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THE VASCULUM

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APRIL 1982

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The Poplars, Chester-le-Street, Co. Durham

BY THE WAY

Secretaries of Societies and other contributors to the "Vasculum' are invited to send their notes to the Editor before 15th June. 1982.

NOTICE TO SUBSCRIBERS

Subscriptions to the N.N.U. and Volume 67, which begins with the present number, are now due. Please do not wait for a postal notification, but send it *now.* It saves trouble; it saves expense and the TreasurerAEditor will be very grateful.

MEETINGS 1982

In order that members can book ahead, the following Field Outings have been arranged for the forthcoming season:

May 22nd. Woodland on the west bank of the North Tyne at the meeting of the waters, near the village of Warden.

July 3rd. A venue in the Cheviots near Wooler, to be chosen by Mr. J. Bowman.

September 11th. Woodlands on the Windlestone Estate, Durham.

September 25th. (Juniors) Hollinside Wood, Durham—a fungus foray.

It has not been possible, at present, to fix a date for the Junior Outing to the coast to study coastal marine life, but details of this and the other outings shown above will be notified by post at a later date.

LEAF MINERS

A number of small moths in the family Nepticulidae constitute a highly specialised group, all of which have caterpillars which make the familiar light coloured squiggles on leaves of various selected plants. These marks show how they feed between the upper and lower surfaces of the leaves. The moths themselves are the smallest Lepidoptera known to science. In Britain the family is well represented, the number of species known to occur being about 100.

Because of their small size, difficulty of handling and identification, and their obscure habits, the distribution of the various species is most imperfectly known. It is more than likely that some species occurring in this country still remain to be discovered.

It will be evident from these few notes that the opportunities for making new observations and records in this group of moths is very great. Mr. T. C. Dunn (address above) would be most grateful if members would send him any leaf mines which they might find in the countryside during the coming season. The important thing is to get the material to him quickly before the leaves dry out or in some sort of air-tight container which will retain the moisture and leave any mine tenants alive and well. Records and observations will be published in this journal from time to time.

B.S.B.I. NETWORK RESEARCH PROJECT ON CHURCHYARDS AND OTHER BURIAL GROUNDS

The aim of this is to identify the 10% botanically most valuable of the above in each county and notify these to the Nature Conservation Trusts so that they can make recommendations for conservation management. Volunteers are wanted to help in either of two ways. Those who can mark a field-card for all or most of the vascular plants in each site they can visit are asked to do so. Those who do not feel able to do this can help by listing all the species they can recognise and giving the total number of species seen. All can help by giving exact locations of the sites and any items of special interest, including animals and lower plants. Without such help it will be almost impossible to do justice to the counties of Durham and Northumberland. Further information can be obtained from the local co-ordinators:— D. Hall, 14 Fairburn Avenue, Houghton-le-Spring, Tyne and Wear. Tel.: (0783) 843848.

J. T. B. Bowman, 21 Ramsey's Lane, Wooler, Northumberland NE71 6NY. Tel.: (0668) 81263.

THE SOCIETIES

We would point out, once again, that there is a special section in this journal for news from the various constituent societies. The Editor would be only too pleased to receive notes of meetings or special projects. At present only a few of our societies submit such notes and information, whilst others have rarely if ever put pen to paper. The Editor cannot spread your news if he does not receive it in written form. Come along, you secretaries; spare a little time and effort to tell us what you are doing, what exciting new plants and animals you have discovered, what new enclaves of rich wild life you have come come across. We are all very interested!

DURHAM SLUG SURVEY NEWSLETTER No. 2

This important little circular, from the pen of Noel Jackson, gives news of two exciting finds in the local slug world. We quote:—

'The rare Durham Slug formerly thought to be *Arion lusitanicus* (Lusitanian Slug) has now been shown to be a separate species. The Durham Slug does not, as yet, have a proper scientific name, as it has not been described to science. We can look forward to Stella Davis (the British expert on *Arions)* publishing a paper on the two species in the near future. We have been assured that its scientific name will reflect the slug's association with Durham City. We will continue to call our species the Durham Slug, *and Anon lusitanicus* (which has not been seen in the North-East) will be called the Lusitanian Slug. We have seen the real Lusitanian Slug in the wild, and a new key to the genus *Arion* will be sent out with the next newsletter. This will enable you to identify this complex group of slugs more easily, and also enable you to separate the Durham Slug from the Lusitanian Slug.

Mr. Doug McCutcheon, one of the survey's keenest slugwatchers, has found the Durham Slug at Rowlands Gill. This is the first confirmed record of the slug in any part of the north-east other than in Durham City. The prime site of Rowlands Gill has also produced a single specimen of the Ash-black Slug *(Limax cinereoniger).* This species had been found by the River Derwent in the 1930's, but this is the first post-war record. It has also been discovered at Chopwell Woods by David O'Brien, one of our younger slugwatchers. As David said. It was unmistakable, a very long black slug with an obvious pale keel. When I turned it over, the black sole has a white central stripe, not a fuzzy one, but one with very well defined edges'. The Ash-black Slug is only found in ancient woodlands (or secondary woodland planted over ancient woodland). It is a useful indicator species, and areas with this species usually provide a home for many other uncommon animals and plants".

THE SOCIETIES

DARLINGTON AND TEESDALE NATURALISTS' FIELD CLUB

On Tuesday, 28th April 1981, the Darlington and Teesdale Naturalists' Field Club celebrated its 90th birthday. The hall at the Arts Centre was beautifully decorated with greenery and floral decorations; Miss E. Shaw having made the centrepiece for the buffet table with all aspects of the Club's activities depicted in flowers, fossils etc.The President, Mr. Barry Hetherington, welcomed the sixty-four members who, after being served with wine, were able to admire the long buffet table with its colourful and tempting display of cold meats, salads, trifle, jellies, pies and cream. The birthday cake, baked by Mrs. Mary Wood, was suitably inscribed and decorated, having our emblem of wood mice clambering around its four corners.

After the meal and coffee, the glasses were refilled and the President proposed the Loyal Toast to The Queen. Miss Winifred Dunning, President-elect, then rose to introduce the President, saying he was perhaps the youngest we have had, who joined the Club in 1975. He was Geology leader and editor of the Annual Report; he was a lecturer in Astronomy for the WEA in Darlington, and he applied his energies with diligence to both organisations.

Mr. Barry Hetherington thanked everyone who had helped, especially the Ladies' Committee who had worked extremely hard to make this a successful and enjoyable function. His address. The Field Club', was a fascinating account of the Club compiled from a detailed study of the Club's records.

On 29th April, 1891, twenty-two people had attended a meeting convened by Dr. Richard Taylor Manson, physician, and the Darlington Naturalists' Field Club

was formed. There were three sections—Zoology, Botany and Geology, and Dr. Manson's "Zig-Zag Ramblings of a Naturalist" formed the basis of the Club's activities. In September of the same year the assets of the now inactive Darlington Naturalists" Society were handed to the Club. In 1896 the name of the Club was changed to the present one. Dr. Manson died in 1910 and in that year the Club erected a glacial boulder in his memory at the Victoria Embankment entrance to South Park.

Our first president was William Fothergill, a dentist, who was also joint founder of the Darlington Total Abstinence Society and a Quaker. The first secretary was George Best, a chemist and dentist, who held the post for seventeen years. He was an eminent geologist, and a unique British fossil, found at Stainton, was named in his honour — *Fayolini esti*. When he resigned he was presented with a suite of furniture!

Other notable members were Robert Hastwell Sargent, Treasurer, who taught botany, chemistry and physics and was one of the founders of the N.N.U.; John Edmund Nowers, president, who was a botanist and entomologist; and Bentley Beetham, a teacher at Barnard Castle School, and photographer on Col. Norton's Everest Expedition in 1924. The Nicholsons, father and son, totalled sixty-nine years service between them in various positions. The first woman president was Miss Ruth Dowling, elected in 1939.

In 61 years the Ornithology Section has had only five leaders; Albert Stainthorpe for 32 years and our present leader. Vie Brown, since 1963. In all we have had 21 sections, some of them existing just as long as that particular specialist leader was active. Today the club is very active; few organisations can boast of holding 60 meetings a year, entailing a great deal of work by our committee who willingly serve the club.

When the club was founded, one of its aims was to compile, as accurately as possible, an account of the recent and fossil flora and fauna of the neighbourhood. This has never been fulfilled and is regrettable as many past members were specialists who could have done important work on the natural history of Darlington. Today our present members are enthusiastic amateurs "in the true sense of the word", and Mr. Hetherington hoped to see the field club produce a Natural History of Darlington, possibly for our Centenary in ten years time. With the goodwill and support of the members such a project would be crowned with success. He thanked everyone in anticipation of the work to be done.

The president then cut the cake and Miss Ruth Vickery rose to propose the toast to the Club. She said she was honoured to have been asked to do so. As a member since 1949 she had been part of the club for one third of its life. She was delighted to share in this happy and formal occasion. In the field club we enjoyed not only companionship but a generous sharing of knowledge. We achieved a very high standard of speaker and the interest of members was shown by their many questions. Our outings were also memorable and she felt sure everyone must have had magical moments on these as she had. One of hers had been to be among the birds on the Fame Islands, another was on the all night walk from Barnard Castle, and only last year she had the excitement of finding moonwort on Widdybank Fell. The president's address had brought back many happy reminders of the past. She remembered with particular affection, Albert Stainthorpe and his gift of bird mimicry, and hearing in Polam School grounds the bords answering his call. Miss Vickery proposed the toast, "The Field Club—and to its continued success". Miss Frances Griss then presented a posy of flowers to Miss Vickery.

This memorable evening ended with a prize draw. There were two prizes; the first, a picture, was won by Miss R. Vickery, and the second, a bottle of sherry given by Mr. Geoff Wood, was won by Mrs. K. Stainsbie. Then followed a draw for the many flower arrangements, very much appreciated by the winners.

ANNFIELD PLAIN AND DISTRICT NATURALISTS' CLUB

An account of the summer outings in 1981, records that between 14th March and 17th October a mammoth total of 16 long distance excursions were arranged. These were mostly full day functions by coach and on foot, starting at 9 a.m. and finishing somethimes after dark. All were organised at three levels ("A", "B" and "C" parties) according to the degree of mobility of the members concerned.

In March the venue was Scremerston to Berwick. A few early flowers were seen but the large numbers of sea birds were the main attraction. In April, Gilsiand and Barnard Castle were the places visited. The first butterfly, a small tortoiseshell, was seen on April 4th and the flowers and birds were more plentiful. In May and June, outings in North Yorkshire, Cumbria and South Scotland all encountered a greater variety of birds and flowers although several of the days were affected by rain. Further excursions during mid-summer and autumn to the Lake District, Holy Island, Bishop Auckland, Brampton, Kirk Yetholm, Felton, St. Abbs and Satley, continued with the same success. Birds and flowers were recorded in each case, while items of local history often gave added interest.

BIRTLEY AND CHESTER-LE-STREET NATURAL HISTORY SOCIETY

The winter session 1981-82 has just finished with a remarkable series of lectures of the very highest standard. They have ranged over a wide variety of subjects and of parts of the world.

They started with a film of the birds in the tropical island of Trinidad with a commentary by Sir James Steel, and on another occasion we were privileged to view the wildlife of Alaska, almost at the opposite end of the world, skilfully presented by Dr. Val Standen. In our own area, Mr. lan Findlay talked about Upper Teesdale, while Noel Jackson attempted to recruit us all into his band of slugwatchers. Miss J. Dunn gave us a resume of the marine animals and plants of our N.E. coast, Mr. A. Simpson talked about our birds, while Dr. H. M. Johnson followed another line on the evolution and conservation of our birds. Dr. J. Crosby brought to our attention some remarkable tricks that some plants have invented in order to obtain cross-pollination. A most interesting evening was provided by Mr. P. Davis telling us about the beginning and subsequent history of the Hancock Museum. Lastly Mr. D. Hall stimulated a few thoughts on weeds.

The Annual Supper on January 26th was a highlight of the session. After consuming a plethora of pies, sandwiches and the greatest variety of cakes we have ever seen, Mr. Dunn rounded off the evening with a wildlife competition. This was naming the animals and plants shown on the screen from 50 of his selected photographs. This was won by Mr. R. Harris, with Mrs. Harris and Mrs. B. Harrison taking the second and third prizes. The presentation of the prizes ended the proceedings, a night which was very successful in every aspect.

The session ended with the Annual General Meeting when the officers for the year 1982-83 were elected.

NOTES AND RECORDS

NOTES

An Oak-gall Mystery. Last season, Mr. P. Skidmore bred adults from galls of *Andricus kollari* and of *Andncus lignicola.* On examining the insects, some had characteristics which agreed more closely with the related gall-wasp than with that which was expected. The implications of this observation merit close consideration.

A hundred years ago, Adier published his discovery of the alternation of generations in the oak Cynipidae. He mentioned *Cynips kollari (*now *Andricus kollari)* only briefly in a footnote, probably because the bisexual generation was then unknown. However, the English edition of' Adier's work, translated by C. R. Straton (Alternating Generations, 1885) contains a very full account of *Cynips kollari* as an appendix. This gives descriptions of gall and 'fly', and of experimental work involving a bushel and a half of marble galls from Devon, some of which were released on Hampstead Heath!

In the present context, the most significant part of Straton's note is a quotation from Prof. *G.* Mayr (Vienna, c. 1870): The fly, *Cynips kollari,* resembles *Cynips corruptrix* Schi., *C. aries* Gir., C. *lignicola* Htg., C. *tinctoria, C. calciformis* and C. *galeata* Gir.-species only to be distinguished from each other by their galls'.

It would simplify matters if 'species' could be defined in terms which would satisfy a devotee of the exact sciences, but accepting the usual interpretation it seems hardly valid to accord specific status to a number of insects whose only distinctive features are their effects on another organism, and which cannot be separated on an intrinsic basis.

In Bestimmungstabellen der Gallon, H. Buhr (1965) described the features of each gall, but not of the insects. To summarise his treatment of those quoted by Mayr/Straton:— Agamic generation in all cases on *Quercus robur* and Q. *petraea:* some also on *Q. pubescens* a S. European oak. All arise in a bud.

	Agamic	**Bisexual**
Andricus kollari	Europe; introduced to GB c. 1829	Europe, rare; once known separately as *A.circulans* on *Q.cerris.*
A. corruptnx	.Europe; GB recently.	*Q.cem's* bud, Holland 1958..
A. aries	SE Europe.	Not known
A. lignicola	Europe; GB from 1972.	*Q.cem's* bud, Europe.
A. gallaetinctoriae	SE Europe.	Not known.
A. calciformis	SE Europe.	Not known.
A. oaleatus	SE Europe.	Not known.

All appear to have originated in South-east Europe. E. Houard (Les zoocecides d'Afrique, d'Asie et d Oceanie 1922) gives only *A. kollari* and A *lignicola,* both from Asia Minor.

Considering the two most familiar galls, of *A. kollari* and *A. lignicola,* their surfaces are similar and the inner nutritive cells must be adequate. The differences lie mainly in the less vital intermediate protective cells. Very little is known of the hormone-like secretions of insects and other organisms which initiate a gall. There must be many variants in the chemical sense to account for the wide spectrum of responses by the host plant.

Could we be dealing with one species assuming several forms or races? What effects may arise in a species which for generations, perhaps for centuries, has reproduced almost entirely bv a clonal method?

It could be revealing to extend Peter Skidmore's project. If you have access to galls of *A. kollari* or A *lignicola,* you may be able to breed out adults for inspection by a specialist in the Cynipidae. It is easy to deal with woody galls, and any resulting material could be one step towards resolving the present hazy situation. Comments would also be welcome.

F. B. Stubbs.

Migration habits of Swallows *(Hirundo rustica).* The last few years have shown a changing trend in autumnal swallow migration. Instead of thousands of swallows passing through the Durham City area, often in hundreds per day from one position alone, the numbers have apparently declined dramatically and only a few hundred or less appeared to pass through on passage throughout the whole migratory period.

The causes for this dramatic decline in numbers may be due to many factors, including loss of birds. These were thought to be the most plausible, but a new factor has come to light. It now

seems quite probable that routes from the northern areas have changed, especially since the introduction of a large reed bed created during the last few years at Big Waters, north of the River Tyne, in Northumberland. This new reserve has now the biggest roost of swallows in Northumberland with counts of 50,000 birds (Roebuck, Northumberland Wildlife Trust, No. 32, 1980-81). These birds could wend their way south via the coastal route instead of other river valley systems, etc., thus using a different route from the inland ones formerly followed.

The decline of swallows seen on passage after 1977 in Durham has been steady and appears to correlate with the increasing numbers being found at the reed beds. The fewest passing Durham were in the autumns of 1980 and 1981. This corresponds to the highest numbers at Big Waters. The last few years have seen no real build up of numbers experienced during migratory periods.

Other possibilities could be fewer swallows, from bad winters, bad breeding seasons and many others. Weather conditions whilst the birds are on passage also can affect them, resulting in either flying past nonstop or using, as in the past, the area as a 'main line' station. The query will remain—is Durham City, as far as swallows are concerned, going to change from being a main line station to becoming a wayside halt or even a disused side line?

Hazel M. Johnson.

Curious insect behaviour. During the first week of April (1981) I was in my garden idly watching the insects feeding on the Arabis and Aubretia flowers when suddenly a hive-bee and a small tortoiseshell butterfly shot into the air and for over a minute indulged in a furious display of aerobatics, soaring, diving, twisting and turning, all within the space of a few metres, the butterfly throughout pursuing the bee. At no time, before, during, or after the chase did I see any physical contact between the insects, which kept always about three to five centimetres apart. The chase ended as abruptly as it had begun, the insects just dropping suddenly down on the flowers and resuming feeding quietly side by side as if nothing had happened. I can offer no explanation of the performance.

J. T. B. Bowman.

Butterflies and Squirrels. Visiting the Pont Burn Valley, with a friend on June 22nd 1981, we were amazed to see such large numbers of Orange-tipped butterflies *(Anthocaris cardamines).* The Common Blue *(Polyommatus icarus),* was also present in fair numbers. While in the plantation we were very lucky to spot five red squirrels in different parts, always near the burn. They seemed to favour larch.

R. Pirt.

A singing Whitethroat. One of the nicest things that has happened to me this summer, has been the continuous singing of a whitethroat near my house in Medornsley. There has been more that six weeks of endless song. What can be the reason for such an excessive period? There is was singing away every day when I walked down my garden path. Usually courtship and brooding takes little more than three weeks and feeding the young usually marks the end of singing at least for a time. Could it be that this male had come back to the district where it was born but was not favoured with the arrival of a prospective mate as would normally be the case?

R. Pirt.

Trees. Trees are my favourite plants and during my long life I have studied them in an amateur sort of way which has given me very great pleasure. In some ways they are like human beings in that they begin with a young stage of growth when they are full of sap, vigorous and healthy. This is followed by a stage of maturity at 25 to 35 years of age, marked by their flowering stage, and this extends to 75 to 100 years, depending on the species. After this follows a period of existence but there is a slow drift into old age and senility.

Sadly, in most of the countryside the deciduous trees have reached the final stage, whilst only the conifers show any youthful vigour. During World War I and for years after, half of our deciduous forests were clear felled and replanted with conifers and usually these were foreign introductions not our native species. At the same time the dependent wildlife began to decline and is now at such a low ebb that many voluntary bodies are trying through publicity to make everyone aware of the position in the hope that the trend can be reversed. Again sadly, local councils, fired with the wish to help National Tree Weeks, etc., have planted ornamental cherries, almonds, hybrid whitebeams, hybrid poplars and other silvicultural novelties. The kinds we should be planting are oaks, ashes, beeches, elms, limes, etc., and then the insects native to our countryside will return, followed by the birds and mammals that used to make up such a rich mixture in our forests in years gone by.

I would advise anyone who has the opportunity to fill in a piece of land, be it ever so smell, to plant our native trees and do it quickly. We are running out of time. R. Pirt.

RECORDS

AVES-BIRDS

Bucephala clangula (Goldeneye) 67
Two at Big Waters, Seaton Burn, January 23rd.

Mergus merganser (Goosander) 67
A female at Big Waters, February 28th.

Cygnus cygnus (Whooper Swan) 67
A flock of 32 in field of stubble near Big Waters, November 17th.

C. J. Gent.

Bombycilla garrulus (Waxwing) 66
One in my garden, Durham road, Chester-le-Street, December 12th 1981

Dr. K.G. Brown

ARANEAE-SPIDERS

Diplocephalus protuberans O.P.— Cambridge 62
One female found under a stone by Kilton Beck (NZ7017) on 20.5.79. This is a new v.c. record. The species is usually taken by water and was first found in Britain near Gibside.

OPIUONES-HARVESTMEN

Paroligolophus meadii Pickard—Cambridge. 62
Taken at Coatham Sands (Teesside) in fore-dunes, dune-meadow, wet slacks and on slag tips; and in Eston Moor (NZ5617). Specimens were taken in September, October and November 1978.

Nelima gothica Lohmander 62,66
One female under a piece of slag on the North Gare breakwater (NZ539283) on 18.9.78. Another female in a pitfall trap on a slag tip by the South Gare breakwater (NZ557273) on 28.10.78. This species is mostly found on the coast and has a predominantly western distribution— though there is also a previous record for Durham. There are no further records further south on the east coast as yet.

COLEOPTERA-BEETLES

Hydroporus scalesians Stephens 66
Found at Hart Bog (NZ453354) on 27.2. and 30.5.78. Taken in *Sphagnum* from the wet periphery of this small raised mire. The main centre of distribution of this tiny water beetle is the East Anglican fens. The species was recorded at Askham Bog near York in the 1880's but this is probably the first record this century outside of Norfolk.

Enochrus bicolor Fabr. 62, 66
The specimens found in brackish water at Greenabella Marsh (NZ5125) and Coatham Sands (NZ5626) in March 1979 and reported previously in the 'Vasculum' as f. *quadripunctatus* var. *halophilus* were incorrectly identified and are *E. bicolor*. This species is apparently at its northern limit on Teesside. I am grateful to Dr. Garth Foster for the determination of F. *bicolor* and for the confirmation of *H. scalesianus*.

Agabus melanarius Aube 62
Specimens were taken from a shallow pool full of dead leaves in Kilton Woods (NZ7016) on 31.3.79. A widespread but rare species with other recent records for N.E. Yorkshire, Durham and southern Northumberland.

Chrysomela aenea L. 6 2
Taken in Sweet Hill Woods by Dam Beck (NZ674146) on 27.5.79. There were alders, the host tree of this species, nearby.

D. Horsfield.

LEPIDOPTERA-MOTHS AND BUTTERFLIES

Polychrysia moneta Fabr. Golden Plusia. 66
One in the trap at Sacriston, 10.7.81. M. Mann.

Triaxomera fulvimitrella Sodof. 66
Taken in Hawthorn Dene, 20.6.75, and only recently determined. The caterpillar feeds on fungi and dead wood and is not at all common. Robson, in his Catalogue of the Moths of Durham and Northumberland could only give Hesledon Dene more than 80 years ago, together with a record from Upper Teesdale by J. Gardner at about the same time, and an old record from Waskerley.

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BY THE WAY

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DRAGONFLY MAPPING SCHEME

A mapping scheme has been in progress in Durham (the old vice-county 66) since 1979, during which time a considerable set of records has accumulated. In order to fill in obvious gaps many more records are required. If you are at all interested in dragonflies your help will be most welcome. Since the early stages are spent in fresh water, all ponds, puddles and streams should be checked. The majority of dragonflies are easy to identify once you spend a little time in the field and, as there have been only 10 species recorded in the county, it should soon be possible to recognise most of these, even though the males and females have different markings.

By far the best book for identification is The Dragonflies of Great Britain and Ireland" by C. O. Hammond, but the price is about £13.00. You may, however, be lucky enough to find a copy in your branch of the County Library. There are other books and these too may be found in your nearest library.

Already species are beginning to apprear on the wing, for example the Large Red Damseify, *Pyrrhosoma nymphula* was found along the banks of the River North Tyne on the N.N.U. Field Meeting on 22nd May and the Blue-tailed Damselfly, *Ishnura elegans,* was in thousands at Brasside Ponds on June 4th.

Records, with O.S. Map reference should be sent to the County recorder, Mr. C. Bruce, 10 Victoria Street, Consett. If you have any doubts about identity he will be prepared to look at specimens, but it should be emphasised that no more than one specimen should be collected.

BUTTERFLY POSTER

The Editor has recived a sample copy of a poster illustrating all our British Butterflies, produced by Dr. J. F. V. Vincent and J. Cox. It is exceptional in that the illustrations are absolutely accurate both in design and in colour reproduction. At a total cost of £1.00 we think this is splendid value for money. We would be prepared to obtain copies in bulk if sufficient orders from members were to be submitted. Orders please, to the Editor Treasurer as soon as possible before there is a complete sell-out.

BAT NEWS

The Wildlife and Countryside Bill contains greater protection for bats than is given by any laws in any nation in the world. Not only are all bats protected as endangered species, they may not be killed, injured or taken and the homes they occupy may not be damaged in any way. The Bill realises that disturbance to bat colonies constitutes great danger to all the species. The law will now make it illegal to interfere with any bat colony without having first notified the Nature Conservancy Council and allowing them a reasonable time to advise on whether the colony should be removed at ail and, if so, the method to be used. The only exception is a bat colony occupying the living area of a dwelling house. As most bats living in buildings inhabit the roofs of dwelling houses, they will now be protected.

THE SOCIETIES

NORTHERN NATURALISTS' UNION

The 58th Annual Meeting was held in the Hancock Museum, Newcastle upon Tyne, on 27th March, 1982, by kind invitation of the Natural History Society of Northumbria.

During the short business meeting the Treasurer again reported a moderate surplus on the year's working and felt, therefore, that it was not necessary to raise the current subscriptions, in spite of present day inflation.

During the election of officers it was agreed that Sir James Steel should be invited to become President-Elect to succeed Dr. E. Burtt who became the new President.

The retiring President, Dr. L. Davies, then gave his presidential lecture, 'Observations on Life in constantly cool habitats'.

In his introduction Dr. Davies first of all defined what he meant by 'cool'. It was where little shelter was possible and the temperature remained between —20 degrees C and +10 degrees C all the year round. This is much like our own winter all the time and he had in mind several small island examples where the exposure to wind also added to survival problems. Such places are just north of the Antarctic continent and just south of the Arctic. Some growth is possible but repeated freezing and thawing is a great problem, especially in the winter. In addition, heavy cloud cover with high rainfall are responsible for continued cool temperatures in summer giving continuously cold soils. Windy conditions compound the problems in that excessive grazing will allow soils to be blown away or so continuously on the move as to make stabilisation by plant cover very difficult.

Any animal life must develop some means of insulation against the harshness of the climate. This Elephant Seals and King Penguins feed heavily during the summer to store sufficient fat to last them through the winter. Examples of such places were then described in greater detail.

On St. Kilda striking feature is the many open spaces in the vegetational cover. This is due to heavy grazing by the indigenous sheep together with the constant strong winds.

In the southern hemisphere the Kerguelins have mostly a dense vegetation of the native Cabbage species and *Acaena*, but where rabbits manage to survive the vegetation is much sparser. On the Crozier Islands there is a tight carpet of low-growing plants, mainly mosses up to about 1,000 ft. but no vegetation at all above this contour. At this height quick freezing and thawing is occurring all the time with the result that the soil is continually moving and therefore not at all suitable for the establishment of vegetation.

Insects were few in species; there were, for example, only two species of Carabid Beetles both of which have a vert slow growth rate, taking about two years to mature and living, as adults, about five years. The ecology of these beetles was investigated carefully and'it was found that their habitats were determined largely by the size of the pebbles they lived in. The larger species lived in the larger pebbles with greater spaces between particles and therefore nearer the surface, whilst the smaller species lived lower down in the substratum with larvae further down still. In this way they managed to overcome the problem of obtaining shelter yet did not impinge on each others' territory.

The talk was illustrated and was altogether quite fascinating.

A vote of thanks was given by Mr. L. P. Hird, after which Mr. J. T. Bowman said a few words about the B.S.B.I. Churchyard Survey before we partook of the splendid tea provided by Mrs. Hall and Miss Vincent.

On view were several exhibits dealing with the B.S.B.I. survey by Mr. Bowman, pressed plants by Mr. Hird, selected caterpillars by Mr. M. Mann, pictures illustrating thaw time 1982 by Dr. E. Turnbull, a "Witch's Broom' from Raasay, *Quercus maxima* leaves and plants from Ludworth all from Dr. Todd, and a drawer of migratory butterflies and a number of bramble leaves containing Nepticulid mines by Mr. Dunn.

The 161st Field Meeting near Acomb (meeting of the North and South Tyne) was held on 22nd May and led by Mr. C. Gent.

From Acomb the route was along the quarry road to the east bank of the River North Tyne. We followed public footpaths along the river bank through rather open scrubby woodland. Many plants were in flower and we soon encountered a hybrid swarm of *Geum rivale/Geum urbanum* as well as pure *Geum rivale* in flower and pure *Geum urbanum* plants not quite so advanced. At several points there were discreet colonies of Meadow Saxifrage *(Saxifraga granulata)* and one very large concentration on a sloping bank. Other plants of note were Leopard's Bane *(Doronicum pardalianches),* Hedge Bedstraw *(Galium mollugo).* Primrose *(Primula vulgaris).* Cowslip *(Primula veris).* Rough Chervil *(Chaerophyllum temulentum).* Blackthorn *(Prunus spinosa),* White Poplar *(Populus alba),* Purple Willow *(Salix purpurea)* and Large Bitter-cress *(Cardamine amara).*

A single roe deer was seen by some of the members but it soon made off at high speed.

Birdsong was much in evidence. The summer visitors were well established, the songs of the Willow Warbler, Chiffchaff, Blackcap, Garden Warbler and Whitethroat being noted. Resident birds were also in good voice, the Curlew, Blackbird, Song Thrush, Chaffinch, Dunnock and Wren being heard. Down by the river a Common Sandpiper and Pied Wagtail were seen. Other birds recorded were Oyster Catcher, Pheasant, Swallow, Swift and Blue Tit.

The sunshine encouraged the Orange-tip butterflies whilst other insects were seen by beating. These included several Tortricid larvae which later produced *Aphelia paleana.* Hb. Two large beetles were more common than usual. These were the longhorn, *Rhagium bifasciatum* and the common cockchafer, *Mellolontha mellolontha.* By the river the first Damselfly of the season, the Large Red Damselfly *(Pyrrhosoma nymphula)* was in large numbers.

Much interest was shown bv several members in the spiders.

NOTES AND RECORDS

NOTES

A Fishing Crow. A Carrion Crow has learnt to catch sticklebacks in the River Wear at Chester-le-Street. During May it was seen on several occasions by many people, on the new concrete weir beside the children's playground. Its habit is to advance slowly along the crest of the weir until its feet are just in the water. At this time of the year the great stickleback migration up-river is at its height. In the sunshine these little fish glisten brightly as they try to swim up the weir in the shallow waterfall. It is then that the crow suddenly pecks at them until it is successful in catching one. It then places it under one foot and proceeds to tear it to pieces. It is not possible to be certain whether portions of the fish are eaten or whether the crow just enjoys the practice.

T.C.D.

Holy Island Notes. I spent a week on Holy Island from May 8th until May 15th. The weather was fine but a cold south east wind was in evidence all the week. The following plants were seen in flower: Water Crowfoot *(Ranunculus aquatilis).* Wallflower *(Cheiranthus cheiri),* Dog Violet *(Viola canina),* Common Violet *(Viola n'viniana).* Primrose *(Primula vulgaris),* Cowslip *(Primula veris),* Meadow saxifrage *(Saxifraga granulata),* Field Speedwell *(Veronia persica).* Germander Speedwell *(Veronica chamaedrys).* Slender Speedwell *(Veronica filiformis),* Ivy-leaved Speedwell *(Veronica hederifolia),* Ivy-leaved Toadflax *(Linaria cymbelaria*), coralroot Orchid *(Corairhiza trifida),* Bogbean *(Menyanthes trifoliata),* Balearic Pearlwort *(Arenaria balearica),* and Fairy Foxglove *(Erinus alpinus).*

Bird visitors from abroad were still in small numbers but some of the more interesting were Sedge Warbler, Blackcap, Willow Warbler, Swallow, Swift, House Martin, Ring Ouzel, three late Fieldfares and three Bramblings which disappeared after three days. On 14th May at 11.45 a.m. I was thrilled to see a Marsh Harrier hunting over the Snook and earlier in the week a Merlin was seen quartering the fields on the Straight Lonnen for a few successive days. This sighting was confirmed by two Oxford Birdwatchers, G. Manser and A. Hall.

Finally I would like to mention the excessive increase in the rabbit population. It is now reaching epidemic proportions and something must be done to reduce their numbers. One sees them running about in the village now, eating up vegetation in places where they are causing a nuisance.

L. P. Hird.

A Toad Mystery. Each spring for several years now I have found, near the Chirdon Burn in the North Tyne Valley, the remains of common toads *(Bufo bufo).* These appeared to have been very neatly skinned, and eaten, except for the head region. In almost every case all limbs were missing, once the pelvic girdle and one femur remained, quite fleshless but still loosely attached to the otherwise limbless torso, invariably the ovaries also survived. On one occasion a specimen was found on a mossy rocky islet in the middle of the burn. The toad, because of the poison-secreting glands in its skin is usually reoarded as unattractive to most oredators. and the identity of the hunter

is a mystery. Last year (1981) I fount the remains of half-a-dozen toads along a rough track, hardly a human pace separating one from the other. It is clear that the animals had been moving down to the burn to spawn. Whereas in still waters toads usually congregate in large numbers, I have not located the equivalent area in this burn and the success rate must surely be correspondingly lower.

A further problem was set by the discovery this spring of the bleached bones of over thirty toads, in discreet individual heaps on patches of bare earth on a well-drained heathery hillside some two hundred yards from and over fifty feet above the level of the same burn. On the whole most heaps could be identified as one toad, usually including a disarticulated skull, vertebrae, parts of the pelvic girdle and often two or three limb-bones. It is fair to assume that they were last spring's 'crop' from a similar predator, but much higher above the stream. Had they been carried there, or had they hibernated nearby and been caught before they got nearer the burn? The interesting question seems to be—'whodunnit'? Maybe Vasculum readers have made similar finds. I would be interested to hear from them.

T.Tynan.

Unusual bird reports. I had a report from a member of Consett and Derwentside Field Club of a pair of waxwings feeding on Cotoneaster berries in his garden in December and also of watching a Kingfisher on the River Derwent near Shotley Bridge on January 5th, **1982. R.** Pirt.

Lapwings. In Medornsley I have watched the arrival of Lapwings each spring to take up breeding territories in the rough pastures nearby. At this time their characteristic call and acrobatic display flight are a delight which I never fail to marvel at. They feed mainly on pests of agriculture and so can truly be called the farmer's friend. Each spring I have noted the numbers of pairs of breeding bir'ds. Sadly, over the years, the count has steadily fallen. This spring until now (March 22nd) I have not heard a single lapwing call nor seen a single pair of birds claiming a territory. This is, to say the least, very worrying. In autumn the same bird usually gathers in large flocks to feed on the larvae of craneflies or 'daddy-long-legs' (wire worms) and it usually stays until the frosts make it impossible to dig intq the soil. It then moves to our coastal estuaries for the winter. Again the autumn flocks have declined in numbers just like the spring breeders. At one time they used to congregate in hundreds. The very old pastures that they frequent have not changed and are still as they were when I was a boy. Yet now I can easily count the autumn flocks in scores instead of hundreds. I do hope its decline is only temporary and will not continue on the downward path.
R. Pirt.

RECORDS

FLOWERING PLANTS AND FERNS

Sambucus racemosa L. 67
S. bank of Coquet, W. of Felton.
Dipsacus fullonum L. Teasel. 68
Cawledge Burn.
Scabiosa columbaria L. Small scabious. 67
S. bank of R. Tyne near Unthank Hall.
Seneci'o squalidus L. Oxford Ragwort 67
Felton; Plessey Dene.
Filago minima (SM) Pers. Slender Cudweed. 68
Coidgate Water.
Gnaphalium sylvaticum L. Wood Cudweed. 68
Longhoughton Quarry.
Antennariadioica (L.) Gaertn. Cat's-Foot. 67
Near Girsonfield Wood (Otterburn).
Eupatorium cannabinum L. Hemp Agrimony 67,68
Milkwell Burn; S. bank of Coquet near Ashington (67).Cawledge Burn; Ediingham Burn; Cullernose; N. bank of Coquet near Guyzance (68)
Chrysanthemum segetum L. Corn Marigold. 67
Field on S. bank of Coquet, E. of Felton.
Carlina vulgaris L. Carline Thistle. 68
Redburn links (Bamburgh).

Cichonum intybus L. Chicory 68
Yeavering; near Old Felton.
Crepis mollis (Jacq) Aschers. Soft Hawk's-beard. 67
Brig Burn.
Potamogeton lucens L. Shining Pondweed 68
Tweed near Cornhill; and near Norham.
The following *Potamogetons* were determined by Mr. J. E. Dandy—
Potamogeton gramineus L. Various-leaved Pondweed. 67
Ray burn Lake.
Potamogeton praelongus Wulf. Long-stalked Pondweed. 67
Hallypike Lough.
Potamogeton pusillus L. 67, 68
Lake in Belsay Park (67). Doxford Hall Pond (68).
Potamogeton obtusifolius Mert. & Koch. Grassy Pondweed. 67
Wallington Pond.
Potamogeton berchtoldii Fieb. Small Pondweed. 67, 68
Moralee Tarn; Otterburn Hall Pond; Wallington (67).Longhoughton Quarry (68).
Potamogeton pectinatus L. Fennel-leaved Pondweed. 67
Lake in Belsay Park.
Convallaria majalus L. Lily-of-the-Valley 68
Wilderness, Ewart Park.
Ulium martagon L. Martagon Lily 67
Wansbeck near Wallington; on bank of old railway near Chariton.
Gagea lutea (L.) Ker-Gawl. Yellow Star-of-Bethlehem 67
Honeycrook Burn; rediscovered by Dr. R. High (communicated by Mr. L. C. Crambs), confirming an old record.

G. A. Swan.

The following Ferns and Horsetails are all from the Blaydon Burn and Burnhills area near Blaydon-on-Tyne.
Polypdium vulgare L. Polypody 66
Scarce, on stream banks in mature woodland.
Pteridium aquilinum L. Bracken 66
Common.
Asplenium scolopendrium L. Hart's tongue 66
Common on sandstone walls.
Asplenium trichomanes quadrivalens Meyer. Maidenhair Spleenwort 66
Common on sandstone walls.
Asplenium ruta-muraria L. Wall Rue 66
Occasional on brick walls.
Asplenium ceterach L. Rusty Back 66
A small colony on a sandstone wall. Rare in the North-East.
Athyrium felix-femina L. Lady Fern. 66
Common in woodland.
Polystichum aculeatum L. Hard Sheild Fern. 66
Scarce—on a sandstone wall.
Dryopteris felix-mas L. Male Fern 66
Common in woodland and scrub, also on walls.
Dryopteris affinis borreri Newm. Scaly Male Fern 66
Common in woodland.
Dryopteris affinis robusta. Robust Scaly Male Fern 66
Rare—by streamsides in mature woods.
Dryopteris carthusiana Vill. Narrow Buckler Fern 66
Scarce—in woodland flushes. Rare in the North-East.
Dryopteris austriaca Jacq. Buckler Fern 66
Common in woodland, in scrub and on walls.
Blechnum spicant L. Hard Fern 66
Occasional in mature woodland.
Equisetum hyemale L. Dutch Rush 66
Occasional in woodland flushes. Rare in the North-East.

Equisetum fluviatile L. Water Horsetail 66
A large stand in a shallow pond.
Equisetum arvense L. Field Horsetail 66
Common by roadsides and on disturbed ground.
Equisetum sylvaticum L. Wood Horsetail 66
Common in woodland.
Equisetum palustre L. Marsh Horsetail 66
Occasional in wet grassland.
Equisetum telmateia Ehrh. Great Horsetail 66
Occasional in woodland flushes

J. Durkin and D. McCutcheon.

Euonymus europaeus L. Spindle-tree 177/1
A solitary but flourishing plant in full flower on the old west bank of the College Burn, now some distance from the present bank, a few hundred metres N.E. of the footpath at Hethpool Linn. This is one of the two Cheviot stations given by Baker and Tate. Search has so far failed to reveal any other surviving specimens and I know of no recent record of it here, but in 1958 G. A. Swan recorded its survival in the other Cheviot station, Humbledon Dene (Vasculum 43.1), 15th June 1981.

J.T. B. Bowman.

LEPIDOPTERA-MOTHS AND BUTTERFLIES

Pheosia tremula Cl. Swallow Prominent 66
Once at light, Sacriston.
Pheosia gnoma Fabr. Lesser Swallow Prominent 66
Fairly common at light, Sacriston.
Notodonta ziczac L. Pebble Prominent 66
Two at light, Sacriston.
Notodonta dromedarius L. Iron Prominent 66
Not uncommon at light, Sacriston.
Ptilodon capucina L. Coxcomb Prominent 66
Common at light, Sacriston.
Phalera bucephala L. Buff Tip 66
Once at light, Sacriston.
Thyatira batis L. Peach Blossom. 66
At sugar in Sacriston Wood and at light.
Achlya flavicornis L. Yellow Horned 66
Larvae in Sacriston Wood and moths at light.

R. Woods.

COLEOPTERA- BEETLES

The following records of Coleoptera are all from Beltingham in Northumberland, v.c. 67
CARABIDAE
Nebria brevicollis (Fab., 1792) — abundant.
Elaphrus cupreus (Duff., 1812) — not uncommon by water.
Elaphrus riparius (L. 1758) — not uncommon by water.
Lori'cerapih'cornis{Fab. 1775) —common.
Clivina collaris (Herbst. 1 784) — very local.
Asaphidion flavipes (L. 1761) — somewhat local.
Bembidion lampros (Herbst., 1784) — common.
Bembidion prasinum (Duff., 1812) — very local, at the Northern limit of its range.
Bembidion tetracolum (Say, 1823) — common.
Bembidion gilipes (Sturm, 1825) — local.
Pterostichus madidus (Fab., 1 775) — abundant.
Pterostichus melanarius (III., 1798) — common.
Pterostichus niger (Schall., 1783) — common.
Pterostichus stenuus (Panz., 1 796) — common.
Abax parallelepipedus (P. & M,, 1783) — common in woodland.

Calathus fuscipes (Goeze, 1777) — common in woodland.
Agonum albipes (Fab. 1796) — common by water.
Agonum muelleri (Herbst., 1784) — common.
Amara plebeja (Gyll., 1818) —common.
Dromius quadrinotatus (Z. in P., 1800) — not common in herbage.
HYDROPHYLIDAE
Helophorusaquaticus (L. 1758) — common by water.
SILPHIDAE
Silphaatrata (L. 1758) —common, snail feeder.
STAPHYLINIDAE
Othius punctulatus (Goeze, 1777) — in moss etc., common.
Philonthus decorus (Grav., 1802) —abundant.
Philonthus laminatus (Creut., 1799) — in dung, etc., common.
Tachyporus obtusus (L., 1758) — in vegetable refuse, abundant.
Tachinus laticollis (Grav., 1802) — in moss etc., local.
Tachinus signatus (Grav. 1802) — in moss etc., common.
SCARABAEIDAE
Aegialia sabuleti (Panz., 1796) — sandy banks of rivers, local.
Aphodius prodromus (Brahm, 1790) — in dung, common.
BYRRHIDAE
Mortychus aenus (Fab., 1775) —sandy river sides, local.
Cytilus sericeus (Forst., 1771) — damp places, local.
ELATERIDAE
Hypnoides riparius (Fab., 1 792) — common in damp places.
Zorochros minimus (B. & L., 1835) — banks of streams, local.
Athous haemorrhoidalis (Fab., 1801) —abundant.
Selatosomus incanus (Gyll., 1827) — not uncommon in woods.
Agricotes obscurus (L., 1758) — common under stones etc.
Adrasus pallens (Fab., 1792) —common in woods.
CANTHARIDAE
Cantharis livitia (L., 1758) — common in herbage.
Cantharis pellucida (Fab., 1792) —common.
Rhagonycha femoralis (Brulle, 1832) — common in herbage.
Rhagonycha fulva (Scop., 1763) — very common on flowers.
Rhagonycha lignosa (Muell., 1764)—common
COCCINELUDAE
Aphidecta obliterata (L., 1758 — common in woodland.
Adalia decempunctata (L., 1758) — very common in woodland.
Coccinella septempunctata (L., 1758) — very common.
Calvia quattuordecimpunctata (L., 1758) — very common in deciduous woodland.
CHRYSOMELIDAE
Phaedon tumidulus (Germ., 1824) — common in herbage.
Hydrothassa marginella (L., 1758) —common on Ranunculacae.
Phyllodecta vulgatissima (L., 1758) — common on *Salix* spp.
ATTELABIDAE
Deporus betulae (L., 1758) — common on birch.
CURCUUONIDAE
Otorychus ligneus (Oliv., 1807) — in moss etc., local.
Otiorychus singularis (L., 1767) —abundant.
Phyllobius argentatus (L., 1758) —common in deciduous woodland.
Phyllobius calcaratus (Fab., 1792) —common in deciduous woodland.
Phyllobius pomaceus (Gyll., 1834) — common on nettles.
Phyllobius pyri (L., 1758) — very common in deciduous woodland.
Phyllobius viridicollis (Fab., 1792) — not uncommon in herbage.
Polydrusus cervinus (L., 1758) — common in woodland.
Barypeithes pellucidus (Bohe., 1834) — in moss etc., fairly common.
Brachsomus echinatus (Bons., 1785) — in herbage, locally common.
Rhinonchus pericarpius (L., 1 758) — common, on *Rumex*.-M.D.Eyre & M.A.Walker, May 1981

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SUBSCRIPTIONS

May we, once again, remind readers that subscriptions were due on January 1st last. A few are still unpaid. Would the guilty ones please make a big effort to let the Hon. Treasurer have the money as soon as possible. Since the Northern Naturalists' Union is an organisation without any capital and without any source of income other than your subscriptions, and since the Vasculum has to be paid for when it is passed over the counter so to speak, it follows that your money is absolutely necessary for its continued production on time.

EDITORIAL

Sadly, inflation is still with us, although the rate seems to be falling. We have held the annual subscription at its present level for three years by careful management of our money affairs. It is now imperative that there should be an increase in 1983. The amount will be decided by Council at its next meeting. You can all rest assured that this will be as little as possible but sufficient to maintain the present standards of our publications.

PATROLLING BEHAVIOUR IN ORANGE TIP BUTTERFLIES WITHIN THE BOLLIN VALLEY IN NORTH CHESHIRE, AND A COMPARISON WITH OTHER PIERIDS

R. L. H. DENNIS
The Manchester Grammar School, Manchester M13 OXT

INTRODUCTION

The Orange Tip butterfly occurs throughout much of mainland Britain though the distribution is discontinuous (c.f., Howarth 1973). Some important habitat differences occur within its range. In southern England, the species is widespread, occupying lanes, meadows, woodland glades and marshy areas. In northern Britain, in Aberdeen and Kincardineshire (Palmer and Young 1977) and County Durham, the butterfly is more restricted, being found particularly along river banks. Courtney (1980) linked this to a corresponding restriction of the butterfly's foodplants, various Cruciferae. In north Cheshire, casual observations indicate a concentration along river valleys though the butterfly has been found further afield even flying through suburban gardens.

Orange Tip butterflies spend much of their time patrolling for mates, stopping briefly for feeding. Other butterflies perch or wait, as opposed to seek, for mates rising rapidly to intercept passing insects. The Wall Brown and Grayling adopt this mode of behaviour but perching and patrolling are not mutually exclusive activities and, for instance, the Wall Brown (Dennis, in prep) and Speckled Wood (Davies, 1978) do both. In Durham, Courtney (1980) has studied patrolling activity in Orange Tip butterflies and found that movement is restricted to limited sections of river valleys. This short paper investigates this behaviour in the Bollin Valley in Cheshire. Several questions arise:- to what extent are the male butterflies confined to river valleys? How far do they patrol? Precisely what routes are adopted when patrolling and do these change during the day and flight season? Are there effective barriers to patrolling and are these physical obstacles or intrinsic? Clearly many naturalists must have made casual observations on these activities. However, without a clearly defined method of

tracing a butterfly, one cannot be sure that a butterfly seen is one observed minutes previously or a different, insect. Adoption of one or two simple techniques ensures some reliable judgements. To emphasise variations in butterfly behaviour, comparisons are made between the Orange Tip butterfly and the Green-veined White.

METHODS

Tracing the two butterflies from day to day in the Bollin Valley has been carried out using an amalgam of two techniques, setting up a transect in the valley and capturing, marking, releasing and recapturing (CMRR techniques) butterflies along it. Details of the transect scheme are described by Pollard (1977, 1979). Basically, a route was established on the east bank of the Bollin and divided into 20 habitat sections (Table 1). All but sections 6 and 13 are joint sections divided up on the basis of the precise alignment of the route within the same habitat division representing the out- ward and return journey. The transect is effectively split in two by the M56 motorway. Butterflies were marked in the manner shown in Figure 1 (cf., Ehrlich and Davidson 1960). Precise locations and times of captures were noted on a large scale map (1 :2,500). A number of statistical measures are available using this technique (cf., Scott 1975); only the measure of range is used here, which is the straightline distance between the most distant points of capture. Obviously, for a butterfly which follows winding tracks, the range greatly underestimates the full range of movement.

The transect technique can be modified to provide for a more intensive documentation of insects by effecting random walks within habitat sections and extending the time of CMMR; this became necessary with the inclusion of a grass seed field in the later part of the work. Eleven transects were carried out over the 4600 metre route, each taking something over 1 hr. 15 mins. to complete. Only four marking sessions were carried out along the transect for the Green-veined White, but four more intensive studies were made within four habitats. Finally, note was made of nectar and hostplant sources in each transect section and more direct observations made on the butterfly by following them.

RESULTS

Figure 1 summarizes much of the results of the transect survey on the Orange Tip. The numbers involved reflect a surprisingly small and sparse population for the butterfly (total population of males estimated as less than 400 individuals; not more than 25 on any day) compared to that of the Green-veined White (total population over 4000 males and daily over 160), Large White and Small White. Nevertheless, numerical differences between habitats are obvious, numbers being far less for wood- lands (Sections 6, 10, 16, 12, 14) and for areas separated from the river (sections 1, 20, 13) by woods. Sections 2/5 and 9/17 seem to attract the butterfly out of proportion to their areas; both are well stocked with crucifers, effectively sheltered by surrounding trees and woods and receive the sun's rays directly. Nectar sources are ubiquitous.

Figure 1 also illustrates the movement between sections of the transect and it is clear that although few butterflies were caught along the woodland paths, butter- flies were able to find their way from one open habitat to the next. Observation of their movements showed that they avoided the shaded areas of woodland and adopted paths along the river channel or on the opposite bank in the sunlight.

From the frequency of recaptures in each zone, Figure 1 shows how localised the Orange Tip males are; their mode of behaviour is one of patrolling up and down the valley for varying distances. As such, some have been caught frequently as the figures in Table 2 indicate. Specific details for male No. 9 illustrate the back and forth movement well (Table 3). Speed of movement can be considerable. Male No. 13 in section 8 at 12.13 was recaptured eight minutes later in section 19 flying back to section 8. It had covered a minimum of 925 metres in that time. However, as the butterflies age, so their flight becomes weaker and by May 30, for instance, male No. 9 fluttered slowly within the confines of sections 2, 3, 4 and 5.

TABLE 2 Frequency of recaptures

	0	1	2	3	4	5	6	9
Orange Tip	20	6	8	2	2	1	1	1
Green-veined White	74	8	0	0	0	0	0	0

TABLE 3 Capture/recapture details for Orange Tip No. 9

Sector	Date	Time
3	May 15	11.59
8	15	12.25
2	16	12.28
7	16	13.13
3	28	15.50
4	29	10.25
2	29	12.02
19	29	15.36
1	29	15.36
5	30	12.16
2	30	13.38
2	30	14.07
2	30	14.14
2	30	14.34
2	June 1	11.43

The distance over which male Orange Tips patrol comes as a surprise. Expressed as range the figures for the 21 males recaptured are given in Table 4. These figures and the average (411 metres) must underetimate values for the butterfly if only because some 20 were not recaptured and that the transect probably failed to include the full zones of movement for several insects. Movements are affected by weather conditions. After high windspeeds on May 27, a relatively large number of unmarked insects were caught along the transect but wear on the wings pointed to their having been blown in from elsewhere and not newly emerged. For the most part, straight- lines on maps and range are poor measures of actual movement as evidenced from precise flight paths during the day. These change in sympathy with sun angle. Generally, the butterflies keep to wood edges and lines of trees along the river bank where the sun strikes at a high angle and provides greatest warmth.

TABLE 4 Ranges of movement for recaptured Orange Tip Males

Distance in metres	0-200	200-400	400-600	600-800	800-1000	1000+
Number of Insects	3	8	6	2	1	1

What restricts male Orange Tips to particular areas is an interesting problem_ The transect, with its inclusion of the M56 motorway, at least provides some insight of the affect of major physical obstacles. The fall-off in movement across the motorway in Figure 1 is distinctive; only three crossed to the other side, one butterfly having been caught on the south side four times between May 16 and 26 before being recaptured again in section 9_ Male Orange Tips were seen to be deflected by the motorway bridge over the Bollin, fly along the embankment, occasionally feeding, returning to re-enter the pasture and to patrol upstream. Male No. 9 passed over the embankment down to the hard shoulder, but returned rapidly a few seconds later.

Some interesting insights were gained from comparative data on the Green- veined, Small and Large Whites. All these butterflies patrol in much the same way, except that the Large White patrols somewhat higher than the other three, which fly about one metre above the ground. The three Pierinae were more common and their relative numbers in the transact zones (as illustrated for the Green-veined White in Table 5) very different.

TABLE 5 Numbers of Green-veined White caught in the 20 transect zones during four transacts

Transect	1,20	2,5	3,4	6	7,9	8,18	9,17	10,16	11,15	12,14	13
Numbers	11	9	6	0	4	6	13	5	8	0	5
%	16	13	9	0	6	9	19	8	12	0	8

By no means was patrolling restricted to river banks and wood edges; in fact, the butterflies were as commonly found on higher ground. The proportion of Green- veined Whites found in section 9/17 reflects the concentration of Cuckoo Flowers and females there. Far fewer recaptures of the Green-veined White were made (Table 2). despite modifications to the transect technique which would allow increased recaptures for large populations, and far from following restricted flight paths deter- mined by topographic features, all three Pierinae cut across flelds from one side to the other. Recaptures of Green-veined White also demonstrated the motorway to be no barrier and males were seen to flyover the obstacle. Too few recaptures were made to calculate flight range; long distance recaptures over 1000 metres were made as well as some recaptures in the same zone, but the overall impression was of a continuous flow of the Green-veined White through the zone studied.

This behaviour may well be related to the sparse and unpredictable distribution of resources for Pierids which tend to be concentrated in small areas. An interesting by-product of searching for female Pierinae which appeared to be in short supply in the river valley, was the discovery of one such concentrated resource in a grass-seed field above the woods overlooking section 3. Mixed in with grass seed were nectar sources such as buttercup, clover and yellow crucifers and a larval hostplant in the form of a root crop, turnip. Comparisons with sections on the transect revealed not just a concentration of Pierinae, but also a more favourable sex balance (Table 6).

Relatively lower figures for females in many respects points to the difficulty of seeing them; they settle for longer periods and fly much lower.

TABLE 6 Numbers of Pierids and sex ratios for the Green-veined White in 30 minute samples for four locations.

Section	2/5	3/4	1/20	Grass seed field
Pierids Males	23	14	11	22
Females	1	1	4	15
Green-veined Whites	8	7	3	9
Males				
Females	0	1	1	4
Total Insects	24	15	15	37

The field, and one or two others found elsewhere subsequently, was a hive of activity. Criss-cross patrolling by all three species, skirmishing involving three or more insects, egg-laying, courtship and mating and harassment of females whilst egg-laying by patrolling males, as well as feeding, were all observed, providing a convincing spectacle of the affects of concentrated resources (ct., Root 1973). Moreover, all insects were extremely active and the Green-veined White a great deal harder to capture than in the valley. More recaptures of male Green-veined Whites were made here, a figure of less than 1:4 compared to 1 :21 for sections 2/5 in the river valley, indicating a tendency to stay longer in the habitat.

DISCUSSION

Why do male Orange Tip butterflies patrol as a mate location strategy as op- posed to perch? Why is their patrolling restricted to definite paths? What determines the patrolling distance and what encourages them to return instead of continuing their flight? Why does patrolling in the three other Pierids differ? These are some of the specific questions that now emerge from the study, and though it is not possible to provide definitive answers at this stage some factors are discussed below that provide potential lines of inquiry.

Regarding the alternatives of patrolling and perching it would be thought that the simplest way for males to receive a mate would be to wait near a crucifer patch, since females must lay their eggs there, often feed and emerge near last year's crucifer patches. Males will also have a nectar source nearby. Though it is possible that females may be unable to locate males when at rest, due to the hindwings effective camouflage, this is unlikely as perching males of other species rise to investigate nearly all passers-by. The Red Admiral will even rise to inspect small birds. It would also be a mistaken notion that perching is less energetic than patrolling. Investigative flights (sorties) by perchers are frequent and faster than most patrolling flights and male Orange Tips could well expend considerable energy on inspecting non-conspecific white females and males. Moreover, perching on crucifer patches would lead to harassment of females whilst egg-laying. Egg-laying depends on bright weather and, as It is, female Orange Tips seem to release only a small fraction (possibly 10%) of their egg load (Courtney 1980). Finally if courtship and mating took place near crucifer batches, this would greatly increase the frequency of activities in these zones and Orange Tip density perhaps increasing not just harassment but predation.

Perching-patrolling options, in terms of natural selection, depends on the frequency of finding mates. Initiating courtship and mating is a two-way process. On the one hand, perching males will generally only see other butterflies in a narrow orbit e around them. Patrolling up and down increases the field of vision. On the other hand an emerged female's first task is to get mated. As cues for the female, either the ' perching habitat must stand out (e.g., a sunspot in a clearing for the Speckled Wood a path or sandy patch on heath land for the Wall Brown; a rocky outcrop for the Grayling), the male butterfly must be distinctive or both. The Orange Tip is cryptic against plant surfaces especially when its wings are closed; in flight, the white colouration allows immediate recognition as a Pierid, the red apial patch as distinctive as a neon sign even in terms of disruptive ultra-violet patterning. The red patch must also be a flag to predators but it is also possible that the colouration warns of previous unpleasant experiences. If not, it is likely in the male Orange Tip's best interest to keep moving than to provide a sitting target. Patrolling actively, however, probably has its fundamental explanation in the predictability of resources, more about which is said below.

River valleys provide important habitats for crucifers in north Cheshire with a distinct fall-off in this resource as distance increases (cf., Dennis, in press) and this likely explains the reason why males adhere to the valley floor. The valley sides, the precise location depending on the time of day, also provide the sunniest and hottest locations, as the sun strikes the slopes at the greatest angle, the butterfly closely following sun belts along the wood edges and river banks. Conversely, it avoids deep shade and fully exposed sites. Females thus have distinctive belts of habitat to home in on to find mates.

An unexpected feature of patrolling was the distance covered especially as certain habitats (sections 9, 17 and 2,5) seemed to provide all the resources required by the males:- shelter and sun traps; nectar sources; larval host plant sources in abundance occurring from year to year and thus sites of potential female emergence. Though skirmishing within resource concentration zones could, in part, explain the long distance movement back and forth from such sites, skirmishing contacts seemed to be brief, and in any case, population density was low and contacts were few. More convincing is that distance of movement is related to unpredictability of the larval hostplants. Crucifers are annual and biennial plants; their microgeography varies greatly from year to year. For example, section 6 and 8 lost large resources of Hedge Garlic from 1981. Thus females will be emerging in areas unrepresented by the host- plant; ongoing patrolling over long distances points to greater contacts and mating success by insects so involved, especially in sparse populations (cf., Scott 1975), and indirectly to the wide dispersal of females egglaying in the previous year.

Only the motorway formed an obvious barrier, and then only a partial barrier, to movement, though it is not known specifically what hindered passage. Certainly windspeeds are greater on the smooth surface of the motorway and this may deter movement in one direction if not both on occasion. Vehicles pass in a constant $stream_b$ along the M56 and this may create turbulence forcing insects back; some may succum to direct collision though many would be brushed over the top of the traffic. The M56 may also act as an implicit barrier in as much as none of the resources are met by the

wide expanse of six carriageways. Some indication of this is given in the effectiveness of woodlands and hedges as barriers. On approaching such obstacles, males keep to their patrolling height and In the sunlight, thus using low level access corridors where available and crossing over the river where necessary. Only those strong in flight spiral up and over the barrier; weaker aged insects turn in the sunlight. Sunlight and heat seem to be the overriding factors and turns could not be related to particular nectar sources nor to crucifer patches.

A last question relates to the different patrolling behaviour of the Green-veined, Large and Small Whites-their widespread unrestricted movements. They differ from the Orange Tip in one important respect; they are double brooded and as such their larval hostplants more unpredictable in space and time. Concentrations of resource in one year, or during one brood, can be deserts the next (as in fact has been the case with the grass seed field) and second brood Pierids will not find healthy populations of Hedge Garlic and Cuckoo Flower along the river banks. These insects depend more than the Orange Tip on mobility and such is the mobility that it is difficult to study using the transect technique. To understand it and the mechanics of movement as they relate to resources, larger scale surveys need to be undertaken involving a number of recorders at fixed stations.

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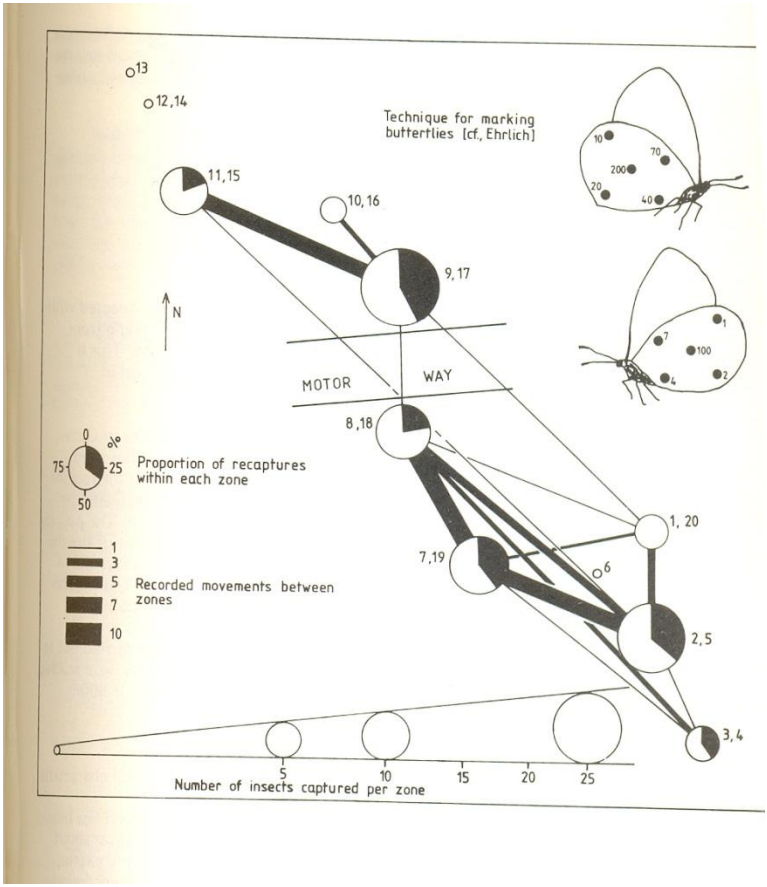
TABLE 1. Transect sections along the Bollin study zone

Section	Length (metres)	Habitat	Hostplant sources
1	375	Wood edge; ley grass field & rough pasture	C.p. (30)
20	225	Hedgerow; ley grass field	A.p. (45)
2	150	Wood edge; rough pasture infrequently grazed*	C.p. (13)
5	200	River edge; as for 2 above*	C.p. (41); A.p. (31)
3	325	Wood edge; permanent pasture	C.p. (10)
4	425	River edge; as for 3 above	C.p. (38 + 100 in field over stream)
6	25	River bank; wood	None
7	275	River edge; permanent pasture	A.p. (26); C.p. (1000 & over river)
19	375	Wood edge & terrace in permanent pasture	C.p. (100)
8	200	River edge; permanent pasture	A.p. (27)
18	175	Terrace in permanent pasture	None
9	150	River edge; wetland & ungrazed meadow*	A.p. (14); C.p. (7000)
17	125	Wood edge; as for 9 above*	As for 9 above
10	250	River bank; wood	None
16	425	Path through wood & clearing	None
11	250	River bank; rough pasture*	A.p. (67)
15	225	Wood edge; rough pasture*	A.p. (300)
12	125	River bank; wood	None
14	75	Path through wood	None
13	225	Rough pasture and Hedgerow	C.p. (16)

**Particularly sheltered localities. C.p. Cuckoo Flower; A.p. Hedge Garlic; Numbers indicate flowers counted.*

Potential Nectar sources
Woods: Bluebell; Red Campion; Garlic Mustard; Celandine; Stitchwort.
Pastures: Dandelion; Buttercup; Daisy; Clover; Umbellifers.
Hedges & river banks: Red Campion; Bluebell; Celandine; Umbellifers. Hawthorn & Rowan for the Green-veined White.


13
12,14
Technique for marking
buttertlies (cf, Ehrlich)
11,15
10,16
9,17
N
MOTOR
WAY
8,18
1, 20
7,19
6
2,5
3,4
0
%
75
25
50
Proportion of recaptures
within each zone
1
3
5
7
10
Recorded movements between
zones
5
10
15
20
25
Number of insects captured per zone

EXPERIMENTS WITH NPK FERTILISERS IN RELATION TO THE GROWTH OF TOADSTOOLS IN BEECHWOODS
11 FURTHER STUDIES

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INTRODUCTION

These studies were a follow-up investigation into the problems connected with the mechanism by which changes in environment induce the change leading from the fungal vegetative mycelial phase to the reproductive toadstool phase. This is presumably due to an acceleration of the metabolic rate and an alteration in metabolic pathways under the guidance of hormones.

The initial study of toadstool growth in the autumn of 1970 at Beech Grove, Castle Eden Dene, Co. Durham, and at Herrington Woods, Sunderland, has been described on a previous paper (HALL, 1978). This detailed the sites and the routine methods used to monitor the quadrat plots that had been set up to investigate the effect of differing quantities of compound fertiliser on toadstool growth. The paucity of terricolous species recorded at Herrington had led to the abandonment of the site for the 1971 study and to the decision to concentrate experimental work at the Castle Eden site. The toadstool yields from the Beech Grove site in 1971, using the same large quad rats (83.5 sq.m.) as in 1970, were also reported in that paper.

The extended field-work which forms the basis of this paper was carried out at the Castle Eden site in the later summer and autumn of 1971. Two areas were studied, one of which was Beech Grove, the other being Miss Mary's Walk which is 500m eastwards approximately.

DESCRIPTION OF THE SITES

1. **Beech Grove**. (Grid Ref. NZ 424388). The vegetation and soil characteristics were described in the previous paper.

2. **Miss Mary's Walk.** (Grid Ref. NZ 429 389). This site was much less humid due to its locally elevated position. The altitude was similar to Beech Grove, about 75m. Like Beech Grove, the site was of mature beechwood of very limited extent, the dense canopy as well as the acid soil discouraging most of the field layer found elsewhere in the dene.

Vegetation. The site was in the midst of twelve mature beech trees *(Fagus sylvatica)* whose heights and girths were similar to those at Beech Grove. A solitary sycamore *(Acer pseudoplatanus)* was the only other mature tree. nearby. A small elderberry *(Sambucus niger)* and a small yew *(Taxus baccata)* were the only shrubs. Seedlings of beech, sycamore, yew bramble *(Rubus fruticosus)* and sessile oak *(Quercus petraea)* were abundant. Soft grass *(Holcus mollis)* and wood sorrel *(Oxalis*

acetosella) were co-dominant in the ground-flora although the ubiquitous brvophvte, *Mnium hornum,* tended to be so in one quadrat area. In terms of species the vegetation, including bryophytes, was sparse compared to Beech Grove.

Soil. This resembled the acid mor soil found at Beech Grove rather than the acid mull soil found at that site also. The litter and fermentation layers were of several centimetres and were composed mainly of beech leaves and beech masts with some twigs. Beneath this was a 2-3 cm. black humus-mineral A 1 layer which was not distinct from the shallow A2 horizon. The underlying bright brown boulder clay was, in places, very near the surface. The mineral soil was moister that that at Beech Grove and the pH was more acid, around 3.9.

Methods. Sixteen quad rats, each of only 4 sq.m., were pegged.out at the two sites, ten at Beech Grove and six at Miss Mary's Walk (Table 1). Six of the Beech Grove quadrats (1 a, 1 b, 2a, 2b, 3a, 3b) were situated within the three major 83.5 sq.rn. quadrats set up previously (two of which had been treated in the previous year with differing amounts of balanced compound fertiliser).

Fertiliser treatments were varied in the quadrats, some receiving compound fertiliser that was unbalanced in terms of N, P and K, whilst others were treated with a single chemical. Whereas in the previous year a proprietory compound fertiliser was used (7n:7P:7K), in the current study sulphate of ammonia, superphosphate, sulphate of potash and nitrate of soda were applied, separately or as unbalanced mixtures relatively rich in N, P or K. Untreated control plots were also set up. Both the rate of application and the number of applications were varied (Table 1).

Fertiliser was first applied carefully to most of the pegged-out quad rats in rnid-Julv, six weeks earlier than in the previous year so that the August rains could wash it in in good time. The routine work involved weekly visits to the two sites from 16th August until 19th December. At each visit all the toadstools were collected, identified, recorded and then dried for several days in an incubator set at 35 degrees C prior to ascertaining the dry weight to 0.1 g. Soil and air temperatures as well as relative humidity of the air were recorded on each visit.

Less-frequent routine work was the digging up of soil samples for subsequent analysis of moisture and humus content, pH, conductivity as well as NPK mineral content (for methods of analysis consult Hall, 1975). Wooden litter boxes were sunk at Miss Mary's Walk to collect fallen litter for regular weekly analysis (as was done at Beech Grove in the previous year). The aerial herbaceous litter annually returned to the soil as humus was estimated by weighing the air-dried classified herbage cut down in late summer.

To investigate the soil microflora cores of soil were dug up from all of the quadrats and soil plates and dilution plates prepared. Soil and litter animals were also collected for identification.

Meteorological data was kindly provided by Durham Observatory.

RESULTS

Much data was analysed and correlations sought. Only a very brief summary can be given other than for the toadstool yields.

Soil Moisture

There was generally more moisture in the mineral soil below the litter layer at Miss Mary's Walk than at Beech Grove. At both sites however the data fluctuated, moisture levels and moisture ranges showing no set pattern.

Soil Temperatures

The temperatures at 3 or 4 cm. below the litter were similar at the two sites, as were the temperature ranges (3·14 degrees C.)

Air Temperatures

The temperatures of the air 5cm. above the litter at both sites were usually higher than the soil temperatures and were similar at the two sites ranging from 1·17 degrees C. at Beech Grove and 1-19 degrees C. at Miss Mary's Walk.

Mineral Content of the Soil

The heavy rain in mid-August washed in the fertiliser that had been applied in mid-July. The subsequent dry autumn was similar to that of the previous year. The control quadrats at the two sites were both similar in their total ion content throughout the six months under review, both having peaks in July and November. The levels in the plots that had been given only one fertiliser application all dropped rapidly after the August rains whereas the soils treated with light monthly applications of single fertilisers registered rises which peaked in November.

Nitrogen

The quadrat soils at Miss Mary's Walk generally registered higher nitrogen values and greater fluctuations than for Beech Grove. No clear correlation could always be found between rainfall, soil nitrogen and fertiliser treatment.

Phosphorus

The soluble phosphorus levels were very depressed compared with the previous year's data. Both sites recorded much fluctuation in their total phosphorus content.

Potassium

The control quadrat soils at Miss Mary's Walk were generally richer in potash than those at Beech Grove.

Soil pH

The control quadrats at both sites steadily decreased in acidity between July and December, those at Beech Grove always being less acid. Most of the treated soils registered less-acid conditions in the dry month of December.

Mineral soil humus

The soils from Miss Mary's Walk were generally found to have higher average

humus contents and they generally declined In humus content by December, whilst at Beech Grove the data increased.

Litter

Well over twice as much litter was deposited in the Miss Mary's Walk litter boxes compared to that collected at Beech Grove (in the previous year). The percentage of leaves in the litters were similar at 76% dry weight. Litter decay was more rapid at Miss Mary's Walk.

Toadstools

Beech Grove

The yields obtained from the 4 sq.rn quadrats (Table 2) were interesting even if not significant statistically because of the small samples. Increased yields were associated with both potassium and phosphate-enriched NPK fertiliser applications at the medium rate of 85g sq.m compared to the yield from the immediate surround- ing area acting as a control. Dry weight was increased by 45% and toadstool numbers were up by 23%. The average dry weight was 20% greater. However, the quadrats treated with the ammonium-enriched NPK fertiliser at the same medium rate proved inhibitive if anything, as did monthly low-rate applications (34g sq.m) of either sulphate of ammonia or nitrate of soda.

Similar monthly phosphate treatment was also possibly of little direst use, the comparatively high yield obtained initially being probably due more to a fortuitous patch of mycelium of *Collybia peronata.*

The weekly toadstool data listing individual species that were collected is set out in Tables 3, 4, 5 and 6. About 20 species were found. Autecological studies of half a dozen of these species were done over two seasons and will be the subject of a later paper.

Miss Mary's Walk

The yields obtained from applying either heavy (170g sq.m) or light (34g sq.m) doses of NPK fertiliser enriched with either phosphate or ammonium have shown only one stimulating effect (Table 2). This was where the light application of phosphate- enriched NPK fertiliser was followed by a few relatively heavy toadstools. Heavy application of both types of fertiliser, especially the ammonium-enriched mixture, were accompanied by low yields possibly due to pH changes or osmotic problems. Only a single mycorrhizal species was found in each of these quadrats. The quad rat treated with the heavy application of phosphate-enriched NPK fertiliser yielded toadstools in October when most other quadrats yielded little. A similar peak was obtained by Hora (1959) using phosphate treatment although it was a second peak for his toadstools. The lighter dosage of ammonium-enriched NPK fertiliser was followed by yields that were only slightly above average numerically as well as in terms of dry weight and average weight.

The weekly toadstool data listing individual species that were collected is set out in Tables 7, 8 and 9. Only seven species of toadstool were found in the quadrats, mostly mycorrhizal, and two of them *(Russute ochroleuca* and *R. fellea)* will merit attention in a future paper.

DISCUSSION

The effects of fertilisers in the field were first studied by Gilbert in 1875. Other early workers on the nutritional needs of toadstools include Krieger (1936), Cayley (1937) and Grainger (1942). Whilst calcium, zinc, manganese and sodium have been shown to be required for toadstool growth, some workers have found that the addition of inorganic salts delays the appearance of toadstools and reduces their number and weight (Edwards, 1949; Flegg. 1958; Bond, 1972). Too much fertiliser can cause overheating of mushroom compost and reduce yield. It has to be remembered that the effects of nutrient treatment may act inseveral ways. Apart from direct stimulation, or inhibition, of toadstool mycelia there will be important effects on the microflora and fauna, on the vegetation and also on the pH of the substrate.

The large surface area of the mycelium and the active penetration of the substrate help to make the toadstools richer in minerals than the substrate. Calcium and potassium ions have been found to be abundant in toadstools (Styer, 1928). Fungi contains from 3-5% dry weight of nitrogen and 5-10% of other inorganic nutrients (Harley, 1971), both perhaps being greatly exceeded at times. Much of this nitrogen at maturity is in the form of urea and other soluble materials. As leaf litter contains less than 1 % nitrogen and 3.5% other nutrients, and woody tissues even less (0.1--0.2% nitrogen), fungi must be avid accumulators of ions.

NPK studies

Increased toadstool yields were reported by Gilbert (1875) with phosphate as opposed to nitrogenous fertilisers, although his control plot also yielded more. No relation between available phosphorus and potassium and mushroom yield was found however by Pizer and Leaver (1947), whilst Pizer and Thompson (1938) had indicated that potassium ions in compost adversely affected productivity (as did sodium and magnesium).

Both at Beech Grove and at Miss Mary's Walk, like Gilbert, the author recorded some increased yields after additional phosphate treatment (provided that excess was not applied). Also, after potassium-enriched compound fertiliser application at Beech Grove, the average yield in terms of dry weight in the two small quadrats was better than in the surrounding area by more than 50%. Indeed, compared to the official control plot there were eight times more toadstools, the dry weight was six times greater and there were many more species. Unfortunately, neither plain potash enrichment plots nor potash-enriched compound fertiliser plots were set up at Miss Mary's Walk.

Increased yields were recorded by both Hora (1959) and Laiho (1970) after application of sulphate of ammonia and other nitrogenous fertilisers, whilst mushroom workers have found that composts with the highest nitrogen content give the biggest yields. However, in the current study and possible effects were inhibitory except perhaps at Miss Mary's Walk.

The possible effects of fertiliser treatment on specific mycorrhizal and litter-inhabiting species will be dealt with in a later paper.

In conclusion it must be stressed that investigations such as described need to be continued over many more years with more and bigger quadrats and with greater replication. The choice of plots needs great care to ensure homogeneity of soils and vegetation.

Table 1. Data relating to fertiliser treatment given to the 4 sq.m quadrats set up at Beech Grove and Miss Mary's Walk, Castle Eden Dene, mid-July, 1971

Quadrat	Fertiliser	Rate of application (g./sq.m)	No. of applications	Size of plot (sq.m)	No. of plots
Beech Grove					
1a, 1b	Compound, High NH4	85	1	4	2
2a, 2b	Compound, high PO4	85	1	4	2
3a, 3b	Compound, high K	85	1	4	2
4	Ammonium sulphate	34	5 (monthly)	4	1
5	Sodium nitrate	34	3* (monthly)	4	1
6	Superphosphate	34	5 (monthly)	4	1
7	Control	—	—	4	1
			*Set up on 26th Sept.		
Miss Mary's Walk					
8a	Compound, high NH4	170	1	4	1
8b	Compound, high NH4	34	1	4	1
9a	Compound, high PO4	170	1	4	1
9b	Compound, high PO4	34	1	4	1
10a, 10b	Controls	—	—	4	2

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Table 2. Yields of toadstools in the four sq.m quadrats treated with various fertiliser regimes.

Beech Grove

Quadrat	*Cumulative No. of toadstools*	*Cumulative dry wts. in g.*	*Mid-date of fruiting*	*Average frequency*	*Total No. of species*	*Monthly No. of species A S O N D**
1a, 1b	13	6.4	29 ix	1.5	6	05101
2a, 2b	25	11.3	8 x	2.1	8	43230
3a, 3b	48	33.7	6 x	1.8	11	36411
4	2	0.4	21 x	1.0	2	10001
5	3	1.2	2 x	1.0	1	–3000
6	15	2.6	21 viii	3.0	1	10000
7	3	2.7	28 x	1.0	3	01101
Miss Mary's Walk						
8a	1	1.6	30 viii	1.0	1	10000
8b	10	8.7	18 x	2.7	3	12020
9a	4	5.3	8 xi	3.0	1	00111
9b	5	11.9	10 x	1.3	3	02110
10a, 10b	16	10.2	7x, 29x	1.4	5	12210

*3 wk. only in December

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The project was suggested and ably directed by Dr. C. H. Dickinson as part of an M.Sc. thesis (1975). Thanks are also due to Mr. W. Monck for his assistance in selecting the sites at Castle Eden Dene.

Table 3. Weekly sampling data for the two four sq.m quadrats at Beech Grove from 16th August – 19th December, 1971. Soil treated with high ammonium compound fertiliser (85g/sq.m) in July 1971.

	16 viii	20 viii	30 viii	5 ix	10 ix	17 ix	26 ix	2 x	9 x	16 x	22 x	31 x	5 xi	12 xi	21 xi	27 xi	4 xii	12 xii	19 xii
(i) Numbers																			
Collybia butyracea								2									1		
Entoloma ameides						1													
Inocybe pyriodora						3													
Russula fellea									1		1								
Lactarius blennius						1													
Lactarius subdulcis					1	2													
(ii) Dry wt. in g.																			
Collybia butyracea								0.6											
Entoloma ameides																	0.1		
Inocybe pyriodora							0.5												
Russula fellea							2.4												
Lactarius biennius									0.3		0.5								
Lactarius subdulcis							0.4												
					0.5	1.1													

Table 4. Weekly sampling data for the two four sq.m quadrats at Beech Grove from 16th August–19th December, 1971. Soil treated with high phosphate compound fertiliser (85g/sq.m) in July 1971.

	16 viii	23 viii	30 viii	5 ix	10 ix	17 ix	26 ix	2 x	9 x	16 x	22 x	31 x	5 xi	12 xi	21 xi	27 xi	4 xii	12 xii	19 xii
(i) Numbers																			
Hygrophorus chrysaspis										1		3	2	1					
Collybia butyracea							1					2				2			
Mycena capillaris			1																
Mycena galericulata																1			
Mycena sp.			1																
Inocybe fastigiata							1												
Inocybe maculata				1															
Lactarius blennius			2		5		1												
(ii) Dry wt. in g.																			
Hygrophorus chrysaspis										0.1		0.4	0.2	0.2					
Collybia butyracea							0.5					0.4				0.7			
Mycena capillaris			0.1																
Mycena galericulata																0.1			
Mycena sp.			0.1																
Inocybe fastigiata							0.1												
Inocybe maculata				0.3															
Lactarius blennius			1.4		5.5		1.4												

Table 5. Weekly sampling data for the two four sq.m quadrats at Beech Grove from 16th August–19th December, 1971. Soil treated with high potash compound fertiliser (85g/sq.m) in July 1971.

	16 viii	23 viii	30 viii	6 ix	10 ix	17 ix	26 ix	2 x	9 x	16 x	22 x	31 x	5 xi	12 xi	21 xi	27 xi	4 xii	12 xii	19 xii
(i) Numbers																			
Hygrophorus chrysaspis						1			2										
Collybia butyracea																7	2	4	
Collybia peronata		2		12															
Mycena sp.												1							
Cortinarius pseudosalor						1													
Amanita rubescens		1																	
Russula cyanoxantha		1	3				1												
Russula fellea						1													
Lactarius blennius					2	1		3	1										
Lactarius quietus												1							
Clavaria cinerea								1											
(ii) Dry wt. in g.																			
Hygrophorus chrysaspis						0.4			0.4										
Collybia butyracea																3.2	0.5	2.4	
Collybia peronata		0.7		2.7															
Mycena sp.												0.1							
Cortinarius pseudosalor						1.1													
Amanita rubescens		1.0																	
Russula cyanoxantha		0.3	10.8					3.2											
Russula fellea						0.4													
Lactarius quietus												0.2							
Clavaria cinerea								0.2											
Lactarius blennius					2.0	1.4		2.5	0.3										

Table 6. Weekly sampling data for the four sq.m quadrats at Beech Grove from 16th August–19th December, 1971. Soil treated with monthly low doses (34 g/sq.m) of single fertiliser salts.

Ammonium sulphate	16 VIII	23 VIII	30 VIII	5 IX	10 IX	17 IX	26 IX	2 X	9 X	16 X	23 X	31 X	5 XI	12 XI	21 XI	27 XI	4 XII	12 XII	19 XII
(i) Numbers																			
Ensoloma amendes		1																	
Collybia butyracea																			1
(ii) Dry wt. in g.																			
Ensoloma amendes		0.2																	
Collybia butyracea																			0.2
Sodium nitrate																			
Lactarius blennius																			
(i) Numbers								3											
(ii) Dry wt. in g.								1.2											
Superphosphate																			
Collybia peronata																			
(i) Numbers	7	6		2															
(ii) Dry wt. in g.	1.5	0.6		0.5															
Control Plot																			
(i) Numbers										1									
Russula fellea																			
Russula mairei																		1	
Lactarius blennius							1												
(ii) Dry wt. in g.										0.5									
Russula fellea																			
Russula mairei																		0.9	
Lactarius blennius							1.3												

Table 7. Weekly sampling data for the four sq.m quadrats at Beech Grove from 16th August–19th December, 1981. Soil treated with high and low doses of compound fertiliser enriched with ammonium sulphate (170 g/sq.m and 34 g/sq.m)

	16 VIII	23 VIII	30 VIII	5 IX	10 IX	17 IX	26 IX	2 X	9 X	16 X	22 X	31 X	5 XI	12 XI	21 XI	27 XI	4 XII	12 XII	19 XII
(High dose)																			
Russula ochroleuca																			
(i) Numbers			1																
(ii) Dry wt. in g.			1.6																
(b) (Low dose)																			
(i) Numbers																			
Mycena galericulata																1			
Russula fellea				1		1	1	1					2	2					
Russula ochroleuca								1											
(ii) Dry wt. in g.																			
Mycena galericulata																0.1			
Russula fellea				0.3		0.5	0.5	2.3					2.3	2.4					
Russula ochroleuca								0.4											

Table 8. Weekly sampling data for the four sq.m quadrats at Miss Mary's Walk from 16th August–19th December, 1971. Soil treated with high and low doses of compound fertiliser enriched with superphosphate (170g/sq.m and 34g/sq.m)

	16 VIII	23 VIII	30 VIII	5 IX	10 IX	17 IX	26 IX	2 X	9 X	16 X	22 X	31 X	5 XI	12 XI	21 XI	27 XI	4 XII	12 XII	19 XII
(High dose)																			
Russula fellea																			
(i) Numbers									1				2						
(ii) Dry wt. in g.									2.1				2.6						
(Low dose)																			
(i) Numbers																			
Pisteus cervinus											1								
Amanita rubescens					1														
Russula fellea						2										1			
(ii) Dry wt. in g.																			
Pisteus cervinus											0.8								
Amanita rubescens					0.2														
Russula fellea						0.5										1.0			

Table 9. Weekly sampling date for the two four sq.m quadrats at Miss Mary's Walk from 16th August–19th December, 1971, which served as control plots

	15 VIII	23 VIII	30 VIII	5 IX	10 IX	17 IX	26 IX	2 X	9 X	16 X	22 X	31 X	5 XI	12 XI	21 XI	27 XI	4 XII	12 XII	19 XII
(i) Numbers																			
Boletus chrysenteron			1																
Mycena galericulata												8							
Amanita rubescens						1													
Russula fellea							1						3	1					
Russula mairei									1										
(ii) Dry wt. in g.																			
Boletus chrysenteron			2.3																
Mycena galericulata												0.2							
Amanita rubescens						0.4													
Russula fellea							2.3						3.6	0.8					
Russula mairei									0.6										

A FOSSIL ECHINOID FROM THE TOP OF CROSS FELL

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During a regional study of quartz-rich sandstones (quartz arenites) of the Northern Pennines by one of us (CJP), a fossil regular echinoid was found in the Dun Fell Sandstone (Namurian, Carboniferous) on Cross Fell, Cumbria (Fig. 1). The horizon is well known because it forms the summit of the fell with conspicuous cliffs and scree on all sides. The calcareous test of the echinoid was lost owing to leaching and the specimen is preserved as an internal mould. It was found in place projecting from the sandstone, but the counterpart or external mould, is missing. The specimen is entire with the plates of the test in life position though compaction has caused flattening and considerable distortion; a flexible test is indicated. As found the specimen is 52mm in maximum diameter and 21 mm high. Originally it could have been nearly spherical. The ambulacral and interambulacral areas are clearly visible on the test with the interambulacral plates strongly imbricate to a degree that indi- cates absence of any large tubercles on the outer surface. The interambulacral appear to be composed of four rows of thin smooth plates. The ambulacral plates are in six rows in each area and appear to enlarge from the peristorie adorally. At the peristone the apical disc is missing, but the periproct, central on the oral surface, is preserved and shows elements of the Aristotle's lantern. Fine detail is not preserved on this sandstone mould and the specimen can only tentatively be identified as belong- ing to the order Echinocystitoida of noncidaroid Palaeozoic echinoids, possibly the family Echinocystitidae.

The echinoid came from the Dun Fell Sandstone which is approximately 18m thick and consists of a medium-grained quartz arenite (quartz content is approxi- mately 99%) containing rounded, moderately sorted quartz grains. This occurs in sharply or erosively based beds which range from a few ten's of centimetres up to approximately 2m thick. They display parallel lamination and occasional trough cross- bedding with palaeocurrents directed northward. Individual beds often show low-angle depositional dips to the north, but in many cases these appear to have been over- steepened by cambering downslope. Bioturbation is common and includes abundant star-shaped traces, believed to be formed by the siphons of marine bivalves, at the top of the beds.

Occasionally large-scale planar cross-bedding is present in sets up to several metres high. These cross-bedded units appear to drape over the edge of previously deposited sandstones, and increase in height down palaeocurrent which varies from northwest to northeast. Such cross-bedded units are common on the bench east of Cross Fell summit and were formerly thought to represent upturned blocks due to glacial over-riding and plucking (Johnson and Dunham, 1963). The top of the Dunn Fell Sandstone is also exposed in this region and consists of a reworked, friable iron-stained

sandstone which contains occasional crinoid ossicles. Fossil rootlets are absent on the top of the sandstone, and previously described examples (Arthurton and Wadge, 1981) probably represent misidentified burrows.

The presence of a well-preserved echinoid in the sandstone in association with a lack of features indicative of sub-aerial exposure e.g. rootlets, suggests that deposition of the Dun Fell Sandstone took place in a shallow-marine environment. The quartz rich nature of the sandstone probably reflects high energy reworking due to wave and storm action. Low angle depositional dips and the draping nature of the large s.cale cross-beds suggests that during the deposition the sand body formed a topographic ridge or shallow marine sandbar, at least several metres high. Palaeocurrents and bed contacts indicate that rapid deposition of sand took place down the northern side of the sandbar principally during storm events. During fair weather colonization of the sand surface by marine organisms and bioturbation took place.

Several other Carboniferous shallow-marine sandbar deposits occur in the Northern Pennines. However, these tend to be less than 9m thick and represent deposition from discrete migrating bars. The thickness of the Dunn Fell Sandstone and the preserved sedimentary structures suggest that deposition took place in an actively aggrading sandbar area, rather than by migration of a single bar form.

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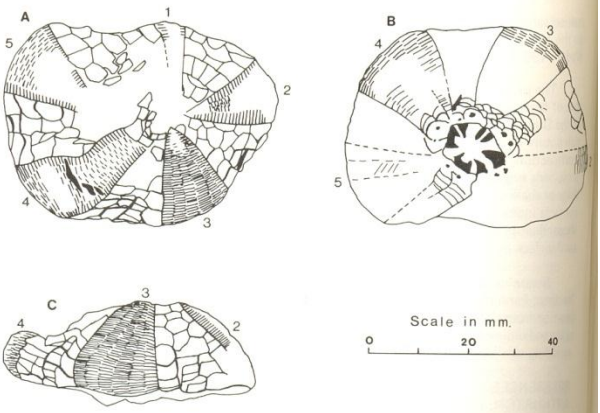

Fig. 1.

Crushed and distorted internal mould of the regular echinoid, tentatively assigned to the Echinocystitidae, from the Dun Fell Sandstone of Cross Fell, Cumbria. A—aboral surface, B—oral surface showing Aristotle's lantern and possible buccal plates, C—side view of the test. The ambulacra have been given arbitrary numbers to assist identification in diagrams A, B and C. Specimen in the collection of the Dept. of Geological Sciences, University of Durham, No. P8422.

THE MILLIPEDES, CENTIPEDES & WOODLICE OF CASTLE EDEN DENE
(with descriptive notes on the commoner species)

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INTRODUCTION

In the course of his studies of the insects of Castle Eden Dene, David Sheppard set many pitfall traps. These captured a large number of other animals which he did not have time to identify, including numerous millipedes [Diplopoda}, centipedes (Chilopoda) and woodlice (lsopoda). Together with my own observations and those of Dr. Val Standen, they have provided the basis for this list.

This account cannot be regarded as definitive. Neither Val Standen nor myself have sampled more than isolated areas within the Dene. David Sheppard's pitfall traps were sited all over the Dene throughout most of the year, however, this method relies on the inability of animals to stop themselves at the brink of the pitfall. This could account for the large numbers of millipedes (especially the bumbling pill millipede *Glomerls marginata)* that were caught, whereas relatively few of the more agile centipedes were trapped.

Species are included in this account which to my knowledge, have not been found in the Dene, but which have been found by myself elsewhere in the county, and could reasonably be expected to occur in the Dene. Where I have done this, it is clearly indicated in the text. In an effort to make this paper interesting to those not actively involved in recording woodlice, centipedes and millipedes, jargon has been avoided as much as possible and vernacular names for species and groups of species have been included where appropriate. Some of these, like pill millipede and sea slater, are well established folk names. Others, like chocolate woodlouse and striped millipede, are my own inventions. These vernacular names are now used by many groups of junior and adult 'inverters' and I hope that they achieve even wide usage.

It is particularly noticeable that youngsters are quick to learn how to identify species with common names, whereas if the animals only have scientific names, they tend to be dismissed as woodlice, centipedes or millipedes *sensu tattoo*

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CLASSIFICATION AND IDENTIFICATION

Many of the animals discussed in this paper can easily be identified in the field with a 10X hand-lens, if not by naked eye. However, some of the smaller species are more difficult to determine and up to a 100X binocular microscope was used where necessary.

For identification and classification, BLOWER (1958) has been followed for millipedes, EASON (1964) for centipedes and SUTTON, HARDING & BURN (1972) for woodlice. The one exception to this is the millipede which Blower knew as *Schizophyllum sabulosum* (L., 1758); it is now known as *Ommetoiulus sabulosum.*

In view of the large amount of material identified from pitfall traps, only mature males of the critical species pair *Julus scandinavius/Ophyiulus pilosus* were identified to species level. Shortage of time precluded the microdissections necessary for the separation of the females of these two species.

No Geophilomorph centipedes were trapped in the pitfalls, and this remains a group which needs further study in the Dene.

DIPLOPODA - MILLIPEDES

PENTAZONIA

Glomeris marginata (Villiers 1789). Pill Millipede. Abundant throughout most of the Dene. It is a compact animal, up to 20mm long, which is often confused with *Armadillium vulgare* (Pill Woodlouse). Both these animals get their common names from the way they roll up into a 'pill' when disturbed. Indeed, both species have been used as veterinary remedies in the past. They may be easily distinguished as *A. vulgare* forms a round ball, whereas a curled G. *marginata* has a flattened area where its head tucks under its telson (tailplate}, When the animals are active, the telson provides the clue to identity; in the woodlouse, it is composed of three separate plates; in the millipede it is one continuous structure.

Despite its heavy armouring, G. *marginata* is not found only on chalk and limestone, though it is more adundant on calcareous soils.

NEMATOPHORA

Polymicrodon polydesmoides (Leach 1815). Eyed Flatback. Not found in the Dene, but recent fieldwork has shown this species to be present on a number of other sites in the county. Superficially it looks like a pale polydesmid (flat-backed) millipede, though it is slimmer, and has 30 segments as an adult as opposed to 20 in the Polydesmida. Adults are between 17 and 21 mm long. *P. potydesmoides* also differs from the true polydesmids in that it has well developed eyes. It can be found under trees in most suitable microhabitats, such as under stones and logs, in moss, in leaf litter and under loose bark.

POLYDESMIDA

Polydesmus angustus (Latzel, 1884). Common Flatback. Abundant throughout wooded areas of the Dene and by far the commonest polydesmid in the North-East. It is the only polydesmid so far identified from Castle Eden Dene. The flatbacked millipedes take their vernacular name from the lateral keels which protude from the

sides of each segment. This armour qives protection against predators, but prevents them from being able to coli Into a tight spiral like the iulid (watchspring) millipedes. The backs of the polydesmids are sculptured with bosses and bumps: These can be used to identify the animals to species level, but for accurate identification, the accessory genitalia must be examined. *P. angustus* grows up to 25mm long, and is usually a warm brown in colour.

Polydesmus gallicus (Latzel, 1884). French Flatback. Not found in the Dene, although I have found a single specimen at nearby Wheatley Hill.

JULIDA

Proteroiulus fuscus (Am Stein, 1857). Several females have been identified from pitfall traps in the Dene, though none have been discovered by hand searching. The only other recent record of this species is another female collected by Peter Davis in Finchale Abbey Woods. In Yorkshire, it is very common under loose bark, often in association with *Cylindroiulus punctatus* (club-tailed millipede, q.v.)

Blaniulus guttulatus (Bosci 1792). Spotted Snake Millipede. Abundant in leaf litter in the Dene. It is a very slim watchspring millipede, potentially reaching a length of 20mm. but usually shorter. It is a pale cream with red spots along its sides. It is primarily a species of arable land where it can sometimes cause considerable damage to crops.

Tachypodoiulus niqer (Leach, 1815). Fast Black Millipede. Abundant throughout the Dene, and possibly the commonest millipede in the area. It can reach a length of 50mm and is a very active species. Together, these factors make this species more visible than most others. It is the only large, dark watchspring millipede with white (rather than pale) legs. BLOWER (1958) states that this species is much more abundant in calcareous habitats, but in Co. Durham, it seems to be found everywhere.

Ommatoiulus sabulosus (L., 1758). Striped Millipede. Only four records for the Dene, three from pitfalls and ony by hand-searching. A spectacular animal with two bold orange stripes running down its back, reaching a length of nearly 50mm. BLOWER (1958) suggests that *O.sabulosus* is complimentary to *T.niger* in that it occurs in acid rather than calcareous habitats. This seems to hold true for Durham with specimens being found on coastal dunes, sand and gravel quarries and on moorland. It has also proved abundant in rotting vegetation, particularly in the piles of grass clippings left when roadside verges are mown.

Julus scandinavius (Latzel, 1884). Scandinavian Millipede. Common in exposed and acid habitats within the Dene. Much more abundant than *Ophyiulus pilous* (snake miliipede, q.v.) in pine and birch woodland, though nowhere as common as *Tachypodoiulus niger* (fast black millipede) or *Glomeris marginata* (pill millipede). *J. scandinavius* is slimmer and shorter than *T. niger* and has beige, rather than white, legs. It can be very difficult to separate from O. *pilosus.* Females must be preserved and then examined under a good binocular microscope. Live males are often too active for the first pair of legs to be seen, but if one can hold the animal still and use a handlens,*J. scandinavius* males can be seen to have what appears to be a third leg between the

front pair. This is actually a pair of projections from the coxae (segments nearest to the body) of the second pair of legs. These spurs are held adjacent to one another, and so appear to be one structure.

Ophyiulus pilosus (Newport, 1842). Snake Millipede. Commoner than *J. scandinavius* in the Dene overall, especially in mature deciduous woodland. It is very similar in appearance to *J. scandinavius,* and females require preservation and the use of a good binocular microscope before identification is possible. Males may be identified by their sickle-shaped first legs, which are about half the size of the following pair. However, these can often be difficult to see in an active animal. *O. pilosus* takes its common name from its sinuous, snake-like way of walking; *J. scandinavius* does not weave about in the same fashion.

Cylindroiulus londinensis (Leach, 1815). The giant *forma typica* (Leach) is present at Ryhope Dene, but has not been recorded from either Castle Eden Dene or Hawthorn Dene.

Cylindroiulus punctatus (Leach, 1815). Club-tailed Millipede. Hand-searching has shown that this animal is very common in the Dene, especially under bark and moss on dead and fallen trees. It is also abundant in leaf litter, but was noticeably absent from the pitfall traps. Only nine traps captured this species. Any small, slim, pale brown millipede found under bark in Co. Durham usually turns out to be C. *punctatus.* It is easy to confirm its identity with a hand-lens as the telson (tail plate) ends in a rounded club-shaped projection. This is particularly obvious if viewed from directly above.

Cylindroiulus britannicus (Verhoeff, 1891). Two males from pitfall traps in the Dene. I am grateful to Dr. Gordon Blower for confirming that these specimens were not C. *latestriatus* (Curtis, 1845). C. *britannicus* is a small millipede, growing to a maximum of 16mm long. It is found in much the same habitat, though not as frequently, as C. *punctatus.*

CHILOPODA - CENTIPEDES

L1THOBIOMORPHA

l.ithobius variegatus (Leach, 1815). Striped (or Variegated) Centipede. Not found in the Dene. This species is found mainly in the upland west of the county (BARBER 1981), though I have found a single specimen on the old railway at Malton, near Lanchester. This is at variance with Dr. Eason's observation that in both England and Scotland the area from which *L. variegatus* seems to be absent is bounded by the 38 degrees January isotherm, so that a strong preference for an oceanic, as opposed to a continental, climate may possibly explain this limitation of range in Britain as well as its absence from Europe. EASON (1964). This points to a need for much more fieldwork. *L. variegatus* is up to 24mm long, and in most cases can be distinguished by its striped legs from *Lithobius forficatus* (Common Centipede) the only other large centipede found in Co. Durham. The striping is especially prominent on the last pair of legs.

Lithobius forficatus (L. 1758). Common Centipede. Although this is the commonest centipede in the East of Co. Durham, it was only trapped in one pitfall. This is undoubtedly due to the agility of the species, as hand-searching shows it to be quite abundant throughout the Dene. It can grow up to a length of 30mm, and in contrast to most specimens of *L. variegatus* (Striped Centipede), it has plain brown legs.

Lithobius melanops (Newport, 1845). Not found in the Dene. It is a medium- sized species, up to 17mm long, which is often found in areas disturbed by man. It has been found at the old lead mine at Killhope in Weardale, (BARBER 1981), and I have also found it at the foot of the Transporter Bridge on Teesside. It seems quite conceivable that this species could turn up in the Dene.

Lithobius crassipes (L. Koch, 1862). Found in five traps in the Dene, all from mature deciduous woodland. The only small centipede found in the Dene so far. *L. crassipes* is only 14mm long at most, and closely resembles *Lithobius curtipes.* I am grateful to Tony Barber for confirming that all the Castle Eden specimens were the former species.

CRUSTACEA

ISOPODA,ONISCOIDEA-WOODLlCE

Ligia oceanica (L., 1767). Sea Slater. Not yet found in the Dene. However, this exclusively coastal species has been found at Blackhall Rocks and Whitburn, so a good search of the cliffs at Denemouth may well prove fruitful. *L. oceanica* is our biggest woodlouse, sometimes reaching a length of over 25mm.

Trichoniscus pusillus (Brandt, 1833). Chocolate Woodlouse. Frequent in all habitats in the Dene where there is a reasonable ground cover of leaf litter. *T. pusillus* is probably the commonest British woodlouse. It is no more than 5mm long and usually the colour of milk chocolate; the rarer purple form has not been found in the Dene. Two sub-species occur. *T.p. pusillus* is parthenogenetic i.e. the females reproduce asexually. This is the sub-species found throughout Co. Durham. The sub-species *T.p. provisorius* reproduces sexually but has not been found this far north to date.

Androniscus dentiger (Verhoeff, 1908). Pink Woodlouse. Not yet found in the Dene, though recent observations show that it is present at several scattered locations over the County. This attractive species is bright pink with a golden stripe running down the centre of its back. It is only just bigger than *Trichoniscus pusillus* (Chocolate Woodlouse) at 6mm long, but even so, it seems strange that this aesthetically pleasing animal has not been noticed by more observers. It is found in three superficially different types of habitat: in quarries; around habitation; and on sea cliffs, especially those which are slumping. The last two habitats occur in the Dene, and so this is another species which could be expected to turn up.

Oniscus asellus (L., 1761). Shiny Woodlouse. Common throughout the Dene, and the rest of Co. Durham. This is one of the two species referred to as 'the Common Slater' by North-Easterners. It is a fairly large 'typical' woodlouse growing up to 16mm long. It may be distinguished from members of the genus *Porcellio* by having three segments at the end of its antenna. In practice, one soon gets to recognise the species on sight. It has a distinctive 'gloss finish', as opposed to the matt surface of *Porcellio scaber* (Scabby Woodlouse) and the dull finish of *Porcellio spinicornis* (Spiny Woodlouse).

Philoscia muscorum (Scopoli, 1763). Meadow Woodlouse. Found throughout the Dene, and although it is primarily a grassland species, it proved to be most abundant in an area of mature beech/oak woodland. *P. muscorum* is a very active, medium-sized woodlouse, 11 mm long when full grown. It is characterised by its black head and the black central line down its back. The rest of the back can be more or less any colour, although all the live Castle Eden specimens that I have seen have been the most common colour-variety, light brown. I am indebted to Stephen Sutton for suggesting the very appropriate vernacular name for this species.

Platyarthrus hoffmanseggi (Brandt, 1833). Ant Woodlouse. Not found in the Dene. Until recently, this animal was regarded as having a southern distribution, reaching as far north as Yorkshire. However, a recent record from Durham City suggests that an effort should be made to locate other sites in this county. This will not be an easy task, for it lives in ants' nests, chiefly those of *Lassius flavus* (Common Yellow Ant). Once unearthed, it is easy to identify as it is small (3.5mm long), white, and disproportionately broad for a woodlouse.

Porcellio spinicornis (Say 1818). Spiny Woodlouse. Not found in the Dene.
This uncommon species has been found in a couple of places in Co. Durham, always on old walls. It is known to inhabit drier habitats than most other woodlice (Paul Harding, personal communication), and appears to be restricted to calcareous habitats, both natural and man-made. (SUTTON, HARDING & BURN, 1972). Castle Eden Dene would appear to provide a lot of suitable habitat for this species. Although it is closely related to *Porcellio scaber* (Scabby Woodlouse), it looks like a specimen of *Oniscus asel/us* (Shiny Woodlouse) with a dark head. It often has splashes of yellow on its back. Confirmation of its identity can be made by checking that it has only two segments at the ends of its antennae.

Porcellio scaber (Latreille 1804). Scabby Woodlouse. Trapped at five sites in the Dene, and found by hand-searching throughout the area. This is the other species which is called 'Common Slater' by North-Easterners. Throughout the County it is less common than *Oniscus asellus* (Shiny Woodlouse); from my own observations, I would estimate that O. *asellus* occurs with something like four times the frequency of *P. scaber* in lowland Durham. This is in agreement with the frequency with which the two species were trapped in pitfalls. In general, *P. scaber* is more tolerant of dry microsites than O. *asellus*, although this did not manifest itself as a difference in habitat preference between the two species within the Dene. *P. scaber* reaches a length of 17mm and is usually grey with a characteristic 'matt' finish.

CONCLUSION

The habitat which showed the greatest diversity within the Dene was an area of mixed beech/oak woodland with a good understorey of herbs. The areas of alder and yew proved singularly unexciting for the groups discussed in this paper.

Consideration of species that could (or should) occur in the area indicates the lack of systematic work on this richly varied and important site. I hope that this paper will stimulate other naturalists to join me in filling in the gaps.

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BY THE WAY

Secretaries of Societies and other contributors to the "Vasculum" are invited to send their notes to the Editor before 15th March, 1983.

THE BUTTERFLY YEAR

The two years 1981 and 1982, the years of the butterfly, were very different as far as the abundance of these insects was concerned. 1981 Could only be called a poor year with very few immigrants from abroad and even our resident species only moderately successful. This year, however, truly lived up to its name. Unusual sightings started early in the year with the help of a wonderful spell of warm dry weather in May. The warm south east winds from the continent were just right for helping visitors to reach our shores. In this area an odd Red Admiral and Painted Lady were seen in late May and early June, an exceptional occurrence so early in the North East

The most astonishing happening, details of which are given elswhere in this edition of the journal, was undoubtedly the arrival of a Swallowtail Butterfly, *Papilio machaon*, in early June and spotted by Dr. Peter Evans in his garden at Neville's Cross. Robson makes no mention of this insect in his 'catalogue" at the end of the last century, so we must presume it to be the only one ever to be recorded from our counties.

The summer season continued to be very suitable for our native butterflies and these must have been in their largest numbers for several years. Another surprise was the enormous number of Vanessids on the wing in September and October. There were only a few Painted Ladies, but the Red Admiral, Peacock and Small Tortoiseshell did extraordinarily well. There were so many that autumn flowers in our gardens were covered with butterflies for several weeks. The Painted Lady and Red Admiral are regular immigrants, whilst Small Tortoiseshell and Peacock are resident species. The enormous increase in numbers in September and October was so sudden and breath-taking that one must presume that the residents too, were supplemented by immigrants from the continent. This theory is borne out by observations reported from the beaches at Redcar of swarms of dead and dying Small Tortoiseshells in September. They had probably flown across the North Sea from North Germany (or somewhere near) and made a landfall at Redcar. Exhausted by such a long journey many died before finding suitable nectar flowers to replenish their depleted food reserves. Those that survived may manage to hibernate through the winter to start new families in the spring of 1983. So keep a look out for more than average numbers of Small Tortoiseshells next year.

In addition to immigrants, our resident species have also done well. A further spread of the Wall Brown, *Lassiommata megera*, has taken place into Northumberland, whilst just about the whole of Durham has now been colonised. Three more colonies of the Small Peari-bordered Fritillary were discovered in West Durham during June and July and vice-county 66 acquired a completely new resident butterfly. This is the White Letter Hairstreak**,** *Strymonidia w-album*, discovered in Cleveland County but north of the Tees for the first time. All told, a marvellous year for the Lepidopterists.

SWAN DEATHS FROM LEAD POISONING

A recently published report by the Nature Conservancy Council (NCC) entitled 'Lead Poisoning in Swans' calls for voluntary phasing out of lead weights in angling within five years and immediate action meanwhile to reduce the effects of lead, especially split-shot. It also recommends that the situation be reviewed in 1984 and that if lead is then found to be still widely in use, further consideration should be given to securing its phasing out in angling.

This report is the work of the NCC's Working Group on Swans set up in 1979 at the request of the Department of the Environment following public concern over the deaths of mute swans on the River Avon at Stratford. The Working Group included representatives of national angling, amenity and conservation organisations, the angling trade, research biologists and veterinary officers. The report shows conclusively that large numbers of swans are dying as a result of lead poisoning due to the ingestion of fishing weights—especially split lead shot. An estimated 250 tons of lead is introduced into the environment each year in the form of lead shot—an equivalent of two pieces of shot per foot per annum along lowland rivers and canals.

The problem is particularly acute on the Rivers Trent, Avon and Thames, where there has been a rapid decline in swans over the past 10—15 years; this is likely to have a marked effect on future swan populations. However, in Scotland where coarse fishing using lead shot is less prevalent, the situation is better.

SUBSCRIPTIONS

Inflation, sadly, is still with us and as from January 1983 we are proposing to increase the yearly subscription rate by 50p. This is a very modest increase and should not inconvenience members too much. We are most conscious of the extra expense to every member and have tried in every way to absorb as much of the increase in printing and postage as we possibly could. Over the years this has steadily increased so that once again we are having to make this decision.

The new rates to be proposed will be £3.00 for ordinary membership, £3.50 family membership and £1.50 for juniors. There will also be a 50p increase on the affiliation fees for constituent societies.

These new rates will automatically apply to all new members joining from 1st January 1983. It would be appreciated if members paying by Bankers Order would inform their banks NOW advising them that the next payment due on January 1st should be increased to the appropriate amount. Many members paying by Bankers Order overlooked the last increase and this created an enormous amount of additional work for the Treasurer, and also cost the Union a great deal in extra postage for reminders.

THE SOCIETIES

NORTHERN NATURALISTS' UNION

The 162nd Field Meeting was held on 3rd July 1982 at Wooler. Due to various mishaps it was poorly attended. Despite this and the showery weather, the small party, including a guest invited to assist in leading, drove to the head of the College Valley, and made its way up one of the Cheviout cleughs as far as the crags.

The effects of many years of over-grazing and burning were evident, the good grasses characteristic of andesite pastures being replaced by heather, heaths, bilberry and black crowberry, and these in their turn beginning to be replaced by mat-grass. The local wheatears and ring-ouzels were in evidence, taking advantage of the cover of the bracken which has seized what little fertile ground remains.

In the drier areas were tormentil, cow-wheat, eyebright, harebell and yarrow, and in wetter places marsh violet, water blinks, starry saxifrage, golden saxifrage, tufted forget-me-not, butterwort, marsh thistle and cotton-grass.

Near the streams were fine stands of male fern and lemon-scented fern, and higher among the rocks and screes, hard fern, polypody, broad buckler-fern, bladder fern, and green spleenwort. Though the dor-beetle was seen at work here, the ground is mostly steep enough and wet enough to be less vulnerable to sheep and burning, so, being also enriched by tumbling rock fragments and drainage water, it had quite a different flora, including fir clubmoss, milkwort (showing a range of colours), purging flax, herb robert, meadowsweet, water avens, lady's mantle, burnet rose, dog rose, mossy saxifrage, dark-leaved willow, red cowberry, foxglove, thyme, devil's bit scabious, golden rod, melancholy thistle, hawkweed and viviparous fescue.

Also prominent here was a relict woodland flora, including slender St. John's wort, wood cranesbill, wood sorrel, raspberry, wild strawberry, rowan, wood angelica, dog's mercury, yellow pimpernel, wood-sage and greater woodrush, all betraying that' the ancient Cheviot forest once extended to at least 1500 feet.

At this point the female peregrine flew silently over the heads of the party to her nest-site, and the male immediately flew out, equally silently. This behaviour strongly suggested that the birds had been robbed and were bravely trying to breed again. At the same time in 1981 they were feeding young and vigorously and vociferously defending their territory.

As the weather worsened, the party made its way down again, somewhat dampened, though not, it appeared, in spirits.

J. T. B. BOWMAN.

The 163rd Field Meeting was held at Windlestone Hall on 11th September 1982, by kind permission of the Director of Education for County Durham. The weather was hot and sunny when a party of about 30 members and friends were led round the Hall grounds by Mr. Dunn and Mr. Hall.

First of all we admired the large numbers of Red Admirals, Peacocks and Small Tortoiseshells feeding on the flowers of the Buddleia bushes growing alongside one wing of the Hall. On the lawns we examined a fine stand of the Holm Oak, *Quercus Ilex,* whilst Mr. Hall talked about the rings of toadstools in full fruit under the trees. The wild woodland areas produced the usual ground flora, the most notable plant being the broad-leaved helleborine, *Epipactis helleborine.* In a clearing there is a small pond which proved to be very fertile. Apart from the surrounding growth of dogwood, *Thelycrania (Comus) sanguinea,* the pond itself contained many aquatics such as *Juncus effusus* and *Juncus in/fexus* round the edges, *Potamogeton natans, Lemna trisuica, Alisma plantago-aquactica, Myriophyllum spicatum* and *Ranunculus sceleratus* in the water. Large dragonflies of the *Aeshna* kind were flying but were too speedy and too high for capture and identification. Several large dragonfly nymphs were seen at the edges as if ready to emerge from the pond for their final transformation to adult fly. Several water beetles of the genus *Agabus* were also seen but not identified to species and one specimen of the Great Diving Beetle. The surface of the pond was a mass of pond skaters, thought to be the common *Gems lactustris.*

The afternoon was rounded off by the provision of coffee in the school hall by the kindness of the headmaster.

The Autumnal junior field meeting was again a fungus foray led by Mr. D. Hall in Hollinside Woods, Durham, on 25th September. Once more we were lucky to have fine weather when some twenty juniors and seniors set forth to look for fungi. There were plenty, for there had been a shower or two during the previous week and with the unusually high temperatures growth had been prolific. Although there was nothing new on previous years, many species were found and Mr. Hall delighted the children with his methods of detecting species.

The fifteenth Harrison Memorial Lecture was held on 30th October 1982, in Sunderland Museum, by kind invitation of the Sunderland Natural History Society and the Director of Museums and Art Gallery. Some 60 members and friends gathered to hear Dr. J. A. Richardson talk about "Professor Harrison—a part of his life'.

Dr. Richardson had been closely connected with Professor Harrison for many years both professionally and socially so that he brought a huge fund of experience and wit to thoroughly entertain all present.

He started with a short history of the Professor's early years including anecdotes concerning his family life in Birtley, then in Middlesbrough and again in Birtley.

He then picked on several episodes of the Professor's work, starting with his greatest and most sustained interest, the distribution of plants and insects. This led naturally to the many years spent sorting out the flora and fauna of the Western Isles of Scotland, mentioning specific discoveries like the Pipewort *Eriocaulon septangulare*. Drooping Lady's Tresses, *Spiranthes romanzoffiana*, etc. This led to his lifelong interest in our native orchids, particularly those found in the claypits at Birtley.

Next, he dealt with work on reclaiming pit heaps and recalled how the Professor had both encouraged and almost driven him to investigate the re-vegetation of certain heaps near Birtley.

Another story was that of the Magnesian Limestone Flora and details of the discovery of *Primula farinosa, Antennaria dioica, Trollius europaeus, Linum anglicum, Sesleria caerulea*, etc., in their various stations were revealed. The lecture as a whole was a very real testimony to a great naturalist, told in a manner both interesting and thrilling.

ANNFIELD PLAIN AND DISTRICT NATURALISTS' CLUB

The outings of the society have benefitted, in the main, from much good weather during 1982.

On 18th September, the venue was from Cronkley Bridge to Holwick in Upper Teesdale. The day was hot and sunny as we left Annfield Plain. During the coach journey a field of toadstools caught our attention just out of Lanchester.

High Force was in full flow as the 'B' party passed and Low Force was as appealing as always. The juniper trees on the slopes of Cronkley Scar gave an impression of being on another planet. It was here that we passed many dead rabbits and we wondered if myxomatosis was prevalent again. En route we were able to inspect the Shrubby Cinquefoil, Bog Asphodel, Mimulus and Sneezewort amongst other plants.

The next walk on 2nd October was from Hasty Bank to Great Ayton in North Yorkshire. It was a dry, cool day as we left. The 'A" party enjoyed a breezy walk over the moor tops from Hasty Bank to Kildale where they joined the "B" party. After leaving Kildale the whole party climbed up to Captain Cook's monument where we had tea, with marvellous views of the surrounding countryside. Thence we walked to Roseberry Topping and back to the coach.

Autumn fruits were much in evidence with some plants still in flower, for example honeysuckle, sow thistle, golden rod, cross-leaved heath and common heath.

Grouse were very plentiful on the moors.

NOTES AND RECORDS

NOTES

Swallowtail Butterflies in Durham City. Towards the end of the spell of fine weather, on June 5th 1982, my wife and I were enjoying lunch in the garden of our home on the western outskirts of Durham. I looked up towards the silver birch tree and was amazed to see a Swallowtail, *Papilio machaon* fluttering up and down the *Clematis montana* which covers some of the branches of the birch. After a few seconds, during which my wife and son also saw the butterfly, it flew off strongly to the north.

Some days later, on June 11th, Dr, Peter McDougall looked out from his office window at the University Institute of Education, nead Bede/Hild College, Gilesgate in Durham and was similarly amazed to see another (or the same) swallowtail feeding on a *Weigelia* shrub close by. It too, flew off after a few seconds.

Apparently Swallowtails were very abundant in the Norfolk Broads in May. Possibly the warm southerly winds that blew late in the month may have carried a few specimens north to Durham—or has someone been breeding them successfully in this area?

P. R. EVANS.

(Exhaustive inquiries amongst local anateurs have failed to produce any evidence other than that the butterfly or butterflies were immigrants. Ed.)

A Changing Rookery. Rooks are a familiar sight within Durham City. Over the years however, their distribution has changed. The largest rookery near the centre of the city has decimated considerably but its occupants now seem to have spread over a wider area. Twenty years ago, the nests extended fron near Framwellgate Bridge, along the banks of the River Wear, parallel to South Street to trees near Quarry Heads Lane, in all about half a mile in length. The nests then numbered nearly 300. Then, probably correlated with tree felling, building and alterations, the northern end of the rookery disappeared and the southern end extended mostly westward, in beech and other deciduous trees including oak and sycamore. Most of the nests remaining were at a height of about 50-60ft. (up to 20 metres). Numbers of nests were lower but stabilised at about 100 in the late 1970's. Then, as the northern end became further reduced, the rooks not only occupied the banks of the River Wear near Prebends Bridge and the trees on both sides of the road above (Quarry Heads Lane) but also moved eastward across Pimlico (which extends beyond South Street) towards Durham School. The next change came when the westward trend ceased but numbers of birds remained more or less constant by pairs now nesting east of the main group around Prebends Bridge, Pimlico and towards Durham School as in 1981 .

Since the felling of the fine large beeches and other deciduous trees in the area, the birds extended their range of nest sites to more trees across the road in Quarry Heads Lane, then later nested in trees on the far side of Durham School, which could now almost be counted as a separate rookery. Fewer nests are now recorded at the east end.

The final results this year, probably the combination of several causes but mainly it appears the abnormally cold winter, is that not only 'the loss of past good sites but the intensity of cold . meant that figures are now down to half those of the previous year.

The only satisfaction gained is that a small outpost, still within the City had more birds nesting this year but not enough to offset the Prebends rookery losses. It is with interest that we look forward to the further diversification of this old established rookery and hope it will not disintegrate further.

HAZEL M. JOHNSON.

Bird notes. Spring 1982. The exceptionally severe conditions of December and January were followed by open weather during February and there was a brief spell of mild weather towards the end of March. Cooler conditions returned during April.

Willow warblers were singing at Low Gosforth and Big Waters, Seaton Burn on April 12th.

I was absent from the area during the last week of April and did not see my first swallow locally until May 5th when there were two flying over the Big Waters along with a single swift. There was a whitethroat at Low Gosforth the same day. There were blackcaps in Jesmond Dene, Newcastle upon Tyne on 8th and sedge warblers at Big Waters on 11th. The main body of swifts' appear to have arrived on 13th when they were heard flying overhead at West Denton and West Gosforth. A cuckoo was calling near the Big Waters on 17th.

Reed warblers were again present in the reedbed in Gosforth Park; two were singing there on June 8th.

C.J. GENT.

Water Shrews. The remains of a water shrew, *Neomys fodiens,* was found in a tawny owl pellet from Flass Vale, Durham City. I have analysed some 80 pellets from this site so far this year, and only one, collected in June, contained this species—the left dentary was well preserved and is highly distinctive due to the long blade-like incisor and greater size relative to the other red-toothed shrews (the common shrew, *Sorex waneus* and the pygmy shrew, *Sorex minutus).*

Dr. K. Ashby is aware of two other records of water shrews in the Durham area over the last 30 odd years, though this would appear to be the first from Durham City itself.

Though apparently widespread in Britain, water shrews turn up only rarely in Longworth traps and owl pellets so that populations are difficult to sample and records are few.

J. D.S. BIRKS.

The Bryophytes of Thirlwell Bank, Sunderland. Robin Stevenson, who wrote an account of this site in the Vasculum-Vol. 66 No. 3, page 37, has kindly donated these to the Sunderland Museum. In view of the subsequent destruction of this site, shortly after his survey these specimens are now of historic value and are available for reference purposes.

JOHN BAINBRIDGE.

Occurrence of marine fishes at Lynemouth, Northumberland. In April 1981 , an approach was made to Alcan (Lynemouth) Ltd., regarding the possibility of gaining access to the Company's Power Station in order to make regular observations of fishes impinged on the cooling water intake-screens. Some 150,000 gals. of seawater per minute are abstracted from a point approximately 253 metres offshore in a mean depth of 8.07m. The water passes through coarse grids into a screen well where it is filtered by revolving metal screens of fine mesh. Marine organisms of many kinds are collected on these screens, which are washed by water jets, so transferring the 'catch' into a collecting tub akin to a giant collander which is emptied by crane at irregular intervals. Permission was kindly given by Alcan to visit the intake screens, and a container of preservative was left on site into which any unusual specimens could be deposited. Initially it was thought that visits to Lynemouth would provide useful data on the seasonal occurrence of fish species, as had been obtained at Blyth (Davis & Dunn 1982). It was also expected that the position of the intake in the sublittoral on a rocky seabed would provide a species list of different composition to that of the sheltered, muddy waters of the Blyth estuary. Unfortunately the very nature of the operation of collecting debris from the screens hindered the effectiveness of monitoring. The large collecting tub could only be emptied by site workers, and often the only fish which could be recorded were those exposed at its surface. Even when close examination of the contents of the container was possible, all too often fish were unrecognisable due to physical damage or decay. Because of this, regular monitoring was abandoned. However, twenty or more visits to the power station have been made on a casual basis from April 1981 to July 1982. Fish species recorded are listed below according to the order in Wheeler (1978).

Lampern	*Lampetra fluviatlis*	Greater pipefish	*Syngnathus acus*
Spurdog	*Squalus acanthias*	Snake pipefish	*Entelurus acquorus*
Thornback ray	*Raja clavata*	Tub gurnard	*Trigia lucerna*
Eel	*Anguilla anguilla*	Bull rout	*Myoxocephalus scorpius*
Herring	*Clupea harengus*	Short-spined sea scorpion	*Taurulus bubal is*
Sprat	*Sprattus sprattus*	Hooknose	*Agonus cataphractus*
Trout	*Salmo trutta*	Lumpsucker	*Cyclopterus lumpus*
Angler	*Lophius piscatorius*	Montagu's sea snail	*Liparis montagui*
Cod	*Gadus morhua*	Lesser Weaver	*Echilchthys vipera*
Whiting	*Merlangus merlangus*	Butterfish	*Pholis gunnel/us*
Bib	*Trisopterus luscus*	Sandeel	*Ammodytes tobianus*
Pollack	*Pollachius pollachius*	Greater sandeel	*Hyperoplus lanceolatus*
Saithe	*Pollachius virens*	Dragonet	*Callionymus lyra*
Five-bearded rockling	*Ciliata mustela*	Sand goby	*Pomatoschistus minutus*
Northern rockling	*Ciliata septentrionalis*	Plaice	*Pleuronectes piatessa*
Ling	*Molva molva*	Flounder	*Platichthys flesus*
Tadpole-fish	*Rainceps raninus*	Dab	*Limanda limanda*
Eel pout	*Zoarces viviparus*	Lemon Sole	*Microstomus kitt*
Stickleback Stickleback	*Gasterosteus aculeatus*	Sole	*Solea solea*
Fifteen-spined	*Spinachia spinachia*		

The total of 39 species is less than for the Blyth Estuary (53), which is certainly a reflection on the sampling technique. There was little difference between the species encountered at both sites—indeed the species which were common at Blyth (coalfish, whiting, plaice, flounder, sprat) were also common at Lynemouth. Only one species (Thornback ray) in the Lynemouth list was absent from Blyth, whereas many of the smaller or rarer fish known at Blyth, were not seen or collected at Lynemouth. Nothern rockling *(Ciliata septentrionalis)* was a notable capture however—it is probably more common than its recent discovery (Davis 1981) would suggest.

P.S. DAVIS &J. L. DUNN

RECORDS

ARANEAE-SPIDERS

The following spiders were found by the Durham County Conservation Trust Insect Survey Team (C. Bruce and W. Woodford) in 1981 . Except for *Haplodrassus signifer, Agroeca proxima, Milleriana inerrans* and *Lepthyphantes pallidus* they are all probably new v.c. 66 records.

Drassodes cupreua (Bi.) 66
Roddymore (NZ 1436), 9.7.81.

Haplodrassus signifer (C. L. Koch) 66
Roddymore (NZ 1436), 9.7.81. First record Seaton Dunes (NZ 5328) by D. H. in 1978.

Clubiona brevipes (Bl.) 66
Hetton Woods (NZ 3448), 14.9.81 .

Agroeca proxima (O.P.— C.) 66
Fulwell Quarry (NZ 3658), 11.9.81. First record Seaton Dunes (NZ 5327) by D. H. in 1978.

Oxoptila trux (Bl.) 66
Bishop Middleham Quarry (NZ 3332), 3.7.81; Trimdon Grange (NZ 3637) 6.7.81.

Philodromusaureolus (Bl.) 66
Dyance Plantation (NZ 1918), 7.7.81.

Anelosimus vittatus (C. L. Koch) 66
Hawthorn Dene (NZ 4245), 1 .7.81 .

Th end ion mystaceum (C. L.Koch) 66
Dyance Plantation (NZ 1918), 7.7.81 ;Roddymoie (NZ 1436), 9.7.81.

Tetragnatha obtusa (C. L. Koch) 66
Dyance Plantation (NZ 1918), 7.7.81.

Meta mengei (Bl.) 66
Found at nine sites, the first at Dyance Plantation (NZ 1918) 7.7.81 This widely distributed species may be presumed to have been mistaken in the past for the closely related,and more abundant *Meta segmentata.*

Araneus umbraticus (Cl.) 66
Brasside Pond (NZ 2945), 17.8.81 .

Zygiella atrica (C. L. Koch) 66
Barlow Burn (NZ 1516), 3.9.81; Malton Wood (NZ 1745), 7.10.81.

Hypommacornutum (i.) 66
Dyance Plantation (NZ 1918), 7.7.81.

Milleriana merrans (0.P.— C.) 66
Hawthorn Dene (NZ 4345), 1 .7.81 .

Centromerus expertus{O.P— C.) 66
Witton-le-Wear (NZ 1631), 15.1081.

Lepthyphantes obscurus{Q\.) 66
Morion Kilns (NZ 1820), 7.7.81.

Lepthyphantes pallidus (O.P.—C.) 66
Witton-le-Wear (NZ 1631), 15.1081. First record Thorpe Wood (NZ 4024) by D. H. in 1978.

D.HORSFIELD.

Dysdera crocata (C.L.K.) Woodlouse Hunting Spider 66
Fulwell Quarry, Sunderland. Under rocks on quarry floor. This species is regarded as nocturnal by David Horsfield (Vase. 65 (3) 1980). However, this animal was observed to be active, attacking woodlice and other spiders in broad daylight.

NOEL JACKSON.

LEPIDOPTERA BUTTERFLIES AND MOTHS

Aphantopus hyperantus L. Ringlet 68
College Valley; 36/907294-36/897280. Slopes of West Hill to footbridge at Hethpool Linn, 8.7.81 . From there to just north of Hethpool Mill, 14.7.81 . Estimated number several hundreds.

J. T. B. BOWMAN.

Strymonidia w-album Koch. White Letter Hairstreak. 66
On 8th July 1982 I visited a woodland with which I was quite familiar, when I noticed what was thought to be a small specimen of the Meadow Brown butterfly which had settled on the footpath 20 yards ahead. On closer inspection this proved to be the above species. There were about five specimens altogether. This is the first record north of the Tees.

J.C. BINGE.

As a result of a telephone call from Mr. Binge, I checked out this report on 19th July, on a hot sunny day and was fortunate enough to see about 20 pairs of the butterfly.

T. C. DUNN.