals denote the year in which the gall wasps emerge, ordinary numbers the months in which the galls may be found, or in which the insects emerge. It should be noted that all the larvae pupate in the galls ; also that the emergence times given are all from galls kept under as near natural conditions as possible.

SECTION I. GALLS ON QUERCUS SPP

Andricus albopunctatus Schlecht. : Galls in buds, 4, 5, 6, emerge II, III, 3. On *Quercus robur:* K.16, Abbey Wood, Hayes Common, West Wickham Wood. S.17, Arbrook Common, Ashtead Common, Banstead Wood, Beddington, Bookham Common, Burgh Heath, Coulsdon Common, Epsom Common, Epsom Downs, Fetcham Downs, Langley Vale, Limpsfield Chart, Oxshott Heath, Park Downs, Riddlesdown, Wallington, Walton Heath, Worms Heath. E2.18, Epping Forest ; M.21, Edgware. On *Q. petraea* : K.16, Abbey Wood, Bostall Heath. S.17, Addington, Banstead Wood, Croham Hurst, Kings Wood, Selsdon Wood, Worms Heath.

A. callidoma Htg. : Galls in buds, 6, 7, 8, emerge II, III, 3, 4, On *Q. robur* : S.17, Bookham Common, Limpsfield Common, Park Downs, Riddlesdown, Walton Heath. E2.18, Epping Forest. On *Q. petraea*. S.17, Banstead Wood.

A. callidoma Htg., form *cirratus* Adler : Galls on catkins, 4, 5, emerge I, 5, 6. On *Q. robur :* S,17, Bookham Common, Banstead Wood, Epsom Common, Fetcham Downs. E2.18, Epping Forest. On *Q, petraea*: S.17, Banstead Wood.

A. corticis Htg. : Galls in wood of trunk, 8-3, emerge II, 3, 4. On *Q. robur :* S.17, Addington Hills, Ashtead Common, Bookham Common, Coulsdon Common, Epsom Common, Limpsfield Chart, Wimbledon Common. E2.18, Epping Forest.

A. corticis Htg. f. *gemmatus* Adler : Galls in buds, 6, 7, emerge I, 6, 7. On *Q. robur :* S.17, Bookham Common. E2.18, Epping Forest.

A. curvator Htg. : Galls on leaves, 5, 6, emerge I, 5, 6. On *Q. robur :* K.16, Bostall Heath, Hayes Common, West Wickham Wood. S.17, Arbrook Common, Ashtead Common, Banstead Downs, Banstead Wood, Beddington, Beddington Park, Bookham Common, Burgh Heath, Colley Hill, Coulsdon Common, Epsom Common, Epsom Downs, Fetcham Downs, Kings Wood, Langley Vale, Leatherhead, Limpsfield Chart, Limpsfield Common, Mitchley Wood, Oxshott Heath, Park Downs, Riddlesdown, Wallington, Walton Heath, Wimbledon Common, Woodmansterne, Worms Heath. E2.18, Epping Forest. M.21, Edgware.

On *Q. petraea :* K.16, Abbey Wood, West Wickham Wood. S.17, Addington, Addington Hills, Banstead Wood, Croham Hurst, Headley Kingswood, Selsdon Wood.

A. curvator Htg. f. *collaris* Htg. : Galls in buds, 9, 10, emerge III, 3, 4. On *Q. robur :* Bookham Common, Epsom Downs, Fetcham Downs, Langley Vale, Reigate Heath, Riddlesdown, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Banstead Wood, Croham Hurst, Littlesheath Wood, Selsdon Wood. M.21, Edgware.

A. fecundator Htg. Galls in buds, 7, 8, 9, emerge I 10, II, III, 3, 4. On *Q. robur :* K.16, West Wickham Wood. S.17, Addington Hills, Arbrook Common, Ashtead Common, Banstead, Banstead Downs, Banstead Wood, Barnes Common, Beddington, Bookham Common, Burgh Heath, Carshalton, Chipstead, Colley Hill, Coulsdon, Coulsdon Common, Epsom Common, Epsom Downs, Fetcham Downs, Farthing Down, Lady Margery Wood, Langley Vale, Leatherhead Common, Limpsfield Chart, Limpsfield Common, Mugswell, Oxshott Heath, Park Downs, Riddlesdown, Wallington, Walton Heath, Wimbledon Common, Woodcote, Woodmansterne, Worms Heath. E2.18, Epping Forest. M.21, Edgware. On *Q. petraea :* K.16, West Wickham Wood. S.17, Addington, Banstead Wood, Croham Hurst, Headley Heath, Kings Wood, Limpsfield Chart, Littleheath Wood, Selsdon Wood, Worms Heath.

A. fecundator Htg. f. *pilosus* Adler : Galls on catkins, 4, 5, emerge I, 5, 6. On *Q. robur :* S.17, Banstead Wood, Bookham Common, Epsom Common, Fetcham Downs, Limpsfield Common, Oxshott Heath, Walton Heath. On *Q. petraea :* K.16, Abbey Wood. S.17, Croham Hurst, Worms Heath.

A. glandulae Schnk. : Galls in buds, 8, 9, 10, emerge II, 4, III, 3. On *Q. petraea :* K.16, West Wickham Wood. S.17, Banstead Wood, Chipstead, Croham Hurst, Kings Wood, Littleheath Wood, Limpsfield Chart, Selsdon Wood, Worms Heath.

A. glandulae Schnk. f. *xanthopsis* Schlcht : Galls on catkins, 5, 6, emerge I, 5, 6. On *Q. robur :* S.17, Bookham Common, Fetcham Downs, Walton Heath. On *Q. petraea :* K.16, Abbey Wood. S.17, Banstead Wood, Croham Hurst, Kings Wood, Littleheath Wood, Selsdon Wood, Worms Heath.

A. inflator Htg. : Galls in buds, 5, 6, 7, emerge I, 5, 6, 7, On *Q. robur:* K.16, West Wickham Wood. S.17, Arbrook Common, Ashtead Common, Banstead, Banstead Downs, Bookham Common, Carshalton, Epsom Common, Epsom Downs, Fetcham Downs, Headley Heath, Kingswood, Leatherhead, Limpsfield Chart, Limpsfield Common, Mitchley Wood, Oxshott Heath, Park Downs, Riddlesdown, Walton Heath, Woodcote, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Banstead Wood, Croham Hurst, Littleheath Wood, Selsdon Wood.

A. inflator Htg. f. *globuli* Htg. : Galls in buds, 8, 9, 10, emerge II, 12 III, 1. On *Q. robur :* K.16, West Wickham Wood. S.17, Ashtead Common, Banstead Downs, Bookham Common, Epsom Common, Epsom Downs, Fetcham Downs, Limpsfield Chart, Limpsfield Common, Oxshott Heath, Park Downs, Riddlesdown, Worms Heath. On *Q. petraea :* S.17, Banstead Wood, Croham Hurst, Littleheath Wood, Selsdon Wood.

A. kollari Htg. : Galls in buds, 7-6, emerge I, 8, 9, 10, II, 6, 7, 8, 9. On *Q. robur :* K.16, West Wickham Wood. S.17, Addington, Addington Hills, Arbrook Common, Ashtead Common, Banstead, Banstead Downs, Beddington Park, Bookham Common, Burgh Heath, Carshalton, Chipstead, Colley Hill, Coulsdon, Coulsdon Common, Epsom Common, Epsom Downs, Fetcham Downs, Headley, Headley Heath, Lady Margery Wood, Limpsfield Chart, Limpsfield Common, Mitchley Wood, Mitcham Common, Mugswell, Park Downs, Reigate Heath, Riddlesdown, Wallington, Walton Heath, Wimbledon Common, Woodcote, Worms Heath. E2.18, Epping Forest. M.21, Edgware. On *Q. petraea :* S.17, Addington, Banstead Wood, Croham Hurst, Kings Wood, Limpsfield Chart, Littleheath Wood, Selsdon Wood, Worms Heath.

A. kollari Htg. f. *circulans* Mayr. : In buds 4, 5, 6, emerge I, 4, 5, 6. On *Q. cerris :* K.16, West Wickham Wood. S.17, Addington Hills, Arbrook Common, Ashtead Common, Bookham Common, Epsom Common, Epsom Downs, Farthing Down, Fetcham Downs, Kings Wood, Selsdon Wood. E2.18, Epping Forest.

A. marginalis Adler : On leaves, 5, 6, emerge II, 4. On *Q. robur :* S.17, Riddlesdown. On *Q. petraea :* S.17, Worms Heath.

A. nudus Adler : Galls on catkins, 5, emerge I, 6. On *Q. robur :* E2.18, Epping Forest. On *Q. petraea :* S.17, Selsdon Wood.

A. nudus Adler, f. *malpighii* Adler : Galls in buds, 9, 10, emerge II, III, 34. On *Q. robur :* S.17, Ashtead Common, Banstead, Banstead Downs, Bookham Common, Colley Hill, Epsom Common, Epsom Downs, Oxshott Heath, Walton Heath. E2.18, Epping Forest.

A. ostreus Gir : Galls on leaves, 7, 8, 9, emerge I, 10, 11. On *Q. robur :* K.16, West Wickham Wood. S.17, Addington, Addington Hills, Arbrook Common, Ashtead Common, Banstead Downs, Banstead Wood, Barnes Common, Beddington, Bookham Common, Burgh Heath, Carshalton, Chipstead, Colley Hill, Coulsdon, Epsom Common, Epsom Downs, Farthing Down, Fetcham Downs, Headley, Headley Heath, Kings Wood, Langley Vale, Limpsfield Chart, Limpsfield Common, Mickleham Downs, Mitchley Wood, Mugswell, Oxshott Heath, Park Downs, Reigate Heath, Riddlesdown, Selsdon Wood, Wallington, Walton Heath, Wimbledon Common, Woodcote, Woodmansterne, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* K.16, Abbey Wood. S.17, Addington, Banstead Wood, Croham Hurst, Headley, Headley Heath, Limpsfield Chart, Selsdon Wood, Wallington, Worms Heath.

A. ostreus Gir. f. *furunculus* Beij. : Galls in buds, 4, 5, emerge I, 4, 5. On *Q. robur :* K.16, Abbey Wood, West Wickham Wood, Hayes Common. S.17, Ashtead Common, Bookham Common, Burgh Heath, Epsom Common, Oxshott Heath, Wallington, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* K.16, Abbey Wood, West Wickham Wood. S.17, Addington Hills, Worms Heath.

A. quadrilineatus Htg. : Galls on catkins, 4, 5, 6, emerge II, III, 3, 4. On *Q. robur :* K.16, Hayes Common, West Wickham Wood. S.17, Ashtead Common, Banstead Wood, Bookham Common, Burgh Heath, Colley Hill, Coulsdon Common, Epsom Common, Epsom Downs, Fetcham Downs, Limpsfield Chart, Limpsfield Common, Oxshott Heath, Riddlesdown, Selsdon Wood, Walton Heath, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Addington Hills, Banstead Wood,

Croham Hurst, Selsdon Wood, Worms Heath. K.16, Abbey Wood, Bostall Heath.

A. radicis F. : Galls on trunk or root, 8-2, emerge II, III, 3, 4, 5. On *Q. robur :* K.16, Bostall Heath, Hayes Common, West Wickham Wood. S.17, Arbrook Common, Ashtead Common, Bookham Common, Coulsdon Common, Epsom Common, Epsom Downs, Leatherhead, Limpsfield Chart, Limpsfield Common, Park Downs, Walton Heath. E2.18, Epping Forest. M.21, Edgware. On *Q. petraea :* K.16, Abbey Wood, West Wickham Wood. S.17, Croham Hurst, Headley, Selsdon Wood.

A. radicis F. f. *trilineatus* Htg. : Galls on leaves, 6, 7, 8, emerge I, 7, 8. On *Q. robur :* S.17, Beddington Park, Bookham Common, Epsom Common, Epsom Downs, Limpsfield Chart, Oxshott Heath, Walton Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Banstead Wood, Croham Hurst, Selsdon Wood, Worms Heath.

A. ramuli L. : Galls on catkins, 5, 6, emerge I, 6, 7. On *Q. robur :* K. 16, Bostall Heath. S.17, Ashtead Common, Bookham Common, Coulsdon Common, Epsom Common, Fetcham Downs, Limpsfield Chart, Limpsfield Common, Park Downs, Walton Heath. E2.18, Epping Forest. On *Q. petraea :* K.16, Abbey Wood. S.17, Banstead Wood, Selsdon Wood, Worms Heath.

A. ramuli L. f. *autumnalis* Htg. : Galls in buds, 10, emerge III, 4. On *Q. petraea :* S.17, Croham Hurst, Limpsfield Chart.

A. seminationis Adler : Galls on catkins, 5, 6, emerge II, 3. On *Q. robur :* S.17, Arbrook Common, Ashtead Common, Bookham Common, Burgh Heath, Coulsdon Common, Epsom Common, Epsom Downs, Fetcham Downs, Limpsfield Chart, Limpsfield Common, Park Downs, Walton Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Addington Hills, Banstead Wood, Croham Hurst.

A. solitarius Fonc. : Galls in buds, 7, 8, 9, emerge I, 9, 10. On *Q. robur :* K.16, Bostall Heath, West Wickham Wood. S.17, Arbrook Common, Ashtead Common, Bookham Common, Coulsdon Common, Epsom Common, Epsom Downs, Leatherhead, Limpsfield Chart, Limpsfield Common, Oxshott Heath, Park Downs, Walton Heath, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* K.16, Abbey Wood. S.17, Banstead Wood, Croham Hurst, Kings Wood, Limpsfield Chart, Littleheath Wood, Selsdon Wood, Worms Heath.

A. solitarius Fonc. f. *occultus* Tschek : Galls on catkins, 4, 5, emerge I, 4, 5. On *Q. robur :* S.17, Banstead Wood, Bookham Common, Epsom Common, Walton Heath. E2.18, Epping Forest. On *Q. petraea :* K.16, Abbey Wood, Bostall Heath, Croham Hurst.

A. testaceipes Htg. : Galls on leaves, 7, 8, emerge I, 8. On *Q. robur :* S.17, Ashtead Common, Bookham Common. E2.18, Epping Forest.

A. testaceipes Htg. f. *sieboldi* Htg. : Galls on stems, 6-3, emerge II, 3, 4. On *Q. robur :* K.16, Hayes Common. S.17, Arbrook Common, Ashtead Common, Bookham Common, Burgh Heath, Epsom Common, Fetcham Downs, Langley Vale, Limpsfield Common, Oxshott, Oxshott Heath, Oxted, Wimbledon Common. E2.18, Epping Forest.

Biorhiza pallida Oliv. : Galls in buds, 5, 6, emerge I, 6, 7. On *Q. robur :* K.16, Bostall Heath, Hayes Common, West Wickham Wood.

S.17, Addington Hills, Ashtead Common, Banstead, Banstead Downs, Banstead Wood, Beddington Park, Bookham Common, Burgh Heath, Carshalton, Colley Hill, Coulsdon Common, Epsom Common, Epsom Downs, Fetcham Downs, Kingswood, Kings Wood, Langley Vale, Leatherhead, Limpsfield Chart, Limpsfield Common, Mitchley Wood, Oxshott Heath, Park Downs, Riddlesdown, Wallington, Walton Heath, Wimbledon Common, Woodmansterne. E2.18, Epping Forest. M.21, Edgware. On *Q. petraea :* K.16, Abbey Wood, West Wickham Wood. S.17, Addington Hills, Banstead Wood, Croham Hurst, Limpsfield Chart, Littleheath Wood, Selsdon Wood, Worms Heath.

B. pallida Oliv. f. *aptera* Bosc. : Galls on roots, 10, 11, emerge I, 11, 12. On *Q. robur :* S.17, Banstead Wood, Bookham Common, Limpsfield, Wallington. E2.18, Epping Forest. On *Q. petraea :* S.17, Croham Hurst.

Callirhytis glandium Gir. : Galls in acorns, 9 onwards, emerge III-VIII, 3, 4. On *Q. cerris :* K.16, St. Pauls Cray. S.17, Addington Hills, Beddington Park, Bookham Common, Headley Heath, Kings Wood, Limpsfield. E2.18, Epping Forest.

Cynips disticha Htg. : Galls on leaves, 8, 9, emerge I, 10, 11. On *Q. robur :* S.17, Arbrook Common. On *Q. petraea :* S.17, Addington Hills, Banstead Wood, Croham Hurst, Limpsfield Chart, Selsdon Wood, Worms Heath.

C. disticha Htg. f. *indistincta* Niblett : Galls on leaves, 5, emerge I, 5. On *Q. petraea :* S.17, Selsdon Wood.

C. divisa Htg. : Galls on leaves, 7, 8, 9, emerge I, 10, 11. On *Q. robur :* S.17, Arbrook Common, Ashtead, Ashtead Common, Banstead Downs, Barnes Common, Bookham Common, Bookham Downs, Burgh Heath, Epsom Common, Epsom Downs, Esher Common, Fetcham Downs, Langley Vale, Limpsfield Chart, Norbury Park, Oxshott, Oxshott Heath, Park Downs, Reigate Heath, Riddlesdown, Walton Heath, Wimbledon Common, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Banstead Wood, Croham Hurst, Selsdon Wood.

C. divisa Htg. f. *verrucosa* Schlcht. : Galls on leaves, 4, 5, emerge I, 4, 5. On *Q. robur :* S.17, Limpsfield Chart, Oxshott Heath, Woodmansterne. E2.18, Epping Forest.

C. folii L. : Galls on leaves, 8, 9, 10, emerge I, 11, 12, II, 1. On *Q. robur :* K.16, West Wickham Wood. S.17, Arbrook Common, Ashtead Common, Banstead Downs, Banstead Wood, Beddington, Bookham Common, Burgh Heath, Colley Hill, Epsom Common, Epsom Downs, Esher Common, Fetcham Downs, Headley, Limpsfield Chart, Limpsfield Common, Oxshott Heath, Park Downs, Reigate Heath, Riddlesdown, Wallington, Walton Heath, Wimbledon Common, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Selsdon Wood.

C. folii L. f. *taschenbergi* Schlcht. : Galls in buds, 4, 5, emerge I, 5, 6. On *Q. robur :* S.17, Arbrook Common, Ashtead Common, Banstead Wood, Bookham Common, Epsom Common, Limpsfield Chart, Park Down. E2.18, Epping Forest.

C. longiventris Htg. : Galls on leaves 7-11, emerge I, 11, 12, II, 3, 12. On *Q. robur :* S.17, Arbrook Common, Ashtead Common, Banstead Downs, Burgh Heath, Colley Hill, Epsom Common, Epsom Downs,

Fetcham Downs, Leatherhead Common, Limpsfield Chart, Norbury Park, Oxshott Heath, Park Downs, Reigate Heath, Riddlesdown, Walton Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Limpsfield Chart, Selsdon Wood, Worms Heath.

C. longiventris Htg. f. *substituta* Kinsey : Galls in buds, 4, 5, emerge I, 4, 5. On *Q. robur :* S.17, Bookham Common, Epsom Common, Park Downs. E2.18, Epping Forest.

Neuroterus albipes Schenk. : Galls on leaves, 4, 5, 6, emerge I, 5. On *Q. robur :* K.16, West Wickham Wood. S.17, Arbrook Common, Ashtead Common, Banstead Wood, Bookham Common, Burgh Heath, Coulsdon Common, Epsom Common, Epsom Downs, Headley, Kingswood, Leatherhead, Limpsfield Chart, Oxshott Heath, Riddlesdown, Walton Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Banstead Wood, Croham Hurst, Kingswood, Kings Wood, Worms Heath.

N. albipes Schnk. f. *laeviusculus* Schnk. : Galls on leaves 8-10, emerge II, 2, 3. On *Q. robur :* K.16, West Wickham Wood. S.17, Arbrook Common, Ashtead Common, Addington Hills, Banstead, Banstead Downs, Bookham Common, Colley Hill, Coulsdon Common, Epsom Common, Epsom Downs, Fetcham Downs, Headley Heath, Headley, Kings Wood, Limpsfield Chart, Limpsfield Common, Mickleham, Mitchley Wood, Oxshott Heath, Park Downs, Reigate Heath, Riddlesdown, Walton Heath, Wimbledon Common, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Addington, Banstead Wood, Colley Hill, Croham Hurst, Headley, Kings Wood, Limpsfield Chart, Selsdon Wood, Worms Heath.

N. aprilinus Gir. : Galls in buds, 4, 5, emerge I, 4, 5. On *Q. robur :* K.16, West Wickham Wood. S.17, Arbrook Common, Ashtead Common, Bookham Common, Burgh Heath, Colley Hill, Epsom Common, Fetcham Downs, Limpsfield Chart, Limpsfield Common, Oxshott Heath, Riddlesdown, Wallington, Walton Heath, Worms Heath. E2.18, Epping Forest. M.21, Edgware. On *Q. petraea :* K.16, Abbey Wood, West Wickham Wood. S.17, Banstead Wood, Croham Hurst, Kings Wood, Limpsfield Chart, Selsdon Wood, Worms Heath.

N. baccarum L. : Galls on catkins and leaves, 4, 5, 6, emerge I, 5, 6. On *Q. robur :* K.16, Bostall Heath, West Wickham Wood. S.17, Arbrook Common, Ashtead Common, Ashtead, Banstead Wood, Beddington, Beddington Park, Bookham Common, Burgh Heath, Colley Hill, Coulsdon Common, Epsom Common, Epsom Downs, Fetcham Downs, Headley, Kingswood, Leatherhead, Limpsfield Chart, Limpsfield Common, Mitchley Wood, Oxshott Heath, Park Downs, Riddlesdown, Wallington, Walton Heath, Wimbledon Common, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* K.16, Abbey Wood. S.17, Addington Hills, Banstead Wood, Croham Hurst, Headley Heath, Kingswood, Kings Wood, Littleheath Wood, Selsdon Wood, Worms Heath.

N. baccarum L. f. *lenticularis* Oliv. : Galls on leaves, 8-10, emerge II, 3. On *Q. robur :* Addington, Addington Hills, Arbrook Common, Ashtead Common, Banstead, Banstead Downs, Barnes Common, Beddington Park, Bookham Common, Burgh Heath, Carshalton, Chessington, Colley Hill, Coulsdon Common, Epsom Common, Epsom Downs, Farthing Down, Fetcham Downs, Headley Heath, Lady Margery Wood, Leatherhead Common, Limpsfield Chart, Limpsfield Common, Mickleham,

Mitchley Wood, Oxshott Heath, Park Downs, Reigate Heath, Riddlesdown, Wallington, Walton Heath, Wimbledon Common, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Addington, Banstead Wood, Bookham Common, Colley Hill, Croham Hurst, Headley Heath, Kings Wood, Littleheath Wood, Limpsfield Chart, Selsdon Wood, Wallington, Worms Heath.

N. numismalis Oliv. : Galls on leaves, 8-10, emerge II, 3, 4. On *Q. robur :* K.16, West Wickham Wood. S.17, Addington Hills, Arbrook Common, Ashtead Common, Banstead, Banstead Downs, Beddington Park, Bookham Common, Burgh Heath, Carshalton, Chipstead, Colley Hill, Coulsdon Common, Epsom Common, Epsom Downs, Farthing Down, Fetcham Downs, Headley Heath, Lady Margery Wood, Leatherhead Common, Limpsfield Chart, Limpsfield Common, Mickleham, Mitchley Wood, Oxshott Heath, Park Downs, Reigate Heath, Riddlesdown, Wallington, Walton Heath, Wimbledon Common, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Banstead Wood, Colley Hill, Croham Hurst, Headley, Kings Wood, Limpsfield Chart, Littleheath Wood, Selsdon Wood, Wallington, Worms Heath.

N. numismalis Oliv. f. *vesicator* Schlcht. : Galls on leaves, 5, 6, emerge I, 5, 6. On *Q. robur :* K.16, West Wickham Wood. S.17, Arbrook Common, Ashtead Common, Banstead Wood, Beddington Park, Bookham Common, Burgh Heath, Coulsdon Common, Epsom Common, Epsom Downs, Fetcham Downs, Kingswood, Leatherhead Common, Limpsfield Chart, Limpsfield Common, Mitchley Wood, Park Downs, Riddlesdown, Wallington, Walton Heath. E2.18, Epping Forest. M.21, Edgware. On *Q. petraea :* K.16, Abbey Wood. S.17, Croham Hurst, Kingswood, Limpsfield Chart, Selsdon Wood, Worms Heath.

N. schlechtendali Mayr : Galls on catkins, 4-6, emerge I, II, III, 7, 8. On *Q. robur :* S.17, Ashtead Common, Banstead Wood, Bookham Common, Colley Hill, Coulsdon Common, Epsom Common, Fetcham Downs, Oxshott Heath, Riddlesdown, Walton Heath, Wimbledon Common, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* K.16, Abbey Wood. S.17, Banstead Wood, Croham Hurst, Kings Wood, Littleheath Wood, Selsdon Wood, Worms Heath.

N. tricolor Htg. : Galls on leaves, 5-7, emerge I, 6, 7. On *Q. robur :* S.17, Arbrook Common, Ashtead Common, Bookham Common, Epsom Common, Epsom Downs, Fetcham Downs, Headley, Lady Margery Wood, Leatherhead, Limpsfield Chart, Mitchley Wood, Riddlesdown, Wallington, Walton Heath, Wimbledon Common. E2.18, Epping Forest.

N. tricolor Htg. f. *fumipennis* Htg.: Galls on leaves, 8-10, emerge II, 4,5. On *Q. robur :* S.17, Arbrook Common, Ashtead Common, Bookham Common, Carshalton, Colley Hill, Epsom Common, Epsom Downs, Fetcham Downs, Mitchley Wood, Oxshott Heath, Reigate Heath, Riddlesdown, Wallington, Walton Heath, Wimbledon Common, Worms Heath. E2.18, Epping Forest. On *Q. petraea :* S.17, Croham Hurst, Kings Wood, Selsdon Wood, Worms Heath.

Trigonaspis megaptera Panz. : Galls on trunks, 4-6, emerge I, 6-7. On *Q. robur :* S.17, Arbrook Common, Bookham Common, Coulsdon Common, Epsom Common, Epsom Downs, Limpsfield Chart, Mitchley Wood. E2.18, Epping Forest. On *Q. petraea :* S.17, Croham Hurst, Limpsfield Chart, Selsdon Wood, Worms Heath.

T. megaptera Panz. f. *renum* Gir. : Galls on leaves, 9, 10, emerge II, 1, 11, 12. On *Q. robur :* S.17, Bookham Common, Epsom Common, Epsom Downs, Limpsfield Chart, Mitchley Wood. E2.18, Epping Forest. On *Q. petraea :* S.17, Croham Hurst, Limpsfield Chart, Selsdon Wood, Worms Heath.

SECTION II. ON PLANTS OTHER THAN QUERCUS

Aulacidea hieracii Kieff : Galls on stems of *Hieracium* spp., 8-10, emerge II, 5, 6. K.16, Darenth Wood. S.17, Chobham Common, Walton Heath, West End Common, Wimbledon Common, Worms Heath.

A. hypochoeridis Kieff : Galls on stems of *Hypochoeris radicata*, 7-10, emerge II, 5-7. S.17, Addington, Banstead Downs, Bookham Common, Croham Hurst, Coulsdon, Epsom Common, Epsom Downs, Fetcham Downs, Kings Wood, Mitchley Wood, Oxshott Heath, Riddlesdown, Walton Heath, West End Common, Worms Heath. E2.18, Epping Forest.

A. pilosellae Kieff : Galls on leaves of *Hieracium pilosella*, 7-9, emerge II, 6, 7. S.17, Banstead Downs, Banstead Wood, Bookham Common, Buckland Hills, Walton Heath.

A. subterminalis Niblett : Galls on runner-ends of *Hieracium pilosella*, 8-10, emerge II, 6, 7. S.17, Ashtead Common, Banstead Wood.

A. tragopogonis Thoms : Galls on stems of *Tragopogon* spp., 7-10, emerge II, 5-7. K.16, Eynsford. S.17, Banstead Wood, Bookham Common, Banstead Downs, Epsom Downs, Headley, Mickleham Downs, Riddlesdown, Selsdon Wood, Woodmansterne.

Aylax fitchi Kieff : Galls on leaves of *Centaurea scabiosa*, 8, 9, emerge II,

A. papaveris Perris : Galls in seed capsules of *Papaver* spp., 8-10, emerge II, 4-6, III, 5.

Diastrophus rubi Bouche : Galls on stems of *Rubus* spp., 6-12, emerge II, 5, 6. S.17, Ashtead Common, Bookham Common, Mickleham Downs, Riddlesdown.

Isocolus jaceae Schenk : Galls in achenes of *Centaurea nigra*, *C. scabiosa*, 8-12, emerge I, 8, 9, II, 6, 7. S.17, Addington, Banstead Downs, Banstead Wood, Bookham Common, Colley Hill, Epsom Common, Epsom Downs, Farthing Down, Fetcham Downs, Headley, Lacey Green, Mickleham Downs, Park Downs, Riddlesdown.

I. Rogenhoferi Wachtl : Galls in involucral bracts of *Centaurea scabiosa*, 7-12, emerge I, 8, 9, II, 6-8. S.17, Addington, Banstead Downs, Banstead Wood, Coulsdon, Epsom Downs, Farthing Down, Fetcham Downs, Headley, Lacey Green, Langley Vale, Mickleham Downs, Riddlesdown, Selsdon Wood.

I. scabiosae Gir. : Galls on stems of *Centaurea scabiosa*, 8-10, emerge II, 7. S.17, Ashtead, Bookham, Epsom Downs, Fetcham Downs, Woldingham, Woodmansterne.

Liposthenes glechomae L. : Galls on leaves of *Glechoma hederacea*, 6-8, emerge II, 3, 4. S.17, Banstead Wood, Bookham Common, Buckland Hills, Colley Hill, Coulsdon, Epsom Common, Fetcham Downs,

Headley Heath, Kingswood, Mickleham Downs, Norbury Park, Walton Heath.

Phanacis centaureae Först.: Galls in stems of *Centaurea nigra*, *C. scabiosa* 8-12, emerge II, 5-7. S.17, Banstead Downs, Banstead Wood, Colley Hill, Epsom Downs, Farthing Down, Fetcham Downs, Headley, Riddlesdown, Woodmansterne, Worms Heath.

Xestophanes brevitarsis Thoms. : Galls on stems of *Potentilla erecta*, 8-10, emerge II, 6. S.17, Ashtead Common, Arbrook Common, Bookham Common, Epsom Common, Kingswood, Limpsfield Common, Sydenham, Walton Heath. E2.18, Epping Forest.

X. potentillae Vill. : Galls on rhizomes of *Potentilla reptans*, 8-5, emerge II, 5, 6. S.17, Ashtead Common, Bookham Common, Colley Hill, Epsom Downs, Fetcham, Limpsfield Common, Walton Heath.

Note.—As the smooth pea galls caused by several species of *Rhodites* are identical in appearance, only those records have been included in which the insects have been bred and their identity determined. All previous records of *Rhodites* spp. based upon the pea galls only must be considered as being very doubtful.

Rhodites centifoliae Htg. : Smooth pea galls on leaves of *Rosa spinosissima*, 8-10, emerge II, 6. S.17, Barnes Common.

R. dispar Niblett : Smooth pea galls on leaves of *Rosa* spp., 7-10, emerge II, 4-6. K.16, Eynsford. S.17, Addington, Ashtead Common, Banstead, Banstead Wood, Bookham, Bookham Common, Buckland Hills, Chelsham, Chipstead, Colley Hill, Court Wood, Croham Hurst, Epsom Common, Epsom Downs, Esher Common, Farleigh, Farthing Down, Fetcham Downs, Headley, Headley Heath, Littleheath Wood Park Downs, Riddlesdown, Sanderstead, Selsdon Wood, Wallington, Walton Heath, Wimbledon Common, Worms Heath. E2.18, Epping Forest. H.20, Bayford, Hoddesdon.

R. eglanteriae Htg. : Smooth pea galls on leaves of *Rosa* spp., 7-10, emerge II, 5-7. S.17, Ashtead Common, Banstead, Banstead Downs, Banstead Wood, Bookham, Bookham Common, Coulsdon, Farleigh, Fetcham Downs, Mickleham Downs, Park Downs, Riddlesdown, Sanderstead, Selsdon Wood, Wimbledon Common, Worms Heath. E2.18, Epping Forest.

R. dispar Niblett : In spiked pea galls on leaves of *Rosa* spp., 7-10, emerge 4-6. K.16, Eynsford. S.17, Addington, Ashtead Common, Banstead Downs, Banstead Wood, Bookham Common, Chipstead, Colley Hill, Coulsden, Court Wood, Croham Hurst, Epsom Common, Epsom Downs, Farthing Down, Fetcham Downs, Hamsey Green, Headley Heath, Kings Wood, Langley Vale, Leatherhead, Littleheath Wood, Mickleham Downs, Mitchley Wood, Norbury Park, Park Downs, Reigate Heath, Riddlesdown, Sanderstead, Walton Heath, Wimbledon Common, Woldingham, Woodmansterne, Worms Heath. H.20, Bayford, Hoddesdon.

R. mayri Schlecht. : In galls on leaves or stems of *Rosa* spp., 7-10, emerge II, 5, 6. K.16, Eynsford, Shoreham. S.17, Banstead Downs, Mickleham Downs, Riddlesdown, Sanderstead, Selsdon Wood.

R. rosae L. : Galls on leaves of *Rosa* spp., 8-4, emerge II, 4-7. K.16, Eynsford, Stone Marshes. S.17, Addington, Arbrook Common, Ashtead Common, Banstead Downs, Banstead Wood, Bookham Common, Chipstead, Colley Hill, Coulsdon, Croham Hurst, Epsom Common, Epsom Downs, Farthing Down, Fetcham Downs, Hackbridge, Headley Heath, Kings Wood, Kingswood, Lacey Green, Langley Vale, Leatherhead Common, Limpsfield Chart, Mickleham Downs, Mitcham Common, Mitchley Wood, Norbury Park, Park Downs, Reigate Heath, Riddlesdown, Sanderstead, Selsdon Wood, Walton Heath, Wimbledon Common, Woodcote, Woodmansterne, Worms Heath. E2.18, Epping Forest. H.20, Bayford, Berkhamstead.

R. spinosissimae Gir. : In galls on leaves of *Rosa* spp., 7-9, emerge II, 4-7. S.17, Addington, Banstead Downs, Barnes Common, Coulsdon, Farthing Down, Kings Wood, Mickleham Downs, Riddlesdown, Walton Heath. E2.18, Epping Forest. H.20, Hertingfordbury.

The Moths of London and its Surroundings

By C. G. M. de Worms, M.A., Ph.D., F.R.I.C., F.R.E.S.

(Continued from p. 99 of the *London Naturalist*, **36**, 1957)

THE next group of the Geometers to be treated is popularly known as the Pugs. They mainly comprise the very large genus *Eupithecia* which is found all over the temperate regions of the world and most of the tropical areas as well. The insects are all of small dimensions, probably never exceeding an inch in expanse. The majority of their larvae feed on the seeds and flowers of numerous plants. Of the fifty recognized species in the British Isles very few have not been recorded from the London Area.

**Eupithecia centaureata* Schiff. (=*oblongata* Thunb.). I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Lime-speck Pug is one of the most readily distinguishable of this group. Its white colour is often very conspicuous when at rest on walls or trees. It appears as a rule twice a year in May and August and is widespread over most of the British Isles up to the edge of the Highlands. It is equally common over most of the London Area, being noted in the 1898 list from Paddington, Hammersmith, Highgate, Chiswick, Hackney, Dalston, Wimbledon and more recently from South Kensington in 1938 (Fletcher), the Zoo in 1951 (Bushby), also from Hounslow (Pierce) and Mill Hill (Goater).

**Eupithecia pulchellata* Steph. M.21, H.20, K.16, S.17, B.24.

This very attractive species, the Foxglove Pug, is found all over the British Isles wherever its larval foodplant occurs. In the Hebrides and the west of Ireland it produces special races. It can often be found at rest in great numbers in June in spots where foxgloves abound. The 1898 list only gives it from Croydon. Elsewhere it is recorded from

Middlesex. Ruislip (Minnion) ; Hounslow (Pierce).

Herts. Watford, rare (Penrose) ; Totteridge, common (Lorimer) ; Bushey Heath and Hoddesdon (Foster, *Lep. Herts.*, 1937).

Kent. Orpington, 1948 (Siggs) ; Pett's Wood and Chelsfield, 1951 (A. Swain) ; West Wickham and Abbey Wood (West, *Ent. Rec.*, 1906) ; Darenth (V.C.H., 1908).

Surrey. Putney and East Sheen, 1933 (D. King) ; Barnes (Gardner) ; Weybridge (Messenger).

Bucks. Chalfont St. Peter (Ansorge).

**Eupithecia linariata* Fabr. M.21, H.20, K.16, S.17, B.24.

The Toadflax Pug is very similar to the last species, but is smaller with a darker cross-band on the forewing. Its larvae can be found freely in the pods of *Linaria* in the late summer. The insect occurs all over England up to the north, but has been only occasionally recorded from Scotland or

Ireland. In the 1898 list it is mentioned from Eltham, Croydon, Beckenham and Bromley (Kent). Also from

MIDDLESEX. Mill Hill, a few in 1955 (Goater) ; Hounslow, 1953 and 1955 (Pierce) ; Ruislip, Northolt and Southall, 1950 (J. Ward).

HERTS. East Barnet, St. Albans, Hoddesdon and Broxbourne (Foster, *Lep. Herts.*, 1937).

KENT. Orpington, 1949 (Siggs) ; Pett's Wood, 1950 (A. Swain) ; Abbey Wood, 1953 (Showler) ; Hayes, Downe (Birchenough) ; West Wickham (Trundell).

SURREY. Wimbledon (van Emden) ; Coulsdon, 1944 and Tadworth, 1954 (Wheeler) ; Chipstead, 1946 (Johnson) ; Weybridge (Messenger) ; Putney, one, June 1950 (H. Swain).

BUCKS. Chalfont St. Peter (Ansorge).

Eupithecia irriguata Hübn. (E2.18).

The Marbled Pug is one of the more local species of this genus. It has been found in most of the big oak woods over a large part of the southern counties of England with the New Forest as its headquarters. It can often be dislodged from branches of oak at the end of April, while its larvae can be beaten from the oak shoots in the summer. There appears to be only one old record for the Area, from Epping Forest by Doubleday (V.C.H., 1903).

Eupithecia tantillaria Boisd. (=*pusillata* Fabr.). M.21, H.20, K.16, S.17, B.24.

The Dwarf Pug sometimes abounds among spruce plantations in late May, but up to the beginning of the century it was considered to be very localized in the southern part of England. However, the increased growing of spruce has brought about an expansion in its range to the northern counties and the Highlands. It is not in the 1898 list, but has been recorded from

MIDDLESEX. Ruislip area (Minnion).

HERTS. Aldenham, May 1939 (Fletcher) ; Watford, 1894, and Hoddesdon (Foster, *Lep. Herts.*, 1937).

KENT. West Wickham (V.C.H., 1908).

SURREY. Limpsfield Chart (Cockayne) ; Weybridge (Messenger).

BUCKS. Chalfont St. Peter (Ansorge).

**Eupithecia indigata* Hübn. K.16, S.17.

The Ochreous Pug with its characteristic narrow wings is found in May in most parts of the British Isles where pines are grown. It may often be seen at rest on the trunks or dislodged from the branches. The 1898 list only gives it as numerous in the south-eastern district with two records also from Forest Hill. Elsewhere it has been reported from

KENT. Orpington, 1955 (Siggs) ; Abbey Wood and Plumstead (V.C.H., 1908).

SURREY. Oxshott (Cockayne) ; Weybridge (Messenger).

Eupithecia insigniata Hübn. H.20, E2.18, S.17, B.24.

This very pretty insect, the Pinion-spotted Pug, is regarded as one of the most difficult of this group to obtain, though it has been recorded from most of the southern counties. Its very uncertain appearance is usually in early May when the apple is in bloom, since its larva feeds mainly on the flowers. There are very few records from the London Area, as follows :—

HERTS. New Barnet in 1919 (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Clark) ; Loughton (Machin, V.C.H., 1903).

SURREY. Burford Bridge, Box Hill, on May 25, 1881 (A. T. Jones, *Ent. mon. Mag.*, **18**, 39).

BUCKS. Chalfont St. Peter (V.C.H., 1905).

**Eupithecia venosata* Fabr. M.21, H.20, E2.18, K.16, S.17, B.24.

The Netted Pug is another readily recognizable species which frequents nearly every part of the British Isles where Sea and Bladder Campion occur since its larvae inhabit the pods. In the Shetlands the form has the fore-wings almost plain without any cross-markings. The 1898 list gives it from Ealing, Clapton and Croydon where it was said to be very common. Other records include

HERTS. Haileybury and Hoddesdon (Foster, *Lep. Herts.*, 1937).

KENT. West Wickham (Trundell) ; Orpington, 1954 (Siggs) ; Erith and Darenth (V.C.H., 1908).

SURREY. Box Hill (Gardner) ; Addington (Birchenough) ; Chipstead, June 1946 (Johnson).

BUCKS. Chalfont St. Peter (Ansorge).

**Eupithecia pimpinellata* Hübn. M.21, E2.18, S.17.

The Pimpinel Pug is mainly a downland insect, since its larva feeds on the Burnet Saxifrage (*Pimpinella*) and may often be located on the flower-heads in September. The species which is out in August has been found in most of the southern English counties as well as in Ireland. The 1898 list mentions it from Hampstead Heath, Walthamstow, Woodford and Croydon. From SURREY it has been taken at Banstead (Gardner) and Riddlesdown (Cockayne), also at Croydon in 1897 (Meldola : Hope Dept. Collection, Oxford).

Eupithecia distinctaria H.-S. (=*constrictata* Guen.). S.17.

The Thyme Pug is a very small insect which inhabits areas where the wild thyme flourishes in England, Ireland and the Western Highlands, but is seldom common and always difficult to obtain. It does not appear in the 1898 list and there is a single authentic record for SURREY from East Sheen where it was obtained on August 6, 1931 (D. King).

**Eupithecia expallidata* Doubleday K.16, S.17.

The Bleached Pug belongs to a group of these small moths which are by no means easy to distinguish from one another. It is the largest of them and has a very shiny appearance. It inhabits woods in southern England

ranging up to the north and occurs also in Ireland. Its larvae may often be readily beaten from golden-rod in September. In the 1898 list it is reported from Croydon and Plumstead and for KENT also from Westerham (Cockayne), from Greenhithe and Dartford (V.C.H., 1908).

**Eupithecia assimilata* Doubleday I.L., M.21, H.20, E2.18, K.16, S.17, B.24.

This widespread species, the Currant Pug, is to be found in almost every part of the British Isles, mainly in gardens where there are currants or in areas where hops are cultivated or grow wild. The insect is double-brooded, appearing in May and August. The 1898 list reports it for most of the Area, including from Ladbroke Square, Hampstead, Highgate, Islington, Tottenham, Woodford, Hackney, Croydon, Sydenham and Wimbledon Common, also from

MIDDLESEX. Greenford and Southall (J. Ward) ; Stamford Brook, 1955 (Uffen).

HERTS. Watford, one (Penrose) ; St. Albans, Hoddesdon, Cheshunt and Bushey (Foster, *Lep. Herts.*, 1937).

KENT. Abbey Wood, 1952 (Showler) ; Hayes and Downe (Birchenough) ; West Wickham (Trundell) ; Lee and Eltham (V.C.H., 1908).

SURREY. Putney, 1934, and East Sheen, 1931 (D. King) ; West Ewell and Banstead (Gardner) ; Weybridge (Messenger).

BUCKS. Chalfont St. Peter (Ansorge).

**Eupithecia absinthiata* Clerck M.21, H.20, K.16, S.17, B.24.

The Wormwood Pug is often a very common species at midsummer in almost all areas of Great Britain even up to the Highlands. Its larva feeds in the flowers of various plants besides wormwood (*Artemisia*). In the London Area it has been noted in the 1898 list from Stamford Hill, Southgate, Harrow, Croydon and Plumstead and from

MIDDLESEX. Hampstead, 1944 (Bretherton); Hounslow, 1956 (Pierce); Greenford, Southall and Northolt (J. Ward).

HERTS. Totteridge, common (Lorimer) ; Watford, rare (Penrose) ; Haileybury, Cheshunt, Bushey, Hoddesdon, St. Albans and Barnet (Foster, *Lep. Herts.*, 1937).

KENT. Orpington, 1949 (Siggs) ; Pett's Wood, 1946 (A. Swain) ; West Wickham (Trundell).

SURREY. Putney, 1928 and East Sheen, 1939 (D. King) ; West Ewell and Banstead (Gardner) ; Coulsdon, 1941-45 (Wheeler) ; Weybridge (Messenger).

BUCKS. Chalfont St. Peter (Ansorge).

**Eupithecia goossensiata* Mabeille M.21, H.20, E2.18, K.16, S.17.

The Ling Pug is considered by some to be only a special form of the preceding species, but its environment always connected with heathland together with its slightly different larva seems to give it specific status. It

is found in places where heather grows in most parts of the British Isles. The 1898 list mentions it from Highgate, Hampstead Heath and the Shirley Hills. Elsewhere from

MIDDLESEX. Ruislip area, scarce (Minnion).

HERTS. Bushey Heath and Watford (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Clark).

KENT. Abbey Wood, August 1952 (Showler) ; Dartford and Chislehurst (V.C.H., 1908).

SURREY. Oxshott and East Sheen, 1928 (D. King).

**Eupithecia denotata* Hübn. K.16, S.17.

The Campanula Pug is a very local species occurring only where its chief foodplant the nettle-leaved bellflower grows, mainly in woods in most of the southern counties of England up to Norfolk. The larvae can be readily obtained in the seedheads in September, but the moth seldom appears in the wild, though there is a record in the 1898 list from Croydon. Also noted from

KENT. Darenth Wood (V.C.H., 1908).

SURREY. Larvae at Chipstead in 1946 (Johnson) ; East Sheen in July 1933 and 1934 (D. King).

**Eupithecia albipunctata* Haworth (=*tripunctaria* H.-S.). M.21, H.20, K.16, S.17.

The White-spotted Pug is a very widespread insect in most regions of these Islands up to the Highlands, appearing as a rule in May, while its larva may be found readily on several kinds of the *Umbelliferae*, notably Angelica. The 1898 list gives it from Chiswick where larvae were said to be common on *Heracleum sphondylium*, also from Crouch End, Croydon and Wimbledon.

MIDDLESEX. Highgate, 1925 (Andrewes) ; Ruislip (Minnion) ; Bishop's Wood, Hampstead (Cockerell, *Lep. Middx.*, 1891).

HERTS. Watford, one (Penrose) ; Cheshunt and Hoddesdon in 1925 (Foster, *Lep. Herts.*, 1937).

KENT. Lee and Eltham (V.C.H., 1908).

SURREY. Tadworth, 1949, and Bookham, 1947 (Wheeler) ; Wimbeldon, common (Cockayne) ; Weybridge (Messenger) ; Oxted, 1902 (Meldola : Hope Dept. Collection, Oxford).

**Eupithecia vulgata* Haworth I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Common Pug, as its name implies, is one of the most well-known and widespread of this group, being found in almost every corner of the United Kingdom as well as in every quarter of the London Area, whence it has been noted in the 1898 list from Ladbroke Square, Hampstead, Highgate, Clapton, Tottenham, Woodford, Hackney, Dulwich and Wimbledon, also from Thurloe Square, 1918 (Baynes), Brixton (Farmer), Hounslow (Pierce) and Mill Hill, 1955 (Goater).

Eupithecia virgaureata Doubleday. M.21, H.20, E2.18, K.16.

The Golden-rod Pug is always regarded as a scarce insect, though its larva feeds on *Solidago* flowers in many woodland areas in England, Wales and also in Ireland. It is not recorded in the 1898 list and occurs only from a few localities in the Area, notably from

MIDDLESEX. Southall, 1951 (J. Ward) ; Hampstead (Cockerell, *Lep. Middx.*, 1891).

HERTS. Watford, one (Penrose) ; Hoddesdon (Bull : Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (V.C.H., 1903).

KENT. Plumstead (West : *Ent. Rec.*, 1906).

Eupithecia trisignaria H.-S. M.21, K.16.

The Triple-spotted Pug is another species seldom seen on the wing, but only obtained as larvae in the flowers of Angelica. Its occurrence is very sporadic and it is only found in rather widely separated localities in the South, ranging up to the borders of the Highlands. It is not given in the 1898 list and has been reported for MIDDLESEX from Southall where one was obtained in June 1950 (J. Ward) and for KENT from Dartford (V.C.H., 1908).

**Eupithecia lariciata* Freyer M.21, H.20, E2.18, K.16, S.17, B.24.

The Larch Pug which is on the wing in May is now very widespread wherever larch is grown in quantity, being found well into the Highlands, and it is also quite common in Ireland. The 1898 list reports it only from Hale End and Croydon. Elsewhere from

MIDDLESEX. Ruislip area, rare (Minnion).

HERTS. East Barnet, Watford, St. Albans (Foster, *Lep. Herts.*, 1937).

ESSEX. Theydon Bois, 1912 (Meldola : Hope Dept. Collection, Oxford).

KENT. West Wickham (West, *Ent. Rec.*, 1906) ; Dartford (V.C.H., 1908).

SURREY. Weybridge, rare (Messenger) ; Box Hill, 1906 (Meldola, Hope Dept. Collection, Oxford).

BUCKS. Chalfont St. Peter, 1957 (Ansorge).

**Eupithecia castigata* Hübn. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Grey Pug is a very common insect to be found all over the British Isles, while its larva is cosmopolitan in the type of foliage it consumes. The moth appears in June and often again in September. The 1898 list gives it from many localities, notably from Hampstead, Highgate, Dalston, Hale End, Chingford, Dulwich and Wimbledon Common.

MIDDLESEX. Ruislip, Northolt and Southall, 1951 (J. Ward).

HERTS. Watford, common (Penrose) ; Bricket Wood, St. Albans, Haileybury, Hoddesdon, Cheshunt, Bushey Heath (Foster, *Lep. Herts.*, 1937).

KENT. West Wickham (Trundell) ; Eltham and Bexley (V.C.H., 1908).

SURREY. Coulsdon, 1944, and Tadworth, 1949 (Wheeler) ; Ham Common and Sheen, 1930 (D. King) ; Weybridge (Messenger).

BUCKS. Chalfont St. Peter (Ansorge).

Eupithecia helveticaria Boisd. *f. arceuthata* Freyer M.21, S.17, B.24.

The true Edinburgh Pug is a denizen of the northern counties and the Highlands where the larvae feed on wild juniper which is also the foodplant of the somewhat larger form known as ab. *arceuthata*, considered by some to be a separate species, though no difference appears to exist between its genitalia and those of *helveticaria*. In recent years this Pug has become quite common in suburban gardens as well as in many parts of southern England where the larvae feed in August on species of cypress, mainly *macrocarpus* and also on cultivated junipers. For the London Area it has been recently recorded for

MIDDLESEX. Ruislip, fairly common (Minnion) ; Mill Hill, many bred from *macrocarpus* in 1950 (H. King).

SURREY. Riddlesdown (Cockayne) ; Chipstead, six in June 1946 (Johnson) ; Tadworth, 1950 and 1951 (Wheeler) ; Egham, 1931 (C. de W.) ; Weybridge (Messenger).

BUCKS. Chalfont St. Peter, 1957 (Ansorge).

**Eupithecia satyrata* Hübn. M.21, H.20, S.17, B.24.

The Satyr Pug is another species which occurs in almost every area of the United Kingdom where there is heath or moorland as well as in other types of terrain. It is on the wing in May and in Shetland produces a race known as ab. *curzoni*. The 1898 list only gives it from Highgate.

HERTS. Watford, one (Penrose) ; Cheshunt and Watford (Foster, *Lep. Herts.*, 1937).

SURREY. Putney (Gardner) ; Box Hill (West, *Ent. Rec.*, 1906) ; Chipstead, 1904 (Meldola : Hope Dept. Collection, Oxford).

BUCKS. Chalfont St. Peter (Ansorge).

**Eupithecia succenturiata* Linn. M.21, H.20, K.16, S.17, B.24.

This very pretty insect, the Bordered Pug, is by no means common throughout the country, except perhaps in some city areas such as the Metropolis where it can often be met with in July, while its larvae are sometimes abundant on mugwort in the autumn. It is found up to the north of England and in Ireland. But the 1898 list and Suppt. only mention it from Eltham, Lee, Croydon and Wimbledon Common. More recently it has been noted from

MIDDLESEX. Hounslow (Pierce) ; Mill Hill (Goater) ; Ruislip (Minnion) ; Ealing (Ellison) ; Greenford and Southall, 1946 and 1949 (J. Ward).

HERTS. Watford, rare (Penrose) ; Totteridge, a few (Lorimer) ; Watford and Cheshunt (Foster, *Lep. Herts.*, 1937).

KENT. Orpington, 1948 (Siggs) ; Pett's Wood, and Chelsfield (A. Swain) ; Pinden (Hare) ; Abbey Wood, 1952 (Showler) ; Hayes and Downe (Birchenough) ; West Wickham (Trundell) ; Lee, Eltham and Dartford (V.C.H., 1908).

SURREY. Putney, 1928, and East Sheen, 1933 (D. King) ; Banstead (Gardner) ; Wimbledon (van Emden) ; Coulsdon, 1946, and Tadworth, 1950 (Wheeler) ; Chipstead, two in 1946 (Johnson) ; Sutton, 1903 (Meldola : Hope Dept. Collection, Oxford) ; Weybridge, scarce (Messenger) ; Oxshott, 1957 (de Mornay).

BUCKS. Chalfont St. Peter, 1956 (Ansorge).

**Eupithecia icterata* Vill. (=*subfulvata* Haworth). M.21, H.20, E2.18, K.16, S.17, B.24.

The normal form of the Tawny-speckled Pug is easily recognizable with its red bar on the forewings. It is one of the most widespread of the group, while its larvae are often abundant on yarrow. It is to be found all over the London Area, being reported in the 1898 list from Hale End, Hanwell, Hampstead, Highgate, Hornsey, Harrow, Muswell Hill, Hammersmith, Crouch End, Eltham and Croydon, also more recently from Mill Hill, 1955 (Goater), Totteridge and Stanmore (Lorimer) and from Watford (Penrose).

**Eupithecia haworthiata* Doubleday M.21, E2.18, K.16, S.17, B.24.

Haworth's Pug is a very small insect which sometimes swarms in July round its foodplant the Traveller's Joy (*Clematis vitalba*). It is found over most of England where this plant occurs up to northern counties, as well as in Wales and Ireland. For London the 1898 list gives it from Dalston, Stamford Hill, Highgate, Crouch End, Woodford, Forest Hill and Croydon, and more recently from

MIDDLESEX. Highgate, 1925 (Andrewes).

KENT. Chelsfield, 1949 (A. Swain) ; Dartford (V.C.H., 1908).

SURREY. Barnes (Gardner) ; Coulsdon, 1944 (Wheeler) ; Reigate and Riddlesdown, 1912 (Meldola : Hope Dept. Collection, Oxford) ; Weybridge (Messenger).

Eupithecia valerianata Hübn. S.17.

The Valerian Pug is of very local occurrence where its larval foodplant the wild valerian (*Valeriana officinalis*) flourishes in most parts of southern England, also in Wales and Ireland. The insect flies freely about this plant in late May, but it is not noted in the 1898 list. Its only apparent record is from Weybridge where it is rare (Messenger).

**Eupithecia plumbeolata* Haworth M.21, K.16, S.17.

The Lead-coloured Pug is an inhabitant of woods where cow-wheat grows. The species which ranges over most of England and Wales up to Scotland has been noted from Ireland. It can often be flushed at dusk in early June from its special haunts. It is only mentioned in the 1898 list from the south-eastern area of the Metropolis. Elsewhere from

Middlesex. Ruislip (Minnion) ; Bishop's Wood, Hampstead (Cockerell, *Lep. Middx.*, 1891) ; Haverstock Hill (Selwyn Image Collection, Oxford).

Kent. Lee (V.C.H., 1908).

Surrey. Caterham (West, *Ent. Rec.*, 1906) ; Wimbledon, 1895 (Geldart : Hope Dept. Collection, Oxford) ; Putney, one, 1951 (H. Swain).

Eupithecia palustraria Doubleday M.21.

The Marsh Pug is a very local insect which is widespread in its distribution over the British Isles, ranging up to the Highlands and occurring in Ireland. It is on the wing in late May and can often be obtained flying in the afternoon sunshine over its foodplant, the Stitchwort, in marshy places. There appears to be at least one authentic capture of this little moth in the London Area, in Middlesex in May 1955 (Minnion).

Eupithecia tenuiata Hübn. M.21, H.20, E2.18, E1.19, S.17.

The Slender Pug is much more frequently met with in the larval state than as the imago, since the short, stumpy larva feeds inside the sallow catkins and is often dislodged when beating the blooms in April. It appears to occur all over these Islands wherever sallow is plentiful. But in the London Area it is not in the 1898 list and has only been recorded for

Middlesex. Ruislip district, rare (Minnion).

Herts. Haileybury and Cheshunt (Foster, *Lep. Herts.*, 1937).

Essex. Epping Forest (Clark) ; also there in 1903 (Meldola : Hope Dept. Collection, Oxford).

Surrey. Box Hill (Meldola : Hope Dept. Collection, Oxford) ; Weybridge, one on July 15, 1953 (Messenger).

Eupithecia inturbata Hübn. M.21, S.17, B.24.

The Maple Pug is a very local species, only to be found where there are large maple trees which bloom freely. From the flowers the larvae may be beaten in late May. The moth flies in late July in many parts of southern England and in Wales, but seems to have hardly been recorded for the London Area.

Middlesex. Two obtained at Harefield (Cockerell, *Lep. Middx.*, 1891).

Surrey. Box Hill (West, *Ent. Rec.*, 1906).

Bucks. Chalfont St. Peter, 1957 (Ansorge).

Eupithecia innotata Hufn. I.L., M.21, H.20, S.17.

The Angle-barred Pug is another extremely local insect which has only been obtained very sporadically over England up to Durham. Its larva feeds mainly on mugwort in the autumn. For London it has been recorded from

Inner London. The Zoo in 1954 (Bushby).

Middlesex. Ruislip, rare (Minnion).

Herts. Cheshunt (Boyd : Foster, *Lep. Herts.*, 1937).

SURREY. Sheen Common, June, 1931 and East Sheen, three in 1933 (D. King) ; Weybridge, one on May 18, 1953 (Messenger).

**Eupithecia fraxinata* Crewe I.L., M.21, K.16, S.17.

Some consider that this insect, the Ash Pug, is only a form of the previous species, but apart from its feeding exclusively on ash and that the forewings are narrower than in *E. innotata*, there is little grounds for not giving it specific rank. It is found in most parts of Britain where ash occurs. The 1898 list mentions it from Highgate, Stamford Hill, Plumstead and Eltham.

INNER LONDON. Regent's Park in 1886 (Cockerell, *Lep. Middx.*, 1891).

MIDDLESEX. Uxbridge, bred from ash in 1951 (J. Ward).

KENT. West Wickham, 1950 (Birchenough) ; Lee, Lewisham and Bexley (V.C.H., 1908).

SURREY. Putney in 1929, 1931 and 1933 (D. King) ; Richmond Park (Gardner).

**Eupithecia nanata* Hübn. M.21, H.20, E2.18, K.16, S.17.

The Narrow-winged Pug is a very familiar little insect in May in every part of the British Isles where there is heathland. The 1898 list reports it from Hampstead Heath, Highgate, Hanwell, Woodford and Shirley, also from

MIDDLESEX. Ruislip (Minnion) ; Greenford and Uxbridge, 1950 and 1953 (J. Ward).

HERTS. Watford, common (Penrose) ; Hertford, Bushey Heath and Hoddesdon (Foster, *Lep. Herts.*, 1937).

KENT. West Wickham, 1950 (Trundell) ; Hayes and Downe (Birchenough) ; Dartford (V.C.H., 1908) ; Plumstead (West, *Ent. Rec.*, 1906).

SURREY. Wimbledon Common, numerous in 1928 and Putney in 1937 (D. King) ; Weybridge (Messenger).

**Eupithecia abbreviata* Stephens M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Brindled Pug is one of the commonest species throughout the British Isles in the spring, being on the wing in late April. It is always associated with oak on which the larva feeds. A melanic form is becoming increasingly numerous in many parts of the country. The 1898 list gives it from Walthamstow, Hale End, Croydon, Dulwich and Highgate.

MIDDLESEX. Mill Hill, 1955 (Goater) ; Ruislip (Minnion) ; Northolt, one in 1953 (J. Ward) ; Pinner and Highgate Woods (Cockerell, *Lep. Middx.*, 1891).

HERTS. Cheshunt, Hoddesdon, Bushey Heath, Broxbourne Woods (Foster, *Lep. Herts.*, 1937) ; Watford, common (Penrose).

ESSEX. Epping Forest (Clark).

KENT. West Wickham (Trundell); Pett's Wood, 1947, and Orpington, 1953 (Siggs).

Surrey. Bookham Common (van Emden) ; Wimbledon Common, 1921 (Coulson) ; Weybridge (Messenger).

Bucks. Chalfont St. Peter, 1956 (Ansorge).

**Eupithecia dodoneata* Guen. M.21, E2.18, E1.19, K.16, S.17.

The Oak-tree Pug appears later than the preceding species, usually about the middle of May, but is much less abundant or widespread. Its larva feeds for preference on the shoots of holm oak (*ilex*) throughout most of the southern English counties up to Yorkshire and it is also found over most of Ireland. For London the 1898 list reports it from Hendon and Eltham where it has always been scarce. Also from

Middlesex. Ruislip area, rare (Minnion).

Essex. Epping Forest (V.C.H., 1903).

Kent. Lee and Eltham (V.C.H., 1908) ; Kidbrooke (West, *Ent. Rec.*, 1906).

Surrey. Weybridge, one on May 19, 1952 (Messenger).

**Eupithecia exiguata* Hübn. M.21, H.20, E2.18, K.16, S.17, B.24.

The Mottled Pug is another very plentiful little insect appearing in late May and June and found in most parts of Great Britain where its larva feeds on many types of foliage, mainly hawthorn. In the 1898 list it is noted from Hale End, Chingford, Forest Hill, Croydon, Barnes, Highgate, Hampstead, Muswell Hill, Harrow, Southgate and Wimbledon Common.

Middlesex. Hounslow, 1956 (Pierce) ; Highgate, 1925 (Andrewes) ; Kenton, 1938 (Fletcher) ; Ruislip, common (Minnion).

Herts. Watford, one (Penrose) ; Haileybury, Hoddesdon, Bushey Heath (Foster, *Lep. Herts.*, 1937).

Kent. West Wickham (Trundell) ; Lee and Eltham (V.C.H., 1908); Hayes and Downe (Birchenough).

Surrey. Worcester Park (Kaye) ; West Ewell and Banstead (Gardner) ; Coulsdon, 1946 (Wheeler) ; Wimbledon Common (van Emden) ; Weybridge (Messenger).

Bucks. Chalfont St. Peter (Ansorge).

**Eupithecia sobrinata* Hübn. M.21, H.20, E2.18, K.16, S.17, B.24.

The Juniper Pug, as its name indicates, is to be found in every part of the British Isles where its foodplant flourishes. The larvae may be beaten in great numbers from the bushes in June. In the Highlands a very bright form of the moth occurs. In the London Area it has been reported in the 1898 list and 1902 Suppt. from Finsbury Park, Crouch End, Highgate, Stamford Hill, Croydon, Dulwich, Forest Hill, Woodford and Eltham.

Middlesex. Highgate, 1925 (Andrewes).

Herts. Cheshunt and Bushey Heath (Foster, *Lep. Herts.*, 1937).

Kent. Blackheath (V.C.H., 1908).

Surrey. Wimbledon (van Emden) ; Tadworth, 1954 (Wheeler) ; Juniper Bottom, Box Hill, many larvae (C. de W.); Riddlesdown, larvae

(Birchenough) ; Caterham and Headley (West, *Ent. Rec.*, 1906).

BUCKS. Chalfont St. Peter, 1957 (Ansorge).

**Eupithecia pini* Linn. (=*togata* Hübn.). E2.18, K.16, S.17, B.24.

This most handsome insect, the Cloaked Pug, is probably the largest of this group, but has in recent years become very difficult to obtain, as its larva feeds in the cones of spruce, most of which are now cut before they are old enough to carry cones. It used to be found in some of the southern counties, notably in the New Forest, but its stronghold seems now to be in the big spruce forests of the Highlands where it can be beaten out of the foliage in late June. The 1898 list gives it only in single examples from Hale End and Lee. It was first discovered in 1845 by Samuel Stevens in Black Park, Fulmer, in BUCKS. Also recorded from

ESSEX. Highams Park in 1892 (V.C.H., 1903).

KENT. Gravesend area (*Entom.*, 1871, **5**, 393).

SURREY. Weybridge, one on July 8, 1952 (Messenger).

**Eupithecia subnotata* Hübn. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17.

The Plain Pug is a very common species and what might be called a regular Londoner, since it has been found in the larval state feeding on goosefoot (*Chenopodium*) in many parts of the Metropolis. Elsewhere it is widespread up to the northern counties and in the east of Ireland. The 1898 list gives it from a number of localities, including Holloway, Islington, Hampstead, Highgate, Hackney, Woodford, Streatham and Wimbledon.

INNER LONDON. South Kensington, July, 1938 (Fletcher).

MIDDLESEX. Greenford, Southall, Uxbridge, Northolt, Ruislip (J. Ward) ; Highgate, 1911 (Andrewes) ; Mill Hill, 1955 (Goater).

HERTS. Watford, common (Penrose) ; St. Albans, Bushey Heath, Waltham Cross (Foster, *Lep. Herts.*, 1937).

KENT. Orpington, 1948 (Siggs) ; Pett's Wood, 1948 (A. Swain) ; West Wickham (Trundell, Birchenough).

SURREY. Sydenham, 1891 (Sellon : Hope Dept. Collection, Oxford) ; Sutton, 1904 (Meldola: id.) ; Weybridge (Messenger).

Eupithecia subumbrata Schiff. (=*scabiosata* Borkh.). M.21, K.16, S.17, B.24.

The Shaded Pug can claim to be one of the few British species to be discovered in the London Area, since it was originally described by Stephens from examples taken at Riddlesdown in 1831. Since then it has been found to occur all over England and in many parts of Scotland and Ireland, appearing in late June. Its larva feeds chiefly on hawkbit. Though not mentioned in the 1898 list, it has been recorded from

MIDDLESEX. Ruislip area, scarce (Minnion) ; Southall, one bred in 1951 (J. Ward).

KENT. Pett's Wood, 1948 (A. Swain) ; West Wickham, 1950 (Trundell) ; Pinden (Hare).

SURREY. Box Hill (West, *Ent. Rec.*, 1906) ; Chipstead, 1904 (Meldola: Hope Dept. Collection, Oxford) ; Croydon, 1913 (Geldart : id.) ;

Coulsdon, 1952 (Wheeler) ; Weybridge, rare (Messenger).

Bucks. Chalfont St. Peter, 1957 (Ansorge).

**Gymnoscelis pumilata* Hübn. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Double-striped Pug is a very familiar species which appears in early May and seems to be about all the summer. It is to be found all over Britain with a specially well-marked form in Ireland. It has been noted in almost every part of the London Area, being reported in the 1898 list from Walthamstow, Hale End, Ealing, Muswell Hill, Richmond Park and Putney, also from Epping Forest (Clark), Brixton (Farmer), Hampstead, 1944 (Bretherton), Hampton (Keywood) and Wimbledon (van Emden).

**Chloroclystis coronata* Hübn. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24·

The V-Pug is a pretty little insect which is on the wing in May and August and seems to occur all over England up to the Lowlands, while it is widely distributed in Ireland. It has been seen in many parts of the Area, notably in the 1898 list from Tottenham, Hampstead, Highgate, Mill Hill, Dulwich, Croydon, Shirley, Chiswick and Richmond Park.

Middlesex. Ruislip area, scarce (Minnion).

Herts. St. Albans, East Barnet, Bushey Heath, Waltham Cross (Foster, *Lep. Herts.*, 1937).

Essex. Epping Forest (Clark).

Kent. Pett's Wood, 1948 (A. Swain) ; Orpington, 1953 (Siggs) ; Joyden's Wood (Owen) ; Abbey Wood, 1949 (J. Burton) ; Dartford and Erith (V.C.H., 1908) ; Otford, 1955 (Manley).

Surrey. Selsdon (Barnett) ; Putney, 1929, Oxshott, 1928 and Sheen Common, 1931 (D. King) ; Banstead (Gardner) ; Tadworth, 1952 (Wheeler) ; Chipstead, one in 1946 (Johnson) ; Weybridge (Messenger).

Bucks. Chalfont St. Peter, 1956 (Ansorge).

**Chloroclystis rectangulata* Linn. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Green Pug is a most variable species occurring all over Britain wherever apples are grown. The melanic form seems to predominate in many quarters. It is widespread over London, being noted in the 1898 list from Hale End, Hackney, Chiswick, Isleworth, Tottenham, Streatham and Dulwich, also from Epping Forest (Clark), Highgate, 1925 (Andrewes), Hounslow (Pierce), Blackheath (Hyatt) and Wimbledon Common (van Emden).

Anticollix sparsata Treits. E2.18, S.17.

The Dentated Pug is a very local insect occurring sporadically in some of the southern English counties up to Yorkshire. It inhabits marshy spots where its foodplant the Yellow Loosestrife flourishes. The larvae can be sometimes found in numbers on the underside of the leaves in late August, but the moth which flies in June, is seldom taken on the wing. The species is not given in the 1898 list, but there are a few authentic records for the Area notably from

Essex. Epping Forest (Welti).

SURREY. Upper Warlingham (Welti) ; Tadworth, one on May 25, 1952 (Wheeler) ; Weybridge, one on July 13, 1954 (Messenger).

The next Group of Geometers comprise members of the large Family known as the Ennominae.

**Abraxas sylvata* Scop. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Clouded Magpie is a very spectacular insect in its haunts, usually among beech and wych elm in many parts of the south as well as the north of England, extending into southern Scotland and it is also found in Killarney in Ireland. It can be dislodged freely by day and comes readily to any illumination in late June. It has been reported from many parts of the Area, in the 1898 list from Walthamstow, Shirley, Shepherds Bush, Barnet and Harrow, also from

HERTS. Rickmansworth, Bushey, Chorley Wood, Whippendell Woods (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (V.C.H., 1903).

KENT. Abbey Wood, common (J. Burton) ; Lessness Woods (Showler).

SURREY. Clapham (*Entom.*, 1905, **38**, 239) ; Streatham (*Ent. Rec.*, 1935, **47**, 116) ; Norbury Park on July 8, 1951 (Wheeler) ; Redhill (V.C.H., 1902) ; Weybridge, one on June 26, 1952 (Messenger).

BUCKS. Chalfont St. Peter, 1956 (Ansorge).

**Abraxas grossulariata* Linn. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Magpie Moth is one of the most remarkable among our fauna owing to its tendency to the most extreme variation. Specimens are known entirely black and others pure white. There exists an almost untold number of intermediate forms, some of the most amazing having been bred early this century by the Rev. Raynor. The insect seems to occur all over the British Isles, especially in large towns where the larvae are often in thousands on *Euonymus japonicus*. In the London Area the 1898 list mentions it from Paddington, Ladbroke Square, Islington, Hammersmith, Dalston, Hackney, Woodford, Highgate and Ealing. Also noted from Battersea Park, 1925 (Baynes), and Eccleston Square, 1910 (Baynes), Brixton (Farmer), Anerley, 1905 (Keywood), Hounslow, 1954 (Pierce), Kew and Wimbledon (van Emden) and from all other outlying areas.

**Lomaspilis marginata* Linn. M.21, H.20, E2.18, K.16, S.17, B.24.

The Clouded Border is another species which lends itself to variation, usually as regards the amount of brown markings. An occasional example occurs almost entirely white. It appears in May and August and is to be found all over Britain up to the Caledonian Canal. It has been recorded from every quarter of the London Area. The 1898 list gives it from Wanstead, Hale End, Woodford, Hampstead, Highgate, Ealing, Finchley, Chiswick, Forest Hill and Wimbledon Common, together with more recent records from all the intermediate zones of the Area.

**Ligdia adustata* Schiff. M.21, H.20, E2.18, K.16, S.17, B.24.

The Scorched Carpet is a familiar little moth in the spring when it flits about the spindle bushes on which its larva feeds. It reappears in August in its wooded haunts over England, Ireland and the west of Scotland. It is widely known in the Area, being noted in the 1898 list from Hampstead, Chingford, Hale End, Woodford, Ilford, Chiswick, Harrow, Southall, and Croydon. Also from

Middlesex. Uxbridge in 1950 (J. Ward) ; Potters Bar, 1953 (Odell) ; Ruislip area, scarce (Minnion) ; Whitton, Harefield and Hammersmith (Cockerell, *Lep. Middx.*, 1891).

Herts. Hertford, Haileybury, Hoddesdon and Bricket Wood (Foster, *Lep. Herts.*, 1937) ; Totteridge, one (Lorimer).

Essex. Epping Forest, 1917 (Meldola : Hope Dept. Collection, Oxford).

Kent. West Wickham (Trundell) ; Joyden's Wood, 1947 (Hyatt) ; Pett's Wood and Chelsfield (A. Swain) ; Orpington, 1948 (Siggs) ; Hayes and Downe (Birchenough) ; Kidbrooke and Dartford (West, *Ent. Rec.*, 1906) ; Westerham (Chitty : Hope Dept. Collection, Oxford).

Surrey. Box Hill (van Emden) ; Ashtead, 1952 (Chapman) ; East Sheen, 1931 (D. King) ; Chipstead, common in 1946 (Johnson) ; Coulsdon and Tadworth in 1950, Bookham, 1948 (Wheeler) ; Reigate (V.C.H., 1902) ; Weybridge (Messenger).

Bucks. Chalfont St. Peter, 1956 (Ansorge).

**Perconia strigillaria* Hübn. H.20, S.17, K.16.

The Grass Wave is one of the most well-known moths on heathland in late June when it flies readily in the sunshine. Its range extends over England and Wales to the edge of the Highlands and to the bogs of Ireland, but it seems to have been little reported from the London Area, except as scarce in the south-eastern region, and as also occurring at Shirley and on Wimbledon Common. Elsewhere for

Herts. Haileybury (Foster, *Lep. Herts.*, 1937).

Surrey. Oxshott, 1928 (D. King) ; also there (Cockayne) ; Wisley, 1873 (Meldola : Hope Dept. Collection, Oxford).

Aspitates ochrearia Ross. H.20, K.16.

The Yellow Belle is an easily recognizable insect as it flies up from stony ground and downland in many parts of the south of England up to the Midlands. It is on the wing in May and August, but is not noted in the 1898 list. The only records for the Area seem to be for

Herts. Near Hertford (Stephens : Foster, *Lep. Herts.*, 1937).

Kent. Dartford and Stone Marshes (J. Burton) ; Darenth (D. Owen) ; Chelsfield, 1950 (A. Swain) ; Dartford and Eltham (V.C.H., 1908).

Aspitates gilvaria Fabr. M.21, K.16, S.17.

The Straw Belle is larger than the foregoing species, affecting mostly downland in August. Its range is very restricted, since it is mainly known to occur along the downs of Kent, Surrey and parts of Sussex. It is also

reported from Suffolk, Gloucester, Devon and Cheshire. It is abundant in the Burren in Co. Clare where a duskier form prevails. The records for the Area are from

MIDDLESEX. Willesden and Oxhey Lane (Cockerell, *Lep. Middx.*, 1891); Harrow (South, ii, 331).

KENT. Shoreham (V.C.H., 1902).

SURREY. Box Hill and Betchworth, abundant, 1951 (Wheeler); Mickleham Down, 1911 (Champion : Hope Dept. Collection, Oxford); Reigate, 1877 (Meldola : id.); Caterham (West, *Ent. Rec.*, 1906).

**Dyscia fagaria* Thunb. (=*belgaria* Hübn.). K.16, S.17, B.24.

The Grey Scalloped Bar is a real denizen of heath and moor in all parts of the British Isles where this type of terrain predominates, right up to the northern Highlands. The moth which appears in late May can often be flushed by day from ground covered with small white stones which it simulates. But it is more readily found clinging to heather stalks after dark. It is only given in the 1898 list from Shirley.

KENT. West Wickham, 1896 (Meldola : Hope Dept. Collection, Oxford); Chislehurst and Greenhithe (V.C.H., 1908).

SURREY. Croydon (*Ent. Annual*, 1869); Oxshott (Kaye, Cockayne); Addington (V.C.H., 1902).

BUCKS. Chalfont St. Peter (V.C.H., 1905).

**Gnophos obscurata* Schiff. M.21, H.20, K.16, S.17.

The Annulet is a most extraordinary species in the degrees of variation in ground colour which it displays from one locality to another. In some areas, especially in Surrey, it is almost black, while in East Kent is it grey, in parts of Sussex almost white and in Cornwall it often has a distinctly red tinge. It is out in August on heaths, rocky hillsides and downlands all over the British Isles, though it is less frequent in the Highlands and in Ireland. It is only mentioned from Croydon in the 1898 list. Elsewhere from

MIDDLESEX. Ruislip area, rare (Minnion).

HERTS. Hoddesdon (Bull: Foster, *Lep. Herts.*, 1937).

KENT. Pinden and Stone (Hare); West Wickham (Trundell); Pett's Wood, and Chelsfield, 1951 (A. Swain); Orpington, 1953 (Siggs).

SURREY. Oxshott, 1907 (Kaye); Caterham (Welti); Coulsdon, 1944 to 1946 (Wheeler); Croydon, 1931 (Barnett); Box Hill, 1905 (Meldola : Hope Dept. Collection, Oxford).

Bapta distinctata H.-S. (=*pictaria* auctt.). E2.18, E1.19, [K.16], S.17.

The Sloe Carpet is an exceedingly local species which appears only to inhabit a few counties in the south-east of England from Hampshire to Kent and also Essex and Suffolk. It is on the wing at the same time as the blackthorn is fully in bloom, usually in early April, but sometimes in mid-March, as in 1957. It has only been noted in the Area in

Essex. Epping Forest (Buxton, 1890) ; Loughton (West, *Ent. Rec.*, 1906).

Kent. Formerly near Dartford (V.C.H., 1908).

Surrey. Redhill (S. Webb : Hope Dept. Collection, Oxford) ; Redstone, Reigate and Ashtead (V.C.H., 1902) ; Bookham Common (Wheeler, *L.N.*, **34**, 28).

Bapta bimaculata Fabr. M.21, H.20, E.218, E1.19, K.16, S.17, B.24.

This very attractive insect, the White Pinion-spotted, can often be seen in late May flying briskly at dusk near the wild cherry, its larval foodplant. It is found all over southern England up to the northern counties, as well as in Wales and south-west Ireland. But it does not find a place in the 1898 list.

Middlesex. Harefield, one in 1889 (Cockerell, *Lep. Middx.*, 1891).

Herts. Totteridge, one (Lorimer) ; Haileybury, St. Albans, Watford and Bricket Wood (Foster, *Lep. Herts.*, 1937).

Essex. Epping Forest (Clark, 1898).

Kent. Pett's Wood, 1948 (A. Swain) ; Pinden (Hare) ; Farnborough (Lawrence : Hope Dept. Collection, Oxford) ; Plumstead, Dartford, West Wickham (V.C.H., 1908).

Surrey. Tadworth, Bookham Common and Burgh Heath (Wheeler); Box Hill (Gardner); Putney, May, 1937 (D. King); Addington, June, 1951 (Birchenough); Epsom, 1896 (Sidgwick; Hope Dept. Collection, Oxford); Ashtead (V.C.H., 1902) ; Weybridge, rare (Messenger).

Bucks. Chalfont St. Peter, 1957 (Ansorge).

**Bapta temerata* Hübn. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Clouded Silver is another very pretty species, also on the wing in late May and June all over England up to southern Scotland, as well as in Ireland. It is a cosmopolitan feeder on foliage of many trees, chiefly sloe and birch. The 1898 list mentions it from Highgate, Ealing, Hale End, Croydon and Shirley, also from

Middlesex. Mill Hill, 1955 (Goater) ; Southall and Harefield in 1951 (J. Ward) ; Highgate (Andrewes) ; Ruislip area (Minnion) ; Bishop's Wood, Hampstead (Cockerell, *Lep. Middx.*, 1891).

Herts. Watford, rare (Penrose) ; Oxhey (Fletcher) ; St. Albans, Bricket Wood, Broxbourne, Haileybury, Watford (Foster, *Lep. Herts.*, 1937).

Essex. Epping Forest (V.C.H., 1903).

Kent. Eynsford and Shoreham (D. Owen) ; Abbey Wood (Showler); Hayes, 1947 (Hyatt) ; Pett's Wood and Chelsfield, 1950 (A. Swain) ; Dartford, Eltham and West Wickham (V.C.H., 1908) ; Darenth (West, *Ent. Rec.*, 1906) ; Pinden (Hare).

Surrey. Croydon, 1905 (Keywood) ; Bookham (Gardner) ; Tadworth and Banstead (Wheeler) ; Ashtead and Oxshott (V.C.H., 1902) ; Weybridge (Messenger).

Bucks. Chalfont St. Peter, 1956 (Ansorge).

**Cabera pusaria* Linn. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Common White Wave is a very familiar species in the spring and late summer as it flutters about hedgerows and wooded areas. It ranges all over the British Isles and has been reported everywhere in the London Area, notably in the 1898 list from Highgate, Muswell Hill, Ealing, Southgate, Hale End, Chiswick, Dulwich and Wimbledon, as well as from Highgate (Andrewes), Hounslow (Pierce), Putney (D. King), and from all quarters of the outlying regions of the Area.

**Cabera exanthemata* Scop. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Common Wave is very similar in appearance, habits and habitats to the foregoing species. It is slightly more yellow and the cross-lines are less straight. It is also to be found in every part of Great Britain in May and again in August and is reported widely in the 1898 list from Hale End, Woodford, Highgate, Hampstead, Muswell Hill, Greenford, Chiswick, Croydon and Wimbledon Common, also from Arbrook Common in 1934 (Keywood) and from Joyden's Wood in 1952 (Hyatt).

**Ellopia prosapiaria* Linn. I.L., M.21, H.20, K.16, S.17, B.24.

The Barred Red is essentially an inhabitant of regions where *Pinus silvestris* flourishes. Its wrinkled larva can be readily beaten from the needles in the spring, while the moth is on the wing in July all over the British Isles on heathy terrain. It is only given in the 1898 list and Suppt. from Croydon, Roehampton, Shirley and Wimbledon.

Inner London. The Zoo, Regent's Park, 1951 (Bushby).

Middlesex. Stanmore, common (Lorimer) ; Enfield (Edelsten) ; Whitton and Harefield in 1886 (Cockerell, *Lep. Middx.*, 1891).

Herts. Totteridge, one (Lorimer) ; East Barnet, Waltham Cross, Bushey Heath and Broxbourne (Foster, *Lep. Herts.*, 1937).

Kent. Otford, 1955 (Manley) ; West Wickham (West, *Ent. Rec.*, 1906).

Surrey. Addington Hills and Caterham (Birchenough) ; Oxshott, 1928 (D. King) ; Esher (V.C.H., 1902) ; Weybridge (Messenger).

Bucks. Chalfont St. Peter, 1956 (Ansorge) ; Black Park, Fulmer (V.C.H., 1905).

**Campaea margaritata* Linn. I.L., M.21, H.20, E2.18, [E1.19], K.16, S.17, B.24.

The Light Emerald is a most handsome species when freshly emerged, as it flutters about bushes in wooded areas in July. It is found all over Britain, except the extreme north, and from the London Area has been reported in the 1898 list from Walthamstow, Hale End, Woodford, Hounslow, Highgate, Ealing, Southgate, Chiswick, Tooting, Richmond Park and Wimbledon Common. Other records from

Inner London. The Zoo, Regent's Park, in 1954 (Bushby).

Middlesex. Hounslow, one in 1954 (Pierce) ; Ruislip and Northolt in 1951 (J. Ward) ; Stanmore, common (Lorimer) ; Enfield (Edelsten) ; Hampstead and Harrow (Cockerell, *Lep. Middx.*, 1891).

HERTS. Watford, rare (Penrose) ; Totteridge (Lorimer) ; St. Albans, Oxhey, Broxbourne (Foster, *Lep. Herts.*, 1937).

KENT. Darenth Wood, 1952 (Hyatt) ; West Wickham, 1908 (Keywood) ; Hayes and Downe (Birchenough).

SURREY. Brixton (Farmer) ; Tadworth, Box Hill, 1954 (Wheeler) ; Ashtead and Esher (Gardner) ; Putney Heath and Epsom, 1933 (D. King) ; Bookham (Wheeler) ; Weybridge (Messenger).

BUCKS. Chalfont St. Peter, 1956 (Ansorge).

**Angerona prunaria* Linn. (M.21), H.20, E2.18, E1.19, K.16, S.17.

The Orange Moth is another of our species which lends itself to great variation and it has been bred on a large scale with this end in view. Although it has been taken over most of England and in the west of Ireland, it is by no means common everywhere. It appears in late June and is recorded in the 1898 list and Suppt. from Hale End, Chingford, Wandsworth, Eltham and Wimbledon Common, also from

MIDDLESEX. Bishop's Wood, Hampstead (Cockerell, *Lep. Middx.*, 1891).

HERTS. Bricket Wood, Oxhey, Haileybury and East Barnet (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest, 1903 (Meldola : Hope Dept. Collection, Oxford).

KENT. Abbey Wood, 1951 (J. Burton) ; West Wickham and Darenth (West, *Ent. Rec.*, 1906) ; Dartford and Greenhithe (V.C.H., 1908).

SURREY. Oxshott, 1903 (Sidgwick : Hope Dept. Collection, Oxford) ; Mickleham, 1911 (Waters : id.) ; Reigate (V.C.H., 1902).

**Semiothisa notata* Linn. E2.18, K.16, S.17.

The Peacock Moth is a somewhat local insect appearing in June and again in August in birch woods in most parts of the eastern and south-eastern counties. It is rare in the west, but is found in the Midlands up to Lancashire and then in the western Highlands and also in Kerry. The 1898 list only reports it from Croydon, Coombe Wood and Shirley, also recorded from

ESSEX. Brentwood (V.C.H., 1903).

KENT. Abbey Wood, 1947 (Showler) ; Joyden's Wood (D. Owen) ; West Wickham, 1950 (Trundell) ; Hayes and Downe (Birchenough) ; Darenth (West, *Ent. Rec.*, 1906) ; Chislehurst, Dartford, Greenhithe (V.C.H., 1908).

SURREY. Limpsfield Chart (Cockayne) ; Esher and Oxshott (V.C.H., 1902).

**Semiothisa alternaria* Hübn. S.17.

The Sharp-angled Peacock is distinguishable from the last species by the sharper outline to the wings, across the centre of which there is a shaded band. It is even more local, being found rather sporadically over the southern English counties, also in South Wales and up to Westmorland. It is also double-brooded and its larva feeds on rather stunted sallows such

as occur in the bogs in the New Forest. It is only given for Coombe Wood in the 1898 list and there are two other records for SURREY from Weybridge on August 4, 1952, and again in 1956 (Messenger), also from Reigate (V.C.H., 1902).

**Semiothisa liturata* Clerck M.21, H.20, K.16, S.17.

The Tawny-barred Angle is a well-known insect in pine clad areas over the British Isles up to the Caledonian Canal. A melanic form ab. *nigrofulvata*, fairly prevalent in the north, is appearing of late in the southern counties. Like the two preceding species it is on the wing in June and August. It is mentioned in the 1898 list and Suppt. from Hammersmith, Harrow, Croydon, Coombe Wood, and Wimbledon Common.

MIDDLESEX. Highgate, 1911 (Andrewes) ; Stanmore, common (Lorimer) ; Ruislip area, rare (Minnion).

HERTS. Totteridge, common (Lorimer) ; Bushey Heath and Hoddesdon (Foster, *Lep. Herts.*, 1937).

KENT. Orpington, 1951 (Siggs) ; West Wickham (Trundell) ; Joyden's Wood (D. Owen) ; Hayes and Downe (Birchenough) ; Plumstead, Greenhithe (V.C.H., 1908).

SURREY. Brixton (Farmer) ; Tadworth, 1952 (Wheeler) ; Esher and Bookham (Gardner) ; Richmond Park, 1905 (W. Cox) ; Oxshott (V.C.H., 1902) ; Putney, one, June 1951 (H. Swain).

BUCKS. Chalfont St. Peter, 1957 (Ansorge).

Isturgia limbaria Fabr. (E2.18), (K.16).

The Frosted Yellow can be truly listed among our lost species. Formerly it was known chiefly from the eastern counties, from Suffolk and Essex where it affected old broom, its foodplant. It was last reported in numbers from that area in 1912, though there are still occasional rumours of its reappearance in those parts. It has also been recorded from the Highlands and also in bygone days from the London Area where it was mentioned as occurring near Grays in ESSEX in 1869 by Dr. Gill (V.C.H., 1903) and also that it was formerly abundant at Greenhithe in KENT (V.C.H., 1908).

**Itame wavaria* Linn. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The V-Moth is a regular suburban insect, since its chief habitat is fruit gardens where currants and gooseberries are grown and the larvae are known to do damage to these bushes. It ranges in August all over Wales, England, most of Scotland and certainly the east of Ireland and is reported from the whole of the London Area, notably in the 1898 list from Paddington, Highgate, Hammersmith, Hackney, Clapton, Walthamstow, Woodford, Dulwich, and Wimbledon, also from all the more distant zones of the Area.

**Chiasmia clathrata* Linn. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Latticed Heath is often a most abundant insect on downland in May and August in the south and east of England, though its range extends to the edge of the Highlands and it is widespread in Ireland. It is very subject to variation, almost white examples being known, while a melanic

form ab. *nocturnata* is becoming increasingly prevalent in the South. The 1898 list mentions it from Woodford, Croydon, Shirley and Harrow. Elsewhere from

MIDDLESEX. Ruislip area, common (Minnion) ; Hounslow, 1955 (Pierce) ; Mill Hill, common in 1955 (Goater) ; Southall, 1949 (J. Ward).

HERTS. Totteridge, common (Lorimer) ; Watford (Penrose) ; generally distributed (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Clark, 1898).

KENT. Joyden's Wood, 1948 and Abbey Wood, 1952 (Hyatt) ; West Wickham, 1920 (Keywood) ; Pett's Wood, and Chelsfield, 1951 (A. Swain) ; Shoreham, 1953 (Siggs) ; Hayes and Downe (Birchenough) ; Lee, Eltham, Bexley and Dartford (V.C.H., 1908) ; Forest Hill and Shooter's Hill (West, *Ent. Rec.*, 1906).

SURREY. Epsom, 1929, and Sheen Common, 1930 (D. King) ; Bookham Common (van Emden) ; Coulsdon, 1941-47 (Wheeler) ; Merton Park (Nott) ; Wimbledon Common (*Entom.*, 1871, **5**, 422) ; Box Hill (West, *Ent. Rec.*, 1906) ; Weybridge (Messenger).

BUCKS. Black Park, Fulmer (V.C.H., 1905).

* *Theria rupicapraria* Hübn. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Early Moth, as its name implies, is almost the first geometer to appear in the year, often being seen on warm nights in January at rest on hawthorn whence its wingless female may be dislodged by tapping. It is found all over England to the Lowlands and is also widely distributed in Ireland. It is known from most parts of the Area according to the 1898 list which gives it from Hampstead, Highgate, Harrow, Muswell Hill, Hale End, Tottenham, Chingford, Sydenham, Chiswick and Richmond Park.

MIDDLESEX. Ruislip area (Minnion) ; Mill Hill, Whitton and Harefield (Cockerell, *Lep. Middx.*, 1891).

HERTS. Watford, rare (Penrose) ; generally distributed (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Clark, 1898).

KENT. Pett's Wood, 1949 (A. Swain) ; West Wickham (Trundell) ; Kidbrooke (West, *Ent. Rec.*, 1906) ; Bromley (Lawrence : Hope Dept. Collection, Oxford).

SURREY. Surbiton (Kaye) ; West Ewell (Gardner) ; Tadworth, Feb. 1952 (Wheeler) ; Chipstead, 1946 (Johnson) ; Weybridge (Messenger).

BUCKS. Chalfont St. Peter (V.C.H., 1905).

* *Erannis aurantiaria* Esp. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Scarce Umber somewhat belies its name, since it is a very widespread and quite common species over Great Britain up to the fringe of the Highlands. It also occurs in Ireland. It appears in the late autumn, chiefly in November when it may be found clinging to twigs. The female is almost wingless. The 1898 list gives it from Hale End, Stamford,

Tottenham, Hackney, Highgate, Southall, Hammersmith, Croydon, Lewisham, Richmond Park and Wimbledon Common, elsewhere from

INNER LONDON. Chancery Lane (Selwyn Image : *Entom.*, 1897, **30**, 18).

MIDDLESEX. Ruislip, larvae 1950 (J. Ward) ; Mill Hill, 1955 (Goater) ; Hampstead and Harefield (Cockerell, *Lep. Middx.*, 1891).

HERTS. Totteridge, common (Lorimer) ; St. Albans, Haileybury, East Barnet, Hoddesdon and Broxbourne (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Clark, 1898) ; also abundant there in 1932 (C. de W.).

KENT. Pett's Wood, 1951 (A. Swain) ; West Wickham (Trundell) ; Orpington, 1949 (Siggs) ; Hayes, Downe (Birchenough) ; Chislehurst and Eltham (V.C.H., 1908).

SURREY. Claygate, Nov. 1933 (Keywood) ; Putney Heath, 1929, and Sheen Common, 1933 (D. King) ; Tadworth and Bookham, 1949 (Wheeler) ; Chipstead, 1946 (Johnson) ; Weybridge, rare (Messenger).

BUCKS. Chalfont St. Peter, 1956 (Ansorge).

**Erannis marginaria* Borkh. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Dotted Border is a very common insect in the early part of the year when it can be found at rest on twigs in March. It ranges all over England to the Highlands and is widespread in Ireland. In the north of England a dark brown form ab. *fuscata* is fairly prevalent. The moth has been taken in every part of the London Area, being recorded in the 1898 list from Earl's Court, Hampstead, Kilburn, Ealing, Isleworth, Lewisham, Richmond and Wimbledon Common, also from Brixton (Farmer) and Epping Forest (Gardner).

**Erannis leucophaearia* Schiff. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Spring Usher is another very well-known moth and, as its name implies, its appearance in February in numbers usually portends that the worst of the winter has passed. It is very variable and the melanic form ab. *merularia* is becoming increasingly common in the South. It occurs all over England, Wales and Scotland up to the Highlands, but seems unknown in Ireland. The female, which is devoid of wings, is seldom seen, except when bred from the larvae which sometimes do much damage to oaks. The 1898 list mentions it from almost all quarters, including Highgate, Hammersmith, Southall, Chiswick, Tottenham, Dulwich, Sydenham, Richmond Park and Wimbledon Common. It is widely distributed in Epping Forest and has been noted from all the further parts of the Area.

**Erannis defoliaria* Clerck M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Mottled Umber is another species subject to almost unending variation, hardly two specimens being exactly similar. In some localities a fairly large proportion of the population is melanic as is the case in Epping Forest where quite 10 per cent of the individuals exhibit these tendencies, having black bands on the forewings and dusky hindwings.

The insect is one of the winter species with a wingless female occurring from October to January over most of the British Isles up to the northern Highlands. The larvae are liable to do great damage to tree foliage. It has been reported from all over the London Region with Clapton, Dalston, and Tooting given in the 1898 list ; also noted from Blackheath (Hyatt), Hounslow (Pierce), Enfield (Edelsten) and Wimbledon Common (van Emden).

**Alsophila aescularia* Schiff. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The March Moth is another very plentiful insect in the early part of the year, to be found with a wingless female in all parts of these Islands up to the middle Highlands. It too has a tendency to melanism, especially in the North. The 1898 list describes it as common everywhere, except in the more central regions, though it has been recorded from Regent's Park (Cockerell, *Lep. Middx.*, 1891). In the more outlying areas it has been noted from Epping Forest (Edelsten), Ruislip (J. Ward), Joyden's Wood, 1949 (Hyatt) and Tadworth, 1954 (Wheeler).

**Anagoga pulveraria* Linn. M.21, H.20, E2.18, K.16, S.17.

The Barred Umber is by no means a common moth, although it is found in most parts of Great Britain in May and June when it is wont to come fairly freely to light. In the 1898 list it is only mentioned from Highgate Woods and as being rare in the south-eastern quarter of the Metropolitan district. Also noted from

Middlesex. Northolt, larvae in 1951 (J. Ward).

Herts. Bricket Wood, Haileybury, Watford, and Broxbourne (Foster, *Lep. Herts.*, 1937).

Essex. Epping Forest (Edelsten).

Kent. Bred from Darenth Wood (West, *Ent. Rec.*, 1906) ; Bexley, Eltham and Farningham (V.C.H., 1908).

Surrey. Ashtead, May 1953 (Greenhill) ; Reigate and Addiscombe (V.C.H., 1902).

**Plagodis dolabraria* Linn. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

This pretty moth, the Scorch-wing, is sometimes very prevalent at light in late May. It has been found in almost every English and Welsh county ranging up to the Highlands and occurs in Ireland. The 1898 list and 1902 Suppt. record it from Clerkenwell, Hampstead, Highgate Woods, Mill Hill, Greenwich Park, Ham Common, Richmond Park and Wimbledon.

Middlesex. Ruislip and Northolt in 1946 (J. Ward) ; Mill Hill, 1955 (Goater).

Herts. St. Albans, Bricket Wood, Watford, Bushey Heath and Hoddesdon (Foster, *Lep. Herts.*, 1937).

Essex. Woodford Green, 1923 (Collenette) ; Epping Forest, 1951 (Rutherford) ; also there in 1890 (Sidgwick : Hope Dept. Collection, Oxford).

Kent. Pett's Wood, 1953 (A. Swain) ; Abbey Wood, 1953 (Showler); Orpington, 1954 (Siggs) ; Hayes, Downe (Birchenough) ; Dartford, Bexley, Eltham and West Wickham (V.C.H., 1908).

Surrey. Tadworth and Bookham Common, June 1954 (Wheeler) ; Weybridge (Messenger) ; Box Hill and Oxshott (V.C.H., 1902) ; Putney, one, 1951 (H. Swain).

Bucks. Chalfont St. Peter, 1956 (Ansorge) ; Black Park, Fulmer (V.C.H., 1905).

The next twelve species comprise the Thorns, a group of moths with somewhat indentated wings and with larvae having a very stick-like appearance with warts along the back.

**Ennomos autumnaria* Werb. I.L., K.16.

This fine insect, the Large Thorn, has only been known in this country since 1839. During the last century it was regarded as a rarity, only to be found on the south-east point of Kent and along the Sussex coast. It has spread considerably of late, occurring all along the Kent and Sussex coast to Gosport in Hants. It is now also widespread in parts of Essex and Suffolk. The moth does not as a rule appear till well into September when it comes freely to light. It has been bred on a big scale, producing some melanic forms. There is a single record in the 1898 list of a specimen taken on a truck at Holborn Viaduct Station in 1893 (Mitchell, *Ent. Rec.*, **3**, 301). The only other records for the Area are for Kent where it has been taken regularly at Pinden (Hare), also from Otford where seven were obtained in 1955 (Manley).

**Ennomos quercinaria* Hufn. (=*angularia* Borkh.). I.L., M.21, H.20, E2.18, K.16, S.17.

The August Thorn can be regarded as a regular Londoner, since some of the Parks in the Metropolis are its chief haunts. It is a most variable species, which produces some very beautiful forms, but it is by no means common everywhere, though it is widely spread over England, Wales, Ireland and Scotland up to the edge of the Highlands. It is usually on the wing in early August and sometimes flies freely in sunshine. For the London district, the 1898 list mentions it as common in Hyde Park and St. James's Park, also noted from Ladbroke Square, Kensington Gardens, Ealing, Highgate, Tottenham, Walthamstow, Hornsey, Chiswick, Dulwich, Barnes and Wimbledon Common. Elsewhere from

Inner London. The Zoo, Regent's Park in 1954 (Bushby).

Middlesex. Highgate, 1925 (Andrewes) ; Hounslow, a few 1954-56 (Pierce) ; Whitton and Harefield (Cockerell, *Lep. Middx.*, 1891).

Herts. Watford, rare (Penrose) ; Totteridge, common (Lorimer) ; Haileybury, East Barnet, Bushey, Hoddesdon, Broxbourne (Foster, *Lep. Herts.*, 1937).

KENT. Abbey Wood (Showler) ; Anerley, 1905 (Keywood) ; West Wickham (Birchenough) ; Orpington, 1953 (Siggs) ; Lee, Lewisham, Blackheath (West, *Ent. Rec.*, 1906) ; Eltham, Bexley and Chislehurst (V.C.H., 1908).

SURREY. Brixton (Farmer) ; Putney and East Sheen, 1931 (D. King) ; Weybridge, rare (Messenger) ; Surbiton, Croydon, Sutton and Reigate (V.C.H., 1902).

**Deuteronomos alniaria* Linn. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Canary-shouldered Thorn is a regular visitor to light from late August till October in almost all parts of the United Kingdom and Ireland. It has been noted from many quarters of the London Area according to the 1898 list, from Maida Vale, Wood Green, Highgate, Hale End, Forest Gate, Woodford, Bromley, Streatham, Barnes Common and Wimbledon.

MIDDLESEX. Mill Hill, few in 1955 (Goater) ; Highgate (Andrewes) ; Potter's Bar 1953 (Odell) ; Ruislip (Minnion) ; Stanmore, common (Lorimer) ; Hampstead Heath, Hammersmith and Ealing (Cockerell, *Lep. Middx.*, 1891).

HERTS. Watford, common (Penrose) ; St. Albans, Haileybury, Cheshunt, Bushey and Hoddesdon (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Clark, 1898).

KENT. Orpington, 1951 (Siggs) ; Hayes, Downe (Birchenough) ; Blackheath, Shooter's Hill (D. Owen) ; Pett's Wood and Chelsfield, 1950 (A. Swain) ; Anerley, Oct. 1905 (Keywood) ; Lee and Greenwich (West, *Ent. Rec.*, 1906).

SURREY. Brixton (Farmer) ; East Sheen, 1928 and Putney, 1937 (D. King) ; Banstead (Gardner); Bookham, 1931, and Coulsdon and Tadworth, 1953 (Wheeler) ; Wimbledon, 1929 (D. King) ; Weybridge (Messenger) ; Surbiton, Reigate (V.C.H., 1902).

BUCKS. Chalfont St. Peter, 1957 (Ansorge).

**Deuteronomos fuscantaria* Haworth I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Dusky Thorn is another of this group which appears fairly late in the year, usually in September and October. Its foodplant is normally ash and it is to be found all over England up to the Border. For the London Area the 1898 list and 1902 Suppt. give it from Clapton, Woodford, Leyton, Stratford, Crouch End, Highgate, Dulwich, Norwood, Richmond and Wimbledon Common.

INNER LONDON. The Zoo, Regent's Park, 1954 (Bushby).

MIDDLESEX. Mill Hill, fairly common in 1955 (Goater) ; Stanmore, common (Lorimer) ; Greenford, one in 1950 (J. Ward) ; Hounslow, one in 1955 (Pierce) ; Enfield (Edelsten) ; Acton and Whitton (Cockerell, *Lep. Middx.*, 1891).

HERTS. Watford, common (Penrose) ; St. Albans, East Barnet, Haileybury, Broxbourne and Hoddesdon (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Clark, 1898).

KENT. Orpington, 1949 (Siggs) ; Abbey Wood (Showler) ; Pett's Wood and Chelsfield, 1951 (A. Swain) ; West Wickham (Trundell) ; Charlton, Lee, Greenhithe, Eltham (V.C.H., 1908) ; Greenwich Park (West, *Ent. Rec.*, 1906).

SURREY. Barnes (Gardner) ; Ashtead (Greenhill) ; Tadworth, 1954 (Wheeler); East Sheen, 1931, and Putney, 1937 (D. King) ; Chipstead, a few in 1946 (Johnson) ; Peckham (*Ent. Annual*, 1860) ; Weybridge (Messenger) ; Worcester Park and Reigate (V.C.H., 1902).

BUCKS. Chalfont St. Peter (Ansorge).

**Deuteronomos erosaria* Borkh. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The September Thorn is a peculiar species in that it produces a generation which is on the wing in late July and early August, while a larger form appears in September and October. It is not uncommon over England and Wales ranging up to the Highlands, but is rare in Ireland. The 1898 list and Suppt. note it from Hackney, Highgate, Barnes, Eltham, Blackheath and Wimbledon Common.

MIDDLESEX. Hampstead (*Ent. Annual*, 1869) ; Mill Hill, 1955 (Goater); Ruislip, scarce (Minnion) ; Pinner (Cockerell, *Lep. Middx.*, 1891).

HERTS. Watford, common (Penrose) ; Haileybury, Bushey, St. Albans, Hoddesdon (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Clark, 1898).

KENT. Pett's Wood, 1947 (A. Swain) ; West Wickham (Trundell) ; Bexley, Lee, Eltham (V.C.H., 1908) ; Otford, 1955 (Manley).

SURREY. East Sheen, Sept. 1929 (D. King) ; Weybridge (Messenger) ; Epsom, Reigate, Worcester Park (V.C.H., 1902).

BUCKS. Chalfont St. Peter, 1957 (Ansorge).

**Selenia bilunaria* Esp. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Early Thorn is the first of this genus to appear, being often on the wing in late March with a second brood in August. It lends itself to considerable variation, many remarkable forms having been bred with often a great tendency to melanism. It is generally distributed throughout the British Isles, except in the far north and has been reported from every region of the London Area. It was taken in the Zoo, Regent's Park, in 1954 (Bushby), also noted in the 1898 list as common in Epping Forest and is recorded also from Hackney, Croydon, Forest Hill, Hampstead, Highgate, Finchley, Dulwich, Forest Hill, Richmond and Wimbledon Common, as well as from Watford (Penrose), Northolt (J. Ward), and all the outlying zones of the Area.

**Selenia lunaria* Schiff. M.21, H.20, E2.18, K.16, S.17, B.24.

The Lunar Thorn is by no means an easy insect to obtain. It is always very local, though commoner in the Highlands than in the south of England where it is wont to appear from late May to mid-June and is as a rule single-brooded. It has been taken fairly widely over the London Area,

notably in the 1898 list and 1902 Suppt. from Woodford, Tottenham, Highgate, Wood Green, Stratford, Southall, Forest Hill and Wimbledon Common. Also from

MIDDLESEX. Stanmore, one in May 1951 (Lorimer) ; Potters' Bar on June 13, 1953 (Odell) ; Ruislip, rare (Minnion) ; Northwood, 1936 (Fletcher).

HERTS. St. Albans, Haileybury, East Barnet, Watford, Oxhey and Cheshunt (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Buxton, 1890).

KENT. Darenth Wood (D. Owen) ; West Wickham (Trundell) ; Bexley (C. Fenn : *Proc. South London Entom. Soc.*, 1893) ; Pinden, a few 1945-49 (Hare) ; Dartford, Lee, Bexley, Eltham (V.C.H., 1908) ; Abbey Wood (Showler).

SURREY. Worcester Park (Kaye) ; Weybridge, one on May 18, 1953 (Messenger) ; Worcester Park and Redstone (V.C.H., 1902).

BUCKS. Chalfont St. Peter, 1957 (Ansorge).

**Selenia tetralunaria* Hufn. M.21, H.20, E2.18, K.16, S.17, B.24.

This handsome moth, the Purple Thorn, usually appears first in late April and then again in August in a smaller form. It is found all over England up to the Midlands, but is less common in the northern counties. However, it is often abundant in the Highlands. The 1898 list and Suppt. only mention it from Eltham, Hagger Lane Forest and as occurring in the south-east region of the Area.

MIDDLESEX. Ruislip, scarce (Minnion) ; Stanmore (Lorimer) ; Enfield (Edelsten).

HERTS. Oxhey (Fletcher) ; Totteridge (Lorimer) ; Watford, rare (Penrose) ; East Barnet, Haileybury, Broxbourne, Hoddesdon, Cheshunt (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Buxton, 1890).

KENT. West Wickham (Trundell) ; Orpington, 1955 (Siggs) ; Hayes, Downe (Birchenough) ; Darenth (West, *Ent. Rec.*, 1906) ; Otford, 1955 (Manley) ; Dartford and Eltham (V.C.H., 1908).

SURREY. Shirley Hills (Wild) ; Tadworth, May 1954 (Wheeler) ; Esher (Gardner) ; Chipstead, one in April, 1946 (Johnson) ; Weybridge (Messenger) ; Oxshott (V.C.H., 1902).

BUCKS. Chalfont St. Peter, 1956 (Ansorge) ; Black Park, Fulmer (V.C.H., 1905).

**Apeira syringaria* Linn. M.21, H.20, E2.18, K.16, S.17.

The Lilac Beauty is an exceedingly attractive insect which is often more freely met with as its remarkable larva which is to be found in the spring looking like a piece of twig on stems of honeysuckle and privet. The moth is out in July over the southern part of England, being less common in the northern counties and very scarce in Ireland. It is enumerated from a number of places in the 1898 list and Suppt., from Hale End, Chingford,

Woodford, Hendon, Highgate, Southgate, Ealing, Finchley, Mill Hill, Hounslow, Ham Common and Wimbledon Common.

MIDDLESEX. Ruislip (Minnion) ; Uxbridge, larvae (J. Ward) ; Mill Hill, larvae abundant on privet (South, ii, 278) ; Hampstead, Whitton and Harefield (Cockerell, *Lep. Middx.*, 1891) ; Enfield (Edelsten).

HERTS. St. Albans, Haileybury, Cheshunt, Broxbourne, Hoddesdon, East Barnet (Foster, *Lep. Herts.*, 1937).

KENT. Chelsfield, 1953 (A. Swain) ; Lee, Bexley, West Wickham and Eltham (V.C.H., 1908).

SURREY. Claygate, 1933 (Keywood) ; Selsdon Wood, 1950 (Birchenough) ; Arbrook Common (Stallwood) ; Bookham Common, larvae (van Emden) ; East Sheen, July, 1929 (D. King); Chipstead, 1946 (Johnson) ; Weybridge, rare (Messenger) ; Worcester Park, Reigate and Oxshott (V.C.H., 1902).

**Gonodontis bidentata* Clerck I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Scalloped Hazel is an extremely prevalent species in May and early June throughout the British Isles, almost to the northernmost limits. It is subject to considerable variation, chiefly in the tint of its ground colour. In some of the northern counties an entirely black form is of regular occurrence. It has been recorded from almost every part of the London Area, even from the Zoo, Regent's Park, in 1954 (Bushby), also in the 1898 list from Hampstead Heath, Highgate, Muswell Hill, Finchley, Walthamstow, Hale End, Woodford, Forest Hill, Petersham and Sydenham and from all the main outlying areas.

**Crocallis elinguaria* Linn. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Scalloped Oak is another very common insect with a range all over Great Britain, except the extreme north. It too displays a great degree of variation, chiefly as regards the intensity of the cross-band on the forewings which is sometimes absent in specimens from the Highlands. It is on the wing in August and comes freely to light. Like the last species it has been noted from nearly all areas in the London region, being recorded in the 1898 list from the centre at Paddington, also from Hackney, Islington, Highgate, Walthamstow, Woodford, Dalston, Lee, Brockley, Dulwich, Barnes, and Wimbledon Common, as well as from Epping Forest (Clark), Brixton (Farmer), Putney (D. King), and Bletchingley, 1957 (Hancock).

**Colotois pennaria* Linn. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Feathered Thorn is the latest of this group to be on the wing, since it seldom appears before November when it sometimes swarms at light. It occurs all over the country up to Moray and has been recorded widely for the London Area, notably in the 1898 list and Suppt. from Clerkenwell, Highgate, Enfield, Muswell Hill, Tottenham, Hale End, Stratford, Chiswick, Forest Hill, and Dulwich and Wimbledon Common.

MIDDLESEX. Hounslow (Pierce) ; Hampstead (*Ent. Annual*, 1868) ; Ruislip (Minnion) ; Mill Hill, Whitton, Harefield, Ealing, Hampstead (Cockerell, *Lep. Middx.*, 1891).

HERTS. Totteridge, common (Lorimer) ; generally distributed (Foster, *Lep. Herts.*, 1937) ; Watford, scarce (Penrose).

ESSEX. Epping Forest (Clark, 1898).

KENT. Orpington, 1949 (Siggs) ; Pett's Wood, Chelsfield, 1951 (A. Swain) ; West Wickham (Trundell) ; Blackheath and Darenth (West, *Ent. Rec.*, 1906) ; Hayes and Downe (Birchenough).

SURREY. Wimbledon Common, 1929, Epsom, 1923, Putney, 1929 (D. King) ; Coulsdon, 1946, Tadworth, 1952, also Bookham (Wheeler) ; Chipstead, 1946 (Johnson) ; Oxshott, 1930 (C. de W.) ; Weybridge (Messenger).

BUCKS. Chalfont St. Peter (Ansorge).

**Ophisthograptis luteolata* Linn. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Brimstone Moth is one of the commonest and most widespread of our Geometers, being known from every quarter of these Islands from May throughout the summer. In the London Area it is also reported from almost all over the region, from the Zoo, Regent's Park (Bushby), also in the 1898 list from Paddington, Ladbroke Square, Highbury, Highgate, Clapton, Hackney, Woodford, and Brixton (Farmer).

**Cepphis advenaria* Hübn. (M.21), K.16.

The Little Thorn is often abundant in May in many parts of the southern counties of England where bilberry (*Vaccinium*) flourishes. It is found sporadically up to the north as far as Yorkshire and rarely in Ireland. There is only one record in the 1898 list from Ealing and it has also been recorded from KENT at Westerham (C. Edwards).

**Epione repandaria* Hufn. (=*apiciaria* Schiff.). M.21, H.20, E2.18, E1.19, K.16, S.17.

The Bordered Beauty is quite a frequent species in August, mainly in marshy spots all over the British Isles up to Sutherland and has been met with in most regions of the London Area. The 1898 list and 1902 Suppt. report it from Highgate, Southall, Mill Hill, Tottenham, Buckhurst Hill, Eltham, Mitcham, Beckenham, Dulwich and Wimbledon Common.

MIDDLESEX. Enfield (Edelsten) ; Hampstead, Hammersmith, Harefield and Whitton (Cockerell, *Lep. Middx.*, 1891).

HERTS. Bricket Wood, Haileybury, Cheshunt, St. Albans, Bushey and Watford (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Clark, 1898).

KENT. Lee, Eltham, Dartford, Greenhithe (V.C.H., 1908).

SURREY. Oxshott (Kaye) ; Esher (Gardner) ; Chertsey Meads on Oct. 1, 1953 (Bretherton) ; Weybridge (Messenger).

**Pseudopanthera macularia* Linn. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

This pretty little moth, The Speckled Yellow, is a familiar sight in wooded spots in May as it darts up from the herbage by day. It occurs in most parts of the British Isles, except the northern parts of the Highlands and sometimes produces some remarkable aberrations, all yellow specimens and also others entirely brown in colour being known. The 1898 list only notes it from Hackney, Ealing, Croydon, Shirley and Wimbledon Common.

Middlesex. Ruislip and Northolt (J. Ward) ; Hampstead, Pinner and Harrow Weald (Cockerell, *Lep. Middx.*, 1891).

Herts. Watford, rare (Penrose) ; Hoddesdon, 1952 (Rutherford) ; Bricket Wood, Haileybury, Hoddesdon and Broxbourne (Foster, *Lep. Herts.*, 1937).

Essex. Loughton (Gardner) ; Epping Forest, 1948 (Wheeler).

Kent. Pett's Wood, Eynsford, Chelsfield, 1949 (A. Swain) ; Sundridge Park, 1947, Darenth Wood, 1952, Shoreham, 1952 (Hyatt) ; West Wickham, 1906 (Keywood) ; Farningham (Wheeler).

Surrey. Box Hill (Wheeler) ; Oxshott, 1928 (D. King) ; Claygate (V.C.H., 1902).

Bucks. Chalfont St. Peter (Ansorge).

**Lithina chlorosata* Scop. (= *petraria* Hübn.). I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Brown Silver-line is a very prevalent species in May and June among bracken in most parts of Great Britain up to the Western Highlands. It has been widely obtained in the London Area, being noted in the 1898 list from Ladbroke Square, Hampstead, Highgate, Tooting, Ealing, Croydon, Richmond Park and Wimbledon Common, also from

Inner London. City Bombed Sites, 1948 (D. Owen).

Middlesex. Ruislip, Sudbury and Uxbridge, 1950 (J. Ward) ; Elstree, common (Lorimer) ; Harrow and Whitton (Cockerell, *Lep. Middx.*, 1891).

Herts. Watford, common (Penrose) ; Bricket Wood, Broxbourne, Haileybury, Northaw, Bushey Heath and Oxhey Woods (Foster, *Lep. Herts.*, 1937).

Essex. Epping Forest (Clark, 1898).

Kent. Pett's Wood and Chislehurst, 1950 (A. Swain) ; Hayes, 1947, Darenth and Joyden's Wood, 1952 (Hyatt) ; West Wickham and Shooter's Hill (West, *Ent. Rec.*, 1906).

Surrey. Tadworth, 1954, and Bookham (Wheeler); Oxshott, 1930 (D. King) ; Richmond Park (Gardner) ; Weybridge (Messenger).

Bucks. Chalfont St. Peter (V.C.H., 1905).

**Pachycnemia hippocastanaria* Hübn. E2.18, K.16, S.17.

The Horse Chestnut is a most peculiar insect as regards its time of appearance, since it is often seen as early as February and is apparently on

the wing most of the summer on heathy ground in all the southern English counties, but does not seem to penetrate far north. In the 1898 list it is only named from Shirley and Addington Hills.

Essex. Rochford (Stephens, V.C.H., 1903).

Kent. West Wickham and Chislehurst (V.C.H., 1908).

Surrey. Esher, March 1936 (Keywood) ; Oxshott (Kaye) ; Bookham Common and Tadworth, August 1953 (Wheeler) ; Weybridge, rare (Messenger) ; Croydon, 1920 (Webb : Hope Dept. Collection, Oxford).

**Ourapteryx sambucaria* Linn. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Swallow-tailed Moth is one of the most well-known of our lepidoptera as it flits about hedges and woods in July all over England and Wales to the Western Highlands. It is widespread in Ireland where the form is distinctly yellower than the normal type. It has been recorded from all over the London region, notably from Paddington, Ladbroke Square, Highbury, Hammersmith, Dalston, Hackney, Dulwich, Croydon and Wimbledon Common in the 1898 list, also from Brixton (Farmer), Hounslow (Pierce), Ealing (Baynes) and Grove Park, 1948 (Hyatt).

The final series of the Geometers is usually classed as the Boarmiinae. They are mostly soberly coloured and the majority are wont to sit about on tree trunks, fences, etc. Nearly all the species have a tendency to melanism.

**Phigalia pedaria* Fabr. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Pale Brindled Beauty is probably the first moth to appear in the new season, sometimes being taken even in December. It is fairly variable in ground colour, while the Scottish form which is on the wing in March, is distinctly larger and paler. The black ab. *monacharia* which is prevalent in the north of England, is becoming increasingly numerous in the South in recent years. The species is very common all over the London Area in the late winter and has been noted from Hampstead, Hammersmith, Highgate, Tottenham, Hale End, Finsbury Park, Chiswick, Barnes and Wimbledon Common in the 1898 list, as well as from Epping Forest (Clark, 1898), Shooter's Hill (Burton) and from all the suburban districts and outlying zones.

**Apocheima hispidaria* Fabr. M.21, H.20, E2.18, E1.19, K.16, S.17.

The males of the Small Brindled Beauty sometimes come in great plenty to light on warm nights in late February and early March among oak in most areas of the south of England up to the northern counties. They can often, too, be found at rest on trunks and fences, but as in the last species, the wingless female is seldom seen as it runs up the oak stems at dusk. It is only recorded in the 1898 list and Suppt. from Hale End, Chingford, Richmond Park and Wimbledon Common.

Middlesex. Ruislip and Northolt (J. Ward) ; Bishop's Wood, Hampstead (Cockerell, *Lep. Middx.*, 1891).

HERTS. Watford, one only (Penrose) ; Cheshunt, St. Albans, Hoddesdon and Broxbourne (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Edelsten).

KENT. Beckenham (Birchenough) ; Hayes Common, 1948 (Hyatt) ; Pett's Wood, 1948 (A. Swain) ; Bexley, Shooter's Hill, West Wickham (V.C.H., 1908).

SURREY. Tadworth, March, 1954, and Bookham Common (Wheeler) ; Chipstead, one in 1946 (Johnson) ; Richmond Park, 1878 (Meldola : Hope Dept. Collection, Oxford) ; Shirley Hills (Wild) ; Wimbledon Common, at rest in 1947 (C. de W.) ; Weybridge (Messenger) ; Ewell, Norbury and Betchworth (V.C.H., 1902) ; Putney, two (H. Swain).

**Lycia hirtaria* Clerck I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Brindled Beauty must be one of the most well-known London moths, since it is probably nowhere commoner than in the centre of the Metropolis where in early April as soon as the leaves begin to appear, it can sometimes be seen in hundreds on tree trunks in the parks. The males come readily to light. An all-black form has been recently bred extensively from this source, while in the Highlands a large and pale type is prevalent. It has been noted in the 1898 list and by other authors from nearly every part of Central London as well as from all the suburban areas. It is reported as common in Epping Forest (Clark), and plentiful in the woods in KENT and HERTS., also widespread round Wimbledon (van Emden).

**Biston strataria* Hufn. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Oak Beauty is a very spectacular insect when it appears at light in March and early April. It occurs all over southern England up to the Midlands and also in Ireland. The female is seldom seen in the wild. Occasionally melanic examples devoid of the white markings are known. The 1898 list and 1902 Suppt. mention it from Highgate, Muswell Hill, Forest Hill, Eltham, Coombe Wood, Kingston Vale, Richmond Park and Wimbledon Common. Elsewhere from

INNER LONDON. The Zoo, Regent's Park, 1954 (Bushby).

MIDDLESEX. Ruislip, 1950, and Northolt, 1952 (J. Ward) ; Finchley and Whitton (Cockerell, *Lep. Middx.*, 1891) ; Hampton, 1930 (Keywood) ; Mill Hill, 1955 (Goater) ; Hounslow (Pierce) ; Enfield (Edelsten).

HERTS. Watford, rare (Penrose) ; Totteridge, common (Lorimer) ; St. Albans, Cheshunt, East Barnet, Hoddesdon, Broxbourne (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Edelsten).

KENT. Hayes Common, 1948 (Hyatt) ; Orpington, 1949 (Siggs) ; Pett's Wood (A. Swain) ; West Wickham (Trundell) ; Joyden's Wood (D. Owen) ; Hayes, Downe (Birchenough) ; Bexley and Eltham (V.C.H., 1908).

SURREY. Claygate, 1934 (Keywood) ; East Sheen 1932 (D. King) ; Bookham and Tadworth, 1953 (Wheeler) ; Banstead, Box Hill, 1951

(Wheeler) ; Chipstead, 1945 (Johnson) ; Weybridge (Messenger) ; Worcester Park and Redhill (V.C.H., 1902) ; Putney, 1951 (H. Swain).

Bucks. Chalfont St. Peter, 1957 (Ansorge).

**Biston betularia* Linn. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Peppered Moth is a species which has excited very special interest for a considerable time, since its melanic form ab. *carbonaria* is becoming more and more predominant in built-up and industrial areas, though it has not apparently reached the Highlands or Ireland where a very white form seems to prevail. Intermediate forms with a great proportion of black markings and speckling (ab. *insularia*) are not uncommon. The species which seems to come out all through the summer from May onwards is a very well-known London insect, being noted in the 1898 list from Paddington, Maida Vale, Shepherds Bush, Dalston, Tottenham, Hale End, Dulwich, Chiswick, Blackheath and Ham Common and more recently from the Zoo, Regent's Park (Bushby), Mill Hill, black form (Goater), Hounslow (Pierce), Epping Forest (Edelsten) and Wimbledon Common (van Emden).

**Hemerophila abruptaria* Thunb. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Waved Umber is another species which haunts the inner areas of the Metropolis, since it can often be found in early May at rest or as a larva on privet or lilac round the central London squares. Again this insect shows a great tendency to melanism. The deep-brown form ab. *fuscata* is sometimes commoner than the type in these parts. The species occurs all over England and Wales up to Lancashire, but is hardly known in Ireland or Scotland. It has been obtained in every part of the Area, notably from Paddington, Holloway, Regent's Park, Belsize Park, Grosvenor Square, Hammersmith, Hornsey, Chingford, Hackney, Woodford, Lewisham, and Wimbledon Common according to the 1898 list and in recent years from all the surrounding neighbourhoods.

**Boarmia roboraria* Schiff. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

This fine insect, the Great Oak Beauty, is our largest geometer. The males come sometimes in numbers to light in late June in big oakwoods throughout the south of England with a range up to Lancashire. The large female can often be found at rest on trunks. Again this species lends itself to melanism, frequently producing a dusky form and occasionally a very black one. Its only record in the 1898 list is from Richmond Park, but it has been taken in many other localities in the Area, notably from

Middlesex. Scratch Wood, a few (Lorimer) ; Stanmore (Watkins, *Entom.*, 1925, **58**, 190) ; Ruislip area (Minnion) ; Pinner Wood in July 1882 (Cockerell, *Lep. Middx.*, 1891).

Herts. Northaw, 1952 (Rutherford) ; Oxhey, 1938 (Fletcher) ; Haileybury, Whippendell, Broxbourne, Hoddesdon (Foster, *Lep. Herts.*, 1937).

Essex. Epping Forest (South ii, 309).

Kent. Joyden's Wood (D. Owen) ; Pett's Wood, 1947 (A. Swain) ;

West Wickham (Trundell) ; Shooter's Hill (West, *Ent. Rec.*, 1906).

SURREY. Oxshott, June 1928, and Wimbledon Common, 1928 (D. King) ; Bookham Common (Gardner) ; Selsdon Wood, common (Wild) ; Weybridge (Messenger) ; Redstone (V.C.H., 1902).

BUCKS. Chalfont St. Peter, 1957 (Ansorge) ; Black Park, Fulmer (V.C.H., 1905).

**Boarmia punctinalis* Scop. (=*consortaria* Fabr.). M.21, H.20, E2.18, K.16, S.17, B.24.

The Pale Oak Beauty appears at least a month before the last species, since it hibernates as a pupa. It is very prevalent in the south of England and extends up to the northern counties and is also found in south-west Ireland. A slightly melanic form ab. *humperti* is not uncommon. Only given in the 1898 list and Suppt. from Eltham, Coombe Wood, Richmond Park, and Wimbledon Common.

MIDDLESEX. Scratch Wood (Lorimer) ; Ruislip (Minnion) ; Uxbridge (Cockerell, *Lep. Middx.*, 1891).

HERTS. Watford, one (Penrose) ; Bricket Wood, Hoddesdon, Broxbourne, St. Albans (Foster, *Lep. Herts.*, 1937).

KENT. Biggin Hill, Eynsford, Darenth, 1947 (Hyatt) ; Orpington, 1952 (Siggs) ; Pett's Wood (A. Swain) ; West Wickham (Trundell) ; Hayes and Downe (Birchenough) ; Joyden's Wood (D. Owen).

SURREY. Putney Heath, East Sheen (D. King) ; Oxshott (D. King) ; Esher and Richmond (Gardner) ; Chipstead, one in May 1946 (Johnson) ; Wimbledon Common (Kidner) ; Redhill and Godstone (V.C.H., 1902).

BUCKS. Chalfont St. Peter (Ansorge).

Cleora ribeata Clerck (=*abietaria* Hübn.). H.20, E2.18, E1.19, S.17, B.24.

The Satin Beauty is sometimes a very frequent visitor to light among yew and spruce in July in some of the southern English counties, though it appears to be hardly known in the more easterly ones. This fine geometer can also be found at rest on tree trunks and in some areas a melanic form predominates. It is not mentioned in the 1898 list and has apparently only been recorded for

HERTS. Watford, one in 1948 (Penrose).

ESSEX. Epping Forest (V.C.H., 1903).

SURREY. Box Hill, 1905 (Kaye) ; also there (van Emden) ; Mickleham Down, larvae obtained on yews (C. de W.) ; also there in 1904 (Sidgwick : Hope Dept. Collection, Oxford) ; Redhill and Godstone (V.C.H., 1902).

BUCKS. Black Park, Fulmer (V.C.H., 1905).

Cleora lichenaria Hufn. M.21, H.20, K.16, S.17.

The Brussels Lace is a very pretty member of this group, appearing in July in woods where occurs the special lichen (*Usnea barbata*) on which the larva feeds. It is to be found over most of southern England up to the North as well as in parts of Scotland and the south-west of Ireland. Again

this insect is not enumerated in the 1898 list, but has been widely recorded from

MIDDLESEX. Pinner Woods (Cockerell, *Lep. Middx.*, 1891).

HERTS. Haileybury, East Barnet, Cheshunt, Oxhey, and Broxbourne (Foster, *Lep. Herts.*, 1937).

KENT. West Wickham (*Ent. Annual*, 1867) ; Dartford (V.C.H., 1908).

SURREY. Addington, bred (West, *Ent. Rec.*, 1906) ; Ashtead, Redhill, Box Hill (V.C.H., 1902).

Cleora cinctaria Schiff. E2.18.

The Ringed Carpet is one of the first of this genus to appear, since it is on the wing in late April when it can be readily found at rest, chiefly on fir trunks or rocks. It seems to have a broken range in these Islands, as it exists in only a few of the southern counties, such as Hampshire, Sussex and Surrey, also in Berks as well as in West Wales and right up to Perthshire and near Fortwilliam where a very bright and large form occurs as it also does in the south-west of Ireland. Its chief claim to the London list is an old record from Epping Forest (V.C.H., 1903).

Cleora rhomboidaria Schiff. (=*gemmaria* Brahm). I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Willow Beauty is a very well-known species in July throughout most of the British Isles. It produces many forms, chiefly showing a variation of the ground colour, while a melanic type ab. *rebeli*, is quite frequent in the London Area. The moth has been noted in the 1898 list from Paddington, Ladbroke Square, Hammersmith, Bedford Park, Stamford Hill, Clapton, Dalston, Woodford, Bromley and Streatham, also from Epping Forest (Clark, 1898), Brixton (Farmer), Battersea Park (Baynes), Highgate (Andrewes), Hampton, 1929 (Keywood), Wimbledon Common (van Emden), and as well from all the more distant parts of the Area.

Cleora repandata Linn. M.21, H.20, E2.18, K.16, S.17, B.24.

The Mottled Beauty is among the most variable moths on our list, since it differs in type from one locality to another. The form occurring in the eastern Highlands is grey, while that in the western parts of that region is deep brown. Again the Irish forms are lightly speckled, while in all areas there appears a form with a transverse pale band, ab. *conversaria* and also a melanic type which is especially prevalent in the north of England in July. For the London district it has been reported in the 1898 list from Highgate, Hampstead, Finchley, Harrow, Southgate, the Isle of Dogs, Croydon, Brockley and Wimbledon Common.

MIDDLESEX. Highgate (Andrewes) ; Mill Hill, 1955 (Goater) ; Scratch Wood, common (Lorimer) ; Stanmore (Fletcher) ; Ruislip, Northolt and Uxbridge, 1952 (J. Ward) ; Enfield (Edelsten).

HERTS. Watford, rare (Penrose) ; generally distributed (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Edelsten).

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KENT. Orpington, 1953 (Siggs); Grove Park and Hayes, 1948 (Hyatt); Pett's Wood, 1951 (A. Swain); Joyden's Wood (D. Owen); Hayes and Downe (Birchenough); West Wickham (Trundell); Blackheath (West, *Ent. Rec.*, 1906).

SURREY. Esher, Ashtead, Banstead (Gardner); Selsdon, 1953 (Barnett); Chipstead, a few in 1946 (Johnson); Tadworth and Bookham, 1954 (Wheeler); Weybridge (Messenger).

BUCKS. Chalfont St. Peter, 1956 (Ansorge).

Cleora jubata Thunb. (=*glabraria* Hübn.). K.16.

The Dotted Beauty is a very localized little moth which is sometimes abundant in August in its restricted haunts where the lichen *Usnea barbata*, its larval foodplant, grows in profusion. It seems to inhabit mainly the English counties from Sussex westwards, then to occur in Wales and north-west England, while in the south-west of Scotland, especially in Galloway and up to Argyllshire, it is widespread and the local form is larger and brighter than in the South. Sometimes it produces very remarkable aberrations. There appears to be only one authentic record for the London Area, of a larva obtained in West Wickham woods (Mannering, *Entom.*, 1910, **43**, 204).

Selidosema plumaria Schiff. (=*ericetaria* Vill). S.17.

The Bordered Grey is a denizen of heathland from early August with a range mainly in the western half of England up to North Wales and the Lake District. It also occurs in the Western Highlands and is common in the West of Ireland, mainly along the rocky coastline. It can often be flushed in the daytime. It is not in the 1898 list and the only records for the Area seem to be from SURREY where it has been noted from Esher (Gardner) and from Oxshott in 1904 (Kaye), also there and at Wisley (V.C.H., 1902).

**Ectropis bistortata* Goeze (=*biundularia* Borkh.). M.21, H.20, E2.18, K.16, S.17, B.24.

There has been a great deal of controversy about the true identity of this species, the Engrailed, and that of the next one. For a long time they were considered as one insect with generations following one another. Most recent authors recognize them as distinct species, separating them by the dates of their respective appearance. The insect under review is usually on the wing in late March with a second generation of smaller size in August and sometimes a third brood in October. It varies very greatly in ground colour, according to its habitat, all over the British Isles, while melanic examples occur, but are not so numerous as in the next species. The London 1898 list gives it only from Dulwich and Croydon. Elsewhere from

MIDDLESEX. Ruislip, 1951, and Northolt, 1952 (J. Ward); Hounslow two in 1954 (Pierce).

HERTS. Totteridge, common (Lorimer); Watford, common (Penrose); Bricket Wood, Bushey Heath, St. Albans, Northaw, Hoddesdon (Foster, *Lep. Herts.*, 1937).

Essex. Epping Forest (Edelsten).

Kent. West Wickham (Trundell) ; Keston, March 1948, Darenth, March 29, 1948, and Shoreham, July 9, 1952 (Hyatt); Pett's Wood, 1951 (A. Swain) ; Hayes and Downe (Birchenough) ; Abbey Wood and Shooter's Hill (West, *Ent. Rec.*, 1906).

Surrey. Arbrook Common, April 1934 (Keywood) ; Tadworth, Bookham, Oxshott and Chipstead (Wheeler) ; Weybridge, scarce, with one in October, 1956 (Messenger) ; Addington, April 1896 (Sidgwick : Hope Dept. Collection, Oxford).

Bucks. Chalfont St. Peter (Ansorge).

**Ectropis crepuscularia* Hübn. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

This species known as the Lesser Engrailed, seems to appear in late April and throughout May and only to produce one generation. It is as a rule paler in ground colour in normal examples than the last species and does not occur as far north, probably not reaching Scotland. Like the last species, this insect also sits on trunks, very largely those of larch. A deep grey form ab. *delamerensis* is often fairly common even in the South. The 1898 list reports it from Highgate, Hale End, Forest Hill, Croydon and Wimbledon Common, with other records from

Middlesex. Ruislip area (Minnion) ; Pinner Woods (Cockerell, *Lep. Middx.*, 1891).

Herts. Watford, rare (Penrose) ; same as for the previous species (Foster, *Lep. Herts.*, 1937).

Essex. Epping Forest (V.C.H., 1903) ; also there in May, 1904 (Meldola : Hope Dept. Collection, Oxford).

Kent. Orpington, 1955 (Siggs) ; West Wickham (Trundell) ; Hayes and Downe (Birchenough) ; Greenwich Park (West, *Ent. Rec.*, 1906).

Surrey. Bookham, 1951 (Wheeler) ; Oxshott, 1934, Wimbledon, May 9, 1930, and Richmond Park, May 29, 1930 (D. King); Chipstead, 1946 (Johnson) ; Weybridge (Messenger).

Bucks. Chalfont St. Peter, 1957 (Ansorge).

**Ectropis extersaria* Hübn. (=*luridata* Borkh.). M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Brindled White-spot is a very steady visitor to light in June in most parts of the south of England where there is oak or birch. Its range does not seem to extend further north than the Midlands. It is mentioned in the 1898 list from Hampstead Heath, Eltham, Croydon, Coombe Wood, and Richmond Park.

Middlesex. Ruislip district (Minnion).

Herts. Bricket Wood, Haileybury, Broxbourne, Aldenham, Hoddesdon (Foster, *Lep. Herts.*, 1937).

Essex. Epping Forest (E. N. Buxton, 1890).

Kent. Darenth (*Ent. Annual*, 1868) ; Pett's Wood, 1950 (A. Swain) ; West Wickham (*Entom.*, 1910, **43**, 204) ; Abbey Wood (West, *Ent. Rec.*, 1906) ; Bexley, Dartford, West Wickham (V.C.H., 1908).

SURREY. Addington (Birchenough) ; Esher (Gardner) ; Bookham Common, 1952 (Finnigan) ; Wimbledon Common (D. King) ; Weybridge (Messenger) ; Bookham Common (Wheeler).

BUCKS. Black Park, Fulmer (V.C.H., 1905).

**Ectropis consonaria* Hübn. H.20, E2.18, E1.19, K.16, S.17, B.24.

The Square Spot is another familiar geometer to be found at rest on trunks, mainly pines and spruce during May. It is very local over southern England and through Wales to the Lake District, while it is prevalent in the south-west of Ireland, chiefly around Killarney. An all-black form occurs in a few restricted localities, while in the Wye Valley there is a superb form ab. *waiensis*, with the outer border black and the inner area white. It is only noted in the 1898 list from Croydon.

HERTS. Broxbourne Woods (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (V.C.H., 1903).

KENT. Pett's Wood, 1951 (A. Swain) ; Blackheath, West Wickham and Shooter's Hill (West, *Ent. Rec.*, 1906).

SURREY. Box Hill, 1906 (Meldola : Hope Dept. Collection, Oxford).

BUCKS. Black Park, Fulmer (V.C.H., 1905).

**Aethalura punctulata* Schiff. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Grey Birch is a further very common insect on tree trunks from late April to June in all parts of England and Scotland up to the Caledonian Canal, while it is also widespread in Ireland. But the 1898 list and Suppt. only give it from Croydon, Coombe Wood, Richmond Park and Wimbledon Common. Elsewhere from

MIDDLESEX. Ruislip and Northolt (J. Ward) ; Elstree, fairly common (Lorimer) ; Pinner, 1915 (Tautz : Hope Dept. Collection, Oxford).

HERTS. Northaw (Rutherford) ; also there and in Broxbourne Woods (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Edelsten).

KENT. Darenth Wood, May 1952, and Joyden's Wood, 1948 (Hyatt); West Wickham, 1920 (Keywood) ; Pett's Wood and Chislehurst (A. Swain) ; Hayes and Downe (Birchenough) ; Shooter's Hill and Brockley (West, *Ent. Rec.*, 1906).

SURREY. Esher (Gardner) ; Oxshott, 1931, and East Sheen, 1930, and Wimbledon Common, 1928 (D. King) ; Banstead, 1952, and Bookham, 1952 (Wheeler) ; Weybridge (Messenger) ; Epsom, 1895 (Sidgwick : Hope Dept. Collection, Oxford).

**Ematurga atomaria* Linn. M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Common Heath is one of our most abundant geometers, since it is to be found in May on almost every piece of heathland throughout Great Britain, except perhaps in the Shetlands. It lends itself to a good deal of variation. Melanic specimens are fairly prevalent in the North, while occasionally an almost white one is reported. The 1898 list gives it from

Ealing, Forest Gate, Croydon, Abbey Wood, Shirley and Wimbledon Common.

MIDDLESEX. Hounslow in 1954 (Pierce).

HERTS. Bricket Wood and Broxbourne (Foster, *Lep. Herts.*, 1937).

ESSEX. Epping Forest (Edelsten).

KENT. Hayes Common, 1948 (Hyatt) ; Pett's Wood, 1951 (A. Swain) ; Dartford Heath (D. Owen) ; West Wickham (Trundell).

SURREY. Woldingham, 1949 (Birchenough) ; Coulsdon, 1944, and Box Hill, 1952 (Wheeler) ; Oxshott, 1931 (D. King) ; Epsom, 1895 (Sidgwick : Hope Dept. Collection, Oxford).

BUCKS. Black Park, Fulmer (V.C.H., 1905).

**Bupalus piniaria* Linn. I.L., M.21, H.20, E2.18, K.16, S.17, B.24.

The Bordered White is a very common dayflier during May and June among pine trees throughout England, Wales and Scotland, as well as local in Ireland. Its larvae can be extremely destructive to pines, as was the case in 1954 in Cannock Chase. The ground colour of the males is usually yellow in the South, while in the North it is white. Melanic forms are not uncommon, especially in the female, known as ab. *funebris*. It is recorded in the 1898 list from Lothbury, Stratford, Stamford Hill, Highgate, Ealing, Croydon and Shirley.

MIDDLESEX. Bedfont, three in 1950 (Kindred) ; Highgate (Andrewes); Whitton, 1887 (Cockerell, *Lep. Middx.*, 1891).

HERTS. Aldenham Woods (Foster, *Lep. Herts.*, 1937).

KENT. Orpington, 1953 (Siggs) ; West Wickham (Trundell) ; Hayes Common, numerous (D. Owen) ; Keston (Birchenough).

SURREY. Woldingham and Tadworth (Wheeler) ; Selsdon and Addington Hills (Birchenough) ; Esher (Gardner) ; Oxshott, plentiful in 1934 (Keywood) ; Weybridge (Messenger).

BUCKS. Black Park, Fulmer (V.C.H., 1905).

HEPIALIDAE

This group of Moths, known as the Swifts, is usually classified as among the most primitive in existence. They comprise quite a large Family occurring in all parts of the world with some huge species to be found in Australia and South Africa. The larvae are almost all root feeders and in certain species do a tremendous lot of damage to crops and grass land. Of nine species known from Europe five occur in the British Isles and all are recorded from the London Area.

**Hepialus lupulina* Linn. I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Common Swift is an abundant species all over the United Kingdom, appearing on the wing in late May and the males flying just at dusk when they will come to light. The 1898 list records it as common all over the Metropolitan Area, while it has been noted more recently from the Zoo, Regent's Park (Bushby), from Grove Park (Hyatt), Stanmore (Lorimer) and Hounslow in 1955 (Pierce), also from all outlying parts of the Area.

**Hepialus hecta* Linn. M.21, H.20, E2.18, K.16, S.17.

The Gold Swift flies freely among bracken-covered areas in June in most parts of the British Isles, though it is not seen so often as the last species. It has been widely reported in the 1898 list and the 1902 Suppt. from Hampstead, Highgate, Ealing, Walthamstow, Hackney Marshes, Forest Gate, Clapton, Croydon, Dulwich, Sydenham, Chiswick, Barnes and Wimbledon Common.

Middlesex. Enfield (Edelsten).

Herts. Kenton and Oxhey (Fletcher) ; St. Albans, Bricket Wood, Haileybury, Bushey Heath, Watford and Broxbourne (Foster, *Lep. Herts.*, 1937).

Kent. Joyden's Wood, July 1952 (Hyatt) ; Pett's Wood and Chislehurst, 1949 (A. Swain).

Surrey. Ashtead and Banstead (Gardner) ; Coulsdon, 1943 (Wheeler) ; Selsdon Wood and Addington (Birchenough) ; Weybridge (Messenger).

Hepialus fusconebulosa Deg. (=*velleda* Hübn.). M.21, H.20, K.16, S.17.

The Map-winged Swift is the least common of this family, though it is to be found in most parts of these Islands, even up to the Shetlands. It is prevalent among bracken in June and July and varies a good deal in size and markings. It is not in the 1898 list and there appear to be only a few records for the Area which are from

Middlesex. Greenford, June 1950 (J. Ward).

Herts. Aldenham, June 1946 (Fletcher) ; St. Albans and Watford (Foster, *Lep. Herts.*, 1937).

Kent. West Wickham (Birchenough).

Surrey. Box Hill (van Emden) ; Selsdon Wood (Birchenough).

**Hepialus sylvina* Linn. M.21, H.20, E2.18, K.16, S.17.

The Orange Swift is fairly numerous in August and September throughout England and Wales and the southern half of Scotland, though only doubtfully recorded for Ireland. It has been noted in the 1898 list and Suppt. from Finchley, Hampstead, Highgate, Ealing, Forest Gate, Clapton, Hanwell, Crouch End, Norwood, Lewisham, Chiswick, Croydon, Dulwich, Barnes and Wimbledon Common. Also from

Middlesex. Stanmore, common (Lorimer) ; Hounslow, 1955 (Pierce); Greenford and Southall, 1950 (J. Ward).

Herts. Totteridge (Lorimer) ; Watford, common (Penrose) ; St. Albans, Hertford, Cheshunt, Haileybury, East Barnet, Watford and Broxbourne (Foster, *Lep. Herts.*, 1937).

Essex. Woodford Green, 1923 (Collenette).

Kent. Orpington, 1949 (Siggs) ; Pett's Wood, 1950 (A. Swain) ; Hayes and Downe (Birchenough) ; West Wickham (Trundell).

Surrey. Sheen Common, 1931, and Richmond Park, August 1932

(D. King) ; Barnes, West Ewell, Banstead (Gardner) ; Coulsdon, 1941, and Tadworth, 1950 (Wheeler) ; Weybridge (Messenger).

**Hepialus humuli* Linn. I.L., M.21, H.20, E2.18, K.16, S.17, B.24.

The Ghost Swift is a most spectacular insect. Not only is it the largest of this group, but it is one of the few moths in existence in which the big orange female flies in search of the all white male as it hovers to and fro in the summer dusking. It is also most remarkable that in the very northerly latitudes such as the Shetlands where there is virtually no darkness at midsummer, the male takes on the female coloration, ab. *hethlandica*. It has been noted from nearly every part of the London region and in the 1898 list, from Shepherds Bush, Hampstead, Bloomsbury, Highgate, Woodford, Hackney, Tottenham, Blackheath, Croydon, Dulwich, Bedford Park and Barnes.

Middlesex. Hounslow, common in 1954 and 1955 (Pierce) ; Greenford and Southall (J. Ward) ; Enfield (Edelsten).

Herts. Totteridge (Lorimer) ; generally distributed (Foster, *Lep. Herts.*, 1937).

Kent. West Wickham (Trundell) ; Joyden's Wood, 1948, Blackheath, 1946, and Grove Park (Hyatt) ; Hayes and Downe (Birchenough).

Surrey. Roehampton, 1928, and Putney Heath, 1931 (D. King); Bookham, 1951, and Tadworth, 1953 (Wheeler); Barnes, Ewell and Banstead (Wheeler) ; Weybridge (Messenger) ; Merton, 1919 (Coulsdon).

Bucks. Chalfont St. Peter, 1956 (Ansorge).

[*Concluded*]

It is hoped to publish in due course a Supplement to the Butterflies and the Moths of the London Area ending with a chart showing the number of species of Moths in each Family recorded from each of the Vice-Counties of the Region, together with the totals.

Since this work was begun the following additional recorders have kindly sent in much valuable information about their captures in the Area for which I am extremely indebted to them.

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I would also like to express my warm thanks to Prof. G. C. Varley and his colleagues for allowing me full access to the extensive collections of Lepidoptera in the Hope Museum at Oxford from which many interesting records were gleaned.

I am alike equally grateful to the Staff of the Insect House at the Zoological Gardens, Regent's Park, for permitting me to go through many of the captures of lepidoptera made in the mercury vapour light trap run there between 1951 and 1954 under the direction of the late Mr. L. C. Bushby.

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Collection of Marble and Serpentine Specimens

By R. E. Butler

MARBLE and similar types of rocks are widely used in almost all parts of London for building and decorative purposes. Without suitable references it is sometimes difficult to identify accurately many of the types. Literature on marble is scarce and collections of reference samples are even more scarce. It was suggested some time ago that the Geology Section could perhaps sponsor a collection of samples of marble used in London, and consequently a collection was started in February, 1957. It soon became clear that something much bigger was being formed, as some seven hundred specimens were obtained during the first six months of collecting. By February, 1958, the collection had grown to twelve hundred and fifty specimens from over forty countries.

There are few other collections in this country, the best known being in the Sedgwick Museum, Cambridge. This collection is still the best accessible to the public, but many types represented in it are out of production. John Watson's catalogue of it, published in 1916, is now unfortunately out of print but even so it is one of the most informative of all handbooks on marble. The Sedgwick Museum very kindly lent the Society a copy of this handbook, and I would like to offer our appreciation of this kind help as without it there would have been a much greater difficulty in getting the Society's collection together. The other well-known collection, which is to be seen in the University Museum at Oxford, contains over one thousand specimens of marble used in classical times. Exchanges of duplicates have been made by the Society with both Museums.

The best method of collecting specimens was obviously in the form of commercial samples, which are usually prepared for architects and other persons directly concerned with the use of marble. Contacts made with firms in London produced a ready response to help, whilst the trade agents in London of large overseas producers also gave a great deal of advice and assistance. The search for specimens in some cases extended direct to overseas firms and many very willingly sent examples of their products. In some cases help and advice was sought from British Embassies abroad and this has been of very great value indeed.

It would be quite impossible to obtain a sample of every type of marble that has been produced as the number of specimens needed would be prohibitive. Moreover, the source of many marbles used in antiquity is no longer known, though some have been rediscovered and the stones produced again in recent times. The changing pattern of production resulting from the exhaustion of old sources of supply and the opening up of new sources also adds considerably to the difficulty of forming a

comprehensive collection ; so does the troubled state of some of the marble producing countries, as in the case of Algeria where production has been severely restricted. It has been impossible to obtain examples of the marble from Java because of the troubled conditions there.

The term " marble " (from an ancient word meaning " shining stone ") originally meant any stone capable of taking a polish, and from a commercial point of view the term is used in a very broad sense. Geologically, it is restricted to limestones which have been recrystallized by metamorphic processes (by high temperature and pressure at depth). Geologists do, however, extend the term in practice to cover certain limestones which, though not metamorphosed, are hard enough to take a polish. Serpentines have also been included in the collection because they resemble hard limestones in their physical properties and are used for the same purposes as some marbles.

The following scientific classification has been adopted :—

(i) *True marbles* ; i.e. metamorphic limestones. These rarely contain recognizable organic remains which, if originally present, have been destroyed in the course of recrystallization.

(ii) *Other hard limestones* ; these may be either of organic or of chemical origin. Those of organic origin comprise chiefly crinoidal and coral limestones such as are found in the Devonian and Carboniferous systems in this and other countries. Limestones of chemical origin consist of rocks formed by the precipitation of calcium carbonate from lime-rich waters. They include (*a*) Travertine, formed in rivers, springs and lakes, and (*b*) Stalagmitic limestones formed in caves. Travertine is a term recognized commercially and quite a number of countries produce this material commercially for decorative purposes. Stalagmitic limestones are hard and usually take a very fine polish ; they are sold commercially as " onyx marble."

(iii) *Ophicalcites and Serpentines.* Ophicalcites or serpentinous marbles are really impure metamorphic limestones with more or less serpentine, and grade into pure marbles. Some are formed by the metamorphism of impure dolomites, of which the calcium carbonate has recrystallized as calcite and the magnesium carbonate has reacted chemically with silica to form olivine (forsterite), which by subsequent hydration has become serpentine. It is now thought, however, that most ophicalcites, like pure serpentines, are of igneous origin, the calcite being derived from other calcium minerals such as augite and the serpentine forming from the olivine present in the original rock.

It must be stressed that no small sample of marble can give a true indication of colour and veining since a marble is likely to vary somewhat, but an approximate idea is given and can be of great help in identifying a certain particular marble. Some marbles such as Connemara from Ireland and the Swedish Green vary very much and for this reason several specimens are necessary in the collection as far as such types are concerned.

It is desirable that this collection should be made readily available for reference, and if possible put on permanent exhibition, at least in part. Consideration is now being given to this and enquiries are proceeding to discover a suitable place for this purpose.

Cyperus fuscus in Middlesex

By Douglas H. Kent

THE discovery by Mr. T. W. J. D. Dupree of a colony of *Cyperus fuscus* L. on wet muddy ground by a pond in the Staines area of south-west Middlesex on August 10, 1957, restored to the flora of the London Area a species last recorded there in 1865.

C. fuscus belongs to the order *Cyperaceae*, and is a miniature edition of the tall, handsome *C. longus* L., which is occasionally planted by lakes and streams in the Area. In Britain it is an extremely local species confined to damp areas, especially bare muddy ground left by the drying-up of ponds and ditches, and it is also very uncertain in appearance, fluctuating in quantity from year to year.

It was first recorded as a British plant from Eel Brook Common, Little Chelsea, by A. Haworth in 1819. Here it was found growing in some abundance on the sides of a ditch in association with *Juncus bufonius*, *Bidens cernua*, *Ranunculus sceleratus* and *Polygonum minus* (Hooker, 1819). The plant survived there in varying quantity from year to year until 1865 when the habitat was destroyed by drainage operations (Trimen and Dyer, 1869). Babington (1839) records *C. fuscus* from Jersey on the authority of Professor La Gasca, and Dr. F. H. Perring informs me that there is a specimen, collected from St. Peter's Marsh by W. W. Newbould in 1842, in Herb. Cantab. There do not appear to be any recent records of the plant from the Channel Islands. During 1846 it was discovered growing in great plenty on the margins of a pond near Godalming, Surrey (Salmon, 1847), a locality at which it may still be found from time to time.

In 1871 J. E. Gray published a note in the *Journal of Botany* stating that the plant had been deliberately sown at Little Chelsea from seed from Swiss specimens, and suggesting that it may also have been introduced near Godalming. This was strongly repudiated by A. Irvine and H. Trimen who believed it to be truly native (Trimen, 1871), while A. W. Bennett (1871) was of the opinion that it may have been introduced at Little Chelsea, but was truly native near Godalming.

During 1893 it was discovered near Ringwood, S. Hampshire (Linton, W. R., 1893) and Bere Regis, Dorset (Linton, E. F., 1893), and its status as a British native established beyond doubt. E. F. Linton (1893) writing on the plant in the last two vice-counties stated " The European distribution is so general that the wonder is, not to find it in these islands, but to find it so rarely. A plant that is spread over nearly the whole Continent, from middle and south Russia to Portugal ; and from Sweden, Denmark and Belgium to the shores of the Mediterranean and the Levant, may well be expected to occur in more than two or three southern counties of England ; and further research, in warm dry seasons especially will be very likely to justify the expectation." Linton's prophecy was in part fulfilled for in 1900 the plant was discovered growing abundantly in shallow water at the bottom of ditches near Clevedon, N. Somerset (Coley, 1900), and six years later was found in considerable quantity on the mud of a partly dried-up pond on Dorney Common, Bucks (Druce, 1907), a locality in which I saw it last about 1942. Finally, it was discovered in very small quantity at Suleham, Berks., in 1911 (Druce, 1918). The British vice-comital distribution is thus v.cc. 6, 11, 17, 21, 22, 24 and [S., Jersey].

The plant has also been erroneously recorded from Yorkshire.

When Mr. Dupree discovered the plant in the new Middlesex locality in early August he noted many small plants growing on an area of dry mud measuring 2-3 square yards, with a number of larger plants growing near the edge of the pond. The latter part of August was very wet and the water level of the pond rose considerably, inundating most of the plants ; thus when I visited the pond on September 3 only a solitary large plant was visible growing in about one inch of water ; a further visit was made a few days later and the water level had dropped slightly leaving the plant standing on wet mud. Shortly afterwards Messrs. R. A. Graham and R. M. Harley visited the area and reported that two more plants were visible. Species associated with *C. fuscus* were *Polygonum persicaria*—a., *P. amphibium*—f., *Ranunculus sceleratus*—r., *R. aquatilis*—r., *Lemna minor*—f., *Lycopus europaeus*—r., *Solanum dulcamara*—r., *S. nigrum*—f., *Apium inundatum*—r., *Mentha aquatica*—r., *Chenopodium polyspermum*—r., *Poa annua*—r., *Stellaria media*—r., *Rorippa islandica*—r., and *Equisetum palustre*—o. The pH of the mud at the roots of *C. fuscus* was 6·8 (Johnson's Test Papers).

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Botanical Records for 1957

Compiled by J. EDWARD LOUSLEY

THE present report is the first to appear after completion of publication of *A Hand List of the Plants of the London Area*, which included records of no less than 1835 species accumulated by the Society to the end of 1956. In spite of the intensive work recorded in that volume, additional information about the plants in our Area is still coming in at a very rapid rate, and in order to keep the annual reports to a reasonable length only real additions to the *Hand List* will be printed. These will include species, varieties and hybrids, and records for vice-counties not included in that work. Other records contributed by members will be entered in the card-index maintained by the Recorder.

The long-established basis for recording the distribution of British plants has been the system of vice-counties introduced by H. C. Watson. This was used in the *Hand List*, but since publication commenced a new system based on the National Grid as shown on Ordnance Survey maps has been adopted by the B.S.B.I. Maps Scheme, and is now familiar to most botanists. The new system is likely to receive general acceptance for many purposes, and it has been adopted for several proposed new Floras of counties falling partly within our Area, but the vice-county

system has certain advantages and is by no means obsolete. It is therefore important that our records should give both the Grid square and vice-county concerned.

In the London Area the 10-kilometre squares represented are as follows :

51 (TQ) / 05, 06, 07, 08, 09, 15, 16, 17, 18, 19, 24, 25, 26, 27, 28, 29, 34, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59, 66, 67, 68, 69

52 (TL) / 00, 10, 11, 20, 21, 30, 31, 40, 41, 50.

Of some of these squares, the parts within the Area (i.e. within twenty miles of St. Paul's Cathedral) are small—a few where the portions are so very small that it would be difficult to identify them in the field are omitted. It will be seen that although two 100-kilometre squares (51 and 52) are involved, none of the numbers for 10-kilometre squares are duplicated. By adding these after each locality mentioned the grid-square concerned will be identified. Thus, " Godstone (35) " means that Godstone is in Grid-square 51/35 which covers the area shown on the 2½" to the mile Ordnance Survey Map of the same number (or TQ/35 of current Ordnance Survey use).

In response to a request from the Council, English names have been added for some plants. To attempt to do this consistently would greatly increase the length of the report by printing many fabricated names unlikely to help anyone, but it is hoped that the compromise adopted will assist beginners without greatly detracting from the scientific value.

The weather of 1957, after a good start, repeated many of the unfavourable characteristics of the previous year. It was the mildest March on record at Kew and frosts were almost completely absent, with soil as well as air temperatures about 6-7 degrees above average. By mid-April spring flowers were well advanced, and on Good Friday (19th) bluebells were in full flower in Surrey. The first half of May was rather cold, with some heavy storms, and then at the end of the month a warm dry spell set in which lasted until the second week in July. During this time ponds sunk to a very low level and commons became parched. Most of the remainder of the season was cold and very wet, with occasional warmer days. The rainfall for August recorded at Kew was 3·85 inches—the average is 2·2. The autumn was little better for botanical work and the best that can be said for it is that there were no heavy early frosts. The plants of the London area during the season of 1957 were handicapped first by drought, and then by cold and lack of sun.

In spite of the weather, members contributed about 1,500 records, of which all that are new have been entered in the card index. Those of exceptional interest included the discovery of a small sedge, *Cyperus fuscus*, which had not been seen in our Area since about 1865, and the finding by Mrs. L. M. P. Small of vast quantities of danewort, *Sambucus ebulus*, at Stratford. Amongst the valuable lists contributed special mention should be made of those from R. C. Wingfield for the Mitcham district, A. W. Jones for various commons, and R. A. Boniface from Langley Park.

V.-c. 16, West Kent.

Fringed water-lily, *Nymphoides peltata* (S. G. Gmel.) Kuntze, was found by Mrs. W. I. Brewer in a pool of the River Cray near Crayford (57). H. M. Pratt contributed his usual excellent list, which included the cut-leaved blackberry, *Rubus laciniatus* Willd. from Dartford Heath (57),

Cotoneaster horizontalis Decne. from a chalkpit near Swanscombe (67), and strawberry clover, *Trifolium fragiferum* L. from Swanscombe Marshes (67). He found a few plants of star thistle, *Centaurea calcitrapa* L., on rough ground at Northfleet.

On the sandy verge of A.20 at Ruxley in June, Miss Poulter found *Ornithopus compressus* L. in quantity, and a second generation flowered in October when D. McClintock found it still plentiful.

V.-c. 17, SURREY.

R. C. Wingfield has contributed a list of about 500 records from Grid square 51/26. These include *Barbarea intermedia* Boreau (det. D. P. Young) from Green Lane, Lower Morden, *Sagina filicaulis* Jord. (det. D. P. Young) from The Grange, Wallington and Beddington Lane Dump, knotted pearlwort, *Sagina nodosa* (L.) Fenzl. from Banstead Downs (the only locality in the London Area from which we have records, and these are old), *Mentha* × *piperita* var. *citrata* (Ehrh.) Briq. (det. R. A. Graham) from by the Wandle at Hackbridge, and *Carex polyphylla* Kar. and Kir. (det. A. Melderis), from a roadside at Malden. On Mitcham Common he showed me *Oenanthe lachenalii* C. C. Gmel. in two places, and pennyroyal, *Mentha pulegium* L. in a hollow where I knew it twenty years ago but had forgotten the exact spot. Pennyroyal is a decreasing species in the south of England and is to be found now in very few of its old localities. Mr. Wingfield also showed me eight large patches of galingale, *Cyperus longus* L. in depressions in a rough wet field in Morden Hall Park, and *Polygonum mite* Schrank grew nearby. On Mitcham Common he showed me *Lagarosiphon major* (Ridley) Moss in a pond on Cricket Green ; this rapidly increasing aquarist's introduction has also been found by Mrs. B. Welch in Richmond Park (17). Mr. Wingfield's records from other squares include *Lysimachia punctata* L. from a stream entering the Hogsmill at Surbiton (16), *Veronica catenata* Pennell from Waddon Ponds (36), and marsh mallow, *Althaea officinalis* L., from a roadside near Croydon Power Station (36). This is the first time that marsh mallow has been recorded by the Society from the London Area and, although this maritime species must be regarded as introduced here, it is interesting that there is an old record in Salmon's *Flora of Surrey* from " between Croydon and Mitcham Common."

In allotments near Claygate (16), Mrs. J. E. Smith found weasel's snout, *Misopates orontium* (L.) Raf. and *Avena fatua* L. (det. A. Melderis). A. W. Jones reports *Polystichum aculeatum* (L.) Roth from Gatton Park (25). His record (*L.N.*, **33**, 36), and the record of C. P. Castell (*L.N.*, **34**, 19), for *Myriophyllum alterniflorum* DC. from Bookham Common (15) were accidentally omitted from the *Hand List*—a specimen confirmed by Dr. A. Melderis is in the herbarium of the Natural History Museum. R. A. Boniface found flea sedge, *Carex pulicaris* L. on Ashtead Common (15), apple-scented mint, *Mentha rotundifolia* (L.) Huds. abundant in Ashtead Park (15), and, like R. C. Wingfield (see above), pennyroyal, *Mentha pulegium* L. on Mitcham Common (26).

Dr. D. P. Young has added an alien bur-marigold, *Bidens vulgata* Greene to the British list from Croydon (36) (*Proc. B.S.B.I.*, **2**, 240, 1957). Dr. F. Rose reports *Rhinanthus calcareus* Wilmott from Boxhill (15), *Valerianella carinata* Lois, from Juniper Hall (15), and he has found, or confirmed, alternate-leaved golden saxifrage, *Chrysosplenium alternifolium* L. in the following four localities :—north-east of Oxted Mill (35), an

alderswamp south of Godstone (35), Littleton Bridge, Reigate (24), and near Dungate's Farm, Buckland (25). W. H. Spreadbury contributed a specimen of a curious cristate form of lady-fern, *Athyrium filix-femina* (L.) Roth from Banstead Wood (25), and R. Clarke reports tuberous comfrey, *Symphytum tuberosum* L. from Godstone (35) which R. C. Wingfield found also at Ravensbury, Mitcham (26). My own observations include alexanders, *Smyrnium olusatrum* L. abundant by the Thames near Sunbury Ait (16), *Anthemis mixta* L. near a refuse tip near Walton-on-Thames (16) white mignonette, *Reseda alba* L. in abundance on cinder-covered waste ground at Willow Lane, Mitcham (26) and *Rumex triangulivalvis* (Danser) Rech.f. on Wimbledon Common (27). In July my attention was attracted by a dock conspicuous by its very yellow fruits which occurred in abundance by the Wandle and streams from Morden Hall Park to Merton (26). This proved to be *R. obtusifolius* subsp. *transiens* (Simonk.) Rech.f., an alien from central Europe, and it may have spread down the river from a refuse tip near Beddington Corner where I found it earlier.

From a copse near Kenley Station, H. Britten reported *Allium paradoxum* (Bieb.) Don and *Geranium versicolor* L. as thoroughly naturalized. The following ferns recorded from Beddington Churchyard and attributed to D. P. Young in the *Hand List* pp. 327, 328, 330 and 331 should be credited to R. C. Wingfield :—*Phyllitis scolopendrium*, *Asplenium trichomanes*, *Polypodium vulgare*, and *Ceterach officinarum.*

V.-c. 18, South Essex.

In June, Mrs. L. M. P. Small reported that she had found danewort, *Sambucus ebulus* L. in quantity on Stratford Marshes, where there were other interesting plants such as sweet flag, *Acorus calamus* L. This, like previous by-products of her most useful habit of exploring apparently uninviting parts of the metropolis, proved to be the introduction to a very interesting and neglected area. Amongst other plants noticed on two visits I made in the company of B. T. Ward, were *Angelica archangelica* L. abundant from Marshgate Lane to Hackney Marshes, Bermuda grass, *Cynodon dactylon* (L.) Pers., well established on a rubbish tip, *Astragalus odoratus* Lam. (which is established near Bath, Burton-on-Trent and Newark, but not previously recorded from London) in a patch 6 by 6 yards on the canal bank, and deadly nightshade, *Atropa belladonna* L. on an old tip near Marshgate Lane. *Rumex patientia* L. subsp. *orientalis* (Bernh.) Danser we found in a timber yard in Carpenter's Lane, and subsp. *patientia* on an old refuse tip between the Pudding Mill and City Mill rivers. *R. patientia* was also found by Mrs. Small at Silvertown (48). Near Hackney Marshes (38) Ward and I found *Mentha longifolia* (L.) Huds. and he showed me Indian balsam, *Impatiens glandulifera* Royle. We also recorded *Potamogeton perfoliatus* L. from Walthamstow Reservoirs (38).

Mrs. Small found *Hieracium brunneo-croceum* Pugsley on Bell Common (49) and on a railway bank near Theydon Bois Station (49). In a dry ditch at Coxtie Green, Brentwood (59), P. J. Wanstall noticed elecampane, *Inula helenium* L. The small patch of Essex chalk within the London Area has produced many plants of interest and to these Mrs. A.G.Side has added tuberous pea, *Lathyrus tuberosus* L., which she found in a chalk pit at Grays in 1952 and again in 1957, and kidney vetch, *Anthyllis vulneraria* L., in the same pit.

V.-c. 19, NORTH ESSEX.

The only additional record contributed during the year is of hoary cinquefoil, *Potentilla argentea* L. found by Mrs. L. M. P. Small in a gravel pit at Fisher's Green (40) and confirmed by E. B. Bangerter.

V.-c. 20, HERTS.

Amongst the records sent in, two aliens which are becoming increasingly established in Britain are of special interest. *Allium paradoxum* (Bieb.) Don was found established on the roadside from Rickmansworth to Moor Park (09) by F. M. Day, and his specimens confirmed by J. G. Dony. *Bunias orientalis* L. was found in quantity in a disused sandpit near Cole Green (21) by T. G. and M. Collett and D. H. Kent. Other Hertfordshire records include *Koeleria gracilis* Pers. from Cheshunt Marsh (30) by Mrs. L. M. P. Small and midland hawthorn, *Crataegus oxyacanthoides* Thuill. from Barnet Gate (29) by J. G. Dony and D. H. Kent.

V.-c. 21, MIDDLESEX.

The important discovery of *Cyperus fuscus* L. (07) by T. W. J. D. Dupree is the subject of a separate paper (see p. 180). Another little sedge which has not been recorded from Middlesex for many years—in this case since 1884—is *Eleocharis multicaulis* (Sm.) Sm., and this was found by J. E. Lousley in the small detached part of the county on the south side of the river at Walton Bridge (06). The habitat was rather an unusual one for this bog plant and it is assumed that acid conditions had developed very locally in this Thames-side marsh. Prof. E. H. Warmington reports a large patch of lily-of-the-valley, *Convallaria majalis* L., on Stanmore Common (19), and R. A. Graham a mint, × *Mentha gentilis* var. *gentilis* from a ditch bordering the recreation ground at Northwood (09). *Hieracium lepidulum* (Stenström) Omang var *haematophyllum* Dahlst. has been determined by P. Sell and C. West from material I gathered in the grounds of Buckingham Palace (28) in 1956.

Great burnet-saxifrage, *Pimpinella major* (L.) Huds., has been found in three new places—in Hendon Wood Lane, near Barnet Gate (29) by D. H. Kent, and near Clare Hall, and at the side of Mimm's Wash, South Mimms (20), by D. H. Kent and J. G. Dony. Near Hadley Common (29) they found *Hieracium strumosum* (Ley) Ley, which D. H. Kent and C. West also collected from railway banks at Uxbridge (08)—specimens from both places determined by Sell and West. R. S. R. Fitter reported several large clumps of sea club-rush, *Scirpus maritimus* L., from the east end of the Brent Reservoir (28). H. C. Holme found *Rhynchosinapis cheiranthos* (Vill.) Dandy and *Sagina pallida* (Dumort.) Pire in Regent's Park (28)—specimens of both plants were confirmed by D. H. Kent. It must also be put on record that J. W. Donovan reports that sweet cicely, *Myrrhis odorata* (L.) Scop. has been deliberately sown on the banks of the canal at Harefield (09).

V.-c. 24, BUCKS.

In spite of special efforts which have been made from time to time the small part of this county falling within our Area has remained under-recorded, but in 1957 there was a most welcome increase in records. From Langley Park (08) R. A. Boniface reports the following :—dog violet, *Viola canina* L., heath milkwort, *Polygala serpyllifolia* Hose, bog St. John's wort, *Hypericum elodes* L., petty whin, *Genista anglica* L., bird's foot, *Ornithopus perpusillus* L., *Gaultheria shallon* Pursh., lesser reedmace,

Typha angustifolia L., *Carex demissa* Hornem., *C. caryophyllea* Latour., *C. pilulifera* L., *C. ovalis* Good., and *Deschampsia flexuosa* (L.) Trin., and water horsetail, *Equisetum fluviatile* L. He also found *Carex binervis* Sm. at the north end of Black Park (08). On an L.N.H.S. excursion, *Rorippa sylvestris* (L.) Besser, wart cress, *Coronopus didymus* (L.) Sm., an evening primrose, *Oenothera erythrosepala* Borbás, and hart's tongue fern, *Phyllitis scolopendrium* (L.) Newm. were found near Colnbrook (07). From Cousel's Wood, Denham (08), I. G. Johnson reports marsh valerian, *Valeriana dioica* L.

We are grateful to the following for their contributions during the year :— M. E. Ashburner, E. B. Bangerter, R. A. Boniface, Mrs. W. I. Brewer, Mrs. E. H. Briggs, H. Britten, C. P. Castell, R. Clarke, M. Collett, T. G. Collett, F. M. Day, J. W. Donovan, Dr. J. G. Dony, T. W. J. D. Dupree, R. S. R. Fitter, R. A. Graham, V. F. Hancock, D. J. Hinson, H. C. Holme, C. E. Hubbard, I. G. Johnson, A. W. Jones, D. H. Kent, M. Kent, D. E. Kimmins, Miss B. A. Kneller, G. F. Lawrence, J. E. Lousley, D. McClintock, Dr. A. Melderis, H. M. Pratt, Dr. F. Rose, P. Sell, Mrs. A. G. Side, Mrs. L. M. P. Small, Mrs. J. E. Smith, W. H. Spreadbury, P. J. Wanstall, B. T. Ward, Prof. E. H. Warmington, Mrs. B. Welch, Dr. C. West, R. C. Wingfield, F. E. Wrighton, Dr. D. P. Young.

Devilsden Wood Survey : Birds

Some comparisons with other woodlands

By E. M. Hillman

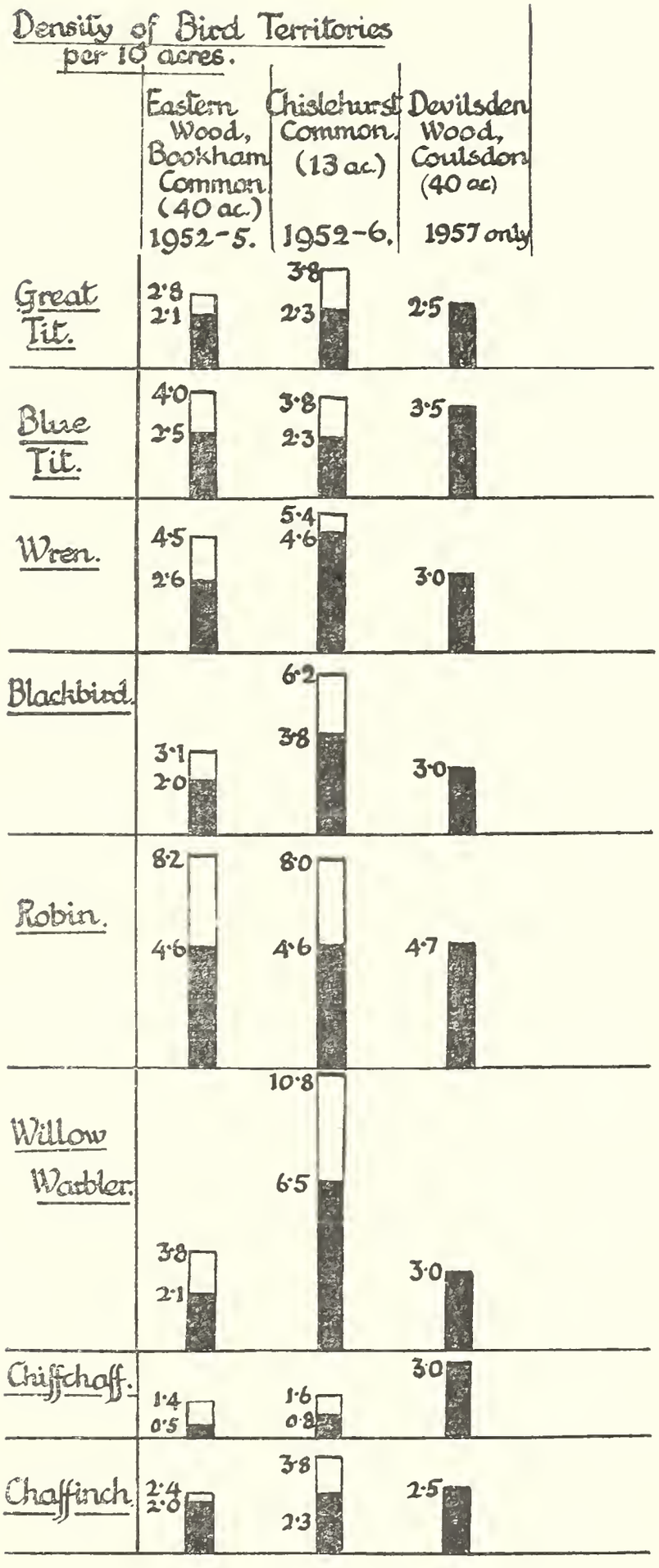
THE survey of birds in Devilsden Wood was begun in January 1957. An area of mixed woodland of approximately 40 acres was chosen, maps were prepared, and by the spring and early summer it was possible to plot the positions of singing males, and from these to draw up territory maps in the manner described for the Bookham Common Survey (Beven, 1951).

Territory numbers have been obtained for two other areas and it is interesting to compare the results. These areas are Eastern Wood, Bookham Common (the Ecology section's survey area) and a 13-acre area of Chislehurst Common, Kent, where counts have been made by the writer on the journey to work in the mornings. To make comparison easy, the figures have been expressed as a density per 10 acres.

The following facts must be borne in mind. The three areas have certain characteristics in common, namely, canopy, shrub and herb layers, with a considerable proportion of oak and hawthorn. Checklists of birds present in each area show very few differences. The main differences in the three areas will now be stated.

Eastern Wood, Bookham, is a damp oakwood surrounded on all sides by further woodland of the same type. It is fairly dense, and is the least frequented by man of the three.

Chislehurst Common is a drier oakwood, and the 13-acre area contains an open patch of gorse. It is flanked by large quiet gardens and busy roads, and the wooded parts are much intersected by paths, which bear witness to the fact that it is used by more people than the other areas.



The columns for Eastern Wood and Chislehurst Common show the lowest and highest numbers of bird territories per 10 acres which have occurred during the years shown at the head of the diagram.

Devilsden Wood contains no open areas but one small part is devoid of shrub layer. This wood has a greater variety of trees : yew, beech, cherry, ash and elm being quite common, and the ground flora is different. The wood is on a fairly steep slope and is surrounded by areas of hawthorn scrub, open downland and farmland.

The conditions under which counts were made show some differences. The time of day does not seem to affect results greatly, when morning and afternoon counts are compared, but it is possible that some blackbirds are missed when counts of singing birds are made at the mid-day times below.

Bookham : once or twice monthly. 4-6 observers to 40 acres. 11 a.m.—1 p.m.
Chislehurst : at least once a week. 1 observer to 13 acres. 8.00—8.30 a.m., and some afternoons.
Devilsden : once a month. 2 observers to 40 acres. 11 a.m.—1 p.m., and some afternoons.

It will be seen that up to the present Devilsden Wood has not been covered as thoroughly as the other two areas.

The results : 1. The years chosen for comparison are those for which results are available for all eight species shown in the figure. In each year the number of territories is the minimum number, and any positions of singing males not adequately confirmed are discarded from the totals. The lower density of observers at Devilsden has meant that some of this confirmation has been lacking, and in six of the eight species the numbers for Devilsden, 1957, are nearer the lowest than the average figures for the other areas. This may reflect lack of observers rather than of birds. As can be seen, however, the relative populations of these component species are much alike in the three areas. The higher proportion of Blackbirds at Chislehurst may be only apparent and due to the timing of the counts, or it may be real, as in the case of the Willow Warbler, and due possibly to the proximity of gardens and open areas.

2. The diagram shows the highest and lowest figures which have occurred in the years chosen. Thus for Bookham and Chislehurst the comparative size of the fluctuations in numbers can be seen, and it will be noticed that (except for the Chiffchaff whose numbers are too small to consider here) the amount of variation is never as large as the lowest number of territories ; in other words, over the 4-year or 5-year period respectively the increases have never reached 100 per cent. Nor are any decreases as much as 50 per cent. These remarks apply, of course, only to the years in question. The highest and lowest figures for the Blue Tit, and for the Chaffinch at Chislehurst, occur in two consecutive years and it may be that in the period 1954-1957 greater fluctuations would be observed for these species, or indeed, for any. Only by continuing counts for many years could it be determined whether the magnitude of the variation in relation to the total numbers of each species is contained within the limits suggested here (assuming that there are no great changes in the habitat), but only a few more years, especially one including a hard winter, may suffice to demonstrate that it is not so confined.

3. The fact that Chislehurst is the area most subject to disturbance by man does not seem to have adversely affected the distribution of the commoner species of birds, and to those given in the figure may be added Whitethroats, Hedge Sparrows, and Song Thrushes in numbers roughly equal to those of the Chaffinch. This disturbance is no doubt offset by

the access to open areas and a more varied habitat, and additional sources of food in rubbish bins and gardens.

4. The number of Chiffchaffs at Bookham is always less than half the number of Willow Warblers in the same year, and at Chislehurst the ratio is much less than this. At Devilsden this year their numbers were equal. Future inquiry must first seek to discover whether this higher Chiffchaff-Willow warbler ratio is a regular feature of this wood.

Future work at Devilsden Wood. Work has begun on the feeding of Tit flocks and allied species. It is felt that the ecology of the adjacent Farthing Down would repay study, as interesting observations were made this autumn, such as the attraction of the mile-long line of yews for many Blackbirds, Song Thrushes and Mistle Thrushes in late September, and the use made of the heads of Knapweed (*Centaurea nigra*), a plant which covers large areas of the down, for feeding by flocks of Goldfinches, Greenfinches, Yellowhammers, and at least two flocks of about twenty Blue Tits.

I should like to thank all those who have helped with the Bird Survey, namely : Miss M. E. Kennedy, Miss E. Phillips, Miss D. A. Rook and H. Greenfield, and also Dr. G. Beven whose work on the Bookham Common Survey which I have been allowed to quote has inspired further study on the same subject.

REFERENCES

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———, 1956. *London Naturalist*, **35**, 22-24.

The Flora of the City of London Bombed Sites

By A. W. Jones

THE AREAS SURVEYED

THE areas surveyed are as shown in the sketch map (which omits all disused roads within the survey areas) :—

1. *Finsbury Area.* Five acres of rather shallow basements including Finsbury Square garden (used for air-raid shelters during the war). It has been divided into seven sites for recording purposes.
2. *Bunhill Area.* A single site of three acres, much at ground level.
3. *Cripplegate Area.* The largest area and the one selected by the Society for its main survey. It is roughly ½ mile from east to west and ¼ mile from north to south ; 39 acres of sites. It is continuous, with only a few isolated buildings standing and a few used roads running through it. A varied area which is divided into 50 sites.
4. *Gresham Area.* Eight acres. A fairly varied area divided into ten sites.
5. *Queen Victoria Area.* Eleven acres of mostly rather deep basements. Divided into twelve sites.
6. *Tower Area.* Three acres of very scattered basements some being deep. Divided into five sites.

The Cripplegate and Gresham areas were exhaustively surveyed in 1952, the Finsbury, Bunhill, Queen Victoria and Tower areas in 1953. In 1955 the Cripplegate area was re-surveyed.

As will be seen, all areas have been sub-divided into " sites " which are very roughly of equal size and have clear boundaries, such as roads. These sites are purely for recording purposes and have no ecological significance.

HABITATS

After the air-raids of 1940 and 1941 all unsound buildings were demolished and the basements (which most City buildings had) were cleared of rubble, leaving only basement floors and walls standing up to ground level.

It is very difficult to describe different habitats on the sites as they consist primarily of the same materials. It is possible, however, to distinguish the following " formations " although it may be doubted whether they are all different habitats and the most abundant plants (see Table 23) are often frequent on many of them indiscriminately :—

1. Paths and Roads, which may be used (and support no flora) or unused, in which case they may become very overgrown, chiefly at the edges with *Dactylis glomerata, Chamaenerion angustifolium* and *Cirsium arvense*.
2. Basement Floors. If a soil accumulates, grasses become abundant but *Epilobium* cf *obscurum* can maintain itself on the thinnest of soils.
3. Cracks in Basement Floors. *Chamaenerion angustifolium, Artemisia vulgaris* and other deep-rooted perennials colonize these.
4. Walls. Here *Senecio squalidus* predominates with *Artemisia vulgaris* and *Diplotaxis tenuifolia* frequent. At the bases *Sisymbrium orientale* and *Atriplex hastata* are usually found.
5. Screes of Fine Materials are often bare but *Cirsium arvense* or grasses may colonize if the slope is not too steep.
6. Screes of Bricks usually occupied only by *Pteridium aquilinum.* This plant found a suitable habitat for germination amongst damp bricks in early years. The apparent anomaly with its heathland or woodland habitat, where it seems only to spread vegetatively, is thus explained. Sporelings used not to be uncommon amongst screes of bricks and sometimes on walls, but, as the years have passed, soil has accumulated amongst the bricks and they have become overrun by grasses.
7. Piles of Fine Materials previously covered with *Erigeron canadensis* and *Tussilago farfara*, but the former has now been almost completely ousted by grasses.
8. Piles of Bricks, often very bare as earth gets washed out and seeds far down are not able to develop without light. The drainage may also prevent plants developing.
9. Basements filled with bricks and fine materials have now largely become overgrown with grasses.
10. Wall Ledges. Where a pavement is still used and adjoins basements with cellars under the pavements, as is commonly the case, rubble was piled in and against the cellars to stop the pavement subsiding. There was thus a ledge of rubble at pavement level and scree down to the basement floor. A 3′ 6″ wall keeps the public away from the basement. The ledges by the walls are an important habitat in connection with the colonization from horse dung as mentioned later.

11. Ramps which are in many of the larger basements and were used by lorries taking away the rubble. *Sagina procumbens* was an abundant plant on these but they are becoming overgrown with grasses.
12. Excavations by Archaeologists after the war. These are of little importance and were only noteworthy for a short period after being dug when the walls of many were covered with *Pteridium aquilinum* sporelings.
13. Tips, usually very small ones, on which a few species of the genera *Chenopodium* and *Polygonum* appear.
14. Gardens.
    (*a*) Cultivated with a few weeds.
    (*b*) Derelict, e.g. St. Giles's Churchyard in which very rarely does anything of pre-war cultivation remain, except trees and shrubs. *Saponaria officinalis* probably originated from St. Giles's.
15. Wastes arising from making of car parks, in three places yielded a few wasteland species. It would seem, however, that many of the plants normally appearing on dumped soil come from surrounding areas and little is brought in the soil.
16. Basements containing water are very few and of no importance. One near the Coach House in the Cripplegate area has supported sticklebacks (no doubt introduced) but no aquatic vegetation. There is a brick-built reservoir on both Bunhill and Queen Victoria areas and another near Cannon Street Station. Each of these reservoirs had one genuine aquatic.

COLONIZATION

It must always be remembered when considering the Bombed Sites that unlike many waste places there was removal of most of the surface material and no dumping of materials. In addition the nearest sources of colonization are some distance away, small in size and have no great variety of flora. There are still some gardens in the City including large areas like those around the Tower or the lawns of the Royal Artillery grounds by Bunhill Row but these appear to be quite inadequate for the provision of the varied flora of 342 species recorded in this paper.

An attempt is being made here to indicate the sources and methods of colonization and the species involved. It must be realized, however, that the groupings are necessarily speculative and that one species may really fall under several headings.

In each of Tables 1–20 is given the aggregate frequency over all the sites surveyed, followed by the numbers of sites in each area in which the species has been recorded. The number of sites in each area is shown in brackets at the head of each table. The nomenclature and the order in which the species appear in all tables is taken from Clapham, Tutin and Warburg (1952) unless otherwise indicated. The English names are taken from Rayner (1927) except for garden plants.

The following abbreviations are used in the tables :—

r = rare	F = Finsbury Area
l = local(ly)	B = Bunhill Area
o = occasional	C = Cripplegate Area
f = frequent	G = Gresham Area
a = abundant	Q = Queen Victoria Area
v = very	T = Tower Area

WIND

Species dispersed by wind fall into three classes :—

(*a*) Those with minute seeds or spores which are very light and may be carried by the slightest breeze. Three ferns and one horsetail are the only species involved here.

(*b*) Those with winged seeds—*Ailanthus altissima*, *Acer pseudo-platanus*, *Betula verrucosa* and *Fraxinus excelsior* come under this head.

(*c*) Those with seeds having a feathery attachment, i.e. the bulk of the wind-dispersed species.

Groups (*a*) and (*b*) are not well represented in the British flora and it is not surprising that so few species have arrived on the sites. In addition group (*b*) does not reach maturity for many years whereas most of group (*c*) can seed in the first or second year and release vast numbers of seeds within a short time. *Senecio squalidus*, *Chamaenerion angustifolium* and *Erigeron canadensis* were thus able to monopolize the sites in the early years.

Table 1 lists the 53 species with wind-dispersed seeds or spores.

TABLE 1

WIND-DISPERSED PLANTS

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Equisetum arvense (Field Horsetail) ...	vr			2				2
Pteridium aquilinum (Bracken)	a	7	1	49	10	12	4	83
Phyllitis scolopendrium (Hartstongue Fern)	vr			1				1
Dryopteris filix-mas agg (Male Fern) ...	o	1		45	8	11	1	66
Clematis vitalba (Wild Clematis)*	vr							
Tamarix sp. (Garden Tamarisk)	vr				1			1
Ailanthus altissima (Tree of Heaven) ...	vr		1		2	1		4
Acer pseudo-platanus (Sycamore)	r	1	1	12	5	6	2	27
Chamaenerion angustifolium (Rosebay) ...	a	7	1	50	9	12	5	84
Epilobium hirsutum (Great Hairy Willow-herb)	o	6	1	43	10	11	3	74
E. parviflorum (Small-flowered Willowherb)	r	1		11	2	1		15
E. montanum (Broad-leaved Willowherb)...	l			19		1		20
E. cf. *obscurum* (Dull-leaved Willowherb)...	a	5	1	47	10	12	2	77
Betula verrucosa (Common Birch) ...	f	3		31	7	10	3	54
Populus alba (White Poplar)	r			6	1	1		8
P. tremula (Aspen)	vr			2	1			3
P. cf. *nigra* (Black Poplar)	r	1		5	1	2		9
Salix alba (White Willow)	r			5		1	1	7
S. fragilis (Crack Willow)	r	2	1	13	2	2	1	21
S. viminalis (Osier)	r			4		3	1	8
S. caprea (Sallow)	vf	3	1	46	8	12	3	73
S. atrocinerea (Grey Sallow)	f	1	1	30	8	6	2	48
S. caprea x *viminalis*	vr				1			1
Fraxinus excelsior (Ash)	vr		1	1			1	3
Senecio jacobaea (Common Ragwort) ...	vr					1		1
S. squalidus (Oxford Ragwort)	a	7	1	50	10	12	5	85
S. viscosus (Sticky Groundsel)	vr	1		3	2	2		8
S. vulgaris (Common Groundsel)	r	1		10			1	12
Tussilago farfara (Coltsfoot)	a	7	1	49	10	11	5	83
Inula conyza (Ploughman's Spikenard) ...	vr				1			1
Solidago canadensis (Garden Golden Rod)	o	4	1	25	7	6	3	46
Aster spp. (Michaelmas Daisy)	o	5	1	38	8	6	3	61
Erigeron acris (Blue Fleabane)	vr			1				1

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
E. canadensis (Canadian Fleabane) ...	a	7		50	10	12	5	84
Cirsium vulgare (Spear Thistle)	f	7	1	50	10	12	5	85
C. arvense (Creeping Thistle)	vf	7	1	50	10	12	5	85
Hypochaeris radicata (Long-rooted Catsear)	f	6	1	47	8	12	1	75
Leontodon autumnalis (Autumnal Hawkbit)	vr	1	1	4				6
Picris echioides (Prickly Oxtongue)... ...	vr		1	2	1			4
Tragopogon pratensis (Goatsbeard) ...	o	3	1	33	3	3	1	44
Lactuca serriola (Prickly Lettuce)	f	3	1	45	6	1	3	59
L. virosa (Wild Lettuce)	vl					5		5
Sonchus arvensis (Corn Sowthistle) ...	l	2	1	13	3	5	1	25
S. oleraceus (Common Sowthistle)... ...	f	3	1	49	10	12	5	80
S. asper (Rough Sowthistle)	vr						1	1
Hieracium—Section *Sabauda* (Broad-leaved Hawkweed)	vr			4				4
Hieracium — Section *Euvulgata* (Wood Hawkweed)	r			9		2		11
H. cf. *maculatum* (Spotted Hawkweed) ...	vr			2		1		3
H. pilosella (Mouse-ear Hawkweed) ...	vr				2			2
Crepis taraxacifolia (Beaked Hawksbeard)	o	4	1	36	3	3	2	49
C. capillaris (Smooth Hawksbeard) ...	vr			4				4
Taraxacum sp. (Dandelion)...	f	6	1	50	10	11	5	83
Phragmites communis (Reed)	vr			1	1			2

* Near Cannon St. Station

Notes on Species : Single plants only were observed of *Phyllitis scolopendrium*, *Clematis vitalba*, *Tamarix* sp., *Salix caprea* x *viminalis*, *Senecio jacobaea*, *Inula conyza* and *Erigeron acris*. *Dryopteris filix-mas* agg was present almost everywhere that it could receive rain but not sunshine, e.g. near the bases of north-facing walls and in very deep basements.

Horses

There were until recently a fair number of horses in the City. When the roads were swept it was the practice of roadsweepers to throw the dung on to the nearest site. Along many streets are the wall ledges described earlier and here more than anywhere else seeds of hayfield plants such as grasses, *Trifolium* spp. and *Plantago lanceolata* found nourishment. In the late 1940's when the sites were barer than they are now, many of these plants were to be found only in abundance along these ledges. Some may have come direct from the horses' nosebags but opportunity for the seeds to get on to the sites is not so great : it has however been observed in one spot where horses were tethered.

The food of the horse so far as it concerns us here is hay, usually cut up for use in nosebags and often mixed with oats, barley and wheat.

The hay may come from one of two kinds of hayfield :—

(*a*) permanent ley or meadow, where grasses and other meadowland plants are allowed to grow tall and are then cut (either once or twice a year),

(*b*) one-year ley often with mixed crops included and in which many weeds of cultivation would naturally appear.

Table 2 gives 42 plants that are often found in meadows and other hayfields excluding 30 weeds of cultivation which are given in Table 3.

TABLE 2

HAYFIELD PLANTS

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Ranunculus acris (Meadow Buttercup) ...	vr		1	2	1			4
R. repens (Creeping Buttercup)	vr	1		4		3	1	9
Medicago sativa (Lucerne)	vr		1	4	1		1	7
M. lupulina (Black Medick)	o	3	1	28	5	3	1	41
Trifolium pratense (Red Clover)	f	6	1	43	6	9	5	70
T. hybridum (Alsike Clover)	vr			3			1	4
T. repens (White Clover)	f	5	1	38	9	7	5	65
T. dubium (Lesser Yellow Trefoil)	vr			1				1
Lotus corniculatus (Common Birdsfoot Trefoil)	vr	1		1	1	1		4
Onobrychis sativa (Sainfoin)	vr			1				1
Vicia cracca (Tufted Vetch)	vr			3				3
V. angustifolia (Narrow-leaved Vetch) ...	vr			2				2
Lathyrus pratensis (Meadow Pea)	vr			3				3
Fagopyrum esculentum (Buckwheat) ...	vr				1			1
Rumex acetosa (Dock Sorrel)	vr			5	2		1	8
Plantago lanceolata (Ribwort Plantain) ...	o	5	1	24	6	6	4	46
Galium verum (Lady's Bedstraw)	vr			1				1
Bellis perennis (Daisy)	vr			1		1		2
Achillea millefolium (Milfoil)	o	5	1	23	6	10	3	48
Chrysanthemum leucanthemum (Ox-eye Daisy)	vr	1	1	5				7
Cichorium intybus (Chicory)	vr			3		3		6
Festuca pratensis (Meadow Fescue) ...	vr			1				1
F. arundinacea (Tall Fescue)	vr			5	1	1	1	8
F. rubra (Red Fescue)	r	1		14	1	3		19
F. ovina (Sheep's Fescue)	vr			1	2			3
Lolium perenne (Perennial Rye Grass) ...	a	7	1	50	10	12	4	84
L. multiflorum (Italian Rye Grass) ...	r		1	12	3	5	4	25
Poa pratensis (Smooth Meadow Grass) ...	a	6	1	49	8	8	4	76
P. trivialis (Rough Meadow Grass) ...	a	7	1	48	10	8		74
Dactylis glomerata (Cocksfoot)	a	7	1	49	10	12	5	84
Cynosurus cristatus (Crested Dogstail Grass)	vr			1	1		1	3
Bromus mollis agg (Soft Brome)	o	2	1	24		1		28
Triticum sp. (Wheat)	vr			4	2	1		7
Hordeum sp. (Barley)	vr	2		5	1			8
Trisetum flavescens (Yellow Oat)	vr			1				1
Avena sp. (Oat)	r	3	1	15	4	4	1	28
Holcus lanatus (Tufted Soft Grass) ...	a	3	1	44	9	11	2	70
Agrostis tenuis (Fine Bent Grass)	vr			1				1
A. alba agg (White Bent Grass)	a	3	1	49	10	7	5	75
Phleum pratense agg (Catstail Grass) ...	r	4	1	7	2	7	1	22
Alopecurus pratensis (Meadow Foxtail Grass)	vr	1	1	4				6
Anthoxanthum odoratum (Sweet Vernal Grass)	vr			2				2

Notes on Species : Both *Phleum pratense* and *P. nodosum* occurred on the sites, but it was not possible to separate the bulk of specimens due to limited material. Species appearing to be *Agrostis stolonifera* and *A. gigantea* have been included under *A. alba* agg, both species probably being frequent.

TABLE 3
WEEDS OF CULTIVATION

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Papaver rhoeas (Corn Poppy)	vr			1		2		3
Brassica nigra (Black Mustard)	vr	1			1		1	3
Sinapis arvensis (Charlock)	r	3		7	2	1	2	15
Raphanus raphanistrum (Wild Radish) ...	r	1		3	1		1	6
Capsella bursa-pastoris (Shepherd's Purse)	f	5	1	34	3	7	3	53
Erysimum cheiranthoides (Treacle Mustard)	l	1		13		1	1	16
Stellaria media (Common Chickweed) ...	a	7	1	50	10	10	5	83
Chenopodium polyspermum (Many-seeded Goosefoot)	vr			1				1
C. album agg (White Goosefoot)	o	5	1	7	8	5	3	29
C. rubrum (Red Goosefoot)	r	2		11	4	2	2	21
Atriplex patula (Spreading Orache) ...	vr	1		4	2			7
A. hastata (Halberd-leaved Orache) ...	f	5	1	46	9	3	4	68
Scandix pecten-veneris (Shepherd's Needle)	vr	1		1				2
Aethusa cynapium (Fool's Parsley)... ...	vr	1		3	2			6
Mercurialis annua (Annual Mercury) ...	vr	1	1	7		1		10
Euphorbia helioscopia (Sun Spurge) ...	vr			1			1	2
E. peplus (Petty Spurge)	vr			4	3		1	8
Polygonum persicaria (Common Persicaria)	o	5		19	9	6	3	42
P. lapathifolium (Pale Persicaria)	vr					1		1
P. convolvulus (Climbing Buckwheat) ...	o	5	1	17	4	7	3	37
Urtica urens (Small Nettle)	vr			2			2	4
Anagallis arvensis (Scarlet Pimpernel) ...	vr			1				1
Solanum nigrum (Black Nightshade) ...	vr			8	5		2	15
Veronica persica (Buxbaum's Field Speedwell)	vr			1			1	2
V. agrestis (Green Field Speedwell) ...	vr			1				1
Galinsoga parviflora (Peruvian Galinsoga)...	vr		1	3		2	2	8
G. ciliata	vr	1					1	2
Matricaria maritima (Scentless Mayweed)...	r	2	1	13	3	2	1	22
M. chamomilla (Wild Camomile)	r	2	1	7		1	1	12
Alopecurus myosuroides (Slender Foxtail Grass)	vr			2	1	1		4

Notes on Species : Erysimum cheiranthoides was locally frequent on sites to immediate east and south of Whitbread's Brewery but rare elsewhere. *Veronica agrestis* occurred only as a weed in a florist's garden in Moorfields.

BIRDS

The five species given in Table 4 have berried seeds and were possibly introduced in the droppings of birds which had eaten berries. *Ilex aquifolium* could easily have come from a piece of holly used in Christmas festivities in a City office.

TABLE 4
PLANTS WITH BERRIES

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Ilex aquifolium (Holly)	vr			1				1
Crataegus sp. (Hawthorn)	vr	1		3		2		6
Sorbus intermedia agg (Intermediate Whitebeam)	vr			1				1
S. aucuparia (Mountain Ash)	vr	1		7	3	2		13
Sambucus nigra (Elder)	o	6	1	38	8	10	4	67

Three strictly aquatic species given in Table 5 have occurred in war-time brick reservoirs and fragments of the plants of the first two or seeds of the third may have come on the feet of Mallards which were occasionally seen in the immediate post-war years in them. *Typha latifolia* may have been wind-borne.

TABLE 5

STRICTLY AQUATIC PLANTS

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Elodea canadensis (Canadian Waterweed)...	vr		1					1
Lemna minor (Lesser Duckweed)* ...	vr							
Typha latifolia (Broad-leaved Reedmace) ...	vr				1			1

* Near Cannon St. Station

HUMAN FOOD

It has become the custom for many City workers to eat their sandwiches and fruit on the sites at mid-day and Table 6 shows 12 species which were probably introduced in this way.

TABLE 6

PLANTS WITH EDIBLE FRUITS

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Citrus aurantiacum (Orange)	vr			1				1
Rubus idaeus (Raspberry)	vr			3				3
R. fruticosus agg (Bramble)	o	3	1	16		3	2	25
Fragaria x *ananassa* (Garden Strawberry) ...	vr			3				3
Prunus domestica (Plum)	r*			10				10
P. avium (Cherry)	o*	4	1	31	6	9	4	55
P. persica (Peach)	vr*		1					1
Pyrus communis (Pear)	vr*			8				8
Malus sylvestris (Apple)	o*			33				33
Ribes rubrum agg (Red Currant)	vr			1				1
Corylus avellana (Hazel)	vr	1						1
Lycopersicon esculentum (Tomato)... ...	r			10	3	2	3	18

* In the surveys of 1952 and 1953 most of these fruit trees were not considered easy to distinguish in the field, but in 1955 notes were made on them in the re-survey of the Cripplegate Area. The Cripplegate distribution is probably a fair indication of their distribution in the other areas.

Notes on Species : Single plants only were observed of *Citrus aurantiacum*, *Ribes rubrum* agg and *Corylus avellana.*

In addition 13 species grown by man for food appear from time to time and are given in Table 7. It is difficult to explain how these reached the sites. *Humulus lupulus* appropriately appeared very near Whitbread's Brewery.

TABLE 7

CROPS

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Brassica oleracea agg (Cabbage)	r	2	1	8	2	3	1	17
Armoracia rusticana (Horse-radish) ...	vr	1						1
Beta vulgaris (Beet)	vr			1	1	2		4
Pisum sativum (Pea)	vr	1			2	1	1	5

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Petroselinum crispum (Parsley)	vr			2		1		3
Carum carvi (Common Caraway) ...	vr						2	2
Pastinaca sativa (Garden Parsnip) ...	l	3		7	2	1		13
Daucus carota (Carrot)	vr	1		4	1			6
Humulus lupulus (Hop)	vr			1				1
Solanum tuberosum (Potato)	o	3	1	15	6	4	4	33
Mentha spp. (Mints)	vr	1	1	3	1			6
Lactuca sativa (Lettuce)	vr			1				1
Allium cepa (Onion)	vr			2			1	3

Notes on Species : The garden form of *Pastinaca sativa* is thoroughly naturalized on sites to the west of St. Giles's Church and is locally abundant on one site. Single plants, only, were observed of *Armoracia rusticana, Humulus lupulus* and *Lactuca sativa.*

Burs

Table 8 lists six species distributed by contact with animals and man.

Table 8

Plants with "Burs"

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Circaea lutetiana (Common Enchanters-nightshade)	vr	1		3				4
Cynoglossum officinale (Common Hound's tongue)	vr			1				1
Galium aparine (Cleavers)	r	5		7	1	1		14
Arctium sp. (Burdock)	r	2	1	6		1	1	11
Anisantha sterilis (Barren Brome)	a	3	1	39	5	6	3	57
Hordeum murinum (Wall Barley)	a	6	1	42	9	8	4	70

Notes on Species : A number of plants of *Cynoglossum officinale* occurred on a site to the south of St. Giles's Church and appear to be thriving.

Species Already Present

The 15 species given in Table 9 are planted trees and shrubs present in gardens or elsewhere. Only *Ficus carica* and *Platanus acerifolia* have appeared on the sites proper. At least one *Platanus acerifolia* (in Gresham Area) was a seedling as it was growing out of the wooden floor of a building ; normally it does not germinate in this country.

Table 9

Pre-existing Garden Species

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Tilia x *vulgaris* (Common Lime)	vr	1		1	1			3
Vitis sp. (Vine)	vr			4				4
Parthenocissus cf. *quinquefolia* Planch (Virginia Creeper)	vr	1		2	2	2		7
Rosa sp. (Rose)	vr	1						1
Pyracanthus sp.	vr	1						1
Morus sp. (Mulberry)	vr			2				2
Ficus carica (Fig)	vr	1		3	1	1	1	7
Platanus acerifolia Willd (London Plane) ...	r	2		8	3	6	1	20
Hedera helix (Ivy)	vr			3				3
Laurus sp. (Laurel)	vr			3				3

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Ulmus glabra (Wych Elm)	vr	1						1
U. procera (Common Elm)	vr	1						1
Syringa vulgaris (Lilac)	vr	1		1				2
Ligustrum ovalifolium (Oval Privet) ...	vr			2	3	1		6
L. japonicum Thunb. (Japanese Privet) ...	vr			1				1

In addition Table 10 shows *Poa annua* which must have occurred in the City before the war and *Parietaria diffusa* about which a little is known.

Parietaria diffusa occurred before the war at St. Alphage's in London Wall (Fitter and Lousley 1953). In 1946 it occurred in a number of basements along London Wall (the street) in the Cripplegate Area. It continued to spread south but was held up in the north by the Metropolitan Railway. By 1952 it had overcome this obstacle and reached as far as the west side of Whitbread's Brewery. In 1953 it was also found (in small quantities) in the Gresham and Queen Victoria Areas. By 1955 it had spread to the four extreme corners of the Cripplegate Area.

TABLE 10

OTHER PRE-EXISTING SPECIES

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Parietaria diffusa (Pellitory)	la			36	4	3		43
Poa annua (Annual Meadow Grass) ...	a	7		50	10	12	5	84

Probably various wasteland plants led a wandering existence from one building site to another before the war.

OTHER SOURCES

There now remain a large collection of species whose method of colonization is doubtful. To facilitate comment on these, the wild plants have been grouped according to their habitats under normal conditions.

Table 11 gives 62 species associated with waste places.

TABLE 11

PLANTS OF WASTE PLACES

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Diplotaxis muralis (Sand Rocket) ...	l			9				9
D. tenuifolia (Wall Rocket)	a	3		37	5	11	1	57
Lepidium ruderale (Narrow-leaved Pepperwort)	vr	1	1	4				6
Coronopus squamatus (Swine's Cress) ...	vr	1		2	2			5
Cardaria draba (Whitlow Pepperwort) ...	vr				1	1		2
Bunias orientalis	vr		1					1
Rorippa islandica (Marsh Yellow Water Cress)	l			9	1	1		11
Alliaria petiolata (Garlic Mustard)... ...	vr	1		2				3
Sisymbrium officinale (Hedge Mustard) ...	r	1	1	12			3	17
S. irio (London Rocket)	vr						1	1
S. orientale (Oriental Rocket)	a	2	1	43	9	4	2	61
S. altissimum (Tall Rocket)	vr		1	3				4
S. loeselii *	vr							
Reseda luteola (Dyer's Rocket)	vr	1		2				3
Hypericum perforatum (Perforate St. John's Wort)	vr			2				2

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Silene cucubalus (Bladder Campion) ...	r	4	1	5	3	4		17
Melandrium album (White Campion) ...	o	4	1	22	2	4	3	36
Cerastium vulgatum (Narrow-leaved Mouse-ear Chickweed)	vf	1	1	41	8	4	2	57
Sagina cf. *ciliata* (Fringed Pearlwort) ...	vr			3				3
S. procumbens (Procumbent Pearlwort) ...	vf	2	1	42	9	12	5	71
Arenaria serpyllifolia (Thyme-leaved Sandwort)	vr			1	1			2
Malva sylvestris (Common Mallow) ...	vr	1	1	4			1	7
Geranium dissectum (Cut-leaved Cranesbill)	vr			1	1			2
G. molle (Dove's-foot Cranesbill)	vr			1				1
Impatiens glandulifera (Indian Balsam) ...	vr						1	1
Medicago falcata (Sickle Medick)	vr			1				1
Melilotus cf. *officinalis* (Yellow Melilot) ...	r			8	1	1	3	13
M. alba (White Melilot)	vr			2		1		3
Potentilla anserina (Silverweed)	vr			1				1
P. reptans (Creeping Cinquefoil)	vr	1		2		2		5
Coriandrum sativum (Coriander)	vr			1				1
Foeniculum vulgare (Fennel)	vr	1				2		3
Heracleum sphondylium (Hogweed) ...	o	1		13	2	4		20
H. mantegazzianum (Giant Hogweed) ...	vr				1	1		2
Polygonum aviculare (Knotweed)	o	3	1	17	2	2	5	30
P. cuspidatum (Giant Knotweed)	vr	2		2	1	1		6
P. sachalinense	vr			1				1
Rumex crispus (Curled Dock)	vf	7	1	40	4	9	1	62
R. obtusifolius (Broad-leaved Dock) ...	vf	5	1	35	8	4	4	57
Urtica dioica (Common Nettle)	l	1	1	15	7	2	1	27
Convolvulus arvensis (Field Bindweed) ...	r	1	1	5			1	8
Calystegia sepium (Hedge Bindweed) ...	vr	1		2				3
C. sylvestris (Bladder Bindweed)	vr		1	1		1		3
Solanum dulcamara (Bittersweet)	r	2	1	11	3	5		22
Datura stramonium (Thorn-apple) ...	vr			1				1
Linaria vulgaris (Yellow Toadflax)... ...	vr			3				3
Ballota nigra (Black Horehound)	r	1	1	3	2	2	5	14
Lamium album (White Deadnettle) ...	vr			2			1	3
Plantago major (Greater Plantain) ...	vf	6	1	36	7	8	4	62
Dipsacus fullonum (Wild Teasel)	vr			1				1
Knautia arvensis (Field Scabious)	vr					1		1
Matricaria matricarioides (Rayless May-weed)	r	3		9	4	2	2	20
Chrysanthemum parthenium (Feverfew) ...	vr		1	2	1	1		5
Artemisia vulgaris (Mugwort)	a	7	1	50	10	11	4	83
A. verlotorum	vr			1				1
A. absinthium (Wormwood)	vl			5			1	6
Centaurea nigra (Black Knapweed) ...	vr	1		5		1		7
Lapsana communis (Nipplewort)	vr			6			1	7
Desmazeria rigida (Hard Fescue)	vr			1	1			2
Cynosurus echinatus (Rough Dogstail Grass)	vr					1		1
Agropyron repens (Common Couch) ...	r		1	6	3	1	2	13
Arrhenatherum elatius (False Oat)	r	2		16	1	1		20

* Near Cannon St. Station

Notes on Species : Single plants only were observed of *Bunias orientale*, *Geranium molle*, and *Impatiens glandulifera*. There was only one clump of the unusual *Medicago falcata* but this was approximately 6 feet across—it flowered so profusely that the vivid mass of yellow was visible from passing trains some distance away. *Sisymbrium irio*

occurred on the sites not far away from the old locality for it at the Tower of London. *Dipsacus fullonum* occurred as far back as 1946 on a single wall ledge at the junction of London Wall and Coleman Street and has been present at that spot every year since, but has been unable to establish itself elsewhere. *Coriandrum sativum* occurred on soil dumped for a car park.

Table 12 gives nine species associated with the Chalk.

TABLE 12
PLANTS OF THE CHALK

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Reseda lutea (Wild Mignonette)	vr		1					1
Anthyllis vulneraria (Kidney Vetch) ...	vr			1				1
Pastinaca sativa (Wild Parsnip)	vr			1		1		2
Echium vulgare (Viper's Bugloss)	vr			2				2
Verbascum nigrum (Dark Mullein) ...	vr			3				3
Origanum vulgare (Marjoram)	vr			1				1
Plantago media (Hoary Plantain)	vr					1		1
Centaurea scabiosa (Greater Knapweed) ...	vr		1	1		1		3
Zerna erecta (Upright Brome)	vr			3				3

Other species dealt with in earlier tables are *Clematis vitalba*, *Cynoglossum officinale*, *Inula conyza*, *Erigeron acris* and *Desmazeria rigida*.

Table 13 gives two species with large seeds. The first may have been introduced by boys. Pallis (1954) records acorns being carried by large birds.

TABLE 13
SPECIES WITH LARGE SEEDS

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Aesculus hippocastanum (Common Horse Chestnut)	vr			4		2		6
Quercus robur agg (Oak)	vr		1	2		1		4

Four woodland plants are given in Table 14.

TABLE 14
WOODLAND PLANTS

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Melandrium rubrum (Red Campion) ...	vr			2				2
Rumex sanguineus (Red-veined Dock) ...	vr			1	2			3
Scrophularia nodosa (Knotted Figwort) ...	vr				1			1
Digitalis purpurea (Foxglove)	1			4				4

Notes on Species : At the corner of London Wall and Coleman Street, *Melandrium album* occurs with apparent hybrids (in colour at any rate) with *M. rubrum*. *Digitalis purpurea* is in some abundance on a site to immediate east of Whitbread's Brewery.

TABLE 15
HEDGEROW PLANTS

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Anthriscus sylvestris (Wild Chervil) ...	vr	1		1				2
Torilis japonica (Upright Hedge-parsley) ...	vr			1	1			2
Stachys sylvatica (Hedge Woundwort) ...	vr			2				2

TABLE 16
WALL PLANTS

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Cymbalaria muralis (Ivy-leaved Toadflax)...	r			5		1		6

Cymbalaria muralis occurred only on a scree and the following plants which are often found on walls, although recorded on the sites (see other tables) were not noticed on walls : *Phyllitis scolopendrium*, *Dryopteris filix-mas* agg, *Corydalis lutea*, *Cheiranthus cheiri*, *Sagina procumbens*, *Arenaria serpyllifolia*, *Sedum acre*, *Kentranthus ruber*, *Chrysanthemum parthenium*.

About the only plants seen on walls were *Diplotaxis tenuifolia*, *D. muralis*, *Parietaria diffusa*, *Senecio squalidus* and *Artemisia vulgaris*.

TABLE 17
HEATHLAND PLANTS

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (7)	*Total* (85)
Lotus tenuis (Narrow-leaved Birdsfoot Trefoil)	vr			1				1
Rumex acetosella (Sheep Sorrel)	r	1		6	1	2		10

TABLE 18
PLANTS OF WET PLACES

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (7)	*Total* (85)
Lycopus europaeus (Gipsywort)	vr					1	1	2
Stachys palustris (Marsh Woundwort) ...	vr	1					1	2
Jurcus inflexus (Hard Rush)	vr					1		1
Carex hirta (Hairy Sedge)	vr						1	1
C. muricata (Prickly Sedge)	vr	1						1
Deschampsia caespitosa (Tufted Hair Grass)	vr			4	1	2		7

A strange feature of the sites is the presence of species usually associated with wet places. Apart from the species in Table 5 (which occurred in semi-permanent water) there are those given in Table 18 and also *Rorippa islandica*, *Impatiens glandulifera*, *Epilobium hirsutum*, *E. parviflorum*, *E. montanum*, *E.* cf. *obscurum*, *Salix alba*, *S. fragilis*, *S. viminalis*, *S. caprea*, *S. atrocinerea*, *S. caprea* x *viminalis*, *Solanum dulcamara*, *Phragmites communis*.

It may be that :—

1. Parts of the sites may contain more moisture than is generally supposed ; the cracks in the basement floors for example may allow water to seep in but possibly do not dry out very easily in summer.
2. The lack of competition may be more important to the plant than moisture (at some stage or other of its existence). Many of these plants can, in more natural habitats, be found on bare mud and the bare areas of the sites may be a suitable alternative. The differences in habitats cannot be too underrated, however, as the sites are veritable suntraps in summer and the vegetation becomes scorched up long before its counterpart in the open countryside. It might be mentioned here that in the spring *Pteridium aquilinum* fronds and *Tussilago farfara* flowers appear earlier because of this extra warmth.

TABLE 19

KNOWN INTRODUCTIONS

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Ranunculus bulbosus (Bulbous Buttercup)...	vr			1				1
Primula veris (Cowslip)	vr			1				1
Luzula campestris (Field Woodrush) ...	vr			1				1
Phalaris canariensis (Canary Grass) ...	vr				1			1

The first three were introduced in the turf for florists' gardens and *Phalaris canariensis* came from emptyings of a bird cage.

Table 20 gives 68 garden plants not already dealt with. These garden plants may be :—

(*a*) Mere casuals which fail to produce seed after arrival and not being perennials are not present the following year.

(*b*) Certain annuals probably arising from packets of seeds thrown over the sites which may come up the next year but then die out.

(*c*) Plants established because they are perennials and last for many seasons without their seeds being able to colonize.

(*d*) Plants truly naturalized on the sites, although not necessarily very common. 21 species.

Some of the ways in which these may have arrived are :—

1. Throw-outs from office window-boxes (*Hyacinthus* sp. and *Endymion* cf. *non-scriptus* were certainly of this origin).
2. Scattering of seeds by persons wishing to beautify the sites. This practice was prevalent shortly after the war and two definite cases of such dissemination are known to the writer.
3. Escapes from gardens. A large garden (started during the war) is tended in the Gresham Area and two small florists' display gardens were set up near Moorgate Station. Some may even have survived from pre-war gardens.

TABLE 20

GARDEN PLANTS

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Naturalized—								
Papaver atlanticum (Orange Poppy) ...	l			7	2			9
Lunaria annua (Honesty)	vr	1		4	1	2		8
Lobularia maritima (Sweet Alison) ...	vl					3		3
Arabis caucasica (White Rockcress) ...	r			6	1			7
Matthiola incana (Hoary Stock) ...	r	1		5			1	7
Cheiranthus cheiri (Wallflower)	l	1		15	2	2		20
Lychnis coronaria (Rose Campion) ...	r			6	1	2	1	10
Dianthus barbatus (Sweet William) ...	r			8	1			9
Saponaria officinalis (Soapwort) ...	lf	1	1	12	2	1		17
Cerastium tomentosum (Snow-in-Summer)	r			10	1			11
Althaea rosea (Hollyhock)	o		1	18	6	5		30
Lathyrus latifolius (Broad-leaved Everlasting Pea)	r		1	7		3		11
Sedum acre (Biting Stonecrop)	vr	1		5	1		1	8
Oenothera spp. (Evening Primrose) ...	la			33	10	6		49
Buddleja davidii (Butterfly Bush) ...	lf			13	7	9		29
Verbascum thapsus (Great Mullein) ...	l			17	8	3		28
Antirrhinum majus (Greater Snapdragon)	r	1		7	4	8		20

		F (7)	B (1)	C (50)	G (10)	Q (12)	T (5)	*Total* (85)
Linaria purpurea (Purple Toadflax) ...	la			25	6	3		34
Calendula officinalis (Pot Marigold) ...	o	2		16	7	7	1	33
Asparagus officinalis (Asparagus) ...	r			6	1	2		9
Alstroemeria aurantiacum (Peruvian Lily)	vr			2				2
Not naturalized—								
Delphinium cf. *orientale* (Larkspur) ...	r			5	2	3		10
Delphinium sp. (Delphinium)	vr			1		1		2
Anemone japonica	vr	1						1
Aquilegia spp. (Columbine)	r			5	1	3	1	10
Papaver somniferum (Opium Poppy) ...	r	1		8	4	2	1	16
Papaver sp. (Poppy)	vr			2	2	1		5
Eschscholtzia californica (Californian Poppy)	vr			2	1			3
Corydalis lutea (Yellow Corydalis) ...	vr				1	1		2
Iberis amara (Candytuft)	vr			2				2
I. umbellata	vr				2	1		3
Aubrietia deltoidea	vr			3				3
Malcolmia maritima (Virginian Stock) ...	vr	1		1		1		3
Hesperis matronalis (Dame's Violet) ...	vr			1				1
Dianthus caryophyllus (Carnation) ...	vr			1				1
D. deltoides (Maiden Pink)	vr			2				2
Linum grandiflorum (Crimson Flax) ...	vr			1	1	1		3
Geranium sanguineum (Blood-red Cranesbill)	vr			1				1
Tropaeolum majus (Nasturtium)	vr	1		2	1	2		6
Oxalis sp. (Wood Sorrel)	vr	1						1
Lupinus polyphyllus (Lupin)	vr			3	2	3		8
Laburnum anagyroides (Laburnum) ...	vr			1	1			2
Galega officinalis (Goats Rue)	vr			2				2
Colutea arborescens (Bladder Senna) ...	vl			2				2
Sedum cf. *telephium*	vr			1				1
Sedum spp.	vr				1	1		2
Clarkia sp.	vr					1		1
Polygonum baldschuanicum (Russian Vine)	vr				1	1		2
Armeria maritima (Thrift)	vr					1		1
Primula sp. (Primrose)	vr				1			1
Lysimachia nummularia (Creeping Jenny)	vr	1						1
Phlox cf. *paniculata*	vr			1				1
Anchusa sp.	vr			1				1
Physalis alkekengi (Chinese Lantern) ...	vr			1				1
Kentranthus ruber (Red Spur Valerian) ...	vr				2			2
Rudbeckia sp.	vr	1		6	5	1		13
Tagetes patula (French Marigold) ...	vr			1				1
Cosmos pinnatus (Mexican Aster) ...	vr			1				1
Chrysanthemum maxima (Gt. Ox-eye Daisy)	r	1	1	2	2	3		9
C. indicum (Chrysanthemum)	vr		1	1	2	1		5
Gaillardia aristata	vr					1		1
Tanacetum vulgare (Tansy)	vr		1					1
Centaurea cyanus (Cornflower)	vr			2				2
Endymion cf. *non-scriptus* (Bluebell) ...	vr			2		1		3
Hyacinthus sp. (Hyacinth)	vr			1				1
Muscari racemosum (Grape Hyacinth) ...	vr			1				1
Narcissus sp. (Daffodil)	vr	1		2				3
Iris cf. *germanica* (Flag)	r		1	9		2		12

Notes on Species : Both long-spurred yellow and wild short-spur deep blue forms of *Aquilegia* noticed. *Matthiola incana* occurs in some abundance high up on the wall of a building near Aldersgate Street and seems to be as at home as on its natural habitat of chalk cliffs.

In addition *Tamarix* sp., *Ailanthus altissima*, *Solidago canadensis*, *Aster* sp., plants with edible fruits in Table 6, crops in Table 7 and pre-existing garden trees and shrubs in Table 9, occur.

Other possible agents in carrying seeds of plants in Tables 11-20 may be :—

1. Wheels of lorries, etc., when clearing rubble in the early 1940's.
2. Turn-ups of men's trousers (not excluding naturalists' during surveys). The custom of City workers of using the sites to have their lunches has been referred to, but they also play football and cricket and stroll about.
3. Occasionally materials are tipped on to the sites (only small quantities) and this must add species.
4. Wind may play a greater part in distribution than is suggested earlier. Wind might carry any small seed even if not specially adapted. Some such as various Compositae (*Artemisia vulgaris* is the most important) have fringes of hairs on the seed which assist wind-dispersal to some extent, as does *Buddleja davidii.*
5. Birds may eat types of seeds other than berries which might pass through the alimentary canal.
6. Almost any seed might be present in the food of a horse, e.g. weeds occurring at edges of meadows and hayfields from which the hay was taken—*Knautia arvensis* and *Stachys sylvatica* for example.

Table 20 concludes the systematic lists of species present and methods of colonization which may be summarized :—

Table		*No. of Species*
1.	Wind-dispersed Plants	53
	Horses :	
2.	Hayfield Plants	42
3.	Weeds of Cultivation	30
	Birds :	
4.	Plants with Berries	5
5.	Strictly Aquatic Plants	3
	Human Food :	
6.	Plants with Edible Fruits	12
7.	Crops	13
8.	Plants with " Burs "	6
9.	Pre-existing Garden Species	15
10.	Other Pre-existing Species	2
	Other Sources :	
11.	Plants of Waste Places	62
12.	Plants of the Chalk	9
13.	Plants with Large Seeds	2
14.	Woodland Plants	4
15.	Hedgerow Plants	3
16.	Wall Plants	1
17.	Heathland Plants	2

Table		*No. of Species*
18.	Plants of Wet Places	6
19.	Known Introductions	4
20.	Garden Plants	68
		342

Sixty-seven families are represented thus : Compositae 55 species ; Gramineae 33 ; Cruciferae 30 ; Papilionaceae 22 ; Rosaceae 15 ; Caryophyllaceae 14 ; Umbelliferae and Polygonaceae 13 ; Scrophulareaceae 10 ; Salicaceae 9 ; Ranunculaceae and Onagraceae 8 ; Labiatae 7 ; Chenopodiaceae, Solanaceae and Liliaceae 6 ; Papaveraceae 5 ; Geraniaceae, Primulaceae and Oleaceae 4 ; Polypodiaceae, Crassulaceae, Euphorbiaceae, Urticaceae, Boraginaceae, Convolvulaceae and Plantaginaceae 3 ; Resedaceae, Malvaceae, Vitaceae, Moraceae, Ulmaceae, Rubiaceae, Dipsaceae, Juncaceae and Cyperaceae 2 ; Equisetaceae, Fumariaceae, Hypericaceae, Tamaricaceae, Tiliaceae, Linaceae, Rutaceae, Simarubaceae, Oxalidaceae, Balsaminaceae, Aceraceae, Hippocastanaceae, Aquifoliaceae, Plantanaceae, Grossulariaceae, Araliaceae, Lauraceae, Cannabinaceae, Betulaceae, Corylaceae, Fagaceae, Polemoniaceae, Plumbaginaceae, Loganaceae, Caprifoliaceae, Valerianaceae, Hydrocharitaceae, Amaryllidaceae, Iridaceae, Lemnaceae and Typhaceae only one each.

SUCCESSION

The first plants to colonize the sites, as has been mentioned, were those with wind-dispersed seeds. Wind-dispersal was doubly effective in that it enabled a plant to come to the sites from remote places and once arrived albeit only a few seeds were then, the next season, able to distribute seeds over the whole of the sites.

Other plants abundant in the early years (Wrighton, 1948-1953) were of the genera *Chenopodium* and *Atriplex* which normally exist in loose soil. Their methods of dispersal are not clearly known but they were possibly introduced on wheels of vehicles clearing away the rubble. When the ground became consolidated they began to disappear. Fitter and Lousley (1953) record *Senecio vulgaris* and *S. viscosus* abundant shortly after the sites had been cleared but these plants seem to have suffered the same fate.

Although the wind-dispersed plants had a flying start, the advance of the grasses was inexorable. This was for three reasons :—

(*a*) The colonization by grasses chiefly from the wall ledges was slow but very sure as the ledges were so widespread. After some years the advance gained momentum.

(*b*) Mosses were abundant and often dominant as a mat on the basement floors at first, but as a thin layer of humus formed grasses gained a hold, spreading over their floors their tangled roots, enabling dust to be collected and added to the soil.

(*c*) Most of the grasses are perennials, and evergreens and other plants dying down for the winter had to push up through the grasses in the spring. Seedlings were unable to grow and annual species like *Erigeron canadensis* at first so abundant are now quite

uncommon. Even plants like *Senecio squalidus* which may exist for several years, as individuals, have to replenish themselves by seed and have to resort to areas the grasses cannot colonize, e.g. walls. This applied to many robust plants where individuals die off and are not replaced—e.g. *Chamaenerion angustifolium* which must lose ground slowly.

Pteridium aquilinum which appeared as an early colonizer is now at a standstill requiring protection from frost and is not able to exist on the thin soil on the basement floors. The screes of bricks where sporelings used to germinate have collected dust and have become overgrown by grasses and other plants. The spread, if any, now has to be confined to vegetative growth.

Artemisia vulgaris started to appear in abundance in 1950 and is still spreading, ousting many plants by its large size and thick rootstock. Its spread has been slow as, like the grasses, wind does not play a very great part in its dispersal. It cannot invade areas occupied by the grasses because of the germination.

It is unlikely that with the present rate of building, we shall see much more of the succession. Clearing for building purposes has already devoured more than a third of the Cripplegate Area, nearly all the Gresham Area, and more than three-quarters of the Queen Victoria Area. If we could foresee further development it would most likely take the form of all flat areas and gentle slopes becoming overgrown with grasses.

The changes shown in Table 21 have taken place since 1947-9 (per Wrighton 1950) on the Cripplegate sites.

TABLE 21

CHANGES IN FREQUENCY

	1947–9	1952–5
Dryopteris filix-mas agg	—	o
Sagina cf. *ciliata* or *apetala* ...	la	vr
Chenopodium polyspermum	la	vr
C. album	va	o
C. rubrum	la	r
Atriplex patula	o	vr
Polygonum persicaria	—	o
Solidago canadensis	—	o
Aster spp.	r	o
Hypochaeris radicata	r	f
Crepis taraxacifolia	—	o
Anisantha sterilis	o	a
Agropyron repens	f	r

TREES AND SHRUBS

The climax of vegetation over much of Britain is woodland, but on the sites the trees and shrubs are not very prominent. Until a good depth of humus and soil have accumulated they cannot make any progress.

During 1952 and 1953 a survey of trees was made. During the survey the numbers and heights of each species was noted and Table 22 summarizes these. Those in gardens have been omitted.

TABLE 22

CENSUS OF TREES

	Number of Trees on Sites						Heights in Feet up to and including				*Total*
	F	B	C	G	Q	T	1	3	6	10 over	
Citrus aurantiacum ...			1				1				1
Ailanthus altissima ...			6				2	4			6
Acer pseudo-platanus ...	1	2	14	12	17	2	21	16	11		48
Aesculus hippocastanum			5		2			6	1		7
Ilex aquifolium ...			1				1				1
Laburnum anagyroides...			1					1			1
Fruit Trees	43	8	122	39	107	28	173	139	29	6	347
Crataegus sp. ...			3		1		3	1			4
Sorbus intermedia agg...			1				1				1
S. aucuparia	2		7	3	1		7	5	1		13
Ficus carica			1		1	1	2		1		3
Platanus acerifolia ...			5	2				2	3	2	7
Betula verrucosa ...	5		51	25	34	5	6	40	42	25	7 120
Corylus avellana ...	1						1				1
Quercus robur agg ...		1	2		1		4				4
Populus alba			5	1	1			3	3	1	7
P. tremula			2	1				2		1	3
P. cf. *nigra*			9	1	2		1	3	6	2	12
Salix alba			5		1	1		1	2	2	2 7
S. fragilis	2	1	10	2	2		6	9		1	1 17
S. viminalis			4		2	1			3	3	1 7
S. caprea	3	4	147	67	52	5	13	55	108	93	9 278
S. atrocinerea	2	2	53	21	18	12	3	29	43	32	1 108
S. caprea x *viminalis* ...				1					1		1
Buddleja davidii ...			22	7	46		14	25	21	14	1 75
Fraxinus excelsior ...						1		1			1
Sambucus nigra ...	27	3	95	47	35	20	78	54	61	29	5 227
	86	21	572	229	323	76	337	396	336	211	27 1307

During the 1952-3 survey the various fruit trees were not distinguished, but from the re-survey of the Cripplegate Area in 1955 it would appear that *Prunus avium* and *Malus sylvestris* are the most frequent with *Prunus domestica*, *P. persica* and *Pyrus communis* much less so. It will be noted that this is a case where introduction of seeds is plentiful and they do germinate, but find conditions for further growth unsuitable : hence a large number of young plants but few older ones.

Sambucus nigra bushes are often broad in proportion to height and are more important than the figures would suggest.

It will be seen that there are very few young Salices but many older ones. It would appear that colonization took place when the soil was much less consolidated than it is now. Although the trees may still be growing, fresh colonization is not taking place, despite abundant seed being produced. *Salix caprea* and *S. atrocinerea* are by far the two most abundant Salices, *Salix caprea* being most characteristic of the sites. As the trees get old many die although they have not reached maturity—it seems probable that in dry summers a tree cannot find sufficient moisture in the crevices in floors or walls. The most hard hit species is *S. atrocinerea* which is rapidly disappearing.

In addition to natural hardships the trees have to contend with having branches broken off (the Salices in spring for "Palm") or wanton destruction.

The following are known to have flowered on the sites : *Prunus avium*, *Betula verrucosa*, *Salix viminalis*, *S. caprea*, *S. atrocinerea*, *Buddleja davidii* and *Sambucus nigra*.

The Most Successful Plants

The real success of colonization can be judged by Table 23 which is an attempt to express the frequencies of the plants numerically.

In 1952 during the survey, the abundance of each species on each Cripplegate and Gresham site was noted. These frequencies were then weighted, for example :—

Senecio squalidus on Cripplegate Area :

Very frequent (weighting 1,500) on 39 sites = 1,500 × 39	=	58,500
Frequent (weighting 1,000) on 9 sites = 1,000 × 9	=	9,000
Occasional (weighting 100) on 1 site = 100 × 1	=	100
Rare (weighting 1) on 1 site = 1 × 1	=	1
		67,601

This arithmetical frequency was worked out for each species, the aggregate being approximately 1,200,000 for the Cripplegate Area and 270,000 for the Gresham Area. The figure for each species was then expressed as a percentage of the total for all species. In the above example *Senecio squalidus* on the Cripplegate Area was

$$\frac{67{,}601 \times 100}{1{,}200{,}000}\% = 6\%$$

It is not pretended that this figure gives a very accurate figure for the proportion of the total vegetation each species represents ; the weightings are arbitrary and the estimates of frequency must be subject to vagaries of human judgment. The figures for each species are probably within 50—150% of the correct figure which even if it sounds very wide is not so in estimating frequencies over a large heterogeneous area. They certainly show the species which are most abundant as apart from widespread.

Table 23
The Most Abundant Plants

	Cripplegate Sites (50)	%	Gresham Sites (10)	%
Pteridium aquilinum (Bracken)	49	4	10	6
Diplotaxis tenuifolia (Wall Rocket)	32	3	5	—
Sisymbrium orientale (Oriental Rocket)	40	1	9	3
Cerastium vulgatum (Narrow-leaved Mouse-ear Chickweed)	39	2	8	1
Stellaria media (Common Chickweed)	50	2	10	1
Sagina procumbens (Procumbent Pearlwort)... ...	41	3	9	4
Trifolium repens (White Clover)	31	2	9	1
Chamaenerion angustifolium (Rosebay)	50	4	9	4
Epilobium cf. *obscurum* (Dull-leaved Willowherb) ...	46	4	10	5
Oenothera sp. (Evening Primrose)	29	1	10	4
Parietaria diffusa (Pellitory)	30	2	4	1
Linaria purpurea (Purple Toadflax)	18	1	6	1
Sambucus nigra (Elder)	37	—	8	2

	Cripplegate Sites (50)	%	Gresham Sites (10)	%
Senecio squalidus (Oxford Ragwort)	50	6	10	5
Tussilago farfara (Coltsfoot)	49	5	10	5
Erigeron canadensis (Canadian Fleabane)	50	3	10	5
Artemisia vulgaris (Mugwort)	49	3	10	3
Cirsium vulgare (Spear Thistle)	50	1	10	1
C. arvense (Creeping Thistle)	50	3	10	4
Hypochaeris radicata (Long-rooted Catsear) ...	45	2	8	1
Lolium perenne (Perennial Rye Grass)	48	4	10	3
Poa annua (Annual Meadow Grass)	49	5	10	3
P. pratensis (Smooth Meadow Grass)	46	3	8	4
P. trivialis (Rough Meadow Grass)	35	2	10	3
Dactylis glomerata (Cocksfoot)	48	4	10	2
Anisantha sterilis (Barren Brome)	33	3	5	1
Hordeum murinum (Wall Barley)	37	2	9	1
Holcus lanatus (Tufted Soft Grass)	35	3	9	4
Agrostis alba agg (White Bent Grass)	48	5	10	5
		83		83

It will be seen that approximately plants with wind-dispersed seeds accounted for 30% of the vegetation, grasses originating from horse dung 25% and other abundant species 25%, a total of 80% by 29 plants.

Table 24 shows plants, none of which constitute as much as 1% of the vegetation but which occurred on half or more of the sites.

TABLE 24
OTHER WIDESPREAD PLANTS

	Cripplegate (50)	Gresham (10)
Dryopteris filix-mas agg (Male Fern)	45	8
Capsella bursa-pastoris (Shepherd's Purse)	34	3
Chenopodium album (White Goosefoot)	7	8
Atriplex hastata (Halberd-leaved Orache)	46	9
Medicago lupulina (Black Medick)	28	5
Trifolium pratense (Red Clover)	43	6
Prunus avium (Cherry)	31	6
Polygonum persicaria (Common Persicaria)	19	9
Rumex crispus (Curled Dock)	40	4
R. obtusifolius (Broad-leaved Dock)	35	8
Urtica dioica (Common Nettle)	15	7
Betula verrucosa (Common Birch)	31	7
Salix caprea (Sallow)	46	8
S. atrocinerea (Grey Sallow)	30	8
Buddleja davidii (Butterfly Bush)	13	7
Solanum tuberosum (Potato)	15	6
Verbascum thapsus (Great Mullein)	17	8
Plantago major (Greater Plantain)	36	7
P. lanceolata (Ribwort Plantain)	24	6
Calendula officinalis (Pot Marigold)	16	7
Solidago canadensis (Garden Golden Rod) ...	25	7
Aster spp. (Michaelmas Daisy)	38	8
Achillea millefolium (Milfoil)	23	6
Lactuca serriola (Prickly Lettuce)	45	6
Sonchus oleraceus (Common Sowthistle)	49	10
Crepis taraxacifolia (Beaked Hawksbeard)	36	3
Taraxacum sp. (Dandelion)	50	10

SUMMARY

1. The sites were created in the early 1940's and consist largely of the open basements of buildings.
2. Plants with wind-dispersed seeds were able to colonize the whole area quickly and abundantly.
3. These plants were later challenged by the grasses originating from horse dung and becoming the most successful.
4. A few other species achieved prominence with the above and 29 species constitute 80% of the vegetation.
5. More than 300 other species colonized the areas, by various means, much less successfully.
6. The principles of successful colonization may perhaps be summarized :—
   (*a*) The seeds must get there.
   (*b*) The seeds must germinate.
   (*c*) The plants must be able to grow to maturity.
   (*d*) The plants must be able to compete with others.

REFERENCES

CLAPHAM, A. R., TUTIN, T. G., and WARBURG, E. F., 1952, *Flora of the British Isles.*
FITTER, R. S. R., and LOUSLEY, J. E., 1953, *The Natural History of the City* (this gives a list of plants recorded by Mr. Lousley, their frequency and approximate date of arrival together with a bibliography).
PALLIS, M., 1954, A Note on Acorn Distributing Birds. *The School Nature Study Journal,* Vol. 49, 49-50.
RAYNER, J. F., 1927, *A Standard Catalogue of English Names of our Wild Flowers.*
WRIGHTON, F. E., 1948-53, Plant Ecology at Cripplegate, 1947-52. *London Naturalist,* 27-32

Books

Man as an Animal by W. C. Osman Hill. 176 pp., 11 figs. Hutchinson University Library, 1957. 10s. 6d.

Here we have in simple terms a clear and short summary of the evidence that man has evolved from ape-like ancestors. Although there is mention of those aspects of physiology, endocrinology, pathology, parasitology, comparative psychology and genetics which have a bearing on this subject, the main emphasis is on comparative anatomy, especially that pointing to man's arboreal descent and the development of the erect posture. There are also interesting chapters on the fossil " missing links " and on the emergence of the various races of man. It might be said in criticism that many aspects are discussed too briefly. However, this treatment does emphasize the mass of evidence that is now available and makes this book a good introduction to the subject. On the whole the production is quite good but some of the line drawings are far from clear.

G.B.

Supplement by David McClintock [to the " Pocket Guide to Wild Flowers "]. 89 pp. and a Preface. 1957. Price 6s. including postage ; obtainable from Miss C. M. Rob, Catton Hall, Thirsk, Yorks.

This is a completion of the Pocket Guide with descriptions of about 450 more species, mainly established aliens and garden plants now apparently " wild," including a number not in C.T.W. It is packed with information in untechnical language. There are lists of hybrids, albinos,

etc., and of plants grouped by Communities. These lists are both useful and interesting. Of the greatest value are the descriptions of so many seldom-seen aliens, particularly non-European plants, in one book, and the mention of localities for some of the rarest is helpful and would afford a clue to the name, say, of an ericaceous shrub found in a bog near Chobham, Surrey, or a *Cytisus* on a railway bank near Dorking. The author has recently travelled round England, Scotland, Wales and Ireland, from the Shetlands to the Channel Islands, to check that each plant is really established and there now.

The emphasis on English names demands great feats of memory, so many being more unfamiliar than the Latin names. Need one remember which *Ammi* is False Bishops Weed and which is the Toothpick Plant ? The Index includes both English and Latin names, and the amount of information included and the low price are both amazing.

B.W.

L'Homme contre l'Animal, by R. Fiasson, pp. 128. Collection " Que sais-je ? " No. 737. Presses Universitaires de France, Paris. 1957. Paper covers. No price stated.

This little book is an admirable summary of the problems involved in the conservation of the world's wild animal life, especially the mammals. The author discusses the natural causes of the disappearance of wild faunas, such as the Ice Age, parasites and mass migrational suicide ; he goes on to man's responsibility—the clearance of primitive forests with the resulting drying up of rivers and soil erosion, the slaughter of game in connection with tsetse fly control—and gives a horrifying picture of the wholesale slaughter in the past, with its extinction and near extinction of many species. He discusses the right of wild animals to live and in the final chapter considers how to preserve them, concluding with an account of famous national parks and with a good word for the educational value of some of our modern films.

C.P.C.

British Herbaria, compiled by D. H. Kent with the assistance of E. B. Bangerter and J. E. Lousley. Published by The Botanical Society of the British Isles ; Feb., 1958. Price 15s. (unglazed " Linson ") or £1 (buckram).

The sub-title of this book is " An Index to the location of Herbaria of British Vascular Plants with biographical references to their collectors." It is to the latter that most of the text is devoted and in which it is so interesting to browse, being full of information accumulated by the compiler during the last ten years. This section is followed by two classified indexes to the location of collections, one, of those with strong representation of local floras, the other of critical groups and genera. There is also a bibliography and a list of the Universities, Museums, etc., possessing herbaria, including that of the L.N.H.S. (some 3,000 sheets) formed by members of the Society, largely between 1900 and 1930. No such guide has hitherto been available, and it is very welcome.

B.W.

A Key to the British Species of Freshwater Cladocera, by D. J. Scourfield and J. P. Harding, pp. 55, 111 figures. Freshwater Biological Association (Scientific Publication No. 5), 1958. Price to non-members 4s. 6d.

This is a revised and improved edition dealing with *Daphnia* and related species found in our freshwaters. Although primarily a key to species, brief distribution accounts and notes on habitats are included. These details record several species from the London Area. The distribution in the Lake District is given in greater detail.

A Key to the Adults and Nymphs of British Stoneflies (*Plecoptera*), by H. B. N. Hynes, pp. 87, 43 figures=219 drawings, 30 distributional maps. Freshwater Biological Association (Scientific Publication No. 17), 1958. Price to non-members 5s. 6d.

An enriched and much improved new edition has appeared, based on the research work of the author helped by many students who have used the 1940 edition to good effect. The keys deal with our 34 species. Distribution is briefly mentioned being almost confined to the maps. Habitat data is slight. The drawings of adult genitalia, etc., are much as before, but to these are added a whole series devoted to the nymphs accompanying the keys to the early stages. The introduction and list of references are both enlarged and a number of changes of names and corrections of earlier mis-identifications have been made to bring the work up to date.

L.P.

Instructions to Young Geologists, by D. H. Dalby, pp. 144, 9 pls., 36 text-figs. Museum Press Ltd., London. 1957. 10s. 6d.

Here at last is a book I can enthusiastically recommend to the beginner. It is well balanced and well written, with a useful glossary and an adequate index. As well as introducing, in a readable way, all the aspects of geology you will find so uninspiringly treated in the average text-book, there is an excellent chapter linking geology with archaeology and another on soils which stresses the importance of geology to the botanist.

Most of the photographs are good and the text-figures simple, making their points without waste of line. The exceptions are the drawings of common fossils, especially the brachiopod on figure 22, which is dreadful : a good photograph of these fossils might well replace the sombre plate 8.

Full marks to the author who heads his list of equipment with " a pair of observant eyes, a notebook . . ." If the Londoner feels that hard rocks and the hammer get too much of the limelight and is hurt by the dismissal of his beloved Tertiaries as " sands and gravels in the main," a rapid glance at the sketch map on page 91 will remind him that there are other Formations.

With so useful a little book it is worth making suggestions that might be considered in a new edition. A little guidance in the field is so useful to the beginner in geology that more prominence should be given to the Geologists' Association and natural history societies which, in this respect, can be more helpful than museums.

Is it wise to use the terms " granitic " and " basaltic " for acidic and basic rocks ? This may lead to confusion later on. There is certainly confusion in the statement (p. 20) " granitic and basaltic rocks produce two types of magma." On page 85 is another curious twist that obscures the meaning : " a certain species of short-lived ammonite " does not convey the idea intended of a species of ammonite with a short time-range. These are, however, minor criticisms of a very readable book.

H.A.T.

The following books have also been added to the Library during 1957:

W. J. Arkell, *The Geology of Oxford.*
C. A. Arnold, *Introduction to Paleobotany.*
F. G. Bawden, *Plant Diseases.*
A. d A. Bellairs, *Reptiles.*
F. Bouliere, *The Natural History of Mammals* (1955).
Bruce Campbell, *Finding Nests* (1953).
Bruce Campbell, *Bird Watching for Beginners* (1952).
H. G. Carter, *Glossary of the British Flora.*
J. D. Carthy, *Animal Navigation.*
G. M. Davies, *The Dorset Coast.*
H. L. Edlin, *Trees, Wood and Man.*
C. Ellis, *Pebbles on the Beach.*
E. A. R. Ennion, *The British Bird.*
E. A. R. Ennion, *The Lapwing.*
F. Finn, *Eggs and Nests of British Birds.*
J. Fisher, *Bird Recognition* (3).
R. S. R. Fitter and J. E. Lousley, *The Natural History of the City* (1953).
R. S. R. Fitter and R. A. Richardson, *Pocket Guide to British Birds.*
Fraser, *Birds of the Middle Thames* (1954).
Fraser, *The Mammals of the Middle Thames* (1955).
D. Grose, *The Flora of Wiltshire* (1957).
V. A. Hochbaum, *Travels and Tradition of Waterfowl.*
E. Hosking and S. Smith, *Birds Fighting.*
P. Irwin, *British Bird Books*, 1481-1948 (1951).
A. King, *The Observer's Book of Garden Flowers.*
D. Lack, *Swifts in a Tower.*
London Natural History Society, *Birds of the London Area*, since 1900.
J. E. Lousley, *Progress in the Study of the British Flora.*
G. V. Matthews, *Bird Navigation.*
G. W. Meates, *Lullingstone Roman Villa.*
H. Mellamby, *Animal Life in Fresh Water.*
C. E. Moss, *Vegetation of the Peak District.*
G. Mountfort, *The Hawfinch.*
Observer's *Book of British Grasses, Sedges and Rushes.*
J. H. Parker, *Golden Treasury of Natural History.*
J. Prestwich, *A Geological Enquiry re Water-bearing Strata around London.*
J. Raven and M. Walters, *Mountain Flowers.*
Rintoul and Baxter, *A Vertebrate Fauna of Forth.*
Ross Craig, *Drawings of British Plants, Parts* IV-IX.
R. E. A. Simmons, *Studies in Great Crested Grebes.*
A. E. Smith, *The Birds of Lincolnshire.*
Worthington G. Smith, *Synopsis of British Basidiomycetes* (1908).
L. D. Stamp, *An Introduction to Stratigraphy.*
A. H. Uggla, *Linnaeus.*
U. Venables, *Tempestuous Eden.*
J. Watson, *Cements and Artificial Stones.*
J. Watson, *British and Foreign Building Stones.*
E. I. White, *Vertebrate Fauna of the English Eocene* (1931).
Woodward, *Catalogue of British Species of Pisidium* (1913).
C. W. Wooldridge and G. E. Hutchings, *London's Countryside.*

Reference Atlas of Greater London, Bartholomew.
Geological Survey, Ten Mile Map.
Check List of Birds of Great Britain and Ireland. B.O.U.
Birds in Inner London.
Bird Banding, 1955, 1956.
Past and Present Status of Buzzard in Britain.
Status of Rarer Birds of Prey.
Notes on British Mammals.

Proceedings of Geologists' Association, Vol. 66 and 67 (1955, 56).
British Birds, Vols. 48 and 49 (1955 and 56).
The Entomologist, Vol. 88 and 89 (1955 and 56).
The Entomologist's " *Gazette*," Vols. 5 and 6 (1954 and 55).
The Entomologist's Monthly Magazine, Vols. 90 and 91 (1954 and 55).
The Entomologist's Record, Vols. 62 and 63 and 67 and 68.
The Vasculum, Vols. 1-25.
and many County and Local Societies' Reports.

Official Reports

Council's Report for 1957

THE campaign to increase membership launched last year continued to show results, and by the end of the financial year, October 31, there were 1,550 members, a net increase of 150 on last year. The number of members in arrears was, at the same time, the lowest on record. Although we are still gaining steadily through the personal efforts of members we owe much to Mr. Eric Hosking who arranged for us to have a publicity stand at the Kodak Exhibition of his photographs. The many members who worked so cheerfully there deserve our grateful thanks for a most successful effort.

Over 5,000 Christmas Cards were sold for a profit of about £50 and thanks to the mention of them in *The Observer* orders came from many places including the U.S.A. and Kenya. The artists were two young members, Miss M. Mathews (now Mrs. Makepeace) and Mr. P. Griffiths, and they certainly made a great contribution to our financial success in this venture.

The Treasurer's report unfortunately shows clearly that even more effort is needed, as in spite of all the hard work of this year we have only cleared expenses by a little over £30. Our printing costs will probably rise again with the transfer of the printing of the *London Naturalist* to the London printer already dealing with the rest of our work, but we hope this policy will be justified.

We have received £40 from the Royal Society's grants-in-aid to scientific publications for the papers by Dr. Beven and Dr. Rose. The series on the Moths of the London Area by Baron de Worms is completed in this issue and adds yet one more important systematic list to our publications.

By September, 1957, 2,250 copies of our book *Birds of the London Area since 1900* had been sold, following its publication in March, and it is now out of print. If demand is sufficient, and we hope that members will make it so, the book may be reprinted. The royalties have not only completely repaid to the Society the expenses involved in its production but have provided the Ornithological section with a nest-egg for a suitable project.

The London University lectures proved very popular. Mr. D. Owen gave a second-year course on " The Ecology of Birds " for former students of Dr. Stonehouse. Unfortunately the University were unable to run a similar course for beginners owing to the departure of Dr. Stonehouse to the South Atlantic. The botany course, held for the first time at Chelsea Physic Garden, was a great success and the students who took it continued for a second year and another first-year course was also run.

The necessity for re-printing the rules which have remained virtually unchanged since pre-war days led to a decision to revise them drastically. It has been decided not to alter the subscription in general but the system has been simplified. The categories of " School and Country Associates " have disappeared and all who join now are members. National Servicemen and students have been helped by being accepted as junior members, regardless of age. Partly to compensate for this, young members in full employment pay full subscription rates from the age of eighteen. The entrance fee has been raised to five shillings to cover the increased postal costs of enquiries and initial membership.

During the year Mr. R. Hale, for many years our Librarian, has been chosen to fill a Vice-Presidential vacancy.

1958 is our Centenary year and the sections are making a great effort to provide especially good meetings. The Society's main celebration was a film show and buffet supper at Church House, Westminster, on March 11.

At the invitation of the Chief Librarian, our Centenary Exhibition will be opened by Professor Munro Fox, F.L.S., at Stoke Newington Public Library on October 4. It will then go to the Royal Exchange for a fortnight from November 4 and Lord Hurcomb will perform the opening ceremony. From November 23 it will be at Wandsworth and Eric Simms has agreed to open it there. We hope that this will enable most of our members to see the exhibition.

Oliver Pike, one of our Honorary Vice-Presidents, has given us some of his large collection of nature photographs which he has exhibited.

P. S. Hayward, a former member who died on October 31, has left the Society his library of ornithological books.

The General Secretary wishes to acknowledge with thanks the help of many members during the year and in particular of Mr. L. Baker, Mrs. H. Braddick, Miss D. Hayes, Mrs. A. Horton, Miss G. Robson, and Mrs. M. Waller.

We have to record with regret the deaths of the following members : G. W. Avery, E. J. Bryce (an Hon. Member), A. G. Davis, P. S. Hayward, and C. F. Jones.

Curator's Report

Botanical Section

The herbarium has been examined and found free of insect pests, but there is continued slight damage to some sheets owing to the damp stale air present during the winter months. A fine collection of mosses has been presented by Mr. R. A. Boniface ; these it is hoped to catalogue and make available for consultation by members shortly. The Section is greatly indebted to Mr. T. G. Collett who kindly arranged for the herbarium cupboards to be repaired and rendered dust-proof.

Ecological Section

There have been no additions to the ecological collections this year. Work is in progress in rearranging the shell collection.

Entomological Section

Progress has been made on the collections of Lepidoptera. A considerable number of useless specimens have been disposed of with a view to finally making one collection instead of two. The Syrphidae have been completely rearranged and work continues on the Coleoptera.

Ornithological Section

The only addition to the skin collection this year is a Swift which is a new species to us. Additions to the wing collection are Red-throated Diver, four species of duck, Brent Goose, five species of gull, Common Tern, Little Owl and Cuckoo. About forty copies of the catalogue of skin and egg collections remain to be sold. Arrangements have been made for a key to the ornithological collections to be kept in the Librarian's drawer so that should the Curator be absent on Library and Collections evenings or on Ornithology Informal evenings members may have access to the collections.

Members are making good use of the collections on Informal Meeting evenings, but those wishing to study specimens in more detail are recommended to come on Library and Collections evenings.

K. H. HYATT, *Curator.*

Report of Curator for Lantern Slides

During 1957, there has been an addition of 100 slides to the Society's collection of Lantern Slides. These were a gift from Miss Longfield, and are the illustrations to her lecture " The St. George Expedition to the South Sea Islands." The total number of slides is now 2,420. I have received only one request from members for the loan of lantern slides. The job of " rearrangement " is proceeding slowly with the limited time available, but is not yet completed.

H. W. PAYTON, *Curator.*

Librarian's Report

I took over the Library from Mr. Hale in November, 1956, and desire to pay tribute to the help and advice I have received from him since then.

The attendance at the Library has shown a welcome increase, amounting to 192 compared with 136 in the previous year, whilst the number of books borrowed has increased from 194 to 257.

Books borrowed from the Ornithological Section exceed all the other sections put together and it is hoped that members of other sections will make more use of the Library.

Sectional indexes are now available for all sections.

Some 100 new volumes and reports, pamphlets, etc., have been added to the Library and binding of periodicals has been kept up to date.

The Library Committee appreciate the action of the Council in increasing the grant to £25 for the coming year.

In conclusion I should like to thank the Sectional Librarians and members of the Library Rota for their work in the Library and attendance at the fortnightly meetings.

J. B. FOSTER, *Librarian.*

South West Middlesex Group Report

The group membership continues to increase steadily. The present total is 87, made up of 67 ordinary members, 18 associates and two affiliated Societies.

Indoor Meetings

These are arranged monthly at Hounslow Town Hall. The lectures are of the same high standard as those at the London centres, but are not

so well supported as they should be. The lectures are open to any members of the Society and, as a poor attendance is a discourtesy to the lecturer, it is hoped that better support will be forthcoming in the future.

Field Meetings

An attractive programme is being arranged to celebrate the Society's Centenary year. One feature will be the monthly informal field meetings at different localities in the Group's Area. In this way the Officers and Committee hope to make closer contact with members of the Group and encourage a useful exchange of interests and observations. If the informal meetings prove successful small field study projects may be attempted.

Nature Conservation

The Group objected officially through the Town Clerk, Hounslow, at the recent public enquiry on the extension of gravel workings on Hounslow Heath.

Langley Park, Buckinghamshire, has been visited by members of the Group in order to study its possibilities for preservation. Further visits are planned for 1958. The Group Nature Conservation Secretary would welcome offers from a few actively interested people to visit this and other places in the Group's Area ; also information about threats to local flora and fauna.

Group Recorders

Observations of birds, insects or plants in the Area should be sent to the recorders, whose names and addresses are shown in the programme, by early October in order that the correlated information may be given in the Annual Reports of the Group. A few short notes on the habitat will add interest to the observation.

E. EVERITT, *Secretary.*

Report of the Epping Forest Field Section

The aim of this Section has been to cover as large a part as possible of the north-east of the Society's Area, thus offering a variety of terrain to its members. The great variety of flora and fauna recorded and studied attracts an ever-increasing number of newcomers, who are impressed by the beauty of the open countryside and rivers, as well as by the sylvan delights of the Forest itself. Over 100 plants or over 50 species of birds is not a rare recording for one outing, and mammals, reptiles and amphibians are all to be seen in the area. The Section would, however, appreciate the co-operation of one or two more experts to help us add to our knowledge, some of whom are known to visit our area. As a proof of enthusiasm, at a recent field meeting of the Ecology Section 12 of the 17 people present were members of our Section. During the coming year the more popular meetings will be repeated, and requested new routes added.

The only indoor meeting was the A.G.M. when our new Chairman, Mr. A. Leutscher, ably replaced at very short notice the lecturer, Mr. F. Speakman, who was ill. Mr. Leutscher's talk, illustrated by slides, was on the reptiles and amphibians of Great Britain.

J. JONES, *Secretary.*

Statement of Accounts

GENERAL

1956			*Receipts*							
£1,117	*15*	*3*	Subscriptions—Current ...	...	£1,224	15	3			
41	*13*	*6*	Arrears ...	...	21	7	6			
20	*16*	*0*	Advance ...	...	34	8	6			
31	*7*	*6*	Entrance Fees ...	...	40	10	0			
£1,211	*12*	*3*						£1,321	1	3
—	—	—	Life Membership ...	...	...	...	...	50	0	0
10	*6*	*10*	Interest on Post Office Account ...	...	...			1	10	0
8	*15*	*9*	,, ,, Deposit Account ...	...	...			21	16	2
2	*12*	*6*	,, ,, £75 War 3½% Stock ...	...	...			2	12	6
5	*8*	*0*	,, ,, £180 Savings 3% Stock, 60/70...		...			5	8	0
4	*14*	*6*	Hire of Rooms ...	...	...	...	...	3	0	0
12	*0*	*0*	Donations ...	...	...	...	...	29	2	0
—	—	—	Return of expenses of *Birds of London Area*				...	55	12	3
—	—	—	Balance at 31st October, 1956, brought forward				...	2	10	9
£1,255	*9*	*10*						£1,492	12	11

PUBLICATIONS

£48	*17*	*1*	Sales of Publications... ...	...	...	...		£58	5	1
35	*8*	*7*	,, ,, Christmas Cards 1956	...	...	...		52	16	3
50	*0*	*0*	,, ,, ,, ,, 1957	...	...	...		15	0	0
49	*0*	*0*	Grant—Royal Society—*London Naturalist*				...	40	0	0
16	*7*	*0*	Advertisements—*London Bird Report*		...	...		4	4	0
5	*0*	*0*	Donation—*London Naturalist*	...	...	...		—	—	—
			London Bird Report—1956 Grant	...	£220	0	0			
			—Printing	...	200	18	8			
								19	1	4
474	*8*	*9*	Balance from General Account	...	...	...		542	0	1
£679	*1*	*5*						£731	6	9

Audited and found correct.
27th November, 1957.

J. H. G. PETERKEN, *Hon. Auditor.*
G. T. MESSERVY-WHITING, *Hon. Auditor.*
V. F. HANCOCK, *Hon. Treasurer.*

Year Ending October 31, 1957

ACCOUNT

1956			*Payments*							
£191	*13*	*4*	Hire of rooms and halls with gratuities					£153	7	0
			25 Eccleston Square, rent and upkeep					78	5	3
—	—	—	Library and Collections					40	0	0
113	*17*	*3*	Programme					153	6	9
59	*14*	*9*	Printing and Stationery					101	19	9
—	—	—	Printing revised Rules					23	14	0
42	*13*	*10*	Postages—Secretaries and Treasurer					46	1	7
4	*8*	*6*	Insurance					4	3	6
10	*12*	*0*	Subscriptions to other Societies					13	14	0
60	*11*	*6*	Sectional Expenses					61	14	8
5	*0*	*0*	South-West Middlesex Group Expenses					14	5	0
136	*12*	*7*	General Secretary's Honorarium and Expenses ...					143	6	8
4	*3*	*10*	Sundry Expenses					6	5	8
—	—	—	Centenary Celebration advance bookings					28	16	0
474	*8*	*9*	Publications Account					542	0	1
—	—	—	Life Composition Account					50	0	0
28	*18*	*2*	*Birds of London Area* Expenses					—	—	—
120	*4*	*7*	Deficit brought forward					—	—	—
2	*10*	*9*	Balance at 31st October, 1957					31	13	0
£1,255	*9*	*10*						£1,492	12	11

ACCOUNT

£382	*9*	*5*	*London Naturalist*—Printing and Postages ...					£455	10	10
220	*0*	*0*	*London Bird Report*—Grant					220	0	0
46	*12*	*0*	Christmas Cards 1956—Printing ...	£46	6	11				
			—Grant ...	30	0	0				
								16	6	11
			,, ,, 1957—Printing					9	9	0
30	*0*	*0*	—Reserve towards Printing					30	0	0
£679	*1*	*5*						£731	6	9

The Life Composition Account has increased from £350 to £400 while the Legacies and Reserve Accounts remain at £93 7s. 6d. and £75 respectively.

Sectional Reports

Archaeological Section

Our 1957 indoor meetings opened with a lecture by Mr. C. W. Phillips entitled "The Third Edition of the Ordnance Survey Map of Roman Britain." Mr. Phillips is a lecturer with rare gifts for he held us enthralled throughout his lecture and there were many murmurs at what seemed to be its shortness, so quickly did the time fly.

We next braved the elements of middle January on an outdoor meeting around Stepney Church and Green, led by Miss Darlington. It is superfluous to remind members that a field meeting conducted by Miss Darlington is always full of little known facts and is an outstanding success.

My next happy memory is still in the chill of winter when we visited the L.C.C. Library and Record Office and once again had the pleasure of being conducted by Miss Darlington. The party was a very large one and sometimes had to be divided. Miss Darlington and her staff went to a great deal of trouble to display many of the treasures of the Record Office and to make this meeting one of memorable interest.

The second half-year began with a visit to Morden College in September. The Custodian of the Muniments Room, who was a retired naval officer with the traditional charm and fund of stories associated with the Royal Navy, was our guide. We were privileged to make a thorough tour of this College, including one of the private flats and, on being shown a new extension to the main building, many smiles were raised when it was pointed out how like a railway station this was—the architect who designed it specialized in such buildings !

Our visit to the Society for the Protection of Ancient Buildings in November was passed in the cosy Committee Room of the Society where we listened to the Secretary, who was obviously in love with her job. Her enthusiasm when a condemned building was saved at little cost was heart-warming and the end of her lecture came all too swiftly.

Our final indoor meeting was an informal one held on the Library premises and, in some respects, is the most memorable one of the year. Informal meetings are popular with the Section in that members can get down to real archaeology. This year, as last, we had the pleasure of the company of Mr. F. J. Collins of the Architects' Dept. of the L.C.C. whose knowledge of pottery is bottomless, as indeed were some of the pieces of pottery he brought with him ! However, this informal meeting was very enjoyable for Mr. Collins produced many pieces of pottery beautifully labelled and dated ; then after giving members time to examine each piece, he held up another unlabelled sample and asked us to date it. Each piece offered for dating had its likeness in another piece previously handed to us. Members were quick to recognize the various types and dates and the crowning memory for the Section came when Mr. Collins donated a magnificent collection of pottery dating from the Roman period to 1880 to be kept at the Library for use of the Section.

Such is the report on meetings for 1957 and we hope to have an even more interesting year in 1958. All members who are interested in archaeology are very welcome to join us both at our indoor and outdoor meetings.

Finally, may I ask all members of the Society who are interested in archaeology to send a postcard with their name and address to the Section Secretary, Miss E. M. Wilson ? As you will have seen in the 1958 programme, we are proposing to try our hand at " digs " and it would be useful for Miss Wilson to know of those interested, so that they may be circulated when something extra is arranged after the printing of the programme.

C. L. REGAN, *Acting Secretary*.

Botanical Section

The membership of the Section is now 452, an increase of 74 during the year.

As in previous seasons a wide variety of outdoor excursions has been held, with venues in all of the counties included in the Society's area. The annual rambles for bryophytes and fungi were again interesting and popular events outside the usual season for flowering plants.

A number of excursions were devoted to plant recording for the B.S.B.I. Maps Scheme. Dr. J. G. Dony, who is now engaged in writing the county Flora for Herts, led a profitable one in that county. Another trip, using the Ramblers' Special Train, this time to Glynde in Sussex, was enjoyed by many members.

Such diverse subjects as " The construction and use of botanical keys " and " The growth of Natural History Societies " were dealt with at indoor meetings, in addition to lectures on the more usual aspects of botany. Among the guest speakers Mr. H. L. Edlin of the Forestry Commission payed us his first visit, and Mr. R. A. Graham of Kew, the leading authority on British mints, again gave a highly informative and interesting lecture.

The experiment of holding informal meetings at Eccleston Square has proved quite successful, and discussions on herbarium technique and the identification of flowers and fungi have been enjoyed by the members concerned. Much remounting work is required to put our herbarium into good order and it is hoped that this may be achieved by the co-operation of keen members at informal meetings. Thanks are due to Mr. T. G. Collett for his excellent services in repairing our cupboards, ready to house the collections.

As readers will know, the *Hand List of Plants of the London Area* is now complete for flowering plants and ferns ; we congratulate the compilers, D. H. Kent and J. E. Lousley, on their achievement. The Section's records will continue to grow, however, and members are asked to co-operate by sending in details of new plants or habitats to the Recorders.

Mr. J. H. G. Peterken has promised to consider the production of a Hand List of Bryophytes and would welcome the help of all interested members in building up from records in his own and the Society's possession.

We feel confident that our colleagues on the Committee who are responsible for B.S.B.I. Maps Scheme recording will continue to be as active in 1958, both in and out of the field, as they have been in the past. This is the final season of the work, and we should like to thank the many members who have helped the Section to fulfil its obligations in this matter.

We should like also to express our cordial thanks to Mr. P. C. Hall, to whom is due the credit for much of the success of our Programme. He resigns from the office of Programme Secretary this year and we extend

a warm welcome to Miss G. W. Dalby, his successor. To Miss J. Small, also, who volunteered to fill a long-felt want in the position of Sectional Lanternist, we are most grateful.

E. B. BANGERTER, *Chairman*. F. E. WRIGHTON, *Secretary*.

Ecological Section

Surveys

1. Bookham Common.—There continues to be a regular attendance at meetings on the second Sunday of each month. During the year Dr. G. Beven gave a short talk on recent work on the birds there.

Since the survey started in 1941 more than 300 pages of the *London Naturalist* have been occupied by papers on almost every aspect of the natural history of this area, which must be one of the most thoroughly documented commons in the country.

2. City Bombed Sites.—As mentioned in the previous report, this survey has now been discontinued because of building, but individual members continue to investigate the now vanishing flora and fauna. Mr. A. W. Jones gave a short talk during the year on " The Flora of the City Bombed Sites."

3. Coulsdon.—Visits are now being made every month (on either a Saturday or a Sunday) to Devilsden Wood and nearby downs, and maps have been prepared by botanists and ornithologists for the survey work they have started. The entomologists have also commenced organized work. Mr. H. Britten gave a short introductory talk on the area to members.

Devilsden Wood is within easy reach of London and is specially suitable for members living in Croydon and district. It is an attractive area rich in plants (including many orchids) and insects, and is part of the area recommended for nature conservation by the Society.

4. Headley Heath.—A further visit was led by Mr. C. P. Castell during the year to Headley Heath to examine the regeneration of the heath from the war-time tank manoeuvres. This annual survey commenced in 1951 and a great deal of information has since been obtained on the factors involved in the very slow recovery of bare heathland.

Mammals

The recently formed Mammals Study Group arranged a lecture by Mr. H. N. Southern on " Small Mammals," and short talks on " Diet of a pair of Suburban Tawny Owls " by Dr. G. Beven and " Bat-banding in Devon " by Mr. J. D. Hooper. In addition, informal meetings were held on such subjects as " Grey Squirrels," " Rabbits and Hares," and " Mammal Traps and Trapping," at most of which live mammals, reptiles or amphibians were exhibited. Visits were made to Godstone Caves for bats and Nor Island in the Medway for voles, and there were two general visits to Epping Forest.

Nature Conservation

In Hertfordshire the spread of towns continues to be the main threat to nature together with all too numerous gravel workings, which in Middlesex were to be started on Hounslow Heath and are the subject of an enquiry. In Essex reports were made to the Nature Conservancy on a gravel pit proposed for preservation in the Lea valley, and on the Walthamstow Heronry. Field meetings were held to examine the flora and fauna of Chertsey Mead and Langley Park. Mr. C. P. Castell

represented the Society at a conference on Fires on Heaths and Commons arranged by the Nature Conservancy.

General

Dr. J. M. Lambert gave a talk on " Problems of the Norfolk Broads," showing how she discovered the origin and development of the Broads by means of borings, and Dr. D. H. Dalby in his talk " Ecology of Saltmarshes " showed us what work could be done on this habitat by the amateur.

The Secretary is always pleased to hear of work being done on local surveys, and to answer enquiries about the Section's surveys.

Membership of the Section (in common with the Society as a whole) continues to rise and now stands at about 350.

G. BEVEN, *Chairman.* A. W. JONES, *Secretary.*

Entomological Section

One hundred years of entomology in the London area organized by this Society is completed this year. The Haggerston Entomological Society came into being in 1858. It later changed its name to the City of London Entomological and Natural History Society and in 1914 amalgamated with the North London Natural History Society to become the London Natural History Society.

The sectional system was introduced into the Society in 1917 and the Entomological Section was formed under the guidance of Dr. E. A. Cockayne and Dr. H. B. Williams, Q.C. Past members of the Society included such world famous entomologists as Lord Avebury, A. W. Bacot, Rev. C. R. N. Burrows, Dr. T. A. Chapman, H. St. J. K. Donisthorpe, Dr. N. H. Joy, Edward Newman, L. B. Prout, A. Sich, A. E. Tonge, J. W. Tutt and Lord Walsingham. These, like many other members of this Society, were also fellows of the Entomological Society of London, now the Royal Entomological Society, founded in 1833. There had been earlier entomological societies in London and the first of these, actually the first in the world—The Aurelian Society—was in existence in 1745 and met at the Swan Tavern, Change Alley, off Cornhill.

The formation of the South London Entomological and Natural History Society in 1872 catered for the " southerners " in the days when meetings of the London societies commenced late in the evening, 8 p.m., and finished after 10 p.m. Our members have always been found in the ranks of these other societies helping to increase entomological knowledge and also keeping our own members in touch with the progress in the study of insects.

In 1957, at the end of a century, our Section has gathered 79 new members and despite some losses has increased its membership to 290, the highest on record.

Indoor Meetings

The indoor meetings have been well attended and many and varied exhibits were shown. The aim of these meetings is to introduce experts on the various orders to our members, to hear of the present progress in entomological studies and to enable members to exhibit specimens to others and report their observations on the habits and distribution of the insects, especially those in our London area. Our lecturers were :— Mr. T. G. Howarth, B.E.M., F.R.E.S., on " An Introduction to the British Lepidoptera," Mr. D. F. Owen on " British Butterflies and Their

Ecology," Mr. L. Parmenter, F.R.E.S., on " Flies and their Relations with Plants," Mr. S. Beaufoy, F.R.P.S., F.R.E.S., on " Some Life Histories of Butterflies, Moths, and Dragonflies," and G. Owen Evans, M.Sc., Ph.D., on " Some Aspects of the Ecology of Mites."

In addition, a series of lectures on " The Natural History of Insects " under the University of London extension scheme for the Society was attended by 43 and given by Professor O. W. Richards, Dr. P. T. Haskell and Dr. T. R. E. Southwood.

More intimate meetings held informally in our Library at Eccleston Square, where the collections as well as the library books are available, included discussions on " Making Microscopic slides, mounting genitalia, etc.," " The Study of British Coleoptera " opened by A. A. Allen, B.Sc., A.R.C.S., " Structure of Insects " opened by J. F. Shillito, B.Sc., " Hibernation of Insects," " Experimental Entomology " opened by J. L. Cloudsley-Thompson, M.A., Ph.D., F.L.S., F.R.E.S., " The Coulsdon Survey," " The Preparation of Specimens for the Collection." The technical demonstrations at these meetings proved as useful to many others as to the beginners for whom they were originally planned.

Field Meetings

These are organized to enable members to visit a variety of habitats around London, especially within our Area. In these days of rising costs of travel it is unfortunate but understandable that members tend to confine their appearances to those meetings most conveniently located. It is at these open country gatherings of entomologists of all grades and of varied special interests that beginners are helped and the more experienced widen their knowledge. This year over a hundred members and friends attended the meetings held at All Hallows on Sea, Bookham Common, Burnham Beeches, Byfleet, Coulsdon, Epping Forest, Farningham, Horsley, Otford, Ranmore Common, Shoreham, Swanscombe, Watford, Wytham Woods (Oxford).

The Ecological Section's surveys have been well supported in the past by this section's members and the Bookham Common and Coulsdon surveys are particularly recommended for those wishing to study small areas intensively and acquire knowledge of the food-plants of insects from the expert botanists present. There are tasks for beginners and experts, simple and complex. Helpers will always be welcome. The Section is also steadily progressing in its accumulation of data on the distribution of insects, spiders and related arthropoda in the Society's area, and it continues to publish its summaries each year. Every member is urged to send distribution notes to our Recorder, Mr. E. W. Groves, 143 Carshalton Park Road, Carshalton, Surrey. Especially useful are summaries of the status of species of a particular area.

Library and Collections

These have been extended, especially by gifts from Miss C. E. Longfield, Dr. C. H. Andrewes, F.R.S., Dr. J. L. Cloudsley-Thompson, Dr. F. R. Irvine, Messrs. H. Britten, D. F. Owen and J. Sneyd Taylor amongst others.

C. G. M. de Worms, *Chairman.* L. Parmenter, *Secretary.*

Geological Section

The year was a busy one for the Section. In all twenty-nine meetings were held and most of them well supported by a record membership.

Highlight of our activities was undoubtedly the Easter field meeting to the Devizes district of Wiltshire. For the third successive year the programme was arranged by Mr. R. E. Butler, who provided a full and varied programme. An enjoyable feature was the linking up of our Society with the Wiltshire Archaeological and Natural History Society, and the Swindon Geological Society, each of whose members participated in the excursions as well as providing leaders for the party. The geological programme included visits by coach to four counties where exposures ranging from Silurian to Cretaceous times were examined, many of them for the first time by the Section. Archaeological interests were served with a look at the classic stone circle at Avebury, and a visit to the Devizes Museum which was specially opened for us. The last day of the holiday was spent on the edge of the Salisbury area and was devoted to botany in particular, though one member found several flint implements belonging to the early inhabitants of the Plain.

Among the other field meetings were two coach trips to the Oxford and Cambridge districts. Though nearly eighty miles apart the geology is a little similar, and it was especially interesting to compare the different facies of rocks of the same formations. The geology about London was not neglected and it is pleasing to note that one of the nearest exposures to London is perhaps the most interesting to the fossil collector. This is at Abbey Wood where a small pit yields many fossils from the Blackheath Beds. A meeting held there in the summer resulted in the collection of many hundred of the impressive sharks' teeth.

During the winter months the Section arranged a series of conducted visits to places of special interest. One of these was to the Hydrographic Chart Department of the Admiralty. Here members were taken, stage by stage, through the detailed processes of chart compilation in, so it seemed, every navigable channel in the world. Some of the earlier charts examined by members were surveys undertaken by such famous Sea-Captains as Cook and Bligh. Another similar visit worthy of special mention was to the Laboratory of the Precious Stone Section of the London Chamber of Commerce,who literally unbolted their doors in Hatton Gardens to us and demonstrated the testing procedures of precious stones and pearls.

Most of the indoor meetings seemed to dwell upon some aspect of London. Mr. C. P. Castell discussed the life and work of William Whittaker, F.R.S., a great cockney geologist of the past, and this was followed by Dr. S. Buchan who spoke on the history of London's water supply in the last thousand years. Fortunately, however, the talk by Dr. A. T. J. Dollar on earthquakes in Britain was well outside the Society's Area, being chiefly concerned with the Midland earthquake of February, 1957. It is with some interest to record, and not a little relief, Dr. Dollar's prediction that if Britain experiences another minor earthquake it would probably take place about Hereford. It appears that Hereford is next along a line of crustal instability from which can be traced all previous earth tremors of the past. The Field Research investigation into the London Clay of Oxshott Brickworks Ltd. has continued, but recent reports suggest that excavation on the main site appears to be ceasing. This is to be regretted, but in the past six years the Section has made a detailed study of the pit and, besides publishing reports in the *London Naturalist*, has presented a sizeable collection of fossils to the Natural History Museum. It is intended to display this collection of Oxshott fossils at the Centenary Exhibition.

R. E. BUTLER, *Chairman*. R. J. PARSONS, *Secretary*.

Ornithological Section

During a year that saw its membership exceed one thousand the Ornithological Section intensified its efforts to provide a continuous and varied programme of indoor and outdoor events. Aware that a fairly large proportion of its members can only occasionally attend indoor meetings, the Committee have endeavoured to include several items that should have a special appeal to those living on the fringe of the London Area, or even outside it. Such members have undoubtedly benefited from the new-style *Bulletin* which is now available through a postal subscription service. Under the editorship of R. P. Cordero, this publication is topical, attractive and of more frequent appearance than before.

Members living at a distance from the centre of our Area can also make a valuable contribution to the various surveys carried out by the Section, including those into the status of the Lapwing and Meadow Pipit, inaugurated last year, and to the national surveys in which the Society participates. The value of " getting together " at indoor meetings is far from being overlooked and 1958 will see the fruition of the Section's plans for a series of regular, joint meetings with neighbouring societies, to be held, where possible, in the outer zone of our Area, so that they are easily accessible to members living in the outer suburbs. It is to be hoped that such meetings will become an established feature of our programme ; emphasis, however, must obviously be on meetings in the Central Area, of which thirteen were provided in 1957. They covered a wide range of subjects, including Behaviour, Studies of Individual Species, Identification, Bird-watching Experiences at Home and Abroad, Man's Influence on Birds and various specific items of Research. A number of these lectures were given by members of our Society and it is particularly gratifying that these were well-attended.

The range of field meetings has continued to be as wide and varied as ever and, in the main, the meetings have been quite well supported. It cannot be stressed too strongly, however, that these meetings are of the utmost value both to beginners and experts. Many of the visits are to habitats on the outskirts of our Area and should, therefore, have special appeal to those living in those localities. It is appropriate, here, to record our thanks to A. H. Betts who, up to the end of last year, carried out with singular conscientiousness the unenviable task of arranging the field meetings programme.

Ringing, always an important part of the Section's activities, came on to a new footing last year, following the introduction by the British Trust for Ornithology's Ringing Committee of a new set of rules. It was decided to facilitate the operation of co-operative ringing ventures, which must now form the basis of the Section's ringing scheme, by dividing the Area into four regions, each with an appointed representative to act as a focal point for group ringing within his region. In this way we hope to encourage group ringing activities such as those already flourishing at Beddington where, in 1957, B. S. Milne and his team achieved quite remarkable results. The Dungeness Bird Observatory, in the management of which the Society shares, continued last year to attract many of our members, particularly ringers, and there, also, results were extremely satisfying.

This is not the place to dilate on the numerous field records submitted by members or on the survey reports and kindred items that, together, make up the *London Bird Report*. The appeal and value of this publica-

tion have never been greater, and special thanks are due to the Editor, F. H. Jones, Recorders, H. P. Medhurst and W. G. Teagle, and the Records Committee for their work in 1957, carried out in the face of quite abnormal difficulties.

Re-organization by Miss N. Goom of the Library and by K. H. Hyatt of the Collections has considerably increased the efficiency of these services, with the result that they are now being used by a greater number of members. Miss E. P. Brown has reported favourably on the support given by members to the various Reading Circles she organizes for the Section.

By far the most important single event of 1957 was the publication of the Society's book, " The Birds of the London Area since 1900." The outcome of many years' diligent, painstaking work, involving an enormous amount of research, the book is one of which any society could be proud. Proof of its excellence was demonstrated by the fact that, before the end of the year, the whole of the first printing was sold out. To the thanks expressed elsewhere to the Editor, R. C. Homes, the Book Committee, contributors and helpers, we should like to add our own appreciation for a very fine achievement, which will be of lasting value to the Society.

In conclusion, we should like to express our sincere appreciation for the support received from all Sectional Officers and Committee Members. We are pleased to welcome two new Committee Members, Mrs. M. Waller and P. J. Hayman, who were elected at the General Meeting in 1957, and Mr. J. Brock who was appointed Junior Committee Member a few weeks later. There has been a change in recording personnel. Mr. H. P. Medhurst, who, up to the end of last year, was Recorder for both North and South of the Thames, continues to be recorder for the South, the recordership for North of the Thames being taken over by J. L. F. Parslow. W. G. Teagle continues as Recorder for Inner London ; R. H. May is the new Field Meetings Secretary. Our thanks are also due to Miss L. B. Langham who, for several years, has co-ordinated the sale of Field Lists—a task now taken over by Mrs. Waller—and to R. H. Ryall who, for many years, looked after the sale of publications, now handled by Misses J. Pattison and J. Grant.

S. CRAMP, *Chairman.* A. V. PETTIT, *Secretary.*

Ramblers' Section

The membership of the Section continues to increase.

Three indoor and sixteen outdoor meetings were held during the year.

Of the general meetings the first was an extremely interesting and lively discourse on " Elephants " by that well-known authority on the subject, Lt.-Col. J. H. Williams (author of " Elephant Bill "). It was held at the College of Preceptors and concluded with refreshments. The second, which gave us a new angle on Natural History, was entitled " Natural History and Designs in Chinese Art " and was given by Mr. G. Witcher, who brought a most interesting and valuable collection of specimens to examine. At the Sectional Annual General Meeting, Miss Hilary B. Newman gave an illustrated talk on a " Ride to Rome."

The rambles have been pleasantly varied, and the districts visited have included Hertford, Chislehurst, Steyning, Sevenoaks and Abinger Hammer. There was an evening excursion on the Thames to see the Docks, when

43 members and friends were present. Places of interest visited in London drew good numbers and included " Indoors at Kew," The Victoria and Albert Museum for some Art Treasures, Cadby Hall and Chandos House.

We would like to thank Miss H. Franks for her past services to the Section as in turn Secretary, Chairman and Committee member, and for her work as Lanternist, which office she is continuing to fill for us.

The *Countryman* is still being circulated.

G. E. LAWRENCE, *Chairman*. L. J. JOHNS, *Secretary*.

PUBLICATIONS OF THE SOCIETY

London Naturalist, 1921-31, each 1s. (1926-28 out of print) ; 1932-46, each 1s. 6d. (1933 and 1937 O.P.) ; 1947-52, each 3s. ; 1953-56, each 7s. 6d.

London Bird Report, 1936-46, each 6d. ; 1947-52, each 1s. 3d. ; 1953-55, each 3s. 6d. ; 1956, 5s.

Transactions of the London Natural History Society, 1916-20, each 1s.

Map of the Society's Area, 6d.

" LONDON NATURALIST " REPRINTS

Note.—Dates in brackets refer to issue of L.N. and are not dates of publication.

21, 22, 25, 30. Survey of Limpsfield Common : 1939, 3d. ; 1940, 2d. ; 1942, 2d. ; 1943, 1d.

24. Randolph William Robbins (1871-1941), (1941), 3d.

29, 33, 35, 44, 46, 51, 60, 67, 71, 75, 81, 87, 99, 103, 117. Survey of Bookham Common : 2, 1943, with maps, 2d. ; **3,** 1944, with map, 5d. ; **4,** 1945, 3d. ; **5,** 1946, with map, 5d. ; **6,** 1947, 6d. ; **7,** 1948, 6d. ; **8,** 1949, 1s. ; **9,** 1950, 9d. ; **10,** 1951, 9d. ; **11,** 1952, 9d. ; **12,** 1953, 1s. 6d.; **13,** 1954, 1s. 6d. ; **14,** 1955, 1s. 6d. ; **15,** 1956, 1s. 6d. ; **16,** 1957, 1s. 6d.

34, 36, 45, 47. Epping Forest Survey : 3, 1944, with maps, 6d. ; **4,** 1945, 3d. ; **5,** 1946, 3d. ; **6,** 1947, with map, 5d.

34a. Docks and Sorrels of the London Area, by J. E. Lousley (1944), 3d.

37. William Curtis (1748-1799), by J. E. Lousley (1945), 3d.

38. Neuroptera of the Home Counties, by E. B. Pinniger (1945), 6d.

42. The Brambles of Middlesex, by C. Avery and W. C. R. Watson (1946), 3d.

43. Coenagrion scitulum Rambur, a Dragonfly New to Britain, by Edward B. Pinniger (1946) (with plate), 2d.

48. Hymenoptera Aculeata of Hampstead Heath (with map), by K. M. Guichard and I. H. H. Yarrow (1947), 9d.

49, 72, 76, 82, 83. City Bombed Sites Survey : 1947, 3d. ; (1948 O.P.), (1949 O.P.) ; 1950, 3d. ; 1951, 3d. ; 1952, 3d. ; 1953, 9d. ; 1954, 9d.

55. The Story of our Society, by L. G. Payne (Part I, 1947, Part II, 1948), 6d.

66. Mammals, etc., of the London Area, Additional Records, by R. S. R. Fitter (1949), 9d.

62. Butterflies of the London Area, by C.. G. M. de Worms (1949), 1s. 6d.

63, 69. Report on the Temporary Geological Sections (1949), 6d. ; (1950), 1s.

64. Kent Plant Records, by F. Rose (1949), 5d.

65. Hepatics of the London Area, by R. A. Boniface (1949), 5d.

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