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A QUARTERLY JOURNAL OF NATURAL HISTORY FOR THE NORTH OF ENGLAND

The spider-hunting wasps (Hymenoptera: Aculeata, Pompilidae) of Watsonian Yorkshire — *Michael E. Archer*

Aspects of the breeding biology of the Buzzard *Buteo buteo* in North Wales — *P. J. Dare*

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Editor **M. R. D. Seaward**, MSc, PhD, DSc, FLS, The University, Bradford BD7 1DP

Photographic Plates

Readers of *The Naturalist* will have noticed that the number of photographic illustrations has increased in recent years. Good clear photographs, suitably captioned, to accompany articles or as independent features, such as the bird portraits by Arthur Gilpin in the last three issues, are always welcome.

To encourage this development, a long-standing member of the YNU, who wishes to remain anonymous, has most generously offered to make a donation, the income from which would finance the publication of a plate or equivalent illustration in future issues whenever possible. The editor, on behalf of the YNU, wishes to record his deep appreciation of this imaginative gesture.

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THE SPIDER-HUNTING WASPS (HYMENOPTERA: ACULEATA, POMPILIDAE) OF WATSONIAN YORKSHIRE

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The spider-hunting wasps are long-legged black or black-and-red insects which characteristically are found flying, usually at speed, close to a sandy surface or low vegetation so making them difficult to net. A few species have pale yellow or whitish markings. The *Dipogon* species can be found flying over dead wood surfaces in sunny situations while *Priocnemis* species and *Episyron rufipes* are to be found on flowers, particularly the Umbelliferae.

For recognition of the group, books by Yeo and Corbet (1983), Willmer (1985) and Betts (1986) will be found useful, but identification to species level is dependent on the German text by Wolf (1972). Shortly, however, an English text by M. C. Day will be published in the *Handbooks for the Identification of British Insects* series.

The adult wasps usually appear in early summer towards the end of June, the males appearing a little earlier than the females. Mating then takes place and the females start hunting for spiders, which they paralyse. In a few species, e.g. *Anoplius viaticus*, the adults mate in the late summer or early autumn, after which the males die and the females dig deep burrows in which to over-winter, emerging during early April if the weather is suitable to start hunting.

The nesting arrangements made by the females are rather variable: *Arachnospila spissa* uses the burrow of its spider-prey; *A. spissa* may also use ready-made crevices as do the black-coloured *Anoplius* species; *Dipogon* species use ready-made cavities in old walls or old beetle burrows in wood; other species dig a burrow in the ground. Usually a short burrow leads to a single terminal cell but some species, e.g. *Priocnemis exaltatus*, *Anoplius viaticus*, *A. concinnus*, build two or more cells connected by a gallery burrow. When a cell is ready, the paralysed prey is brought in by the female, an egg laid and the burrow closed with the tip of her gaster being used as a tool to pound the soil-plug of the burrow.

While the digging proceeds the paralysed spider may be left in the open, e.g. *Anoplius viaticus*, or hidden or even buried, e.g. *Pompilus cinereus*. Often, however, the spider is left on a tuft of vegetation, e.g. *Episyron rufipes*, *Anoplius infuscatus*, *A. viaticus*. The prey is frequently visited while the digging is in progress. The prey, because of its large size relative to the wasp, is usually dragged backwards to the burrow entrance where it is dropped. The cell is then inspected and the spider dragged in. *Dipogon* species, however, walk sideways while transporting their prey, *Pompilus cinereus* and *Calliadurgus fasciatellus* straddle their prey and walk forward while *Episyron rufipes*, with a relatively slightly smaller prey, is usually able, in a forward movement, to make a short hopping flight. The large prey hunted results in only a single spider being placed in each cell. Many species hunt spiders of widely differing families but sometimes there is a tendency either to take web-spinners, e.g. *E. rufipes* or running spiders, e.g. *A. viaticus*. *Dipogon* species specialize in certain species of spiders.

Each female wasp digs several burrows which are usually widely separated from each other although sometimes they may be closer together, e.g. *E. rufipes*, or several females may nest close together, e.g. *P. cinereus*. A larva hatches from the egg, eats the spider, and then over-winters either as a larva or a pupa.

Stealing of the paralysed prey temporarily stored while the digging proceeds is widespread in many species, e.g. *D. variegata*, *P. cinereus*, *A. viaticus*, *A. infuscatus*, *E. rufipes*. The females of *Evagetes crassicornis* and *D. variegata* will dig down to the buried paralysed prey, destroy the egg already present and lay their own egg, thus

behaving as cleptoparasites. The female of the cleptoparasitic species of *Ceropales* each lays its egg in the lung-book of a paralysed spider during the time it is left at the entrance of the burrow. The egg of *Ceropales* hatches before that of its host and the host's egg is eaten. *Ceropales* species are cleptoparasites on other species of spider-hunting wasps. I am indebted to the following authors, Richards and Hamm (1939), Bristowe (1948), Evans (1953), Malyshev (1968), Andrewes (1969), Evans and West Eberhard (1970) and Field (1986) for the above natural history observations.

Work on the Yorkshire spider-hunting wasps started with Smith (1852, 1858) who discovered six species: *Dipogon variegatus*, *Priocnemis exaltata*, *Arachnospila anceps*, *A. spissa*, *Anoplius viaticus*, *Ceropales maculata*. Six species are present in Smith's collection, held at Oxford University Museum, but only the five specimens *D. variegatus* carry labels relating to Yorkshire, which actually includes *Priocnemis fennica* – an additional species can therefore be attributed to Smith.

Roebuck (1907) added two species: *Pompilus cinereus*, *Priocnemis schiødtei* (referred to incorrectly as *P. pusillus*) although specimens relating to these records have not been found.

Butterfield and Fordham (1930) added a further eight species: *Priocnemis parvula*, *P. perburbator*, *Arachnospila trivalis*, *Evagetes crassicornis*, *Anoplius concinnus*, *A. nigerrimus*, *A. infuscatus*, *Episyron rufipes*. Specimens matching these records have only been found for *P. parvula* while that of *A. infuscatus* was probably misidentified (Archer, 1987). A further species, *Arachnospila consobrina* was also listed by Butterfield and Fordham (1930) but doubted by Perkins; since Fordham was unable to find the specimen, this species has been removed from the Yorkshire list (Fordham card index, 1932).

TABLE 1

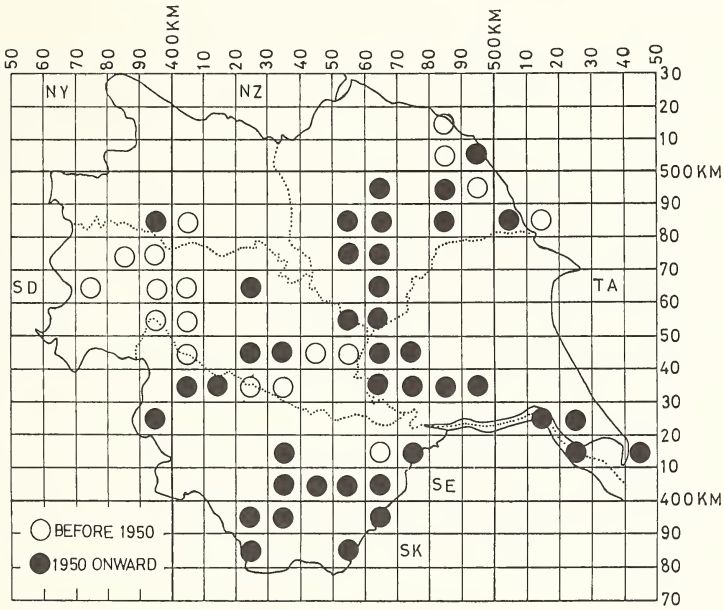
Records and distributional units of the 20 species of the Pompilidae found in Watsonian Yorkshire to July 1987

	No. records	No. localities	No. 10 km squares	No. vice-counties
Dipogon subintermedius	12	5	5	3
D. variegatus	11	11	9	3
Calliadurgus fasciatellus	2	1	1	1
Priocnemis exaltata	32	12	10	3
P. fennica	6	5	5	3
P. gracilis	6	3	3	2
P. parvula	34	20	18	5
P. schiøedtei	52	22	17	4
P. perturbator	17	12	11	4
Pompilus cinereus	38	10	7	3
Arachnospila anceps	58	27	22	5
A. trivalis	12	7	5	3
A. spissa	30	16	14	4
Evagetes crassicornis	42	15	13	4
Anoplius concinnus	12	9	8	3
A. nigerrimus	33	15	14	4
A. infuscatus	4	1	1	1
A. viaticus	33	6	6	3
Episyron rufipes	22	4	4	2
Ceropales maculata	7	2	2	2
Total	463	203	175	62
Actual	463	89	58	5

Two further species, *Prionemis agilis* (Flint 1967) and *Arachnospila minutula* (Flint 1973) are now known to have been misidentifications for *P. schiødtei* and *A. anceps*.

This paper re-introduces *A. infuscatus* and adds the following three species: *Dipogon subintermedius*, *Calliadurgus fasciatellus* and *Priocnemis gracilis* to give a Yorkshire list of 20 species out of a British list of 40 species.

The 20 species are represented by 463 records from 89 localities in 58 10-km squares (Table 1). A record is a specimen whose label data varies in one of the following: name, sex, locality and day–date of capture. The sources of the records are derived from the literature, museum and personal collections. Specimens from the following museums have



Map 1 – Records received of spider-hunting wasps to July 1987.

been examined: Doncaster, Keighley, Leeds, London, Manchester, Oxford, Rotherham, Scarborough, Sheffield and York. I have been able to confirm the following 24 collectors: D. W. Bevan, A. Brackenbury, A. E. Bradley, J. T. Burn, R. Butterfield, H. Britten, I. H. Burkill, J. D. Coldwell, H. H. Corbett, J. H. Elliott, W. A. Ely, J. H. Flint, W. J. Fordham, C. F. George, W. D. Hincks, P. Kendall, E. Saunders, S. Shaw, T. Stainforth, P. Skidmore, A. Smith, D. H. Smith, F. Smith, J. Wood. The following were particularly important sources of records: J. T. Burn, R. Butterfield, J. H. Flint, W. J. Fordham, W. D. Hincks and J. Wood. My contribution is 163 records. I acknowledge many thanks to the past and present collectors and to the museum authorities for the wealth of records.

The situation map (Map 1) shows a relative absence of records from the north of the county, the Wolds and parts of western Yorkshire. Mid-west Yorkshire (VC 64) shows up as being important for the early records, which have not been confirmed more recently.

The records-locality plot (Figure 1) can be vertically divided into the four distributional statuses of common, frequent, occasional and rare species. Four species can be considered above the diagonal line and hence to be locally frequent or common. Further information on the four distributional statuses are given in Table 2.

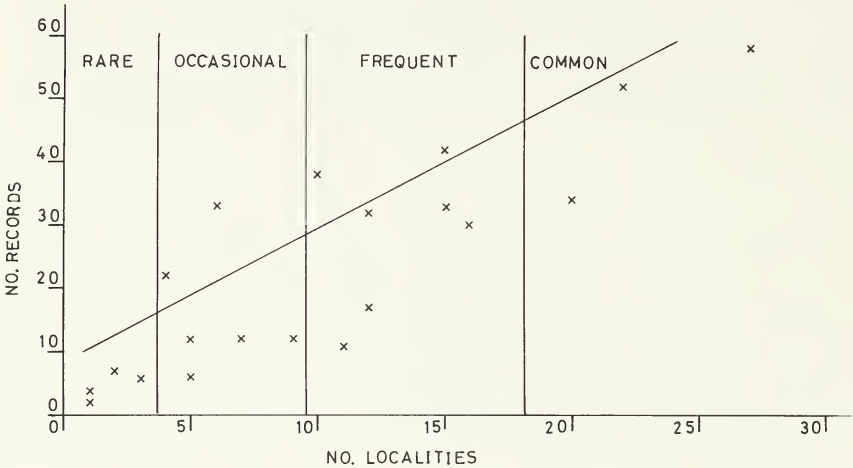


FIGURE 1
The records–localities plot of the Pompilidae found in Watsonian Yorkshire to July 1987.

Status	No. Localities	No. species	No. 10 km squares	No. records
Common	20–27	3	17–22	34–58
Frequent	10–16	7	7–14	11–42
Occasional	4–9	6	4–8	6–38
Rare	1–3	4	1–3	2–7

TABLE 2

Distributional status of the species of the Pompilidae in Watsonian Yorkshire based primarily on the number of localities in which each species has been found (see Figure 1, Table 1)

In the following species accounts information is first given relating to Watsonian Yorkshire records and then to the English distributional status and months of adult activity. I am grateful to M. C. Day for much of the English data. In general in Yorkshire species first appear rather later than in the south of England.

Dipogon subintermedius (Magretti, 1886) (= *nitidus*). Occasional (SE55, SE60, SE66, SE68, SE73), July to August but mainly during July. Aerial nests in walls, bramble stems and old insect borings in dead wood in sunny sheltered situations. Locally common throughout England from June to September.

D. variegatus (Linnaeus, 1758) (Map 2). Frequent, June to August but mainly during July and August. Aerial nests in almost any kind of cavity. Adults associated with upstanding dead wood in sunny sheltered situations. Not common in England but widely distributed, from June to September.

Calliadurgus fasciatellus (Spinola, 1808). Rare, females taken in August and September and only known from Strensall Common (SE66). Dry sandy places. Known from southern England, where it is uncommon, so the Yorkshire record is an unusually northern record, July to early September.

Priocnemis exaltata (Fabricius, 1775) (Map 3). Frequent, July to September but mainly during August, with females much more numerous than males. Dry sandy places. Common throughout England, May to September.

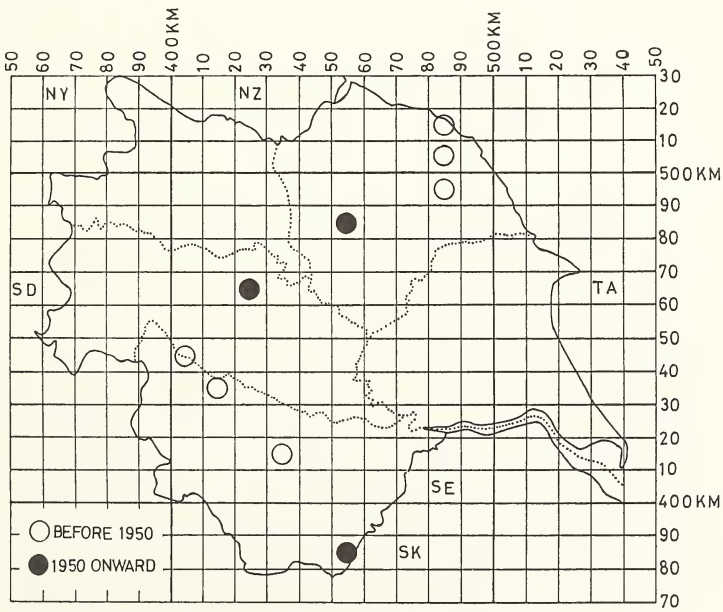
P. fennica Haupt, 1927. Occasional (SE31, SE40, SE63, SE71, TA08), July to September. Sandy and clay soils but also in woodland sites. Recently recognised and has been found to be widely distributed throughout England, June to September.

P. gracilis Haupt, 1929. Rare, in eastern Yorkshire (Fylingdales Moor, SE99; Kelsey, TA22; Spurn, TA41), June to September but mainly during July. Clay soils in woodlands and also more open ground, particularly at coastal sites. Infrequent in England, from Dorset to Kent and north to Yorkshire.

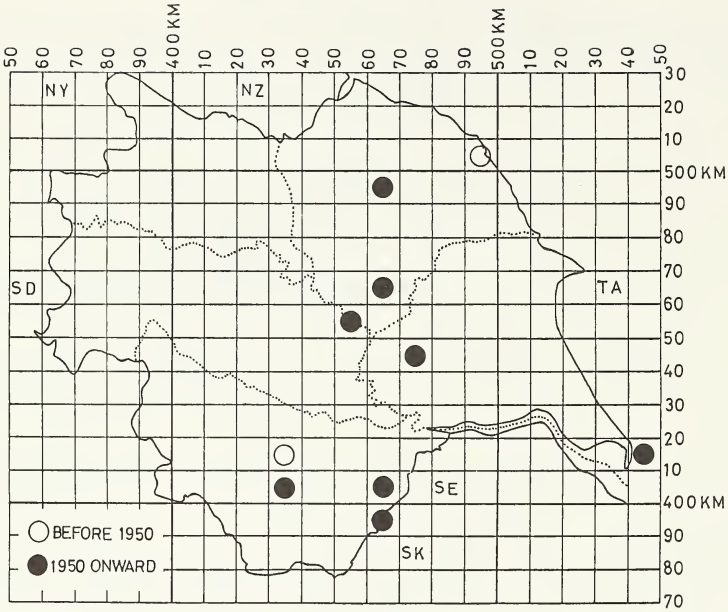
P. parvula Dahlbom, 1845 (Map 4). Common, June to September with one record 4 October. Peak numbers during August, with females much more numerous than males. Usually on sandy soil but also on coastal clay soils. Frequent to common throughout England.

P. schiødtei Haupt, 1927 (Map 5). Common, June to September with females mainly during July and August and males during July, when males more numerous than females. Mainly on sandy soils but also on clay soils and in woodlands. Widely distributed throughout England but often infrequent or uncommon.

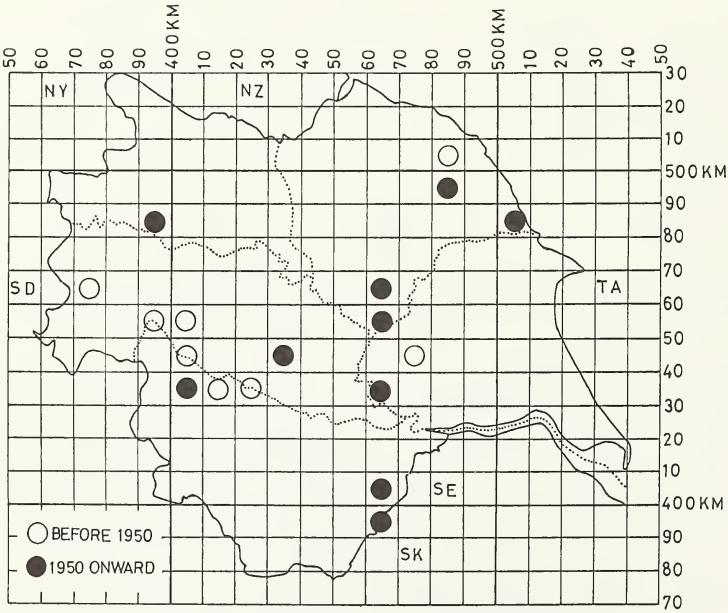
P. perturbator (Harris, 1780) (Map 6). Frequent, May to July but mainly during May when both females and males are more likely to be found. An early species. No evidence of adult activity in the late summer or early autumn. Frequent throughout England but not particularly common, from April to July.



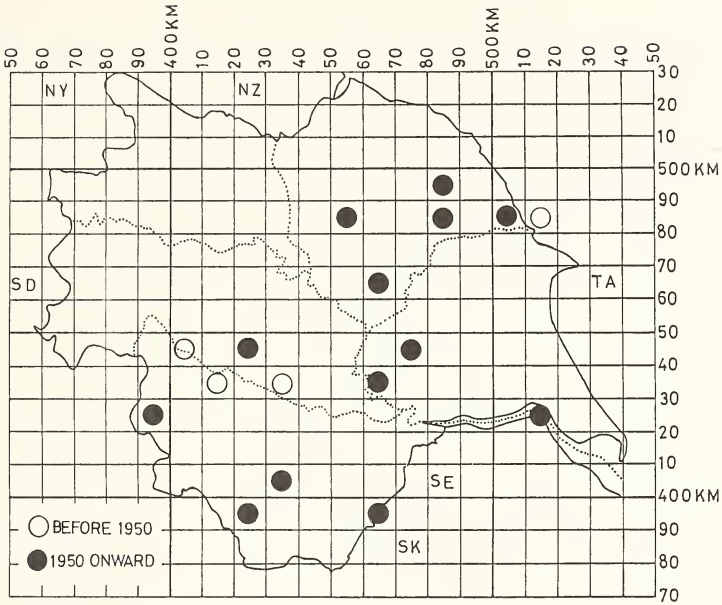
Map 2 – *Dipogon variegatus* (Linnaeus).



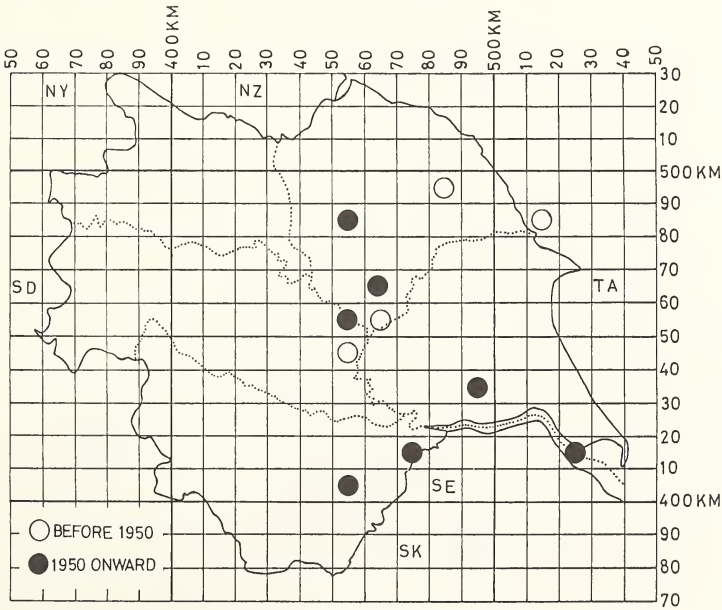
Map 3 – *Priocnemis exaltata* (Fabricius).



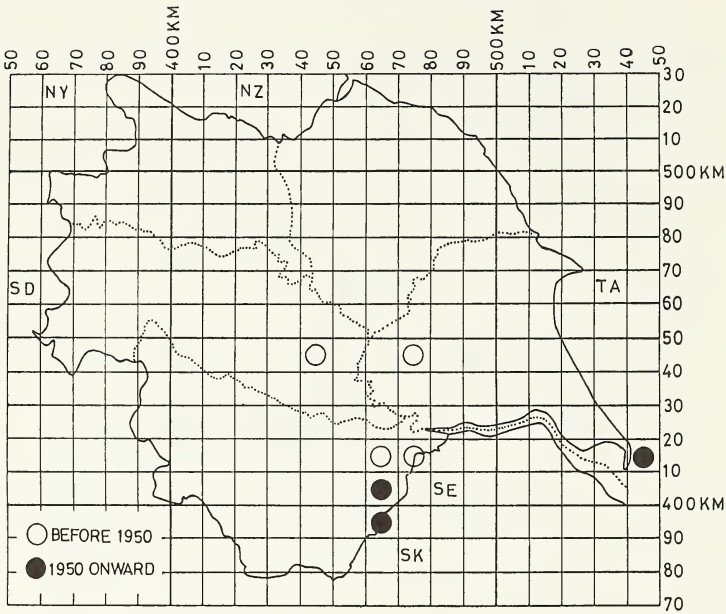
Map 4 – *Priocnemis parvula* Dahlbom.



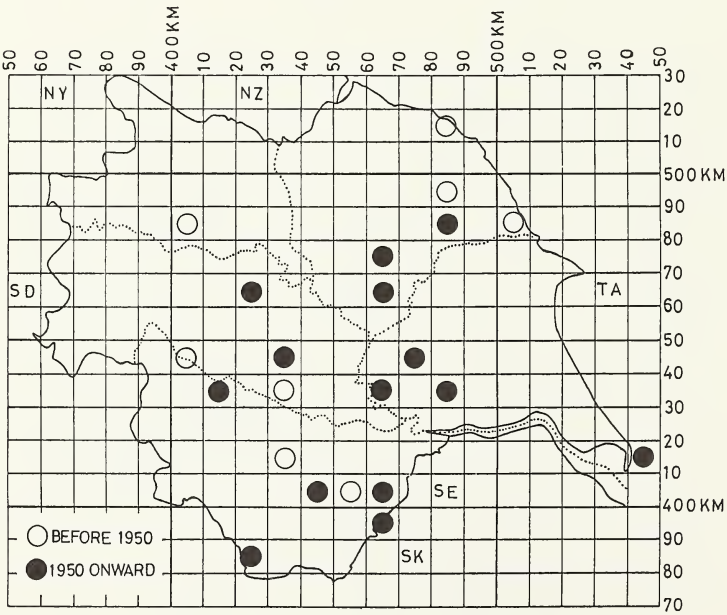
Map 5 – *Priocnemis schiøedtei* Haupt.



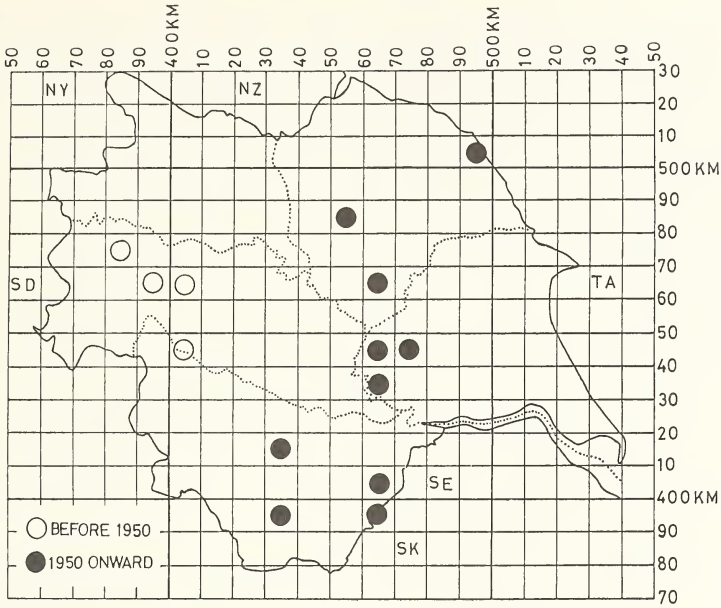
Map 6 – *Priocnemis perturbator* (Harris).



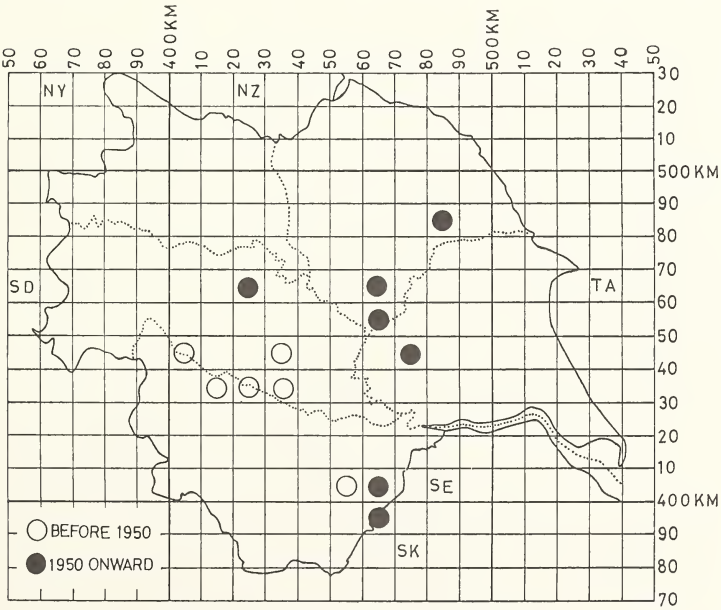
Map 7 – *Pompilus cinereus* (Fabricius).



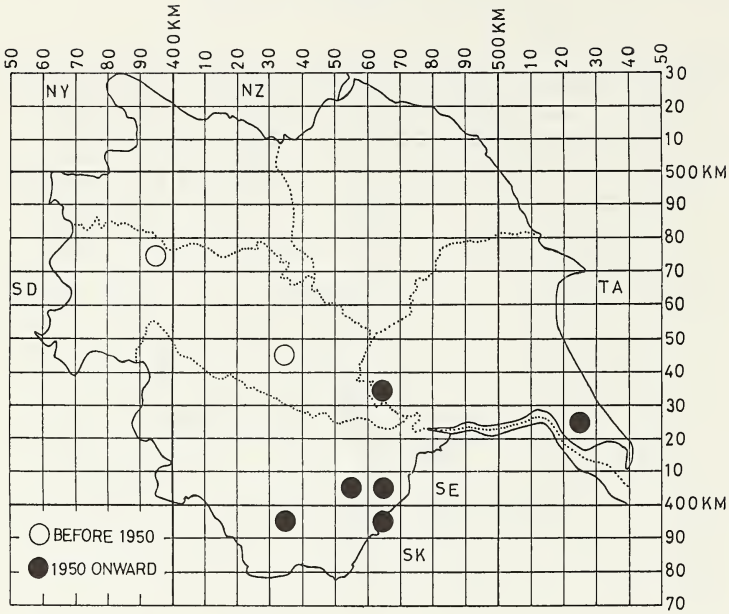
Map 8 – *Arachnospila anceps* (Wesmael).



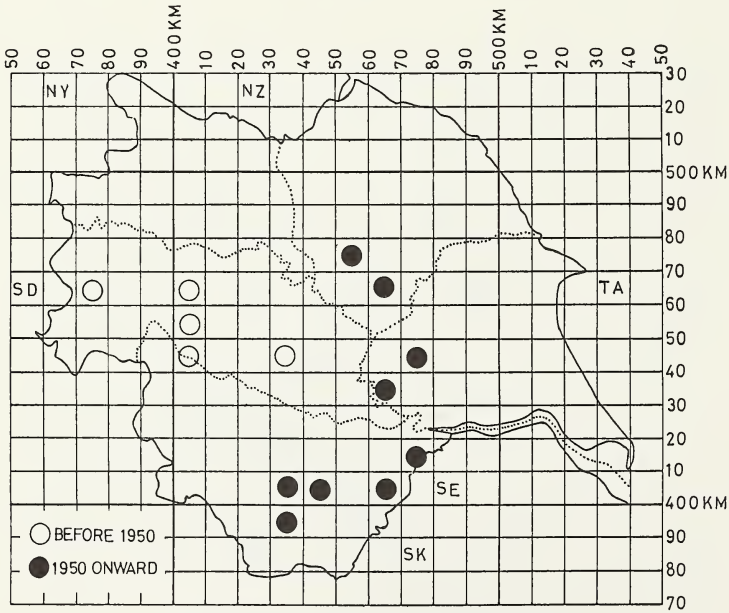
Map 9 – *Arachnospila spissa* (Schiødte).



Map 10 – *Evagetes crassicornis* (Shuckard).



Map 11 – *Anoplius concinnus* (Dahlbom).



Map 12 – *Anoplius nigerrimus* (Scopoli).

Pompilus cinereus (Fabricius, 1775) (Map 7). Frequent but locally common in southern Yorkshire, June to September but mainly during June and July. Open sandy places, particularly on the coast but also inland in sandpits and open sands of heathlands. Frequent to common throughout England, from May to September.

Arachnospila anceps (Wesmael, 1851) (Map 8). The commonest spider-hunting wasp of Yorkshire, June to September with a male record for 30 May. Females equally frequent from June to September but males mainly during June and July. Sandy soils. Frequent to common throughout England, May to September.

A. spissa (Schiødte, 1837) (Map 9). Frequent, June to August with females mainly during June and July and males during June. Associated with various soils including heavier soils but also in wooded situations. Frequent to fairly common throughout England, May to August.

A. trivalis (Dahlbom, 1843). Occasional in central and southern Yorkshire (SK69, SE33, SE34, SE60, SE74), June to September with females much more numerous than males. Sandy soils. Infrequent and locally common throughout England, north to Lancashire and Yorkshire.

Evagetes crassicornis (Shuckard, 1845) (Map 10). Frequent but locally common, June to September but mainly during July and August with females more numerous than males. Sandy places. Frequent throughout England but rarely common, May to September.

Anoplius concinnus (Dahlbom, 1845) (Map 11). Occasional in central and southern Yorkshire, June to September but mainly during July. Not especially associated with sandy places but on stony or gravelly places at coast or riverside. Throughout England but infrequent.

A. infuscatus (Vander Linden, 1827). Rare in southern Yorkshire (Crow Wood, near Finningley, SK69), June to August. Moist sandy places. Frequent to common in England extending north to Lancashire and Yorkshire.

A. nigerrimus (Scopoli, 1763) (Map 12) Frequent, June to September with a female record for 26 May, females mostly encountered during August and males during June. Sandy places. Common throughout England.

A. viaticus (Linnaeus, 1758). Occasional but locally frequent (SE31, SE60, SE65, SE66, SE74, SK69), April to September, with females most frequent from May to June and again from August to September with males mainly during August. An early species with a record of a female on 6 April. Sandy places. Infrequent but locally common in England going north to Yorkshire.

Episyron rufipes (Linnaeus, 1758). Occasional but locally frequent in south-eastern Yorkshire (Blaxton Common, SE60; Allerthorpe Common, SE74; Rossington Bridge, SK69; Spurn, TA41), June to August with males mainly during June. Sandy places particularly at the coast. Locally common in England as far north as Lancashire and Yorkshire.

Ceropales maculata (Fabricius, 1775). Rare (Woolley Edge, SE31; Allerthorpe Common, SE74), June to August and not recorded since 1950. Inland sandy places. Found throughout England but rarely locally common.

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BOOK REVIEW

Turtles and Tortoises of the World by **D. Alderton**, with photographs by **Tony Tilford**. Pp. 191. 98 plates, 61 of them in colour, 6 figs, 12 distribution maps. Blandford. 1988. £11.95.

This is a very good introduction to its subject, and benefits considerably from an excellent range of good colour photographs. Three introductory chapters, covering relationships with man, form and function, and reproduction are followed by a brief discussion of the evolution of Chelonia and then by the main strength of the book, a systematic account, family by family, of all the extant forms.

I got the impression that the author is least happy with the anatomical side of his subject, and I would argue with some of the details (e.g. the precoracoid of Fig. 5 is the ventral prong of the scapula). His Fig. 1 is going to baffle totally anyone who doesn't already know the make-up of a turtle carapace. The discussion of the fossil history, particularly of *Eunotosaurus* and *Proganochelys*, is also a bit suspect, and really needed some diagrams. None of this matters very much in what is only marginal to the main interest and value of the book, i.e. the systematic account in Chapter 5. In 67 pages, this provides a distribution map for each family, and a good general discussion of the appearance, biology and interests of the included species. A very useful appendix lists all the species and subspecies of living Chelonia. A short glossary and index complete the book. It is a pity that the maps and captions for the side-necked turtles got totally confused (Map 10, labelled Platysternidae, belongs to the Chelidae; Map 11, labelled Chelidae, belongs to the Pelomedusidae; and Map 12, labelled Pelomedusidae, belongs to the Platysternidae), but anyone reading the text will soon realize this.

Perhaps the most surprising feature of this book is that it is not dominated by the seven marine turtles on which so much research and conservation effort has been expended. This is particularly true of the photographs, which seem to have been carefully selected to illustrate the full range of chelonians. This is why I recommend this book as an introduction to the group.

DWY

CURRENT DISTRIBUTION OF *COROPHIUM CURVISPINUM* SARS. VAR. *DEVIUM* WUNDSCH (CRUSTACEA: AMPHIPODA) IN BRITAIN WITH NOTES ON ITS ECOLOGY IN THE SHROPSHIRE UNION CANAL

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Distribution

Corophium curvispinum Sars. var. *devium* Wundsch is a tubicolous (tube-dwelling) amphipod crustacean native to the lower and middle courses of the rivers Volga, Danube, Dneiper, Don, Niemen and Elbe and to two lakes in the Caucasus. A second species *C. spongicollum* Velitchkovsky is also freshwater, but other members of the genus are marine and estuarine. Ratcliffe's (1977) listing of *C. curvispinum* var. *devium* as a common brackish water crustacean is incorrect. *C. spongicollum* has not been recorded in Britain, but *C. curvispinum* var. *devium* was first recorded from the River Avon in the vicinity of Tewkesbury (Crawford, 1935) although the exact location is not clear. Repeat collections around Tewkesbury have failed to locate it (Moon 1979). Since 1935, a number of workers have recorded *C. curvispinum* var. *devium* at other locations in Britain, principally navigable rivers and canals, but these records have never been collated.

Figure 1 summarises the current known distribution from all available published and unpublished records. A number of records from other sites, where the locations were not clearly specified, are also listed.

Autecology

The habitat preferences and role in fish diet of this amphipod were investigated at sites on the Middlewich Branch of the Shropshire Union Canal in Cheshire (SJ 662 585) and on the mainline of the same canal in Shropshire (SJ 713 288). The canal carries heavy summer pleasure boat traffic. The channel is 12-14m wide, with a 1.25-1.5m deep central section. Vegetation is sparse, with isolated patches of *Potamogeton pectinatus* L.,*Glyceria maxima* (Hartm.) Holmberg, *Phalaris arundinacea* L., and *Rumex hydrolapathum* Huds. In many places the banks consist of concrete retaining walls. During September 1986, a length of the Middlewich Branch was drained for engineering work and this permitted an examination of the channel to be made. Many thousands of individuals of *C. curvispinum* var. *devium* were present on horizontal parts of the concrete walls. The vertical parts of the walls and a number of large stones and bricks in the channel also supported large numbers, but markedly less than the horizontal surfaces. Small numbers of the animal were also found attached to the stems and leaves of *Potamogeton pectinatus*.

C. curvispinum var. *devium* was the most numerous macroinvertebrate in the canal although several species of bivalve molluscs, particularly species of *Anodonta* and *Pisidium* had larger standing crops.

A small sample of fish from the second site was obtained for diet analysis. Ten stomachs from the following species were examined; Roach *(Rutilus rutilus* (L.)*)*, Gudgeon *Gobio gobio* (L.)*)*, Ruffe *(Gymnocephalus cernuus* (L.)*)* and Perch *(Perca fluviatilis* (L.)*)*. In addition five stomachs from introduced Common Carp *(Cyprinus carpio* (L.)*)* were examined. *C. curvispinum* var. *devium* was an abundant food item in three of the five species with the exception of Roach, which had eaten mainly detritus and plant material and Common Carp, which had eaten a variety of detritus and large bivalve molluscs.

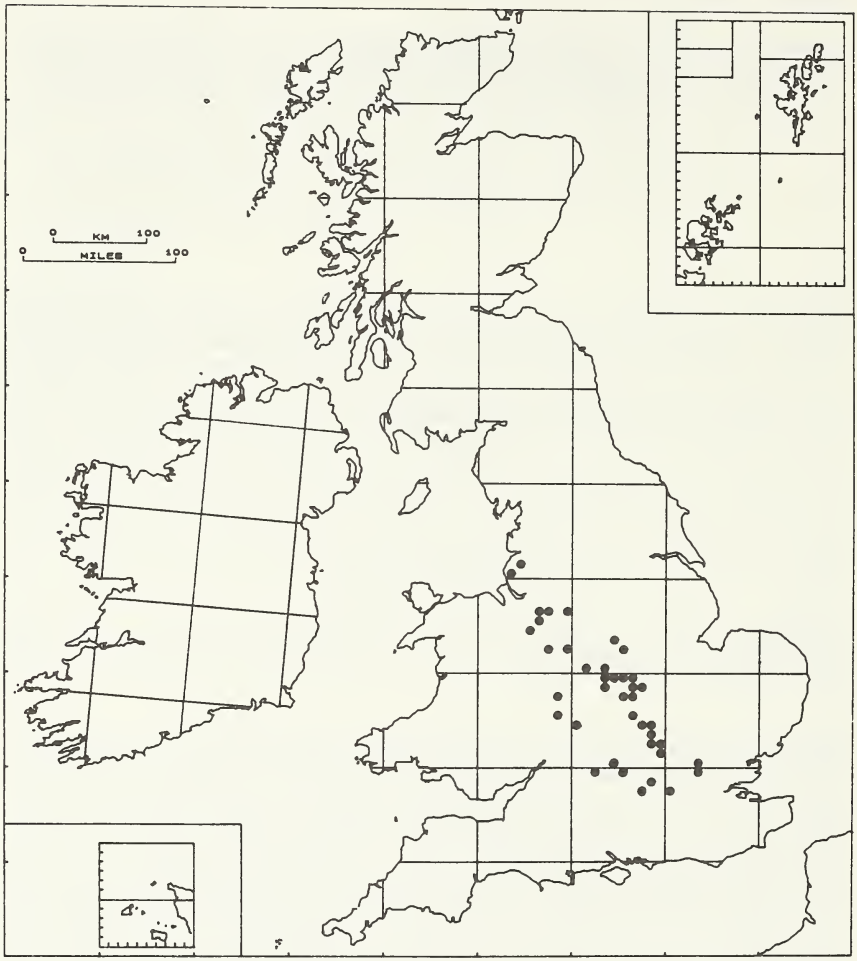

FIGURE 1
Distribution of *Corophium curvispinum* var. *devium*

Exact locations not specified:

1.	South Oxford Canal (northern section)	1984
2.	Worcester and Birmingham Canal	1982
3.	Shropshire Union Canal, Cheshire	1976
4.	River Avon, Tewkesbury	1935

Discussion

C. curvispinum var. *devium* has been recorded from a number of navigable rivers and canals in Britain and a single record from the unnavigated River Swale in North Yorkshire. (Figure 1). This suggests that its spread may have been aided by boats.

In a heavily navigated canal, this amphipod was one of the few invertebrates able to

tolerate the disturbed conditions produced by frequent boat movements. However it was reliant on stable, solid surfaces in order to exist in large numbers. Several of the fish species present in the canal utilised it as a food item. Considering the relative paucity of other invertebrates in this canal, it is suggested that *C. curvispinum* var. *devium* may form an important component of the food web and may have a vital role in maintaining the fish stocks in the canal.

Acknowledgements

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RECENT OCCURRENCES OF HARP SEAL, *PLAGOPHILUS GROENLANDICUS* (ERXLEBEN), IN THE NORTH SEA

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Introduction

The Harp or Greenland seal is a highly migratory arctic and sub-arctic circumpolar species. It seldom ventures south of 60 degrees N and consequently has only rarely been recorded in British waters (Hewer 1974).

Its three major breeding populations are situated in areas of pack ice in northeast Newfoundland and the Gulf of St Lawrence, around Jan Mayen Island and at the mouth of the White Sea (Hewer 1974, Bonner 1977).

It is likely that stragglers from this latter group accounted for the 1–2 records per decade during the 19th century and fewer since, occurring off the northern isles of the

Orkneys and the Shetlands (Hewer 1974).

Other occurrences in Scottish waters include one in the Hebrides pre-1870, one seen off West Loch Tarbert, Kintyre, three in Loch Scridian, Mull and one in the Firth of Forth, all pre-1896 (Lydekker 1896).

Off the Irish west coast Lydekker (1896) notes the occurrence of one off Galway.

From around the coastline and estuaries of England are records of two killed in the Severn in 1836 (Lydekker 1896, Bonner 1977), an adult (preserved in the British Museum Nat. Hist.) caught in the North Sea (Gray 1866), a sub-adult caught in the Thames at Isleworth on 25 March 1885 (Gray 1866, Lydekker 1896), an immature specimen caught in Morecambe Bay in January 1868 (the skull was presented to Kendall Museum) (Lydekker 1896) and a specimen in the Teign (King 1964).

Diet in summer consists of pelagic crustacea such as *Thysanoessa* and *Themisto*, amphipods and mollusca. During autumn and winter, diet switches to fish, notably capelin (*Mallotus villosus*) and arctic cod (*Boreogadus saida*) the seal's distribution at this time closely reflecting that of its prey. Feeding is minimal during the breeding and moulting seasons from February to May (Bonner 1977, Ronald *et al.* 1982).

Harp seals have had a long history of ethnic and commercial exploitation, though a significant decline during the second half of this century, particularly in its eastern populations, was attributed to intensification of annual culls, notably of white-coated unweaned pups, to supply the increased demands of the fur trade (Ronald *et al.* 1982).

Protection since 1983, when the importation of pelts into Europe was banned (a ban in force until 1989), has enabled the species to increase, though at a time when food sources are much depleted.

Altered feeding migrations of the Jan Mayen population, apparently caused by a collapse of fish stocks (particularly capelin and arctic cod) have resulted in large numbers of one and two-year-old animals moving into the fishing grounds off the Norwegian Coast and into the northern North Sea. Specimens which drowned in the Norwegian fishing nets during February 1987 showed evidence of emaciation, with blubber reserves estimated to be only 16 per cent of the norm for the time of year (Dines 1987).

These abnormal winter feeding movements are likely to be responsible for Yorkshire and Humberside's first harp seal records.

Field Notes

On 5 April 1987, a 1.5 – 2 m specimen was hauled out on the mud near the jetty at North Killingholme Haven on the south bank of the Humber (Grid ref. TA/167203). It was observed from a range of 3 – 4 m and due to its contrasting cream and black markings was judged to be a male (M. Fisher, pers. comm.).

Although the situation was apparently not as acute during the winter of 1987/8, feeding movements again resulted in harp seals entering the North Sea.

On 23 February 1988 a specimen was found dead in the Wash near Boston Lincolnshire and on 24 February a sick specimen was reported off the Kent coast (S. Anderson, pers. comm.).

On 12 March a harp seal, judged to be the size of a female grey seal (*Halichoerus gryphus*), was observed at 3.35 pm, 80–100 yards off Flamborough Head. It was watched for over 25 minutes swimming on the surface, rolling and diving, giving good views of its striking black to dark brown facial, shoulder, flank and abdominal markings which contrasted with its generally white to cream pelage, before slowly moving off to the north (A. Allport, pers. comm.).

Since exaggerated winter feeding movements may continue to result in vagrant harp seals seasonally occurring in the North Sea, the Sea Mammal Research Unit, c/o British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 0ET, would be interested to receive any further records.

Acknowledgements

I would like to thank Mik Fisher of Cleethorpes, Anne Frankish of Scunthorpe Museum,

and Andrew Allport of the Flamborough Ornithological Group for detailed field notes and sketches, and Sheila Anderson of the (NERC) Sea Mammals Research Unit for records and valuable background information.

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NOTE ON HIGH BADGER CUB MORTALITY AT A SETT IN THE DONCASTER AREA BETWEEN 1984 AND 1988

P. N. JOHNSON

During a long term study of social interactions and reproductive success of a small clan of Badgers *Meles meles*, in the Doncaster area, a high level of aggression-related mortality was noted in the cubs of the year.

This social group was previously subjected to a high level of persecution by Badger diggers, with up to five separate instances of dogs being placed underground and digging into the sett occurring annually. Despite this the sett has remained occupied continuously for the past 30 years. At present the adult social group consists of four resident adult animals, one boar and three sows, one dominant and two yearlings. Elsewhere in the Doncaster area, the actions of the diggers have artificially reduced the number of natural setts occupied by Badgers by 80 per cent (Johnson and Paget 1984) and has possibly interfered with the normal behaviour of this remaining population. However, since 1984, no known instances of interference have occurred at the sett monitored in this study. This reduction in persecution has provided an opportunity to study the re-establishment of a normal population density for the area, the redefinition of territorial ranges, and the monitoring of the rate of recolonization into previously occupied areas.

The yearly levels of success of the reproductive effort were monitored at the sett.

In 1984, two cubs were reared successfully to independence.

In 1985 two cubs were born, though on 11 September one, a boar cub, was found dead outside the sett, in a shallow depression two metres away from an entrance hole to the sett. This depression had not been previously noted and appeared to have been recently excavated; it may have been a shallow grave excavated by the Badgers themselves, as several Badger prints were noticed in the soft soil beneath the dead cub. Badgers have been recorded previously transporting and burying their dead (Paget and Middleton 1974). Severe bite marks were found around the neck and hind quarters of the dead cub, with areas of fur removed around the point of injury. Ageing by analysis of the skull formation, according to Neal (1986), showed this cub was approximately 36 weeks old.

In 1986, two cubs of the year were observed at the sett in April. On 18 July one of these cubs was recovered dead just inside one of the sett entrance holes. Analysis of this cub revealed it to have been a boar. Though badly decomposed indicating death had occurred at least a week before recovery, the cub had sustained severe injuries to the hind quarters and throat; the pattern of these bite injuries was similar to the tooth arrangement pattern of a large carnivore. The cub was aged from its skull formation which showed it was approximately 28 weeks old at the time of death.

In 1987, breeding was delayed, with two cubs approximately 24 weeks old recorded on 2 September. No mortality was recorded this year. In 1988, on 2 March, a newly-born sow cub, still attached to a length of umbilical cord, was recovered just outside the sett. The cub had bite marks around the hind quarters and had been bleeding before death.

During the past four years, three of the eight cubs raised in this small social group died from physical injuries before attaining maturity.

The actions of aggression were not observed in any of these instances and the circumstances surrounding each case may only be speculated upon. However aggression by dominant sows towards the cubs of other sows has been observed both in the field and within an enclosed study group of Badgers by Hans Kruuk (*pers comm.*). Both boar cubs found in 1985 and 1986 would have been capable of a certain level of mobility about the sett and capable of a level of self defence from other predatory mammals entering the sett. Foxes *Vulpus vulpes* have been recorded killing young badger cubs (Neal 1986) and are present in the area around the sett complex. However, in view of the substantial injuries both cubs had received to the body, the aggressor must have been a large carnivore, capable of biting through the thick fatty skin of a Badger. Though no evidence of interference was recorded at the sett, it is possible that the cubs suffered their injuries away from it, possibly via an encounter with a large domestic dog. Abandoned and neglected dogs are known to roam in the farming areas around the sett. Badgers have been known to return to the sett area after suffering injury and to die in the entrance holes (Neal *pers comm.*).

However, the discovery of the two dead male cubs coincided with a higher level of observed above-ground interactions between the dominant boar and sow. Prior to the time of each death, the sow and cubs had been using a separate section of the sett complex and entrance holes from that used by the boar and no above-ground interactions between the two sexes had been observed. This may possibly indicate a reduction in the level of protection of the cubs by the sow, exposing the male cubs to the aggressive actions of another animal or animals. Aggression by dominant male social mammals against non-related male offspring has been recorded in the Lion. If the cubs found dead at the sett were not related to the dominant boar, they may have been killed by it to remove any potential future competition and ensure that his genes, rather than those of his predecessors, were passed on to the next generation. (Neal *pers comm.*).

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I would like to thank Dr E. Neal and Dr H. Kruuk for commenting upon earlier drafts of this note and on the possible causes of the observed cub mortality.

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FURTHER NOTES ON THE HISTORY OF BOTANICAL INVESTIGATION ON THORNE MOORS

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In a recent paper (Limbert 1987), an outline history of botanical investigation on Thorne Moors was presented. In concluding a more general research programme on the history of naturalists on the Doncaster mires, several further significant botanical references have been located, and are worth noting here.

Thomas Knowlton (1691–1781) was a professional gardener and horticulturist, employed for many years by the Earl of Burlington at Londesborough, north of Market Weighton. Much of his surviving correspondence has been published (Henrey 1986), including a letter to the botanist and collector Samuel Brewer, in which Knowlton listed 'such plants I have observed to grow wild that are not very common'. This was contained in a postscript note dated 29 August 1729, five days after the letter had been commenced. The contents include records from moorland 'at Old Goole', as elucidated by Henrey. Knowlton wrote:

> Ledum palustre nostras arbuti flore [*Andromeda polifolia*] grows at ye moses [mosses] att yould [Old Goole] in marshland plenty & in yorkshire Empetrum montanum [*Empetrum nigrum*] in many places in yorkshire phalangium anglicum palustry [*Narthecium ossifragum*] att yould mosses oxycocus sive vaccine palustre [*Vaccinium oxycoccos*] att yould mosses . . .

In 1772 the Doncaster botanist and civil engineer Thomas Tofield, who lived at Wilsic, undertook 'a View' of the intended course of a canal envisaged to link the Don and Trent rivers, at Stainforth and Althorpe respectively. The projected course included a length 'through some low Grounds, called Common-Hills and Thorne-Peat Moors' (Tofield 1772). It therefore appears that Tofield visited Thorne Moors. However, amongst his extant botanical records (Skidmore *et al.* 1981), there are none from any Thorne site.

Samuel Appleby, another leading Doncaster botanist, who died in 1868 (Anon. 1868, 1868a, Skidmore 1972), spoke to the Doncaster Philosophical Society on 15 May 1865 on 'the botanical features of the neighbourhood of Doncaster' (Appleby 1865). In this he remarked that:

> Doncaster and its neighbourhood is a favourable province for one who has an inclination to pursue botanical researches . . .

He further noted that 'within an easy day's ramble lie thousands of acres of moorland, abounding with numbers of primitive wild plants'. He stated that he had botanised widely in the Doncaster district, including fieldwork 'in the direction of . . . Thorne'. It is not known if he successfully located the *Scheuchzeria*.

The first known visit to Thorne Moors by an organization based beyond the Thorne region occurred in 1865, when on 21 June, the Sheffield Field Naturalists' Society (see Ward 1958) visited the moorland. This was at the invitation of Makin Durham, a local landowner, civil engineer and entrepreneur, who owned large parts of Thorne Moors. Accounts of the visit appeared in three newspapers (Anon. 1865, 1865a, 1865b). The party was accompanied on the moors by William Casson, and their collecting encompassed a wide range of organisms. The accounts of the day included, *inter alia*, a short list of the most noteworthy plants:

> Amongst others, the following plants were observed: the sweet gale (*myrica gale*) . . . two species of sundew, the delicate and comparatively rare andromeda, the cranberry – in blossom and fruit, the wood groundsel, the marsh potentilla . . .

ACKNOWLEDGEMENTS
I am grateful to Peter Tuffrey for directing my attention to the references in the *Doncaster, Nottingham and Lincoln Gazette*.

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BOOK REVIEW

Science for Survival: Plants and Rainforests in the Classroom by **Adam Cade**. Pp. 244. Richmond Publishing. 1988. £9.95.

This book is concerned with the rainforests, one of today's most threatened ecosystems. Arising out of his own experiences in Malaysia, the author establishes a link between the survival of plant species and the conservation of rainforests, with the aim of stimulating a sense of environmental awareness amongst pupils in the classroom.

The book is particularly suitable for use by 11- to 16-year-olds, especially in the context of such subjects as Biology, Geography and Environmental Sciences, although it could also be adapted for use in other disciplines. It provides a choice of 74 suggested activities, covering 14 main topics which vary from 'plants and relationships' to 'forests for people'.

One of the book's objectives is the positive stimulation amongst pupils of a sense of environmental awareness and commitment to conservation. Teachers who use the book will appreciate the information provided, through which pupils will gain an overall insight into the dynamics and structure of rainforests, besides a historical view of the problem of deforestation and its effects on environmental balance as a whole. The exercises, which are designed in order to reproduce many of the phenomena which take place in a rainforest, are accompanied by detailed notes for teachers, as well as guidelines to be followed by their students. In addition, the book provides an appendix which gives complementary data on rainforests and a select list of representatives of the plant communities to be found in such ecosystems.

Finally, the book suggests further avenues for continuing work developed in the classroom, providing a reference and resource list including named organizations which can be contacted for further information on different aspects of the rainforests, as well as a list of organizations concerned with conserving them.

WLF

ASPECTS OF THE BREEDING BIOLOGY OF THE BUZZARD *BUTEO BUTEO* IN NORTH WALES

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The Buzzard *Buteo buteo* is the commonest raptor in the uplands of north Wales and is thus an important member of the resident avifauna. This species is even more numerous in mid-Wales, where its ecology and breeding biology have been studied recently in relation to land use (Newton, Davis and Davis 1982). In north Wales, from 1977 to 1985, a complete census was made of Buzzards breeding in the mountains of Snowdonia and in the contiguous and contrasting region to the east; the density, dispersion and productivity of this population will be described in publications elsewhere. This paper presents information on other aspects of breeding – nest sites, breeding season and the prey brought to Buzzard broods.

Study Area and Buzzard Population

The area covers 1366 km^2 and comprises two contrasting geological and agricultural regions: (A) Snowdonia – 926 km^2 of rugged mountainous terrain west of the river Conwy and north of the Vale of Ffestiniog between 15–1085 m elevation; (B) Migneint-Hiraethog – 440 km^2 of gently undulating moorland and enclosed hill farms extending east from the upper reaches of the river Conwy between 150–688 m a.s.l. Full details are given elsewhere (Dare 1986).

During 1977–85, Snowdonia supported ninety-six breeding territories at a mean density of 9.7 km^2 per pair of Buzzards and with a mean nearest-neighbour distance between nests of 1.95 km. In Migneint-Hiraethog, the corresponding values were sixty-two territories, 7.1 km^2 per pair, and 1.53 km. Annual breeding success was higher than that of the denser Buzzard population in mid-Wales, averaging 0.74 and 0.95 fledglings per pair of population in Snowdonia and Migneint-Hiraethog respectively.

Methods

Nests were located mainly by observing Buzzards and by systematic searches of the many likely tree and rock sites in each territory, usually from January until August each year. For each nest, the following details were noted: grid reference, altitude (from 1:25000 scale maps), type of site (tree species, quarry or natural crag) and height of nest above ground. Buzzard nests were often inaccessible but the nest contents of many could be viewed from nearby vantage points with the aid of binoculars (× 10) or telescope (× 20). The large size of study area, and nest site difficulties, precluded a thorough study of breeding biology. Instead, annual samples of nests were examined occasionally on an opportunistic basis, their number and location varying according to chance and the census priorities each spring.

Few precise measurements of laying interval, incubation and nestling periods have been published, and all show considerable variation. In this study, laying, hatching and fledging dates could be determined accurately for only a few nests. At some others, however, observations were sufficiently close to these critical events to estimate dates to within 1–2 days, using the following procedures. First-egg dates were estimated from (a) completed clutches first found when incomplete, (b) back calculations for clutches observed during the hatch, or (c) very small chicks (< 3–5 days old), by using a mean incubation period of 35 days per egg and an interval between eggs at laying of 2 days (personal observations, and P. E. Davis *in litt.*). Hatching dates were estimated from direct observations, as above, or more usually from the sizes and plumage of chicks less than 10 days old, using experience from another study (Dare 1961). Likewise, fledging dates were either witnessed or, more typically, could be estimated from the behaviour

of fully-feathered young in the nest or scarcely out of the nest. The volume of data increased as the breeding season progressed because more nests were found after than before hatching, while every attempt was made to reduce disturbance to birds during the vulnerable incubation phase.

The diet of Buzzard broods was assessed from prey remains found on or below occupied nests, supplemented by direct observations from hides at three nests. Pellets were not analyzed because very few were found.

TABLE 1
Nest site features of Buzzards in the study area, 1977–85

	Snowdonia	Migneint-Hiraethog
Nest Altitude (m): mean (range)		
tree sites	170 (10–330)	275 (120–410)
crag sites	328 (135–575)	330 (310–320)
quarry sites	260 (90–330)	–
all sites	220 (10–575)	285 (120–410)
Nest Sites: territory frequency		
trees	56 (60%)	59 (95%)
rock – crags	30 (32%)	–
rock – quarries	5 (5%)	–
trees/rocks	2 (2%)	3 (5%)
	93	62
Tree Species: no. of nests		
oak	49*(15)	25 (7)
birch	6	17
sycamore	6 (3)	14†(3)
beech	3	7
ash	2 (2)	2 (1)
alder	1 (1)	4
rowan	0	3
holly	1*	1
Prunus	1	0
Scots pine	7	17†
larch	3	13
spruce/fir	9	8
	88 (21)	111 (13)
Rock Sites: no. of nests		
crag	30††	0
quarry (disused)	7	0
rock inside wood	6‡	1
river gorge/gully	0	3
steep bank (moorland)	1	0
	44	4

Notes
Nests in ivy-covered trees are given in parentheses.
* a single tree growing out of a cliff face.
† old nest of Raven.
‡ includes three nests on ledges under tree roots.
In 1972, one pair bred successfully in a hawthorn tree in Migneint-Hiraethog region.

NEST SITES

The Buzzards were adaptable and used a wide variety of sites, with a marked difference between the two regions (Table 1) reflecting in part the relative availability of rock and tree sites. In the 93 Snowdonia territories where nests were found, 37 per cent of pairs used only rock sites, including disused quarries, and 60 per cent used trees, whereas in Migneint-Hiraethog, where suitable crags were very scarce, no pairs used rocks exclusively and 95 per cent were tree-nesters. In a few territories in each region, both tree and rock sites were used.

Most Snowdonia Buzzards nested on the lower and intermediate hill-sides between the 90 m and 230 m contours, the mean altitude for all 107 sites being 220 m (range: 10–575 m). Not surprisingly, tree-nesting pairs bred at lower altitudes (mean = 170 m, range: 10–330 m) than rock-nesters (mean = 328 m, range: 135–575 m). In Migneint-Hiraethog, the mean nest altitude for 80 sites was 285 m (range: 120–410 m).

Rock-nesting Buzzards in Snowdonia used mainly vegetated ledges on small, sheltered crags on the lower valley slopes and often amongst woodland. Several pairs selected small (10 m high) rocks on steep slopes and hidden within mature conifer forest, the nest being located 4–4.5 m up and either on a ledge or beneath the protruding roots of an overhanging oak tree. Such pairs were perhaps maintaining a 'traditional' trait predating the planting of these forests in the period 1920 to 1970. At the other extreme, some Buzzards nested on high and exposed crags in treeless, montane territories. In Migneint-Hiraethog, two pairs used three sites on ledges in narrow river gorges or gullies on the moorland fringe.

Active nests were found in 13 species of tree, again with regional differences (Table 1). In Snowdonia, 78 per cent of nests were in deciduous trees, and predominantly sessile oak (55 per cent), whereas in Migneint-Hiraethog fewer (66 per cent) were in deciduous and only 23 per cent in oak. Buzzards in Snowdonia also seemed to use heavily ivy-covered deciduous species more (31 per cent) than they did in Migneint-Hiraethog (15 per cent). These differences did not obviously reflect relative tree abundance *per se* because large conifer forests now occur in Snowdonia, as noted above. However, Buzzards there seldom used conifers, seeming instead to prefer indigenous oak woods which are a feature of this region.

Tree sites were usually located within secluded woods or shelterbelts but some were in hedgerow or roadside trees, isolated moorland trees (1), or in small trees growing out of rock faces (2). Buzzards were so tolerant of routine farming and other rural activities that several successful nests were within 250 m of occupied farmsteads or cottages; there was only one known case of deliberate nest interference in 309 recorded breeding attempts during this study. The average estimated height above ground level of 198 active tree nests was 12.2 m in Snowdonia and 11.9 m in Migneint-Hiraethog (Table 2). Maximum heights were 23 m, in oak and beech, with minima of 3.0–3.5 m,

TABLE 2

Estimated heights above ground of Buzzard nests in trees

Height (m)	Snowdonia	Migneint-Hiraethog	Both Areas	
3–5	6	7	13	6.6%
6–8	16	19	35	17.6%
9–11	27	43	70	35.2%
12–14	16	20	36	18.1%
15–17	17	11	28	14.1%
18–20	5	10	15	7.5%
21–24	1	1	1	1.0%
	88	111	199	
Means (m):	12.2	11.9	12.1	

in oak, birch and rowan. Many nests were placed in small trees overhanging steep slopes or streams.

The occurrence of alternative nests in a Buzzard territory is well documented (Dare 1961, for example). In this study, most pairs possessed two or three old nests and a few had up to five possible sites. These were clustered usually within a 250 m radius though exceptionally some nests were 1.0–1.5 km apart in the mountains. Nest size and duration of useful life varied greatly depending upon age, tree or rock site characteristics, and whether it was built entirely by Buzzards or was an adopted nest of Carrion Crow *Corvus corone*. Very small nests in hedgerows tended to be used once only and then disintegrated after one or two years. Large and sheltered structures lasted at least eight to ten years and could be refurbished and enlarged at intervals for use, or be used successfully for up to six consecutive years. By contrast, another equally successful pair changed its nest annually for ten years.

Some Buzzards shared nest cliffs with Ravens *C. corax* and (or) Peregrines *Falco peregrinus*. In three localities, all three species bred successfully within a 400 m sector for several years. Four Buzzard pairs took over old Raven nests, on crags in Snowdonia (2) and in trees in Migneint-Hiraethog (2). Conversely, Ravens usurped, or perhaps reclaimed, one tree nest and forced the Buzzards to move 1.7 km to a new site. Kestrels *F. tinnunculus* took over single old nests of Buzzards on crag and quarry faces.

Nest building or repairs began in mid-winter; the earliest dates for observed structural rebuilding were 10 January (1981, with snow on the ground) and 13 January (1980). Very often, pairs would add sticks or green foliage (sprays of ivy, pine or spruce typically) to several potential nests during late winter and early spring. By late March or early April, most territories contained a fully built and part-lined nest.

Breeding Season Chronology

The Buzzards produced clutches of one to three eggs, mean 2.23, with no repeats in the event of loss during incubation. The estimated patterns of laying, hatching and fledging during 1977–82 are shown by five-day periods in Figure 1. Data for Snowdonia and Migneint-Hiraethog have been pooled because preliminary comparisons indicated no significant regional differences. For most pairs the breeding season lasted from mid-April into early July, with laying, hatching and fledging each being concentrated into 15-day periods – respectively, mid-April, late May and early July. Small annual and altitudinal variations, of up to about one week, in mean laying dates were suspected, especially after the severe winters and springs of 1978/79 and 1981/82, but sample sizes were too small for confirmation.

The median first-egg date for 40 clutches was 18 April, the peak starting period being 15–20 April (Fig. 1). Best estimates of extreme dates for this sample were ca. 1 April and 26 April. However, back calculations from fledging dates for two other nests indicated exceptionally early and late dates in Snowdonia in 1980 of around 27 March and 8 May. The former date was deduced from observation of a nearly fully-feathered chick on 6 June, in a nest at 275 m altitude, the latter from recorded fledging on 27 July. Variations between pairs in laying dates in any season may reflect differences in the food resources of territories, and hence the time needed by individual female Buzzards to acquire the energy reserves for egg production. For inexperienced pairs, the demands of nest repairs or new nest construction might also have affected their breeding dates.

The incubation periods of first-eggs were determined in three clutches as: 34–35, 35–36 and 35–36 days, giving a mean of 35 days. Hatching dates were spread over more than one month, from 3 May (chick seen) until 10 June, with a median date of 23 May (n = 61). The peak hatching period was 20–25 May. For the above two exceptional 1980 broods, extreme hatching dates of around 30 April and 11 June are indicated. Judged by hatching dates, some pairs bred at virtually the same date each year, though others were variable. One quarry-nesting pair was observed to hatch its single egg clutches on

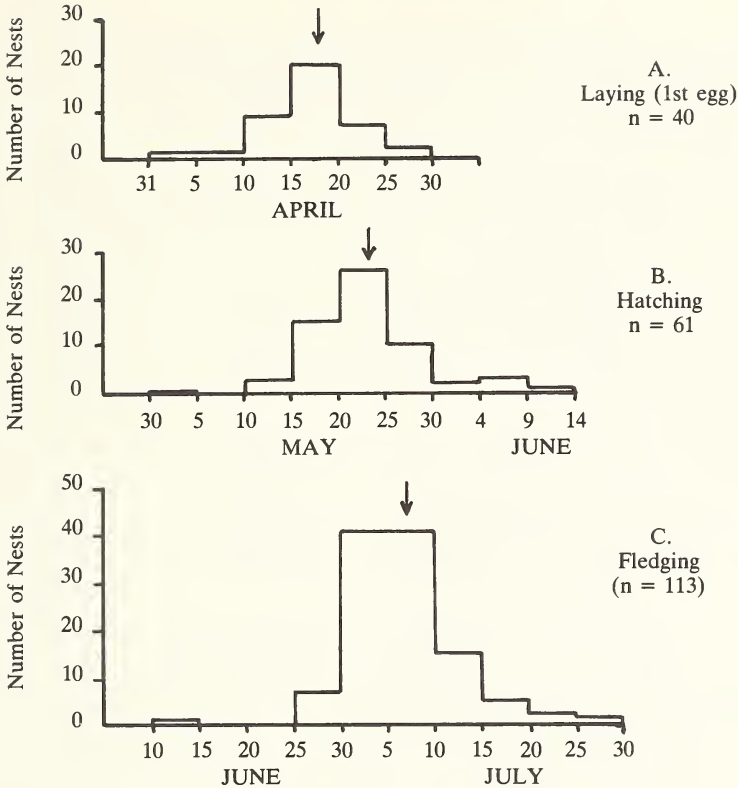

FIGURE 1
Seasonal distribution of dates for (A) egg-laying, (B) hatching and (C) fledging of Buzzards breeding in Snowdonia and Migneint-Hiraethog, north Wales, during 1977–82. Arrows denote median dates.

18 May (1979), 17 May (1980) and 17 May (1982).

Fledging dates were difficult to determine precisely because of the risk of youngsters being frightened into premature departures. Most left the nest during 1–10 July, median date of 7 July and extremes of 27 June and 27 July (n = 113). In the exceptionally early nest noted above, the youngster fledged on or about 12 June. For six broods, the observed mean nestling period was 46 days (range: 43–49 days).

After fledging, the juvenile Buzzards stayed in the parental territories through the summer before dispersing. The latest dates on which families were noted as being still together were in early September.

The breeding season chronology of north Wales Buzzards was similar to that of Dartmoor birds (Dare 1961) and of those in mid-Wales (P. E. Davis, *in litt.*). On Dartmoor, where half of the clutches were started during 16–25 April, the breeding season was so timed that broods were being reared when prey (young rabbits, small mammals and birds) were both numerous and available. Brown (1976), reviewing all British information, concluded that the main laying period was about 10–25 April, with a spread in any one area of more than a month, and less variation than might be expected in relation to latitude, temperature and foliage cover.

TABLE 3

Preys found at Buzzard nests: frequencies of occurrence by habitats and territories

Habitat Type		No. Nest Visits	Mean Number of Prey Items found per 10 Nest Visits: Sheep (carrion)	Rabbit	Mammals small	Mammals other	Birds	Amphibia	Total Prey
Snowdonia:									
Hill farms – deciduous	(28)	82	2.2 (13)	1.8 (10)	1.4 (4)	–	6.0 (21)	0.6 (2)	12.0
Hill farms – coniferous	(6)	16	0.6 (1)	4.4 (3)	2.5 (2)	0.6 (1)	11.9 (6)	–	20.0
Sub-montane	(4)	15	3.3 (3)	0.7 (1)	0.7 (1)	–	1.3 (1)	–	6.0
Montane	(9)	12	9.2 (9)	–	–	–	4.0 (4)	0.8 (1)	14.0
	(47)	125							
Migneint-Hiraethog:									
Hill farms	(28)	74	0.4 (3)	1.1 (8)	1.1 (6)	0.2 (2)	5.1 (20)	–	7.9
Moorland marginal	(14)	71	0.4 (3)	3.9 (8)	3.4 (6)	0.3 (1)	5.4 (10)	0.1 (1)	13.5
Moorland open	(4)	20	4.5 (3)	2.5 (1)	5.0 (1)	1.5 (2)	11.0 (3)	0.5 (1)	25.0
	(46)	165							

Notes

The numbers of territories with nest prey records are given in parentheses for each habitat type and prey species.

Data refer to kills and remains at or below nests; pellets were not analyzed.

Small mammals were voles, shrews and moles; other mammals were weasels, grey squirrels and hedgehog (possibly carrion).

Prey at Nests

A systematic study of nestling diet was not attempted because interpretation based only on prey found at nests during casual inspections is usually biassed (Dare 1961, Tubbs 1974). Prey species differ in the quantity of traces left, and in the length of time that these remain at nests. Such records exaggerate the importance of large species (such as rabbits, large birds and sheep carrion) and under-emphasise the contributions from small mammals, birds and amphibians. This source of bias was confirmed at three study area nests by comparing the casual prey records with direct observations from hides of kills brought to these broods. During 54.5 hours observations, 27 small preys (such as voles, birds and frogs) and no large kills were recorded, whereas 20 of 40 kills noted at 31 inspections were large species (mainly rabbits, sheep carrion and corvids).

Prey remains were generally scarce at nests, only 370 kills being noted during 290 nest inspections made in 93 territories, or 1.2 kills per inspection. All such prey records are listed in Appendix I and analysed in Table 3 according to habitat groupings. Relative frequencies of prey occurrence can be compared for different habitats, whereas bias prevents accurate description of the diets. Buzzards brought a wide range of vertebrates for their broods, notably rabbits, sheep carrion, six species of small mammals and at least 13 species of small and large birds. Some habitat-related differences are apparent. Not surprisingly, sheep carrion occurred most frequently at nests in montane and open moorland territories, least regularly on well-tended hill farms or in conifer forests. Rabbits and small mammals were recorded mainly in conifers and moorland territories, least in montane and sub-montane areas. Birds were taken widely but most often in moorland and coniferous territories; the most prominent and widespread species were corvids and particularly fledglings of Magpie *Pica pica* (35 territories) and Carrion Crow (> 16 territories).

The vertebrate preys found at study area nests were broadly similar to those taken by other upland Buzzard populations in mid-Wales and on Dartmoor (Newton *et al.* 1982, Dare 1961). No single prey species appeared to be of outstanding significance in north Wales, although carrion sheep was clearly important for pairs in the higher and more desolate territories where other foods are likely to be less varied and plentiful than at lower altitudes. Rabbits were a major prey of Buzzards in many parts of Britain before the advent of myxomatosis in the 1950s; subsequently, surviving rabbits were shown to be crucial for Buzzards to breed successfully on Dartmoor (Dare 1957, 1961). In north Wales, rabbits were generally scarce, localized, and subject to recurring outbreaks of disease. Consequently, they were found at relatively few Buzzard nests.

Summary

Buzzards breeding in the mountains of Snowdonia nest both in trees and on rocks (natural crags and quarries) whereas those in an adjoining region of moors and more intensive farming nest almost exclusively in trees. The Buzzard's non-specific nest requirements enable it to breed in all habitats up to intermediate levels on the mountain slopes. The breeding season extends typically from mid-April until early July, with most pairs laying, hatching and fledging young within 15-day periods. There is, however, a wide spread of laying dates, spanning about a month, which may reflect mainly territorial differences in food resources. Buzzard broods were reared upon a varied diet of vertebrate preys, chiefly small mammals and birds, with sheep carrion and rabbits locally important.

Acknowledgements

I am particularly grateful to the following observers who found some nests for me and provided other information: B. Boothroyd, J. Driver, R. H. Fisher, G. Jones-Ellis, G. Parry, N. Pierce and M. Potts. I thank also P. E. Davis for his liaison with the mid-Wales study. Finally, but not least, many farmers allowed me unlimited access to their land.

APPENDIX I

Prey species found at Buzzard nests in the study area, 1975–84

	Snowdonia		Migneint-Hiraethog	
	kills	territories	kills	territories
Mammals				
Rabbit *Oryctolagus cuniculus*	23	14	40	17
Hedgehog *Erinaceus europaeus*	0	0	1	1
Mole *Talpa europaea*	13	2	24	9
Common Shrew *Sorex araneus*	3	1	7	6
Short-tailed Vole *Microtus agrestis*	9	4	6	2
Bank Vole *Clethrionomys glareolus*	2	2	0	0
Water Vole *Arvicola amphibius*	0	0	3	1
Vole sp. *Microtus/Clethrionomys*	1	1	2	2
Grey Squirrel *Sciurus carolinensis*	1	1	1	1
Weasel *Mustela nivalis*	0	0	5	3
Sheep *Ovis aries* (carrion)	35	26	15	9
Goat *Capra hircus* (carrion)	1	1	0	0
	88		105	
Birds				
Carrion Crow *Corvus corone*	11	7	9	7
Jackdaw *C. monedula*	0	0	1	1
Corvidae *Corvus* sp.	15	11	14	12
Magpie *Pica pica*	26	16	21	18
Jay *Garrulus glandarius*	3	2	1	1
Wood Pigeon *Columba palumbus*	1	1	2	2
Feral pigeon *C. livia*	3	2	5	5
Pheasant *Phasianus colchicus*	0	0	1	1
Herring Gull *Larus argentatus* *	0	0	2	2
Kestrel *Falco tinnunculus* *	1	1	0	0
Starling *Sturnus vulgaris* *	1	1	10	4
Blackbird *Turdus merula*	1	1	0	0
Meadow Pipit *Anthus pratensis* †	0	0	4	1
Passerine spp. (small)	12	9	21	7
Unidentified birds (medium/large)	1	1	4	4
	75		95	
Amphibia				
Common Frog *Rana temporaria*	2	2	2	2
Common Toad *Bufo bufo*	3	2	0	0
	5		2	
Grand Totals:	168		202	

Notes

Sheep carrion included adult and lamb remains – bones (34 items) and wool only (16 records).

Goat carrion was from a kid – bones and wool (1 item).

Feral Pigeons may have included scavenged remains from Peregrine kills.

* immatures only.

† pulli taken from two nests.

Hedgehog may have been carrion from nearby road.

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PROGRESS IN THE STUDY OF THE YORKSHIRE LICHEN FLORA

M. R. D. SEAWARD

It is pleasing to report that the publication of maps showing the past and present status of lichen recording for Yorkshire in Seaward (1987) has had the desired effect of stimulating not only considerable field activity but also a re-evaluation of earlier records in the literature and of herbarium material, particularly those relating to the work of Walter Watson (1872–1960); the latter appraisal has been prompted by the recent accession of a considerable amount of Watson's material to the British Museum (Natural History) lichen herbarium, some of which relates to his paper on 'The Lichens of Yorkshire' (Watson 1946).

All this work is especially valuable at this time since three major projects are in progress: (1) *Lichen Flora of Britain and Ireland*, to be published in 1990, (2) the British Lichen Society's Distribution Maps Scheme, the second volume of its *Atlas* being in an advanced stage of preparation, and (3) a *Red Data Book* for endangered cryptogamic plants, for which comprehensive data on the distribution and status of rare species, some of which occur in Yorkshire, are essential for the lichen section.

As well as the individual efforts of local lichenologists, an informal group of Yorkshire lichenologists (often joined by enthusiasts from outside the county) meets at least once a year, and the British Lichen Society held a weekend field meeting based at Sedbergh in October 1988 led by Dr O. L. Gilbert. At local level, Mr A. Fryday, Dr O. L. Gilbert, Mr A. Henderson and Mr D. Smith have been particularly active in the Cleveland, Sheffield, Leeds and Kirkbymoorside areas respectively, with Dr M. R. D. Seaward concentrating on underworked areas, particularly in the east of the county. Additional records have been provided by workers outside the county, especially Mr P. M. Earland-Bennett and Dr C. J. B. Hitch, and Yorkshire records have been included in recent monographic treatments of lichen taxa both in Britain and abroad. I have also had the opportunity to make further studies in several herbaria, particularly that of the British Museum (Natural History); there is always the chance of coming across Yorkshire material collected by William Mudd (1830–1879), author of *A Manual of British Lichens*, since he distributed very large numbers of his specimens to many lichenologists both at home and abroad. Further records have been furnished from time to time by Dr B. J. Coppins, based on his examination of the herbarium at the Royal Botanic Garden, Edinburgh; he has also kindly acted as referee for the confirmation/determination of critical Yorkshire material.

Figures 1a and 1b, prepared in November 1988, show past and present recording of lichens in Yorkshire on a 10 km × 10 km grid square basis. Direct comparisons of these

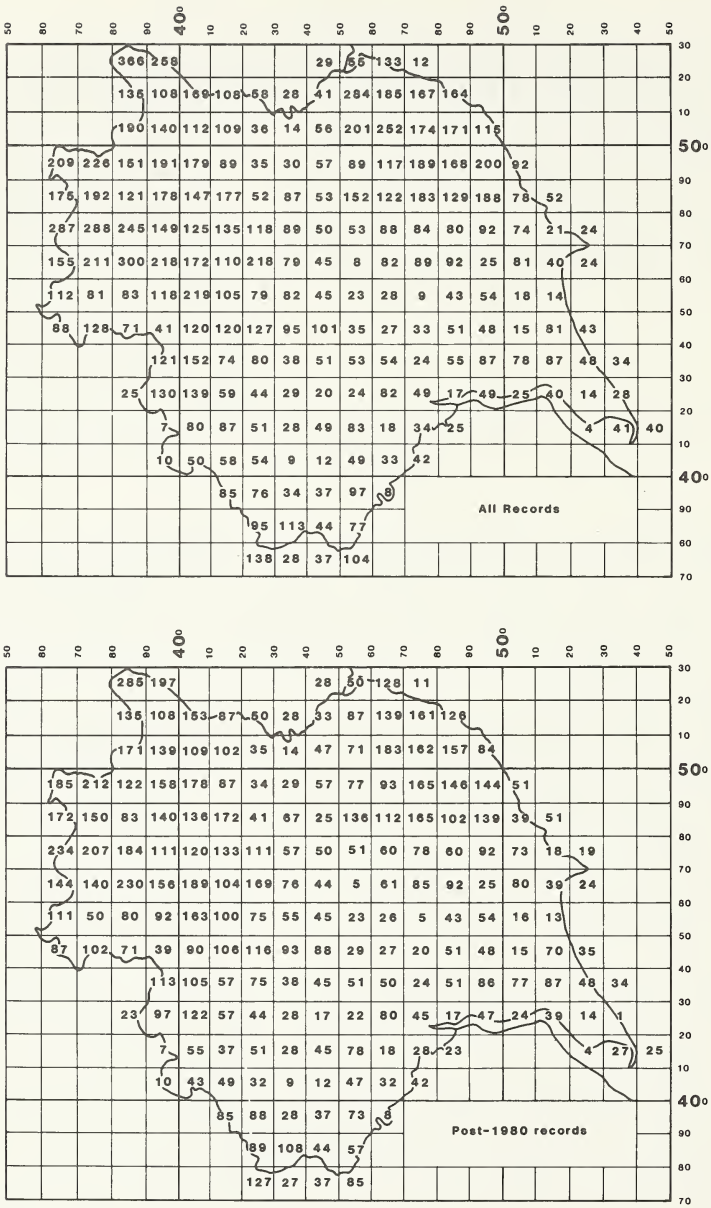

FIGURE 1
Number of lichen taxa recorded from each Yorkshire 10 km × 10 km grid square (November 1988): (a) all records, (b) post-1960 records only. (NB. Border squares may contain records pertaining to the neighbouring county.)

data can be made with Figures 6a and 6b in Seaward (1987), prepared in November 1986, to show the improvement in lichen recording: over the past two years there has been a 9 per cent increase in records, the average number of taxa per grid square for the post-1960 maps increasing from *c*.70 to *c*.77 (which are similar to national figures (*c*.76 in February 1987 – see Seaward 1988, figure 5).

A new lichen flora for the county is in active preparation, the first stage of which will be the publication of provisional maps for all taxa. By November 1988, the Yorkshire lichen flora could be summarized as follows: 770 taxa (747 species, 7 subspecies, 12 varieties and 4 forms) have been recorded from the county over the past 300 years, of which 226 are based on old records, the great majority presumed extinct since they have not been seen for a century or more; of the 544 extant taxa, approximately 160 have been discovered during the past 32 years.

I am grateful to Mr S. Davidson for his help in the preparation of the maps.

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BOOK REVIEWS

How to Identify Mushrooms to Genus VI: Modern Genera by **D. L. Largent** and **T. J. Baroni.** Pp. 277. Mad River Press, Eureka, California. 1988. $22.95.

After a short introduction on how to use the book, the authors provide a key to the families they cover, including the Cantharellaceae, now thought to be more closely related to the club-fungi and Schizophyllaceae, certainly polyporoid-related; 14 other families are considered. Next follow keys to the genera within these families; generic descriptions form the major part of the book. The keys are clear and easy to use if only non-tropical taxa are considered, and under each generic entry references are given to selected keys to temperate taxa so that the interested can go to species level.

Part 2 contains descriptions for each genus, these being arranged in alphabetical order; macroscopic and microscopic characteristics are given, with some habitat data, and useful comments after each genus. This part ends with a synopsis of the families and genera, enabling the amateur to come to grips with the many taxonomic changes which have occurred over the last few years. The delimitation of genera is a personal thing and although some will disagree, the authors have tried to effect a compromise between opposing viewpoints.

Part 3 contains keys and charts emphasizing macroscopic features which although they will work for the commoner taxa, might raise problems with some collections. Nevertheless, the keen amateur will find the tables using stature types of fruiting bodies and spore-colour very welcome, although the generic identification key using stature would have been better placed next to the appropriate table. The authors have fused the information from these macroscopic features and produced a key which will no doubt be one of the most used by readers; it will appeal to the mushroom picker and to the teacher who wants at least to demonstrate the diversity of north temperate mushrooms.

Part 4 gives a comprehensive glossary of terms used in the book and will be a source of information to many. Part 5 is referred to in the introduction as an appendix: it offers several dichotomous keys to the genera in a particular habitat type or substrate, e.g. sand-dunes, *Sphagnum* bogs. In this reviewer's opinion, this part is a major contribution, not simply an appendix.

A useful feature of the book is the cross-reference to earlier parts of the series so that diagrams, photographs or other information can be obtained with ease. The authors hope that the student or reader is offered as much freedom of choice as possible. Although clearly printed, I found it difficult to find my way around all the useful keys because of the lack of sufficiently distinct cut-off points between separate blocks of information; perhaps the use of different fonts or the inclusion of a few diagrams would have helped. (However, there is nothing that a coloured marker cannot quickly put right.)

A worthy follower of the series which will encourage the amateur to look at microscopic features whilst still being able to fall back on field characters for confidence. This is a welcome addition to the series and complements and expands Part 4 which covered keys to families and genera (based on D. E. Stuntz's notes with editorial changes from D. L. Largent and R. Watling and the addition by the last author of family descriptions).

RW

Gasteromycetes: Morphological and Development Features with Keys to the Orders, Families and Genera by **O. K. Miller** and **H. Hope.** Pp. 157. Mad River Press, Eureka, California. 1988. £24.95.

A short introduction outlines the book's objectives and defines the subject, the parameters of which are explained in the next 26 pages with the help of clear, beautifully executed line-drawings and photomicrographs; two pages are set aside for chemical reagents and their formulation. This account of the general morphology allows the reader to tackle with confidence the major part of the book viz. an account of the orders and families of the Gasteromycetes, and within each family all or the major genera. A key is given to the orders to be dealt with and keys are found where necessary under each family heading. Any confusion is brushed aside by the accompanying illustrations. The format is the same for each order, viz. firstly a general account, secondarily a key to families and then a discussion of the genera within those families. It would have been useful had specific examples been provided for all the genera covered. It is good to see at long last the bringing together of the more important secotiaceous genera under one cover and although the astrogastraceous members were intentionally omitted, a reference is given to them and other unfamiliar genera related to members of the Agaricales.

The book ends with an excellent glossary of terms (11 pp.), bibliography (10 pp.) and a clearly set out index.

This is an excellent publication, invaluable not only to those working in the field but in addition to those with a casual interest in stomach fungi or a teaching commitment. The photomicrographs and most informative illustrations enhance the clear text; Cynthia Clem must be congratulated on her contribution to the publication. A commendable publication which brings together for the first time all the most recent work on this bizarre yet interesting group of fungi.

RW

Grasshoppers and Bush-Crickets by **Andrew Mahon**. Shire Publications, Aylesbury. Pp. 24, with 23 figures. 1988. £1.25.

Another title in the Shire Natural History series, a further example of the excellent value for money which we have come to expect from this source. 21 species of these large and highly interesting insects are succinctly described in terms of morphology, distinguishing features, metamorphoses, habits and ecology. A simplified key to 11 native grasshoppers is included, whilst identification of the bush-crickets is greatly assisted by colour photographs of most of the British species. This modestly priced book should enable anyone with a general interest in wildlife to gain a valuable insight into this fascinating group of insects.

PS

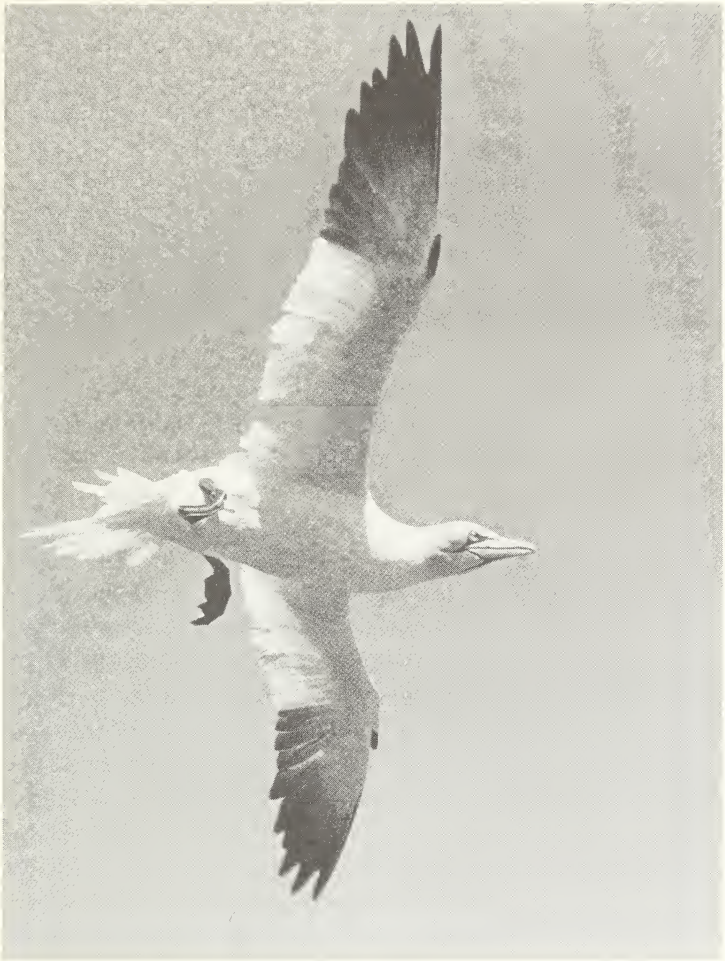

Photo: A. GILPIN

THE GANNET

The first recorded attempt by Gannets to breed on any of Britain's mainland cliffs occurred on the Yorkshire coast in 1937. In that year W. J. Clarke of Scarborough saw a nest containing one of their eggs on Bempton cliffs. That may not have been the first to be laid there, as there are many possible sites that cannot be seen from the cliff-top, and the 'climmers' who were still active then may have taken earlier eggs. At first the colony developed slowly and it was not until 1948 that two pairs succeeded in rearing young. However, thirty-five years later there were over five hundred pairs of Gannets at Bempton. Although compared with the thousands of birds at our island Gannetries that number is small, the presence of these magnificent birds has added to the uniqueness of what is probably England's finest seabird breeding colony.

BOOK REVIEWS

Birds in the Doncaster District by **R. J. Rhodes**. Pp. vi + 269. 16 colour plates, 9 monochrome plates and 14 figs. Doncaster and District Ornithological Society, Doncaster. 1988. £11.50 hardback, £6.50 softback, prices including postage from: Mr A. G. Mitchell, 79 Jossey Lane, Scawthorpe, Doncaster DN5 9DL.

Regional ornithological books have a well-established pattern: an introduction covering the history of bird-watching in the area, a discussion of local habitats with an emphasis on the good bird sites, and a systematic list of the species. This is no exception. It benefits from the attractive section of colour plates of some of the prime sites. The systematic list covers all records up to 1984, though a brief appendix adds some significant records from 1985 as well. The historical coverage is very thorough, and there is a commendable effort to try to give breeding population estimates, either for the whole area (with rarer species) or for particular sites; this is much more valuable, for present readers but more especially for readers in 20 or 200 years time, than vague comments like 'scarce', 'sparse', 'common' and 'abundant'. A very worthwhile summary of the avifauna of the 10 mile radius around the Doncaster Museum, and of interest therefore to students of birds in Lincolnshire and Nottinghamshire as well as S. Yorkshire.

DWY

The Pheasant by **R. A. Robertson**; **The Dipper** by **Stephanie J. Tyler** and **Stephen J. Ormerod**; **The Redshank** by **W. G. Hale**. All three 24 pp, Shire Publications, Princes Risborough. 1988. £1.25 each.

With these three booklets, nos 29, 31 and 33, Shire Publications continue their excellent series of mini-monographs. Each follows the now familiar format: an informative text, written by subject experts, good photographs, many in colour, averaging nearly one per page, useful drawings, and concise suggestions for further reading.

The strengths of this series are the excellent colour photographs and the first-hand involvement in their subjects of the authors. Thus, not surprisingly, Peter Robertson draws attention to the remarkable harem system of the Pheasant, and to the importance of sporting interests in managing it and its habitat; *The Dipper* book covers particularly dispersion, diet, and doesn't overlook the impact of 'acid rain'; while Professor Hale pays due attention to his favourite topic of subspecies and their origin. None of these particular interests is allowed to overbalance the text, however, and their assessment as mini-monographs stands as a fair judgement. I suspect that the booklets in this series are destined to become collectors items rather like (but *much* cheaper than) New Naturalists. If you haven't started your collection yet, you could usefully start with these three.

DWY

Biology of the Land Crabs edited by **W. W. Burggren** and **B. R. McMahon**. Pp. 479. Cambridge University Press. 1988. £40.

Land crabs are mainly tropical and sub-tropical in distribution and range in size from small fiddler crabs of muddy creeks (*Uca* spp) to the huge hermit crab, *Birgus latro*, the largest terrestrial arthropod at 3 kg body weight. Land crabs show many fascinating adaptations to life on land, evolved as most of them are from immediately comparable marine forms. A few land crabs are clearly evolved from fresh water crabs. The necessary adaptations in comparison with marine crabs largely form the subject of this book. None of the land crabs are completely terrestrial in that even the most terrestrial return to water to breed and have planktonic young. However, some spend their entire adult life away from water, while others may make only short excursions out of water. The authors point out that the term 'land crab' is doubly difficult to define since the degree of terrestrial activity varies considerably, and that members of several different crustacean

groups may be regarded as crabs. Nevertheless, a precise definition is avoided since a range of crabs is covered, principally some hermit crabs (Anomura) and true crabs of several families (Brachyura). The criterion used to decide which are terrestrial is to include all those that show some degree of activity in air, as distinct from mere survival.

Individual chapters deal with problems associated with respiration, desiccation, excretion, growth, locomotion and support, as well as taxonomy and ecology. This multi-author book attempts at, and succeeds admirably in, summarizing most of what is known about land crabs, and just as importantly, what is not known. It is a balanced account, generally well illustrated and excellently cross-referenced so that there is little difficulty in finding source material. Some degree of repetition between chapters is inevitable in books of this kind, but the authors and editors have succeeded in minimizing unnecessary duplication. Although the subject is rather specialized, workers in many other fields would find it well worth reading, and should make the effort to do so, despite the price.

HDJ

The Dragonflies of Europe by **R. R. Askew**. Pp. 222, with 502 line drawings, 114 maps and 29 colour plates. Harley Books. 1988. £49.95.

Dragonflies have become an increasingly popular field for study as, paradoxically, their numbers in Britain have declined as a result of habitat destruction. Splendid creatures, often brightly coloured, alert and active in warm sunshine, the larger ones are strong and agile on the wing. Wary of approach, they are a challenge to the photographer's camera or the entomologist's net. In recent years, holiday-makers seeking the sunshine have been travelling in growing numbers to almost all parts of Europe and naturalists and entomologists have followed this trend. A new world of flowers, birds and insects has opened up to them, followed by a desire to have literature enabling them to identify their discoveries.

The British student of dragonflies has been catered for by an adequate (more recently excellent) descriptive literature, and if a specimen has been secured there has been no difficulty in applying the proper name to it. Abroad the position was most unsatisfactory until the publication in 1986 of the first comprehensive work in English, Collins' *Field Guide to the Dragonflies of Britain,, Europe and North Africa* by J. d'Aguilar, J.-L. Dommanget and R. Préchac (reviewed 1987, *Naturalist* **112**: 7). Now comes this magnificent A4 size volume which covers the same field and complements and supplements the earlier work.

Brief introductory sections on the evolution of dragonflies, life history, adult life and behaviour, distribution and morphology are followed by the main body of the work dealing with the identification of the adults and, so far as is possible, the final instar larvae and the exuviae. Dr. Askew's main aim is to simplify the identification of the European dragonflies and most handsomely does he achieve this. Detailed keys are provided to families, genera and species, illustrated by black and white figures of critical features which are models of accuracy and clarity, drawn and reproduced to a most generous scale. The keys are followed by detailed descriptions of each European species and short accounts of biology, flight period and distribution. In passing we may note that the map of *Orthetrum coerulescens* is sufficiently detailed to indicate the approximate position of the isolated North Yorkshire colony. North African dragonflies are included in the keys but those that do not occur in Europe receive only very brief descriptive treatment.

To most of us the glory of the book is the set of 29 superb colour plates prepared from water-colour paintings by the author; every European dragonfly is depicted. These are remarkable both for accuracy of form and colour. It is interesting to read that accuracy of form was achieved by projecting onto a screen and tracing an enlarged image of each specimen used. Some specimens or photographs will be reliably named by comparison with the plates alone but many will inevitably require resort to the keys and descriptions; with this book the task should be straightforward.

The book has been almost a decade in preparation and all the author's family have helped in the work. All concerned with the making of this magnificent book (I have run out of superlatives), author, printers and publisher are to be heartily congratulated. The book will last into the twenty-second century; dare we hope that all the species depicted will last as long?

JHF

Keys to the British Mosquitoes (Culicidae) by **P. S. Cranston, C. D. Ramsdale, K. R. Snow** and **G. B. White.** Pp. 152, with 138 figures. Scientific Publication No. 48 of the Freshwater Biological Association, The Ferry House, Ambleside, Cumbria. £9.00. 1987.

Mosquitoes are such irritating beasts. They start off by making life easy for the general entomologist because, instead of secreting themselves away and requiring careful, time-consuming fieldcraft to locate them, they come to find you. As you sit by the side of a woodland track with a net in one hand and a pooter already seething with an assorted collection of beetles, bugs, flies and sawflies in the other, these delicate, long-legged beauties come and settle on you. The easiest thing in the world is to take a quick suck on the pooter and in they go. Unfortunately, the pattern of light and dark scales covering the head, body, legs, wings and proboscis, which makes these insects so attractive; this information is essential in their identification, since the pattern gets stripped off if a mosquito is introduced to the rough-house of an already-full pooter. Instead, you have to lay down either the net or the pooter and fumble for a tube to place over it, taking care not to startle the highly-strung little beast or it will be off. Oh, and if you dither for too long the little b . . . . r will bite you.

This scenario, of course, only applies to those species which bite man. The males of these species and both sexes of the ones which feed on birds or frogs need to be hunted down like any other insects. Freshwater biologists have long realized that the presence of adult insects at a site does not necessarily imply that a breeding population occurs there, and they take far more interest in the study and identification of the immature stages than do most terrestrial biologists (with due apologies to lepidopterists). This key allows the identification of most mosquitoes in the larval, pupal and adult stages (a few species-groups cannot be identified while immature, and members of the *Anopheles maculipennis* complex, represented in this country by two species, can only be identified by their eggs, unless you have access to a biochemical laboratory). There are separate keys to the adult females and males, using the pattern of scales on various parts of the body, and an extra key to males based on genitalia. The keys are followed by descriptions of each species in which the biology, behaviour and distribution are described. These accounts are often amazingly detailed and include the precise positions in which the eggs are laid. This publication continues the FBA tradition of well-produced, copiously illustrated keys which are a pleasure to use, backed up with information on the ecology and behaviour of the species concerned. This is in marked contrast to the recent trend in keys from the Royal Entomological Society of London, where limitations of space sometimes do scant justice to the quality of the work they contain.

WAE

Companion Animals in Society: Report of a Working Party of the Council for Science and Society edited by **E. J. Lawson Soulsby** and **James Serpell**. Pp. xv + 78. Oxford University Press. 1988. £6.50 paperback.

At one time regarded as quirky and eccentric, the study of urban wildlife, and particularly the ecology and behaviour of domestic pets and their feral descendants in urban and suburban habitats, has in recent years gained in momentum and respectability. Recent studies have contributed significantly to the medical, veterinary, social and environmental sciences.

Roughly half of all households in Britain keep one or more companion animals (pets), a practice which brings considerable pleasure to many people, but generates problems

for owners, the animals themselves, and society as a whole. It also unleashes a range of ecological repercussions, fascinating to the urban naturalist but as yet little studied.

This report, compiled by a working party of eminent experts in the fields of veterinary science, animal behaviour, animal welfare and social sciences, provides a clear analysis of the role of companion animals in Britain today. In addition to exploring the history of companion animals, giving information on their numbers, legal status, welfare, impact on the economy and value as social partners, the report raises moral, medical and conservation issues and forms an invaluable source book for urban ecologists, particularly those investigating the 'wildlife' of domestic animals.

CAH

The Hedgehog by **P. A. Morris**. Pp. 24, 16 colour plates and 6 text figures. Shire Publications, Princes Risborough. 1988. £1.25.

This is volume 32 in the Shire Natural History series, and follows the now familiar pattern – an authoritative text by an expert in the subject and excellent colour photographs, with some line diagrams and hints on further reading. Pat Morris and his students have contributed more new information on hedgehog ecology over the past twenty-five years than all the other hedgehog workers put together, so it is entirely fitting that he should write this account. As a pioneer of radio-tracking of mammals in this country, it is not surprising that he gives a fair coverage to hedgehog movements, including the route map of the male that travelled over 3 km in one night (so did the students tracking it, but they were being paid to do so!). However, this is a well-balanced introduction to the hedgehog, covering all aspects. If you've never seen an albino hedgehog, or one that's lost all of its spines, you'll have to buy this booklet for its photographs.

DWY

Orang-Utan by **Barbara Harrisson** Pp. xx + 217. Oxford University Press. 1987. £9.95. Paperback.

A reissue with an updated introduction of the 1962 hardback: a very readable account of the author's experiences with these fascinating primates, whose future remains insecure and uncertain with the continued exploitation of tropical forest in south east Asia.

Ecology by **Richard Spurgeon**. Pp. 48. Usborne Publishing, London. 1988. £5.50 hardback, £3.50 paperback.

This is an elementary ecology book, covering general ecological concepts and terminology, using examples from the different ecological areas of the world.

The comprehensive series of topics covered range from the basic concepts of environment and ecosystems, to more complex ideas such as 'natural relationships', 'population and conservation' and 'energy and the environment', combinations which make the book of use to primary and secondary students.

The book has two main strengths: firstly, its lavish illustrations not only make the book more attractive to readers, but also facilitate comprehension of the topics covered, with practical examples to help pupils assimilate theory with practical reality; secondly, besides its theoretical approach, it includes many suggestions for practical activities which can be developed either within or outside the classroom, emphasizing different environmental topics, including aspects of conservation and ecosystems management. This combination should enable teachers to prepare a wide range of fieldwork, providing pupils with first-hand experience of the ecological issues taught in the classroom.

Other helpful features of the book include a glossary explaining the main ecological terms used and an address list of organizations which students can contact if they are keen to find out more about the subject.

An excellent publication and at this modest price, good value for money.

WLF

The Cambridge Illustrated Dictionary of Natural History by **R. J. Lincoln** and **G. A. Boxshall**. Pp. 413. Cambridge University Press. 1987. £15.00.

I have found the *Cambridge Illustrated Dictionary of Natural History* a valuable addition to my bookshelf and am certain that it will appeal to anyone involved with or interested in natural history. It is very comprehensive, clearly written and appears to be free from mistakes. The text is complemented by about 700 line drawings by Roberta Smith which are perhaps a mixed blessing. Whereas many are very good, others appear to have been drawn directly from photographs with little thought having been given to the attitude of the subject. This is especially so with the jacana, bee eater and tinamou, the latter being tailless in the illustration; the ostrich looks emaciated and the badger strangely long-legged. I am also unhappy with the choice of some of the species illustrated: the sparrow does not resemble any of the 20 species in the genus *Passer* and I would have expected a cormorant from the Western Palaearctic to be depicted rather than the specimen chosen. These minor criticisms apart, the book should prove to be of great value to many readers

JEK

Guns and Goshawks by **Richard Brigham**. Pp. 138, illustrated with sketches by **Alan Langford**. Blandford. 1988. £10.95.

The author tells us that his interest in guns began at the age of six, when he had a popgun shooting corks with which he tormented the domestic animals on the farm where he lived. Later he was given an air rifle which he used to shoot sparrows and other small creatures, and on one occasion a pheasant roosting in a tree at night. He also engaged in fishing, and had no qualms about impaling live small fish on his hook in order to catch larger ones. He became interested in falconry, and took two fledgeling kestrels from the nest and kept them in a cage. When he attempted to train the female bird she flew away after a few trials but the male bird survived in captivity for seven years. Later in life he acquired a goshawk, already trained. By then he had become obsessed with shotguns; he even went out shooting geese on his wedding night. These reminiscences are intended to be humorous, and one can only hope that the brutality in them is exaggerated.

FHB

100 Families of Flowering Plants by **M. Hickey** and **C. J. King.** Pp. xvi + 620, with 198 full page illustrations, 79 figures and 9 tables. 2nd edition. Cambridge University Press. 1988. £65 hardback, £25 paperback.

The second edition of this book, the first of which was reviewed in the *Naturalist* **106**: 66, has been substantially overhauled. It now appears in a change of format to a larger page size with many illustrations redrawn and many more added, often with second representatives to enlarge the coverage of certain families. There has been considerable alteration to the lay-out of the text, extensive revision of the introduction, an increase in the number of tables, and the addition of a useful Table of Family Characters.

It would not be easy to suggest any improvement within the limits available in the information supplied about each family and for each species selected as its representative, whilst the clarity and detail provided by the copius illustrations admirably support the text. For the serious student of systematic botany and the professional botanist too this should prove a very useful source of information and reference. It is to be hoped that this book will have the success which its merits deserve, but the combination of high price and the fact that few academic institutions any longer teach systematic botany to this level will not be in its favour.

WAS

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Association between carabid beetle distribution and vegetation on the North York Moors — *Mark Fishpool and Michael B. Usher*

Three pollen diagrams from the eastern North York Moors — *M. A. Atherden*

A comparison of the age and palaeoecology of some sub-Shirdley Hill Sand peat deposits from Merseyside and south-west Lancashire — *J. B. Innes, M. J. Tooley and P. R. Tomlinson*

Published by the Yorkshire Naturalists' Union

Editor **M. R. D. Seaward**, MSc, PhD, DSc, FLS, The University, Bradford BD7 1DP

Photographic Plates

Readers of *The Naturalist* will have noticed that the number of photographic illustrations has increased in recent years. Good clear photographs, suitably captioned, to accompany articles or as independent features, such as the bird portraits by Arthur Gilpin in recent issues, are always welcome.

To encourage this development, a long-standing member of the YNU, who wishes to remain anonymous, has most generously offered to make a donation, the income from which would finance the publication of a plate or equivalent illustration in future issues whenever possible. The editor, on behalf of the YNU, wishes to record his deep appreciation of this imaginative gesture.

Notice to Contributors to 'The Naturalist'

Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Volumes of *The Naturalist* for the years 1886 to 1975 have been retrospectively numbered 11 to 100 to accord with numbering before and after this period (see YNU *Bulletin* no. 3, pp. 21–22, 1985); please cite these volume numbers in all references. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

Appointment of Membership Secretary

In order to ease the workload on the Administrative Officer (Mr Don Bramley), all matters **other than subscriptions** should now be addressed to:

Mr John A. Newbould, Rother Pharmacies Ltd, 72–78 York Road, ROTHERHAM S65 1PW.

Items which should be sent to the above include: all membership applications, changes of address, resignations and problems concerning non-receipt of any of the YNU's publications.

Subscriptions (unless covered by Banker's Order) should continue to be sent to Mr Bramley (see below) or to the Treasurer.

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ASSOCIATION BETWEEN CARABID BEETLE DISTRIBUTION AND VEGETATION ON THE NORTH YORK MOORS

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Introduction

The upland areas of the North York Moors have traditionally been maintained as a *Calluna vulgaris* dominated community for grazing by sheep and grouse. Without management, the *Calluna* plant undergoes an ageing process which can be separated into four stages: pioneer, building, mature and degenerate (Miller 1964; Gimingham 1972; Webb 1986). *Calluna* in the pioneer and building stages of development is more nutritious to grouse and sheep than older plants, and after fire it regenerates more rapidly, reducing the risk of erosion and producing a further crop sooner. Old stands are also a fire risk in dry seasons as the plants have a high proprotion of dry, woody tissue. Consequently the aim of moorland management is usually to maintain *Calluna* in the pioneer and building stages by burning every 12 to 15 years, well before the degenerate stage is reached (Gimingham 1972).

Management for sheep can involve burning large areas in any one year, whereas management for grouse involves burning many small areas each year, producing a mosaic of shorter and taller stands. Thus, much of a grouse moor consists of a virtual monoculture of *Calluna*, with patches of different ages, together with small areas dominated by *Pteridium aquilinum* and, in wetter areas, with a more diverse flora.

Previous work on upland carabids has included that of Butterfield and Coulson (1983), who classified the vegetation and carabid community composition of moors throughout the north of England, and Greenslade (1968), who studied faunal changes with altitude on a Scottish mountain. Gardner and Usher (1989) studied the carabid fauna of areas that had been burnt and cut, together with adjacent mature *Calluna* stands, on Danby Low Moor, North Yorkshire. Their aim was to determine the recolonization processes of areas recently subject to such management practices. Working on the same moorland area, the aim of the present study was to investigate the carabid species composition in patches of different vegetational types. The diversity of these communities could have implications for management, especially for the conservation of economically and conservationally important predators of carabid beetles.

Methods

Field Location

Most of Danby Low Moor, North Yorkshire (national grid reference NZ725105) is at an elevation of 260 m, and consists of managed *Calluna vulgaris* of different ages from recent burns with little regeneration to mature *Calluna*. Other species associated with *Calluna* stands include *Erica cinerea*, *Vaccinium myrtillus*, mosses and *Cladonia* lichens. Some areas are dominated by *Pteridium aquilinum* and wetter ground tends to support a more diverse flora including *Juncus* spp., *Carex* spp., *Nardus stricta*, *Erica tetralix* and *Sphagnum* spp. A species list is given in Table 1.

Sample Site Selection

For the study, sites of different vegetational composition were chosen, with a total of 25 sites being selected. Sample sites numbered 1 to 15 were situated on an area of moorland to the south west of the road linking Danby Beacon to Danby Lane. This area had a southwesterly aspect, sloping gently down into a valley. The sample sites were situated at approximately 10 to 15 m intervals along a transect running from the road, down into a freshwater flush. The principal features of the sites (with site numbers in brackets) were 14- to 16-year old *Calluna* with *Pteridium* (site 1), 14- to 16-year old *Calluna* with *Pteridium* and *Vaccinium* (2), *Pteridium* and *Vaccinium* (3), a burnt area

TABLE 1

Plant species recorded, during sampling of 50 1 m square quadrats, at 25 sites on Danby Low Moor. Maximum number of occurrences is 25

Species	Number of occurrences
Calluna vulgaris (L.) Hull	23
Campylopus introflexus Brid.	7
C. paradoxus Wils.	1
Carex binervis Sm.	4
C. nigra (L.) Reichard	1
C. pilulifera L.	1
Cephaloziella sp.	1
Cladonia spp.	8
Deschampsia flexuosa (L.) Trin.	1
Dicranum scoparium Hedw.	9
Erica cinerea L.	5
E. tetralix L.	9
Eriophorum angustifolium Honckeny	9
E. vaginatum L.	1
Festuca ovina L.	1
Hypnum jutlandicum Holman and Warncke	3
Juncus bulbosus agg. L.	1
J. conglomeratus L.	2
J. effusus L.	1
J. squarrosus L.	8
Leucobryum glaucum Schp.	8
Nardus stricta L.	9
Polytrichum commune L.	1
Potentilla erecta (L.) Rauschel	1
Pteridium aquilinum (L.) Kuhn	3
Rumex acetosella L.	1
Sphagnum spp.	5
Vaccinium myrtillus L.	3

with little regeneration of *Calluna* (4), *Calluna* aged 3 to 4 years (5), a small vegetated area in a burn with *Juncus* spp. (6), burnt areas with little regeneration but a number of moss species (7 and 8), a freshwater flush with relatively high plant diversity and with *Eriophorum angustifolium* abundant (9 to 14), and the margin of the flush adjacent to a *Calluna* stand (15). Sites numbered 16 to 25 were situated to the northeast of the road, on a relatively flat plateau. They consisted of mature *Calluna* 17 to 19 years old (16 and 17), building phase *Calluna* about 8 years old (18 and 19), building phase *Calluna* 4 to 6 years old (20 and 21), recently cut *Calluna* (22 and 23) and recently burnt *Calluna* (24 and 25).

Determination of Vegetation Composition

The vegetational composition was assessed quantitatively; at each site, two 1 m × 1 m quadrats, each composed of twenty-five 20 cm × 20 cm subquadrats, were recorded and the frequency of occurrence of each species in the 50 subquadrats was enumerated. The data in Table 1 gives an indication of the frequency of occurrence of the plant species at the sample sites; Fishpool (1988) gives full data on the frequency of plants at each site. The maximum *Calluna* age was estimated at each site by counting the annual rings in stems of greatest diameter.

TABLE 2

TWINSPAN output for the plant data analysis using 14 abundant species and *Calluna* split into groups as described in the text. × indicates presence, – absence. The species groups are indicated by Roman letters, the site groups by Roman numbers

Species, pseudospecies and species groups		Sites and site groups																								
		18	19	25	20	21	16	17	24	4	5	6	7	8	15	9	10	11	12	13	14	22	23	1	2	3
					IV										III							II			I	
B	*Calluna* 5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	×	–	–	–
A	*Pteridium aquilinum*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	×	×
	Vaccinium myrtillus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	×	×
	Erica cinerea	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	×	–	–	×	×	×
	Calluna 1	–	–	–	–	–	×	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	×	–
C	*Dicranum scoparium*	×	–	×	×	–	×	×	×	–	–	–	–	–	–	–	–	×	×	–	–	×	–	–	–	–
D	*Calluna* 4	–	–	–	×	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Cladonia spp.	×	×	–	×	×	×	×	–	–	–	×	×	–	–	–	–	–	–	–	–	–	–	–	–	–
	Calluna 6	–	–	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Calluna 3	×	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Campylopus introflexus	×	×	×	–	–	–	–	–	–	×	×	×	×	–	–	–	–	–	–	–	–	–	–	–	–
	Hypnum jutlandicum	–	–	–	–	–	–	×	–	–	–	–	×	–	–	×	–	–	–	–	–	–	–	–	–	–
E	*Calluna* 2	–	–	–	–	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–
	Eriophorum angustifolium	–	–	–	–	–	–	–	–	–	–	×	×	–	×	×	×	×	×	×	×	–	–	–	–	–
	Leucobryum glaucum	–	–	–	–	–	–	–	–	–	–	–	×	×	×	×	×	×	×	×	–	–	–	–	–	–
	Nardus stricta	–	–	–	–	–	–	–	–	–	–	×	–	×	×	×	×	×	×	×	×	–	–	–	–	–
	Juncus squarrosus	–	–	–	–	–	–	–	–	–	–	–	–	×	×	×	×	×	×	×	×	–	–	–	–	–
	Erica tetralix	–	–	–	–	–	–	–	–	–	–	×	–	×	×	×	×	×	×	×	×	–	–	–	–	–
	Sphagnum spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	×	×	×	×	–	–	–	–	–
	Carex binervis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	×	×	×	–	–	–	–	–	–	–

Pitfall trapping

At each sample site 2 plastic beakers, 75 mm in diameter, were inserted approximately 2 m apart, with the rim level with the substrate surface. The beakers were filled to one tenth of their depth with 25 per cent ethylene glycol (blue antifreeze).

Trapping began on 13 July 1987 and took place continuously until 27 September 1987. Traps were emptied at approximately seven-day intervals, when the ethylene glycol was renewed. Carabids were sorted in the laboratory and identified to species level using Lindroth (1974) and Joy (1976).

Results

Vegetation classification

Two-way Indicator Species Analysis (TWINSPAN) (Hill, 1979) was used to analyse the data since it repeatedly divides the site data into two groups, depending on species composition. Consequently, various site groups of similar species composition are

TABLE 3

Numbers of carabids captured in pitfalls at 25 sites on Danby Low Moor and the number of site occurrences

Species	Total number taken	Site occurrences
Agonum ericeti Panzer	14	5
Amara apricaria (Paykull)	2	2
A. equestris Duftschnid	1	1
Bradycellus harpalinus Serville	1	1
B. ruficollis (Stephens)	122	18
Calathus erratus Sahlberg	52	10
C. melanocephalus (L.)	46	10
Carabus nemoralis Muller	5	2
C. nitens L.	16	8
C. problematicus Herbst	304	25
C. violaceus L.	38	9
Cymindis vaporariorum L.	1	1
Dyschirius sp. (? *D. globosus*)	2	1
Leistus rufescens (Fabricius)	9	5
Loricera pilicornis (Fabricius)	1	1
Miscodera arctica (Paykull)	6	3
Nebria brevicollis Fabricius	2	2
N. salina Fairmaire	323	18
Notiophilus aquaticus (L.)	19	8
N. biguttatus Fabricius	2	2
N. germinyi Fauvel	11	4
Olisthopus rotundatus (Paykull)	48	18
Patrobus assimilis Chaudoir	33	11
Pterostichus adstrictus Eschscholtz	27	7
P. diligens Sturm	24	8
P. madidus (Fabricius)	4	4
P. nigrita Paykull	14	6
Trechus obtusus Erichson	266	15
T. quadristriatus (Schrank)	25	12
T. secalis Paykull	3	3
Trichocellus cognatus (Gyllenhal)	13	7

formed, the final level of division (and therefore group size) being arbitrarily determined. TWINSPAN then associates groups of species, so that the result is an ordered two-way table, as shown in Table 2.

For analysis, *Calluna vulgaris* was subdivided into smaller groups ('pseudospecies') by age and structure. Delany (1953) showed that *Calluna* of different structures can produce different microclimates. In order to allow for this in the analysis, six *Calluna* groups were recognized, namely mature (over 15 years old) stands (*Calluna* 1), young (3 to 4 year-old) pioneer phase stands (*Calluna* 2), late building phase (8 to 10 years old) stands (*Calluna* 3), early building phase (4 to 8 years old) stands (*Calluna* 4), cut heather (*Calluna* 5), and recent burns (*Calluna* 6). The TWINSPAN analysis in Table 2 used the frequency occurrence data of the 14 most abundant species as well as the *Calluna* groups and pseudospecies.

Four site groups and five species groups were recognized. Site group I contained the three *Pteridium* dominated sites, two with mature *Calluna* to the south west of the road, and site group II contained the two cut *Calluna* sites. Site group III contained the burnt heather and the freshwater flush sites south-west of the road; this group could possibly have been further subdivided. Site group IV contained the *Calluna* dominated sites and the two burnt heather areas north-east of the road.

The species classification was less clear. Those of group A were largely confined to site group I, whilst species group B contained only cut *Calluna* and was confined to site group II. Group C and D species were more widespread in distribution though related to site group IV. Group E species were characteristic of site group III.

Carabid Classification

A total of 1434 carabid beetles, of 31 species in 17 genera, was captured. Table 3 gives the species totals and the number of sites of occurrence. Carabid abundance in pitfalls is not necessarily indicative of local carabid population density as the catch depends on both abundance and activity. Therefore TWINSPAN analyses were performed using presence/absence data. This, however, begs the question 'What is presence?' Carabid beetles are known to disperse into unfavourable habitats and hence catches of single individuals could occur in locations where the species does not breed. To overcome this problem TWINSPAN analysis was conducted on the data set (all species) using 1, 2, 3, 4 or 5 individuals captured as a threshold to indicate presence (less than this number indicating absence). Only the results for a threshold of one individual (i.e. of real presence/absence data) will be considered here (Table 4); the results of other analyses are given in Fishpool (1988).

Three site groups were formed. Site group I contained the sites around the freshwater flushes and site group III the sites either with a *Calluna* canopy or with cut *Calluna*. Sites in group II were largely on burnt moorland, although sites 8 and 9 were on wet ground adjacent to the flush and site 3 was bracken dominated.

The carabids separated into five groups, each having a characteristic association with the site groups. Five species (group W) showed wide distribution, with no obvious habitat preference. Species group A was largely confined to site group I and species group B to site group II. Species group C was found in site groups II and III, and species group D in site groups I and II.

Discussion

Three basic site groups were distinguished using the carabid beetle data. Site group I contained mainly freshwater flush sites. In the vegetation classification these sites formed part of plant site group III (combined with the burns). Carabid site group II formed the remainder of plant group III, whilst carabid site group III was divided between plant groups I, II and IV. Although some carabid species appear to be associated with particular vegetation types, TWINSPAN division produced different vegetation and carabid groups. Refseth (1980) found a basic correlation between carabid distribution and vegetation structure. The differences here in plant and carabid distribution may lie

TABLE 4 **TWINSPAN output for the carabid data, with one individual as the criterion for presence. × indicates presence, – absence. The species groups are indicated by Roman letters, the site groups by Roman numbers**

Species, and species groups		Sites and site groups																								
		III										II									I					
		2	1	18	19	20	17	21	22	23	16	4	7	24	25	5	6	3	8	9	12	10	11	13	15	14
B	*Miscodera arctica*	–	–	–	–	–	–	–	–	–	–	×	–	–	×	×	–	–	–	–	–	–	–	–	–	–
	Amara apricaria	–	–	–	–	–	–	–	–	–	–	×	–	–	×	–	–	–	–	–	–	–	–	–	–	–
	Amara equestris	–	–	–	–	–	–	–	–	–	–	–	×	–	–	–	–	–	–	–	–	–	–	–	–	
	Bradycellus harpalinus	–	–	–	–	–	–	–	–	–	–	–	×	–	–	–	–	–	–	–	–	–	–	–	–	–
	Cymindis vaporariorum	–	–	–	–	–	–	–	–	–	–	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Carabus nemoralis	–	–	–	–	–	–	–	–	–	–	×	–	–	–	–	–	×	–	–	–	–	–	–	–	–
	Loricera pilicornis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–	–	–	–	–	–	–	–
	Pterostichus adstrictus	–	–	–	×	–	–	–	–	–	–	×	×	×	×	–	–	–	×	×	–	–	–	–	–	–
	Calathus erratus	–	–	–	–	–	×	–	×	–	–	×	×	×	×	×	×	–	×	×	–	–	–	–	–	–
	Trechus secalis	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–	×	–	–	–	–	–	–
C	*Bradycellus ruficollis*	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–
	Notiophilus biguttatus	–	–	–	–	–	–	–	–	–	×	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Pterostichus madidus	–	–	–	–	–	–	–	–	×	×	–	–	×	–	×	–	–	–	–	–	–	–	–	–	–
	Trechus quadristriatus	–	×	×	×	–	×	×	–	×	–	×	×	×	×	×	×	–	–	–	–	–	–	–	–	–
	Trechus obtusus	×	–	×	×	×	×	×	×	×	×	×	–	×	×	–	×	×	×	–	–	–	–	–	–	–
	Calathus melanocephalus	×	–	×	–	×	×	×	×	×	×	×	–	–	×	–	–	–	–	–	–	–	–	–	–	–
	Notiophilus germinyi	–	–	–	–	–	–	×	×	–	–	–	–	–	×	–	–	–	–	×	–	–	–	–	–	–
	Trichocellus cognatus	–	–	×	–	×	–	×	×	–	×	–	–	×	×	–	–	–	–	–	–	–	–	–	–	–
W	*Carabus violaceus*	×	×	×	–	×	–	–	–	–	×	–	–	×	–	–	–	×	–	×	×	–	–	–	–	–
	Leistus rufescens	×	×	–	×	–	–	×	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Olisthopus rotundatus	–	–	×	×	×	×	×	×	×	×	×	×	×	×	–	×	–	×	×	×	–	×	–	×	–
	Carabus problematicus	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	Notiophilus aquaticus	–	–	–	–	–	–	×	×	×	–	–	×	–	×	–	–	–	–	–	×	×	–	–	×	–
D	*Nebria brevicollis*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–	–	–	–	–	–	–	–	×	–
	Nebria salina	–	–	–	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	Patrobus assimilis	–	–	–	–	–	–	–	–	–	–	×	×	–	–	–	×	×	×	×	×	×	×	×	×	–
A	*Dyschirius* sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–	–	–	–	–
	Pterostichus nigrita	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	×	–	–	–	×	–	×	–	×	×
	Agonum ericeti	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–	–	–	×	–	×	×	×	–
	Carabus nitens	–	–	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–	×	×	×	×	×	×
	Pterostichus diligens	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	–	–	×	×	×	×	×	×	×

in the fact that carabid distribution is determined partly by microclimatic conditions, and different vegetation types may have a similar microclimate.

Carabid site group I contained six sites whose vegetation included *Erica tetralix*, *Juncus squarrosus*, *Eriophorum angustifolium* and *Sphagnum* spp., with *Calluna vulgaris* only occurring as small, irregularly spaced plants. Four carabids (group A, except *Dyschirius* sp.) were particularly characteristic of this habitat. Characteristic species were *Agonum ericeti* and *Carabus nitens*, although *Pterostichus nigrita* and *Pterostichus diligens* also showed an affinity for the wetter areas. Lindroth (1974) associated *P. nigrita* and *P. diligens* with wet areas and *A. ericeti* with peat bogs. Butterfield and Coulson (1983) found *P. nigrita* and *P. diligens* to be characteristic of blanket bogs, but they associated *A. ericeti* with lowland oligotrophic mires, although they did record it at Job Cross, a boggy site near Danby Low Moor. Lindroth (1974) considered *C. nitens* to be a species of dry and wet open country with heather; on Danby Low Moor it was collected largely in the wet areas, but did occur elsewhere.

The group D species *Nebria salina* and *Patrobus assimilis* were found in the wet areas, but also occurred widely in a variety of open habitats, being largely absent from sites with a dense *Calluna* canopy. Perhaps their occurrence at the wet sites was related more to the relative openness of the habitat than to its wetness.

The truly widespread species *Olisthopus rotundatus* and *Carabus problematicus* were found as part of the freshwater flush community. Lindroth (1974) considered *O. rotundatus* to be a species of dry open ground (often under *Calluna*) and *Carabus problematicus* to be a widespread heathland species. Houston (1981) found adult *C. problematicus* on blanket bogs, but rarely encountered larvae. It is a large species, capable of moving considerable distances and may occur on the blanket bog either during dispersion or to feed.

Species particularly characteristic of the burnt areas (species group B) were *Pterostichus adstrictus* and *Calathus erratus*. Lindroth (1974) described *C. erratus* as a species of dry ground with sparse vegetation, which was characteristic of burned heath, although Luff, Eyre and Rushton (1988) associated this species with sand-dunes and wetter upland sites. According to Lindroth (1974) *P. adstrictus* is usually a species of open, usually mountainous ground. Holliday (1984) and Richardson and Holliday (1982) found *P. adstrictus* more abundant in burned spruce forest than undamaged woodland and attributed this to the abundance of rotting logs for breeding in the former. No burnt logs were available on Danby Low Moor, although the species may have been attracted to the charred remains of other species. Alternatively, another feature of burned ground may appeal to this species which has previously been associated with burnt areas on Danby Low Moor (Gardner and Usher 1989).

Other species on the burnt areas included generalists (group W), *Patrobus assimilis* and *Nebria salina* (group D), and also some *Calluna* associated species (group C), e.g. *Bradycellus ruficollis* and *Trichocellus cognatus*. Lindroth (1974) associated the *Trechus* spp. with open country, but associated the remaining species with vegetation cover. Working on Danby Low Moor, Gardner and Usher (1989) found *T. obtusus*, *B. ruficollis*, *C. problematicus*, *O. rotundatus*, *T. cognatus*, *M. arctica*, *N. salina* and *C. melanocephalus* to be abundant on burnt areas.

The burnt moorland and pioneer *Calluna* stands could represent an inhospitable habitat for carabids. Burnt moorland has both a higher summer temperature than *Calluna* clad heath, which may favour some species, and a lower winter minimum temperature. In addition, burns are more susceptible to freezing (Fullen 1986). *Calluna* reduces windspeed, and the higher windspeed on open ground, combined with high insolation and high temperature, could result in serious desiccation as described for pioneer *Calluna* stands (Delany 1953; Gimingham 1972). Food supply may be reduced after burning. Brown (1986) found microarthropod densities reduced by two to four times on moorland one year after burning, compared with a mature *Calluna* stand. However, Gardner and Usher (1989) and Usher and Smart (1988) found arthropods to be active on burnt areas.

There are apparently two anomalous sites, vegetationally, in group II. Site 6 was a wet 'island', with dense vegetation, in a burnt area. The carabid composition was, however, more characteristic of a burnt area than of dense vegetation. As the site was small it may have had no breeding populations of wet habitat species, and the species associated with the burnt areas may have occurred there as dispersing individuals. Site 3 was *Pteridium* dominated and its fauna was perhaps partly influenced by the adjacent burnt area.

Carabid site group III contained the remaining sites, dominated by *Calluna vulgaris*. Most of the species in this group were also associated with the burnt areas. Interestingly, there was little difference in the faunal composition, in terms of species, between the various ages or structure groups of *Calluna*. The sites studied were in mid and late building phase and mature phase, and Delany (1953) and Gimingham (1972) point out that the microclimates are rather similar, being quite equitable. Given that many of the species of these areas also occurred on the burnt areas, the microclimatic difference between the building and mature *Calluna* could be expected to be insignificant in affecting distribution.

Thus, using a criterion of presence of at least one individual captured, three site groups could be recognized. Further analyses (Fishpool, 1988) have, however, shown that increasing the criterion to four individuals produces a different result, with a single site division partitioning sites on opposite sides of the road. It is difficult to perceive why this division arose. However, it may be suggested that, at this level of abundance, species were only recorded as present at the most favourable sites, which were related to factors other than vegetation composition. Sites to the north east of the road were generally dryer than to the south west; the road runs close to, although not along, a geological boundary, and possibly the soil types in the two areas differ. The sites also differed in aspect. Delany (1956) emphasized the importance of studying factors other than vegetation composition in determining community structure.

Butterfield and Coulson (1983), using carabid data from 42 sites on peat in northern England, identified five distinct peat communities. Gardner and Usher (1988) found seven out of ten of the characteristic species of peat community-I on Danby Low Moor. This community was described by Butterfield and Coulson as being associated with 'dry heath-like moorland between 200 m and 450 m where the peat depth is less than 150 mm'; this description is applicable to Danby Low Moor. However, addition of the freshwater flush sites produces a carabid community with similarity to peat community-III, described as occurring where dry heath and deep wet peat are adjacent.

Clearly the freshwater flushes have a carabid community composition distinct from that of other parts of the heathland mosaic, an important finding of the study. Gardner and Usher (1989) suggested that certain predators may prefer to feed on burnt areas than on heather clad heath as food items may be more conspicuous. The extra diversity of prey items provided by a freshwater flush may also be important for predators of carabids. The diet of the commercially important red grouse (*Lagopus lagopus scoticus*) has been studied in some detail. Although *Calluna* forms the greatest part of the diet in all seasons (Lovat 1911), other plants and invertebrates may be important. Wilson and Leslie (1911) indicated that adult grouse took 'black gnats' and Butterfield and Coulson (1975) recorded that insects formed 8 per cent of the items in grouse droppings on a high altitude blanket bog. Slow moving Tipulidae were particularly numerous, but unidentified beetle remains were also recovered. Insects may be an important protein source, especially for young grouse (Grimshaw, 1911; Hudson 1986). Hudson showed experimentally that arthropods were required for chick development. Observational data indicated that broods preferred to feed in bog flushes and damp areas rather than on burnt moorland or in young *Calluna* stands.

A bird of conservation interest on the North York Moors is the golden plover (*Pluvialis apricaria*). Ratcliffe (1976) recorded that these birds ate a wide variety of invertebrates, including beetles. Much of the adult feeding was on improved grassland and in freshwater flushes, whereas chicks were restricted to the moorland for food.

The moorland wetlands are of considerable importance and require conservation. They form an aesthetically pleasing addition to the moorland vegetational mosaic, have unique associations of carabid beetles, and are important feeding grounds for both economically and conservationally important bird species. The moorland environment is most diverse when there is a mosaic of different vegetation types, each with its suite of associated arthropod species. Although it could appear from a conservation viewpoint that this patchwork of habitats is optimal, little is known of the patch dynamics of the organisms, either arthropods or vertebrates, that are associated with particular structural features of this mosaic.

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BOTANICAL REPORT FOR 1987

FLOWERING PLANTS AND FERNS

The thanks of the Recorders go to all members who have contributed to these reports. Names are given the first time they appear in each vice-county report and thereafter initials are used.

The figures indicate 10 km grid squares. *New vice-county record.

East Yorkshire (VC 61) (F. E. Crackles)

Records are included only for species occurring in ten 10 km squares or fewer.

Dryopteris affinis (Lowe) Fraser-Jenkins Oakwood, Burton Carr 54/16; E. Chicken. Det. C. Jermy.

Polypodium vulgare agg. Hornsea 54/14; D. R. Grant.

Hypericum maculatum Crantz x *H. perforatum* L. = *H. destangsii* Lamotte Disused railway station near Harswell 44/84; F. E. Crackles. A plant with some *H. maculatum* genes and thought to be a backcross to *H. perforatum* on the same disused railway line at Foggathorpe 44/74; F.E.C.

Cerastium diffusum Pers. Disused railway near Eppleworth 54/03, 1983; S.M. Arnold.

Stellaria pallida (Dumort.) Piré Near Brigham 54/05; E.C. The only extant vice-county record.

Sagina apetala Ard. subsp. *apetala* (*S. ciliata* Fries) Disused railway near Harswell 44/83; F.E.C.

Corrigiola litoralis L. Disused railway near Harswell 44/84; Mrs Whittaker. Det. A. Fitter.

Salsola kali L. Bridlington 54/16, 1986; M. Simms. Seaside, Hornsea 54/24; D.R.G.

Vicia tetrasperma (L.) Schreb. Disused railway, Foggathorpe 44/73; YNU Bot. Sec. Excn. Near Owsthorpe 44/83; E. H. Wear.

Aphanes microcarpa (Boiss. & Reut.) Rothm. Near Brigham 54/05; E.C.

Sedum reflexum L. Disused railway station, Harswell 44/84; F.E.C.

Apium inundatum (L.) Reichb. f. Howden pond 44/73; B. Greenacre.

Oenanthe crocata L. Foreshore, North Ferriby 44/92; Mrs T. Bannister.

Polygonum arenastrum Bor. Waste place, Wilmington, Hull 54/13; F.E.C.

Lysimachia nemorum L. Settrington 44/87; N. Wise.
Myosotis sylvatica Hoffm. Skillings Wood 54/16; E.C.
Veronica polita Fr. Cornfield, Holme upon Spalding Moor 44/84; E.H.W.
Melissa officinalis L. By cycle path, Wilmington, Hull 54/13; F.E.C.
Galium odoratum (L.) Scop. Settrington 4/87; N.W.
Lactuca virosa L. Near Holme upon Spalding Moor and North Cave 44/83; E.H.W.
Potamogeton berchtoldii Fieb. Pond, Foggathorpe 44/73 and Hornsea Mere 54/14; D.R.G.
**Hyacinthoides hispanica* (Miller) Rothm. x *H. non-scripta* (L.) Chouard ex Rothm. Edge of wood, Burton Horse Carr 54/16; E.C.
Juncus acutiflorus Ehrh. ex Hoffm. x *J. articulatus* L. = *J.* x *surrejanus* Druce By stream at base of clay cliffs, Hunmanby Gap 54/17, 1957; F.E.C. Specimen seen by Prof Stace and believed to be this taxon.
Acorus calamus L. Lambwath stream, Benningholme 54/13; R. Middleton.
Schoenoplectus tabernaemontani (C.C. Gmel.) Palla North Ferriby 44/92; Mrs R. Suddaby Det. F.E.C. Dyke, Hornsea 54/24; D.R.G.
Glyceria fluitans (L.) R. Br. x *G. plicata* Fr. = *G.* x *pedicellata* Townsend Near Boynton 54/16; E.C. Det. Dr T. A. Cope.
G. declinata Breb. Near Owsthorpe 44/83; E.H.W.
Festuca pratensis Huds. x *Lolium perenne* L. = x *Festulolium loliaceum* (Huds.) P. Fourn. Near Acklam 44/76; Mrs D. Haythornthwaite.
Elymus farctus (Viv.) Run. ex Melderis (*Agropyron junceiforme* (A. and D. Love) A. and D. Love) Seaside, Hornsea 54/24; D.R.G.
Leymus arenarius (L.) Hochst. (*Elymus arenarius* L.) Seaside, Hornsea 54/24; D.R.G.

North-east Yorkshire (VC 62) (T. F. Medd)
Ophioglossum vulgatum L. Flaxton 44/66; YNU Bot. Sect. Excn.
Juniperus communis L. N. of Helmsley 44/68; C. King.
Corydalis claviculata (L.) DC. Fyling Hall 45/90 R. and M. Gulliver.
Thlaspi arvense L. Pickering 44/88; Mrs M. Outhwaite.
Myosoton aquaticum (L.) Moench Coxwold 44/57; YNU Bot. Sect. Excn.
Stellaria nemorum L. Aldby Park, Buttercrambe 44/75; T.F.M.
Tilia cordata Mill. Liverton 45/71; Hayburn Wyke 54/09; R. and M. G.
Geranium pyrenaicum Burm. f. Easington 44/56; Mrs P. Abbott.
Euonymus europaeus L. Hildenley Wood 44/77; R. and M. G.
Ulex gallii Planch. Helwath Bridge 44/99; A. J. Wallis.
Lythrum salicaria L. Coxwold 44/57; YNU Bot. Sect. Excn.
Pimpinella major (L.) Huds. East Lilling 44/66; D. R. Grant. Confirmation of pre-1930 record.
Silaum silaus (L.) Schinz and Thell. Oldstead and Byland Abbey 44/57; YNU Bot. Sect. Excn.
Andromeda polifolia L. Strensall Common 44/65; YNU Bot. Sect. Excn. Confirmation of 1964 record.
Orobanche minor Sm. Allerston Forest 44/88; Anne Greatrex.
Stachys palustris L. Oldstead 44/58; Mrs N. Sykes.
Antennaria dioica (L.) Gaertn. Danby 45/70; R. and M. G.
Juncus subnodulosus Schrank Coxwold 44/57; YNU Bot. Sect. Excn.
Dactylorhiza x *transiens* (Druce) Soó = *D. fuchsii* x *maculata* Dalby Forest 44/88; F. Horsman conf. R. H. Roberts. First record for 50 years.
**D.* x *kernerorum* (Soó) Soó = *D. fuchsii* x *incarnata* Helmsley 44/58; F. H. conf. J. J. Wood and D. M. T. Ettlinger; Troutsdale 44/98; F. H. conf. R. H. R.
D. x *kellerana* P. F. Hunt = *D. fuchsii* x *traunsteineri* Harwood Dale 44/99; F.H. conf. R.H.R.

X *Dactylogymnadenia cookei* (H.-Harrison f.) Soó = *D. fuchsii* x *Gymnadenia conopsea* Helmsley 44/58; F. H. conf. J. J. W. Dalby Forest 44/88; F.H. conf. R.H.R. First records since 1930.

X *D. legrandiana* (Camus) Soó = *D. maculata* x *G. conopsea* Troutsdale 44/98; F.H. conf. J.J.W.

Carex rostrata Stokes Great Broughton 45/70; R. and M.G.

Festuca arundinacea Schreb. East Lilling 44/66; D.R.G.

Hordelymus europaeus (L.) Harz Loftus 45/71; R. and M.G.

South-west Yorkshire (VC 63) (D. R. Grant)

Equisetum telmateia Ehrh. Gawthorpe, Ossett 44/22; C. Hartley.

Asplenium ruta-muraria L. Marsden 44/01; J. Lucas.

Ophioglossum vulgatum L. Pintail Hill, near Thurgoland 44/20; D. R. Grant.

Cardaria draba (L.) Desv. Near Wadworth 43/59; D.R.G.

Rorippa sylvestris (L.) Bess. Carleton, Skipton 34/95; T. Schofield.

Saponaria officinalis L. Warmfield 44/32; E. Thompson.

Illecebrum verticillatum L. Brodsworth Colliery 44/50; D. Bramley.

Myosoton aquaticum (L.) Moench Wadworth Carr 43/59; D.R.G.

Chenopodium bonus-henricus L. Eastfield, near Thurgoland 44/20; E.T.

Ulex gallii Planch. Whitewell Moor, Bolsterstone 43/29; E.T.

Daucus carota L. Wadworth Carr 43/59; D.R.G.

Populus tremula L. Near Strines, Sheffield 43/29; D.R.G.

Salix purpurea L. Gargrave 34/95; D.R.G. Near Elslack 34/94; T.S.

S. pentandra L. Woodsome, near Huddersfield 44/11; J.L.

Scrophularia umbrosa Dumort. Near Elslack 34/94; T.S. Carleton, Skipton 34/95; D.R.G.

Pedicularis sylvatica L. Catlow Gill, Carleton 34/94; D.R.G.

Ballota nigra L. Ferrybridge 44/42; D.R.G.

Asperula odorata L. Gorpley Clough, near Todmorden 34/92; T.S.

Galium mollugo L. Denaby Main 43/59; E.T.

Dipsacus fullonum L. Knottingley 44/23; D.R.G.

Butomus umbellatus L. Bank Newton 34/95; D.R.G.

Potamogeton polygonifolius Pourr. Bodkin Top, Shaw, near Oxenhope 44/03; T.S.

P. pectinatus L. Wentbridge 44/51; D.R.G.

P.berchtoldii Fieb. Wellbeck, Wakefield 44/32; D.R.G.

Juncus compressus Jacq. Broughton, Skipton 34/95; D.R.G.

Scirpus lacustris L. Near Elslack 34/94; T.S.

Festuca arundinacea Schreb. Gawthorpe, Ossett 44/22; D.R.G.

Poa compressa L. Kirk Smeaton 44/51; D.R.G.

Helictotrichon pubescens (Huds.) Pilger West Bretton 44/21; D.R.G.

Apera spica-venti (L.) Beauv. Kirk Smeaton 44/51; D.R.G.

Mid-west Yorkshire (VC 64) (L. Magee)

A large number of records were received from eight recorders and space limitations allow for only a small number to be selected. There are a number of new 10 km square records and there are many new records for several species with a very local distribution in VC 64.

During the past two years new vice-county records have been received but have not yet been published since they have not been verified by referees. The disclosure of the site of a plant thought to have been extinct for many years was unfortunate since the influx of visitors posed a threat to its survival.

Thelypteris oreopteris (Ehrh.) Slosson Twistleton Glen 34/77; D.R. Grant.

Pulsatilla vulgaris Mill. Locality and name of finder withheld.

Hypericum maculatum x *perforatum* = *H. destangsii* Lamotte Burton Leonard 44/36; D. Haythornthwaite. Ilkley 44/14; F.E. Crackles. Guiseley 44/14; J. E. Duncan. Embsay Station 44/05; J.E.D. Disused station, Threshfield 34/96; H. Lefèvre.
**Cerastium diffusum* Pers. Embsay Station 44/05; F.E.C.
Minuartia hybrida (Vill.) Schischk. Fountains Abbey 44/26; P. Abbott.
Astragalus glycyphyllos L. Thorpe Arch 44/44; D.R.G.
Myriophyllum spicatum L. River Wharfe. Many sites, Ilkley to Wetherby 44/24, 44/34; L. Magee.
Apium inundatum (L.) Reichb. f. Newby Moor 34/76; D.R.G.
Rumex obtusifolius x *sanguineus* = *R. dufftii* Hausskn. Bishop Wood 44/53; P.A.
Populus tremula L. Thistleton Glen 34/77; D.R.G.
Salix myrsinifolia Salisbury Grassington 34/96; H.L. Above Buckden 34/97; L.M.
Echium vulgare L. Embsay Station 44/05; J.E.D.
Legousia hybrida (L.) Delarb. Newthorpe 44/43; Leeds Naturalists.
Valerianella dentata (L.) Poll. Newthorpe 44/43; Leeds Naturalists.
Dipsacus fullonum L. Swinsty 44/15; L.M.
Senecio fluviatilis Wallr. Below Buckden 34/97; L.M.
Polygonatum odoratum (Mill.) Druce Whitestone Cliffs near river Wharfe 34/77; D.R.G.
Dactylorhiza fuchsii (Druce) Soó x *Gymnadenia conopsea* (L.) R.Br. Hellifield 34/85; F. Horsman.
D. traunsteineri (Sauter) Soó x *D. maculata* (L.) Soó ssp. *ericetorum* (E. F. Linton) Hunt and Summerhayes, Upper Wharfedale 34/96; F.H.
Scirpus sylvaticus L. Scotton Banks, Knaresborough 44/35; D.R.G.
Carex strigosa Huds. Hackfall Woods 44/27; D.R.G. Confirmation of an old record.
C. acuta L. River Wharfe, Harewood 44/34; L.M.
C. disticha Huds. Near Stainforth 34/87; D.R.G.
Aira caryophyllea L. Thorpe Arch 44/44; D.R.G.

North-west Yorkshire (VC 65) (T. F. Medd)
Rubus saxatilis L. Keld 35/80; R. and M. Gulliver.
Saxifraga hynoides L. Keld 35/80; R. and M.G.
Populus tremula L. Keld 35/80; R. and M.G.
Lysimachia vulgaris L. Downholme, Richmond 44/19; YNU Excn.
X *Dactylogymnadenia cookei* (H.-Harrison f.) Soó = *Dactylorhiza fuchsii* x *Gymnadenia conopsea* Dent 34/68; F. Horsman conf. J. J. Wood. First record for over 20 years.
**Carex muricata* L. ssp. *muricata* Downholme Park, Richmond 45/10; Deborah Millward det. R. W. David. Probably only the third extant site in England.
Festuca arundinacea Schreb. Downholme, Richmond 44/19; YNU Excn.

Casuals and Adventives (E. Chicken)
During 1987, 64 records have been received for 52 taxa from 13 contributors. This is fewer than in recent years; perhaps the weather discouraged field botany. With regard to shoddy usage, J. Martin reports that application to fields was delayed until the autumn, thus giving a very short growing time for aliens. An interesting observation from T. F. Medd is that Lovage (*Levisticum*) growing in York was cut down, but Deadly Nightshade growing nearby was left. Again horticultural 'throw-outs' predominate.
Unless otherwise stated, the contributor is assumed to be the determiner.
Lepidium heterophyllum Benth. (63) Merrion Centre, Leeds 44/23; L. Magee.
Alyssum saxatile L. (63) Huddersfield 44/11; Mrs J. Lucas.
Cardamine heptaphylla (Vill.) O. E. Schultz (62) Peasholm Glen, Scarborough 54/08; Mrs M. Robinson per T. F. Medd conf. J. M. Mullin.
Erodium botrys (Cav.) Bertol. (63) Field with shoddy, Wakefield 44/32; J. Martin.
Lathyrus sylvestris L. (63) Disused brickworks, Huddersfield 44/11; J.L.
Spiraea x *billardii* Hering (64) Lane near Beckwithshaw, Harrogate 44/25; Mrs F. Houseman det. Dr A. C. Leslie.

Prunus cerasifera Ehrh. var. *pissardii* (Carrière) L. H. Bailey (64) Knotford Hook, Otley, 44/24; F. H. det. A.C.L.

Crataegus crus-galli L. (62) Roadside lay-by near Byland 44/57 F.H. 1986, per T.F.M.

Epilobium nerterioides A. Cunn. (64) Dunsop Bridge, Bowland 34/64, Ingleton 34/77, and Blea Moor near Ribblehead 34/78; D. R. Grant.

Eryngium giganteum Bieb. (64) Ben Rhydding gravel pits 44/14; F.H. det. A.C.L.

Levisticum officinale Koch (62) Lord Mayor's Walk, York 44/65; T.F.M. (64) Clapham 34/76; F.H. 1986, per T.F.M.

Polygonum amplexicaule D. Don (63) Merrion Centre, Leeds 44/23; L.M.

Rumex obtusifolius L. subsp. *transiens* (Simonkai) Rech. f. (61) Roadside near Bishop Wilton 44/75; E. Chicken det. Dr J. R. Akeroyd.

Quercus cerris L. (63) Huddersfield 44/11; J.L.

Salix daphnoides Vill. (64) Old hedge, Otley 44/24; F.H. det. A.C.L.

Gilia capitata Dougl. (64) Disturbed ground, Otley 44/24; F.H. det. BM(NH) staff.

Atropa bella-donna L. (62) On steps, Lord Mayor's Walk, York 44/65; T.F.M.

Hyssopus officinalis L. (64) Roadside verge near Tanfield 44/27; Mrs M. Rushton 1986, per F.H.

Cicerbita macrophylla (Willd.) Wallr. (62) Near Helmsley Castle 44/68; C. King per T.F.M. (64) Scotton Banks, Knaresborough 44/35; D.R.G.

Calla palustris L. (65) Small pond, Sedbergh 34/69; C.E. Wild per Dr G. Halliday and T.F.M.

Puccinellia distans (L.) Parl. (64) Roadside at Hawk Moor, Aberford 44/43; F.H.

Bromus inermis Leyss. (64) Roadside, Copgrove 44/36; Mrs D. Haythornthwaite and Miss M. Sanderson.

Correction Entries in 1980, 1981 and 1986 for *Epilobium pedunculare* A. Cunn. should be *E. pedunculare* auct. = *E. nerterioides* A. Cunn.

BOOK REVIEW

The Man Who Planted Trees by **Jean Giono**. Pp. 52, with twenty wood engravings by **Michael McCarthy**. Peter Owen, London. 1989. £5.95.

In an Afterword to this story, written by Norma L. Goodrich on the basis of an interview with the author shortly before his death in 1971, she says that his motive in writing it was to make people love planting trees, and explains that it was first published in the magazine *Vogue* under the title *The man who planted hope and grew happiness*. The story begins in 1913 when the narrator, on a walking tour in a desolate part of Provence, comes upon a deserted village where the springs and streams have dried up. Further on he comes upon a shepherd living in an isolated stone house, who spends most of his time planting acorns on the surrounding hillsides, and who says he has been doing this for three years and hopes to go on for another thirty. The narrator returns at intervals, and finds an ever increasing and thriving forest. After the First World War the shepherd has turned to beekeeping, and is planting other species of trees as well as oaks. After the Second World War, the deserted village has been reoccupied and the springs and streams are flowing again. The man who planted trees dies peacefully in 1947. This simply written and well illustrated allegory hints at the way forests modify weather, conserve surface water, and create a landscape worth living in, but begs such questions as who owns the land, where did all the tree seed come from, and if the people made a desert before, what is to stop them doing it again? Its very simplicity will appeal to many, however, and may inspire some to plant trees.

FHB

THREE POLLEN DIAGRAMS FROM THE EASTERN NORTH YORK MOORS

M. A. ATHERDEN

Introduction

The North York Moors, with their large areas of upland blanket peat and numerous valley mires, have attracted the attention of students of vegetation history for many years. There are already about 30 published pollen diagrams from the region and it is one of the areas most intensively studied by palynologists in Britain. However, there are still gaps in the coverage of pollen diagrams, particularly on the more calcareous Tabular Hills in the south and in the eastern part of the region.

In an attempt to fill the latter gap, a series of sites has been studied over the past few years by students from Bradford University (Fig. 1). Three pollen diagrams are presented below, for one of which a set of five radiocarbon dates provides a time-scale. The three sites lie adjacent to the A171 Scarborough–Whitby road. They are within the area of Middle Jurassic rocks of the Ravenscar Group and all are underlain by shales and sandstones of the Scalby Formation.

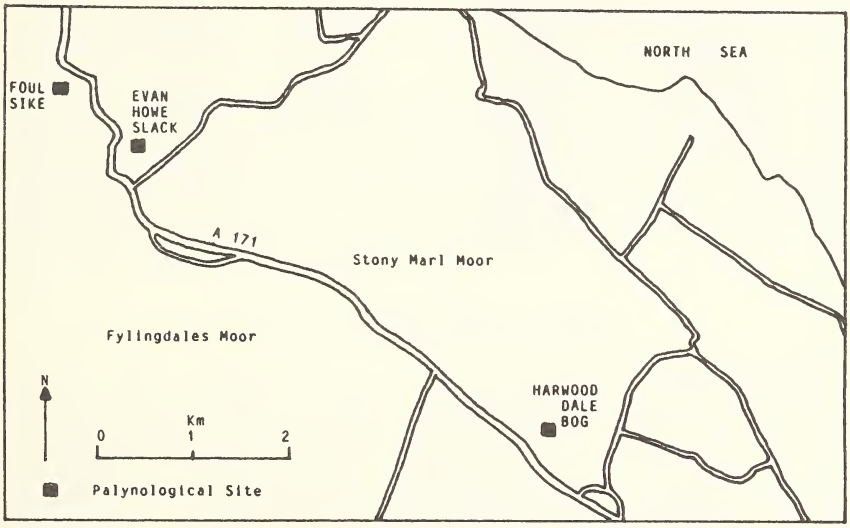


FIGURE 1
Location of the sites.

The Sites and their Stratigraphy

(i) Harwood Dale Bog

Harwood Dale Bog, NZ 967988, is an extensive area of peat, approximately 1 km north–south and up to 0.4 km east–west, situated on a plateau area at 200 m OD. It was described by Elgee in 1912 as 'saucer-shaped' and has been exploited as a source of fuel for many centuries. Today it is surrounded by Forestry Commission plantations. It was studied by Simon Smithson in 1981. In 1985 the author and Dr O. Rackham re-sampled the site and obtained five samples for radiocarbon dating, which were processed by the Low Level Measurements Laboratory at Harwell.

A site was chosen for sampling at the edge of the cut area, where the upper layers of peat were exposed in section. The top 2.35 metres was sampled directly from the exposed peat face. The lower peat was sampled with a Russian-type peat borer about one metre away from the peat face. The stratigraphy is shown on Fig 2. From the stratigraphy it appears that the bog was well wooded during the early part of its history. Later the woodland died out and the bog surface was colonised by cotton-grass, but the presence of occasional twigs throughout the profile suggests that the area surrounding the bog remained at least partly wooded.

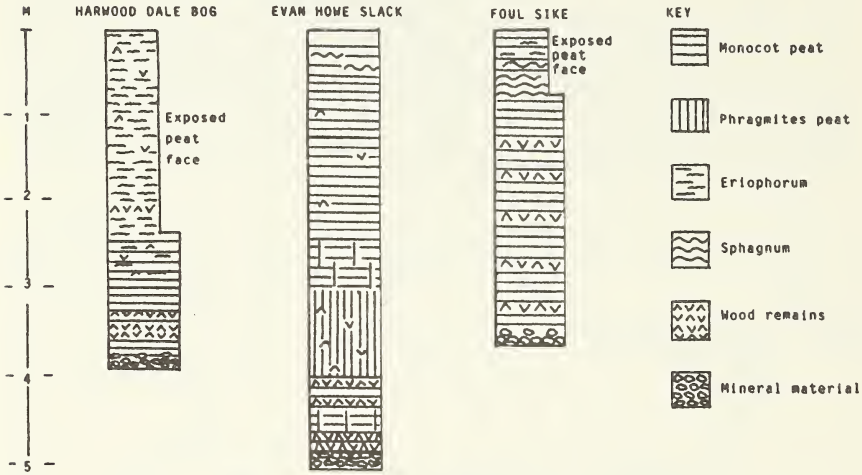


FIGURE 2
Field stratigraphy of the three sites.

(ii) Evan Howe Slack

Evan Howe Slack, NZ 923018, is a glacial drainage channel running north–east/south–west at 170 m OD, in which a valley mire developed over a late-glacial solifluction deposit. The peat was nearly five metres deep when it was studied by Claire Pinder in 1981. Within the last few years the site has been drained and reclaimed as pasture land. The site for sampling was in the central part of the channel in the area of deep peat. A peat borer was used and the stratigraphy is shown in Fig 2. The stratigraphy is similar to that recorded for several other valley mires in the area. An early woodland phase gave way to a reedswamp, which in turn was replaced by a community of grasses and sedges. Within the uppermost layers a more acid bog vegetation with *Sphagnum* is recorded.

(iii) Foul Sike

Foul Sike, NZ 916024, is another glacial drainage channel, running north–east/south–west at *c* 180 m OD. Peat has accumulated in the channel to a depth of three to four metres over a late-glacial solifluction clay; it was studied by David Lewis in 1979. The land surrounding the channel is reclaimed pasture land. No attempt has been made to drain the mire itself but peat cutting has taken place, creating a number of small peat faces. In order to obtain as complete a section as possible, samples were taken both from an exposed peat face and from a borer. The stratigraphy is shown on Fig 2. This site, like

the other two described above, was obviously wooded in its early history. A bog vegetation later developed, dominated by grasses and sedges interspersed with *Sphagnum* carpets.

THE POLLEN DIAGRAMS

Samples from the three cores were prepared for pollen analysis by standard laboratory techniques (see, for example, Faegri and Iversen, 1975). A minimum of 300 grains per sample was counted for Harwood Dale Bog and Evan Howe Slack and 500 grains per sample for Foul Sike. The results are expressed as percentages of total pollen (excluding spores) and are shown on Figs 3, 4, and 5. The following conventional abbreviations are used: AP = tree pollen, SP = shrub pollen, NAP = pollen of dwarf shrub and herbaceous taxa. Pollen of *Corylus avellana* and *Myrica gale* cannot normally be distinguished but it is assumed that the bulk of the pollen type on these diagrams is likely to be *Corylus*.

(i) Harwood Dale Bog (Fig. 3). The diagram is divided into five zones. It begins with a typical Early Flandrian (Post-glacial) pattern of *Pinus* and *Betula* forest in HDB 1, which is replaced in HDB 2 by deciduous woodland dominated by *Quercus* and *Alnus*, with much *Corylus/Myrica*. The *Ulmus* Decline at 2.40 m (dated to 5310 ± 80 bp) is not very well marked, but after this NAP expands and there is evidence of small temporary clearings in the woodland in HDB 3. After a slight regeneration of *Corylus/ Myrica* scrub in HDB 4, a massive clearance is seen in HDB 5, beginning in the Iron Age and involving indications of both agricultural activity and an expansion of heather moorland.

The five radiocarbon dates provide a chronological framework for much of the upper part of the diagram (Table 1). The top could not be dated, owing to the presence of modern roots. However, the absence of a significant rise in the *Pinus* curve shows that the diagram predates the recent coniferous afforestation around the bog. Rates of peat growth may vary considerably and there is likely to be less compaction towards the surface, but, by using the five radiocarbon dates as a rough guide, it may be calculated that the date of the top of the diagram probably lies somewhere between the late Dark Ages and the early Medieval periods.

TABLE 1
Radiocarbon dates for Harwood Dale Bog

Lab. No.	*Depth*	*Date in radiocarbon years bp*	*Approximate true date*
HAR 5916	0.70 m	2190±90	240 bc
HAR 5917	1.10 m	2930±80	980 bc
HAR 5918	1.60 m	3910±80	1960 bc
HAR 5919	2.00 m	4410±80	2460 bc
HAR 5920	2.40 m	5310±80	3360 bc

(ii) Evan Howe Slack (Fig. 4). The diagram is divided into five zones, the first of which corresponds to the deciduous woodland phase of the Middle Flandrian, with *Alnus*, *Quercus* and *Ulmus* as the most important tree types. The *Ulmus* Decline is seen at the beginning of EHS 2 and is followed by an increase of *Corylus/Myrica* pollen. There are two major clearance zones in the top part of the diagram, EHS 3 and EHS 5, separated by a slight regeneration phase in EHS 4. There are no radiocarbon dates for this diagram but correlation with other diagrams from the North York Moors and the lack of a *Pinus* increase at the top may point to a late Medieval date for the top of the diagram.

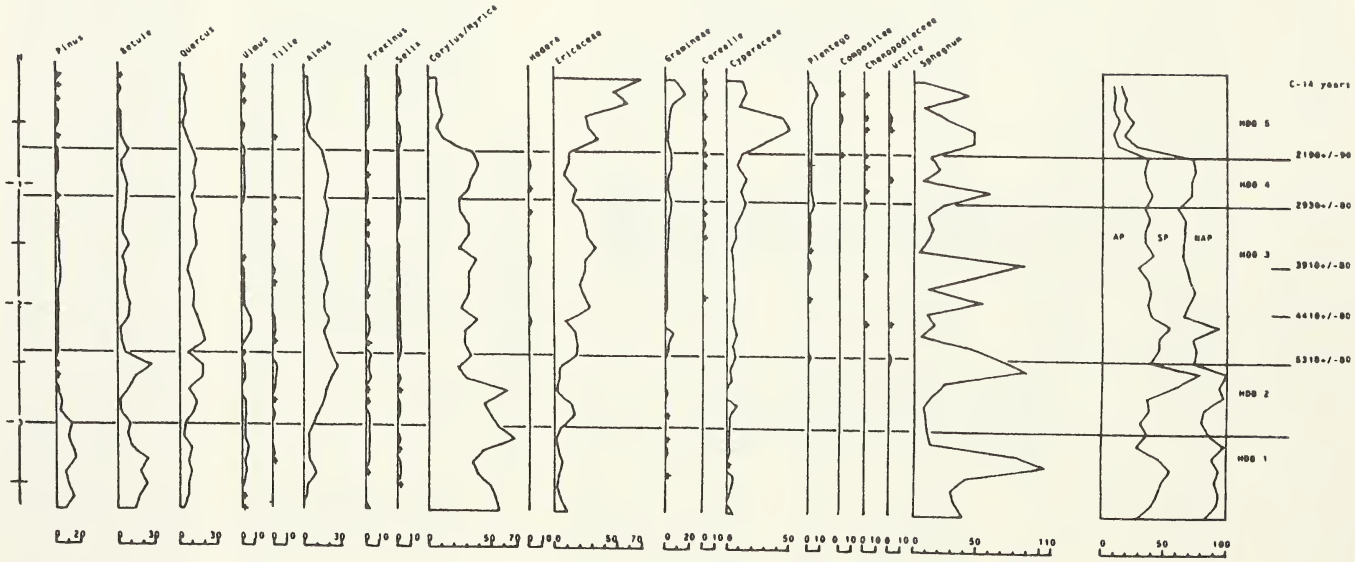


FIGURE 3
Pollen diagram from Harwood Dale Bog.
Figures are percentages of total pollen (excluding spores).
+ = <1%

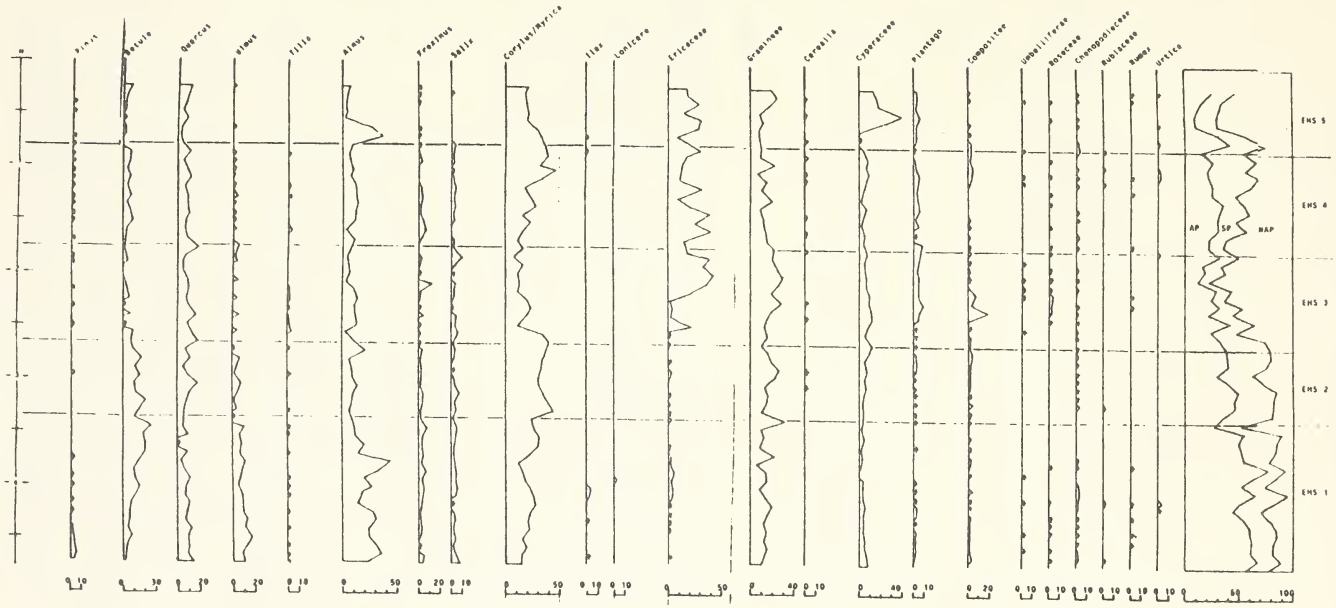
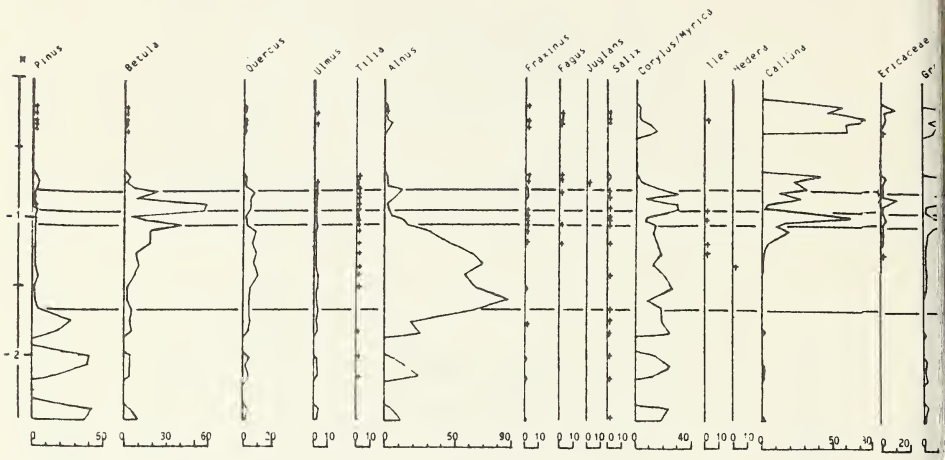


FIGURE 4
Pollen diagram from Evan Howe Slack.
Figures are percentages of total pollen (excluding spores).
+ = <1%



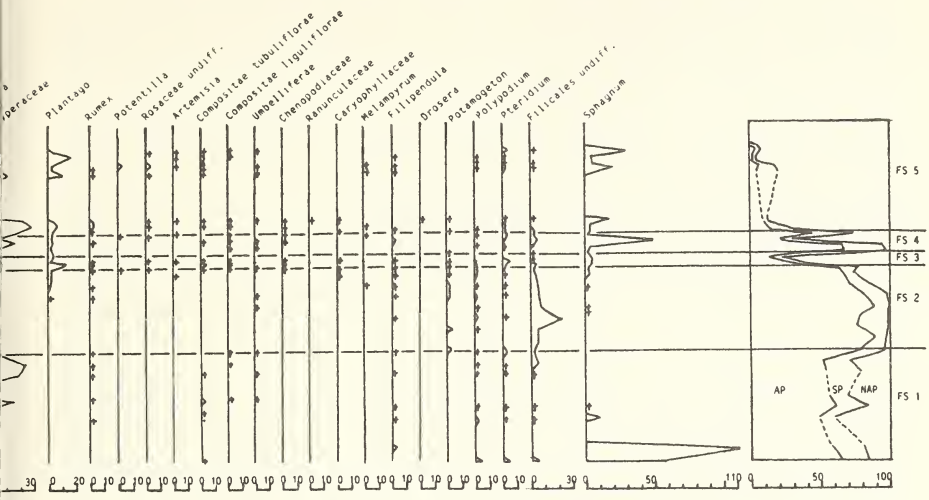
Pollen diag
Figures are percentages

(iii) Foul Sike (Fig. 5). The diagram is divided into five zones, beginning with a zone of Early Flandrian *Pinus* woodland in FS 1. In the deciduous woodland phase of FS 2 the pollen record is swamped by *Alnus* pollen, probably originating from trees growing on or around the site itself (see stratigraphy). Zones FS 3 and FS 4 are very contracted and show rapid large-scale changes in the pollen curves. FS 3 sees a marked decrease in the *Alnus* woodland, followed by a notable regeneration of *Betula* and *Corylus/Myrica* in FS 4. FS 5 represents a large-scale clearance phase, the record for part of which is unfortunately missing as the peat was too wet to sample. It is uncertain whether this diagram continues to modern times or ends a few centuries ago.

Discussion

A tentative correlation of the three diagrams is proposed on Fig. 6. It appears that the Foul Sike core covers the longest time span, from the Early Flandrian through to post-Medieval times. The Harwood Dale Bog core also begins in the Early Flandrian but ends earlier. It was suggested above that the date of the top of the diagram lay between the Dark Ages and early Medieval periods. If the correlations on Fig. 6 are accurate, the lack of a regeneration phase near the top of the Harwood Dale Bog diagram suggests a Dark Age date. The Evan Howe Slack core is thought to start in the Middle Flandrian and end in the Medieval period.

The pattern of vegetation development seen on the diagrams during the Early and Middle Flandrian is typical of the region as a whole. *Pinus* and *Betula* forest was replaced by about 5000 BC by mixed deciduous forest, in which *Quercus* and *Alnus* were the dominant trees with a prominent *Corylus/Myrica* understorey and smaller amounts of *Ulmus, Tilia* and *Fraxinus*. The picture is one of closed forest over nearly the whole area. NAP values are generally low but records for *Ericaceae* in HDB 2 indicate a few patches of heath or bog vegetation to relieve the monotony. It is interesting also to note the indications of occasional openings in the forest canopy on the Evan Howe Slack diagram, as shown by records for *Gramineae* and ruderal species in EHS 1. Elsewhere in the region (Simmons and Innes, 1988), evidence has been found which suggests that



E 5
m Foul Sike.
pollen (excluding spores).
%

Mesolithic hunter-gatherers were opening up the forest, e.g. by burning the undergrowth, and it is possible that such activity was responsible for the records of *Gramineae* and ruderal taxa here.

The five radiocarbon dates for Harwood Dale Bog enable a detailed picture to be built up for the beginning part of the Late Flandrian. The Elm Decline at *c.* 3360 bc was followed by a period of small-scale clearance activity during the Neolithic, culminating in a secondary elm decline at *c.* 1960 bc. The curves for *Quercus*, *Alnus*, *Betula* and *Tilia* all behave in a similar fashion to that of *Ulmus*, but the *Corylus/Myrica* and *Fraxinus* curves show the opposite trend. These light-loving taxa were probably quick to colonise any abandoned clearings in the forest. The NAP is dominated by *Ericaceae*, which increase as the zone continues, suggesting heather moorland became established on land cleared of trees. However, the small peak of *Gramineae* at 2.20 m, occasional weed records and one cereal grain, indicate limited agricultural activity within the catchment area of the site. A similar picture is seen for the early parts of EHS 2 and FS 3, correlated with HDB 3. Archaeological evidence for this period suggests that settled agriculture was concentrated on the better soils of the Tabular Hills and Yorkshire Wolds but that seasonal hunting migrations continued in the Mesolithic pattern between upland and lowland (Spratt, 1982). The picture from the pollen diagrams is consistent with a low population, possibly nomadic in this area, creating small temporary openings in the forest canopy by grazing or hunting activities.

The second part of HDB 3 sees an intensification of this pattern, with marked decreases in *Ulmus* and *Tilia* but generally similar values for other tree species. The *Ericaceae* curve remains high and there are more frequent records for *Cerealia* and weed taxa, suggesting more agricultural activity. Similar indications are seen on the other two pollen diagrams for the corresponding period. The archaeological evidence for the Bronze Age is plentiful, with many round barrows and artefacts, indicating a higher population than in Neolithic times.

The area surrounding the three sites described in this paper is rich in tumuli, e.g. on Fylingdales Moor, Stony Marl Moor. In other parts of the Moors, settlement sites have

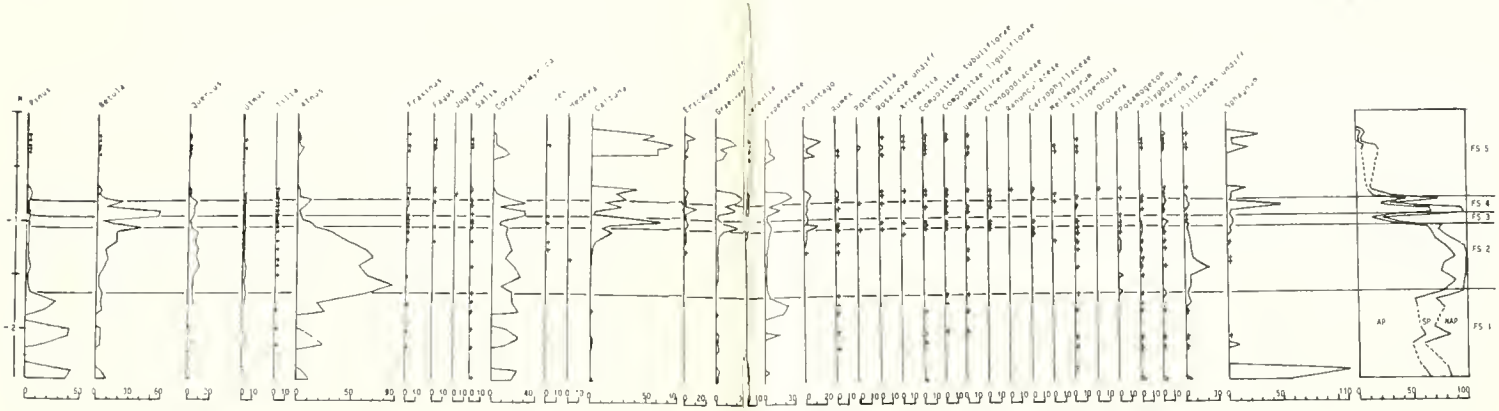


FIGURE 5
Pollen diagram from Foul Sike.
Figures are percentages of total pollen (excluding spores).
+ = <1%

(iii) Foul Sike (Fig. 5). The diagram is divided into five zones, beginning with a zone of Early Flandrian *Pinus* woodland in FS 1. In the deciduous woodland phase of FS 2 the pollen record is swamped by *Alnus* pollen, probably originating from trees growing on or around the site itself (see stratigraphy). Zones FS 3 and FS 4 are very contracted and show rapid large-scale changes in the pollen curves. FS 3 sees a marked decrease in the *Alnus* woodland, followed by a notable regeneration of *Betula* and *Corylus/Myrica* in FS 4. FS 5 represents a large-scale clearance phase, the record for part of which is unfortunately missing as the peat was too wet to sample. It is uncertain whether this diagram continues to modern times or ends a few centuries ago.

Discussion

A tentative correlation of the three diagrams is proposed on Fig. 6. It appears that the Foul Sike core covers the longest time span, from the Early Flandrian through to post-Medieval times. The Harwood Dale Bog core also begins in the Early Flandrian but ends earlier. It was suggested above that the date of the top of the diagram lay between the Dark Ages and early Medieval periods. If the correlations on Fig. 6 are accurate, the lack of a regeneration phase near the top of the Harwood Dale Bog diagram suggests a Dark Age date. The Evan Howe Slack core is thought to start in the Middle Flandrian and end in the Medieval period.

The pattern of vegetation development seen on the diagrams during the Early and Middle Flandrian is typical of the region as a whole. *Pinus* and *Betula* forest was replaced by about 5000 BC by mixed deciduous forest, in which *Quercus* and *Alnus* were the dominant trees with a prominent *Corylus/Myrica* understorey and smaller amounts of *Ulmus, Tilia* and *Fraxinus*. The picture is one of closed forest over nearly the whole area. NAP values are generally low but records for *Ericaceae* in HDB 2 indicate a few patches of heath or bog vegetation to relieve the monotony. It is interesting also to note the indications of occasional openings in the forest canopy on the Evan Howe Slack diagram, as shown by records for *Gramineae* and ruderal species in EHS 1. Elsewhere in the region (Simmons and Innes, 1988), evidence has been found which suggests that Mesolithic hunter-gatherers were opening up the forest, e.g. by burning the undergrowth, and it is possible that such activity was responsible for the records of *Gramineae* and ruderal taxa here.

The five radiocarbon dates for Harwood Dale Bog enable a detailed picture to be built up for the beginning part of the Late Flandrian. The Elm Decline at *c.* 3360 BC was followed by a period of small-scale clearance activity during the Neolithic, culminating in a secondary elm decline at *c.* 1960 BC. The curves for *Quercus*, *Alnus*, *Betula* and *Tilia* all behave in a similar fashion to that of *Ulmus*, but the *Corylus/Myrica* and *Fraxinus* curves show the opposite trend. These light-loving taxa were probably quick to colonise any abandoned clearings in the forest. The NAP is dominated by *Ericaceae*, which increase as the zone continues, suggesting heather moorland became established on land cleared of trees. However, the small peak of *Gramineae* at 2.20 m, occasional weed records and one cereal grain, indicate limited agricultural activity within the catchment area of the site. A similar picture is seen for the early parts of EHS 2 and FS 3, correlated with HDB 3. Archaeological evidence for this period suggests that settled agriculture was concentrated on the better soils of the Tabular Hills and Yorkshire Wolds but that seasonal hunting migrations continued in the Mesolithic pattern between upland and lowland (Spratt, 1982). The picture from the pollen diagrams is consistent with a low population, possibly nomadic in this area, creating small temporary openings in the forest canopy by grazing or hunting activities.

The second part of HDB 3 sees an intensification of this pattern, with marked decreases in *Ulmus* and *Tilia* but generally similar values for other tree species. The *Ericaceae* curve remains high and there are more frequent records for *Cerealia* and weed taxa, suggesting more agricultural activity. Similar indications are seen on the other two pollen diagrams for the corresponding period. The archaeological evidence for the Bronze Age is plentiful, with many round barrows and artefacts, indicating a higher population than in Neolithic times.

The area surrounding the three sites described in this paper is rich in tumuli, e.g. on Fylingdales Moor, Stony Marl Moor. In other parts of the Moors, settlement sites have

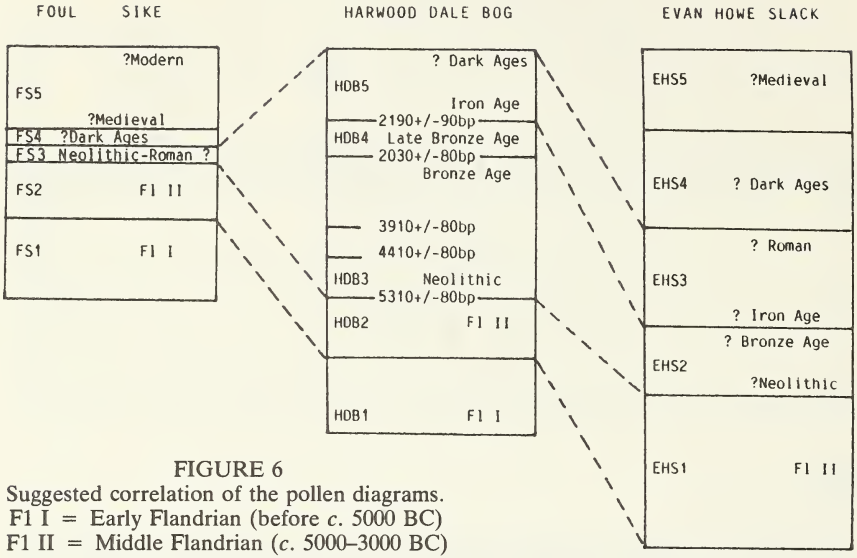


FIGURE 6
Suggested correlation of the pollen diagrams.
F1 I = Early Flandrian (before *c.* 5000 BC)
F1 II = Middle Flandrian (*c.* 5000–3000 BC)

been identified and there are suggestions of a systematic division of the land in the Snilesworth area (Spratt, 1982). Settled agriculture is implied, concentrated on the Tabular Hills and in the dales, with grazing of stock in the woodlands or on the areas of heather moorland which were appearing on higher ground. All this activity seems to have resulted in the opening up of small gaps in the woodland canopy, giving an opportunity for herbaceous vegetation to spread. However, the picture is still an essentially forested one.

In HDB 4 a slight regeneration of hazel scrub over moorland is indicated and a diminution in agricultural activity, corresponding with the early Iron Age. However, in HDB 5 a much more pronounced change in vegetation is indicated, seen also in EHS 3 and the top part of FS 3. This is the first impact which can be described as a major clearance and the date of *c.* 240 bc places it firmly within the later Iron Age period. Although grasses and sedges expand initially, the *Ericaceae* curve increases to dominate the NAP, suggesting the establishment of large areas of heather moorland by the end of the zone. There are more numerous records for weed species and cereals than for the Bronze Age, suggesting either a higher population or agricultural activity closer to the sites. Archaeological evidence suggests that Iron Age settlement was concentrated on the better soils on the margins of the Moors. Large settlement complexes have been excavated on Levisham Moor and at Roxby and there is a small Iron Age enclosure at Snainton. It is believed that the Tabular Hills were quite intensively farmed at this period (Spratt, 1982). In the eastern part of the Moors, it was probably the coastal area around Robin Hood's Bay, with its boulder-clay soils, which would have attracted Iron Age settlers, and it is here that beehive querns have been found, demonstrating that arable agriculture was practised. However, another important activity was iron smelting, which led to the exploitation of many woodlands in the area (Atherden, 1976b) and was probably responsible for the major decrease in AP seen on the pollen diagrams.

This pattern of limited impact in the Neolithic period, greater impact in the Bronze Age and major clearance in the Iron Age is similar to that described in the area around Goathland (Atherden, 1976a, 1979). At Fen Bogs, radiocarbon dates show the first major clearance began at 2280 ± 120 bp (= *c.* 330 bc) and lasted until 1530 ± 130 bp (= *c.* 420 ad), i.e. spanning the Iron Age and Romano-British periods. A regeneration of trees and shrubs followed in the Dark Ages, ending at *c.* 950 AD with a second major clearance in the Viking-Medieval periods. This lasted until *c.* 1470 AD, when it was succeeded by another regeneration phase, followed by the final (modern) clearance phase. This pattern may be repeated at Foul Sike, where a regeneration follows the Iron Age clearance and a long further clearance episode is seen in FS 5, with some suggestion of a slight regeneration within it. At Evan Howe Slack, the Iron Age clearance is followed by a regeneration phase and a second clearance, which may be Medieval. However, without radiocarbon dates it is impossible to be sure of the correlations of the top parts of these diagrams.

Conclusions

The three pollen diagrams presented here add to our knowledge of the vegetation history of the eastern North York Moors, especially for the pre-Medieval period. In general, the picture accords well with that seen further west, in the Goathland region, and confirms the importance of the Iron Age as the first major impact on the woodlands. From then on the forest never re-established itself over the higher ground and the open heathland communities gradually spread to dominate the uplands and produce the characteristic scenery of the North York Moors today.

Acknowledgements

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BOOK REVIEWS

Provisional Atlases of Centipedes by **A. D. Barber** and **A. N. Keay**. Pp. 127. £7.00.
Ticks (*Ixodoidea*) by **K. P. Martyn**. Pp. 62. £4.00.
Click Beetles (*Coleoptera: Elateroidea*) by **Howard Mendel**. Pp. 89. £5.50.
Sepsidae (*Diptera*) by **Adrian Pont**. Pp. 27. £3.00.
Harvest Spiders (*Arachnida: Opiliones*) by **J. H. P. Sankey**. Pp. 42. £3.00.
All published in 1988 (except Sepsidae in 1986) by Biological Records Centre, Institute of Terrestrial Ecology, Huntingdon.

Each of these sets of maps cover small assemblages varying from 23 to 82 species; they range from a single family (Sepsidae) to a whole Class (Centipedes). Each species is plotted on a grid of 10 km squares to give an accurate statement of what is currently known of their geographic distribution in Great Britain and Ireland. This accounts for a minimum of one page per species, but for Harvesters there are nearly twice as many pages as species because of the inclusion of much interesting material on coverage, check-list of species and an index. The Atlases for Ticks and Centipedes contain more than twice as many pages as species; that for Ticks includes a list of the hosts used by each species and the frequency of occurrence on them. This is the first time such an analysis has been attempted and should greatly add to the usefulness of the Atlas. The Centipede Atlas includes an illuminating and detailed analysis of the habitats of each species and the frequency of each species within given habitats.

One encouraging feature apparent from these atlases is the growth of panels of experts (amateur and professional) which have come together for the preliminary surveys and the eventual mapping of distribution. These groups are likely to remain long after they have produced the definitive maps in the near future. The labour forces for Ticks (23) and for Sepsidae (27) are modest, but their data sets have relied heavily on museum staffs, collections and collectors. The same is true for click beetles although they have also attracted over 80 recorders. In a different league are the Harvesters and the Centipedes, each with over 200 recorders and consequently less dependence on museum collections. The attitude of the authors to records from the literature varies; these older records are deemed 'unreliable' or the time necessary for their validation too great by the authors of the Sepidae and the Ticks. Fortunately, the data derived from museum collections will allow the inclusion of older, dated records and in the Atlas of Click Beetles there is a list of time-specific records according to Vice-County as well as the usual 10 km maps. In the Atlases for Harvesters and for Centipedes, records from different periods are distinguished on the maps by the use of different symbols (for the Centipede Atlas be sure to get your *errata* slip which explains the symbols).

The appearance of geographic patterns depends on coverage. Where this is included in the Atlas there are distinct biases, e.g. towards the south-east in Sepsidae and ticks; the Harvesters and the Centipedes get more even coverage (thanks to a greater number of recorders). The extensive analysis of habitats in the Centipede Atlas owes much to the co-operation between the recorders of other groups (Millipedes and Woodlice – the definitive Atlas of the latter having benefited from 436 recorders), and the joint decision to use cards with habitat data from the outset.

The input from the staff of BRS is very much in evidence – collaborating with chief recorders in checking and analysis of data. BRS can be proud of these attractive and important publications, not least for providing the *raison d'être* and encouragement to each of the growing groups of specialists. That the various groups have already developed the taxonomic expertise and field skills necessary for these ambitious ventures is already evident. We can be assured that any shortcomings in coverage and analysis must even now be the subjects of vigorous activity as the final definitive Atlases take shape.

JGB

A COMPARISON OF THE AGE AND PALAEOECOLOGY OF SOME SUB-SHIRDLEY HILL SAND PEAT DEPOSITS FROM MERSEYSIDE AND SOUTH-WEST LANCASHIRE

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Introduction

In 1979 the stripping of the superficial deposits from the north-western part of Holiday Moss, 1 km NE of Rainford, Merseyside, prior to the use of the site for the disposal of domestic refuse, exposed a section through five metres of Flandrian reedswamp, fen and raised-bog peats and a similar depth of the underlying Shirdley Hill Sand Formation. A thin peat layer was seen at depth within the Sand itself and a sample was retrieved for analysis from a point (SD494018) where it achieved its maximum thickness of 6 cm, being covered by *c*.2 m of Shirdley Hill Sand. Examination of this peat in the laboratory showed it to be composed of the poorly humified stems and leaves of the bryophyte *Drepanocladus aduncus* (Hedw.) Warnst. A sample was radiocarbon dated at the Scottish Research and Reactor Centre, East Kilbride and yielded a date of 9120±60bp (SRR-2701). Pollen analysis of the peat showed it to be poor in pollen, although those pollen and spores which were present were well preserved, and only a limited total microfossil count could be obtained. The results are shown in Table 1.

Background

The Shirdley Hill Sand of Merseyside and south-west Lancashire has been shown to be a coversand derived largely from fluvioglacial material laid down during the Late Devensian Age and subsequently redistributed at intervals by aeolian action (Kear 1977, Tooley and Kear 1977, Wilson *et al* 1981, Kear and Wilson 1986). Surface sandy facies believed to be waterlain have also been described from south-west Lancashire, such as the Mere Sands (Wilson 1985), but these are of very limited extent. Organic deposits formed beneath and within the Shirdley Hill Sand have been instrumental in revealing its complex depositional history and its associated palaeoenvironments (Innes 1986) through their contained pollen, spore and macrofossil assemblages. Godwin (1959) recognised the Sand formation at Moss Lake, Liverpool, where it overlay organic muds shown by pollen analysis to be of Allerod (cf. LDe II: Windermere Interstadial) age, and was subjacent to muds and peats of Flandrian Ia and later age. The Sand itself contained a cold climate herbaceous pollen flora dominated by grasses, sedges, *Artemesia*, *Rumex* and *Ranunculus*, with *Empetrum* and *Betula*. Bio- and lithostratigraphic analysis thus assigned the Shirdley Hill Sand a Late Devensian Stadial (LDe III) age.

This age was later broadly confirmed by a radiocarbon date of 10,455±110bp (Hv4710) from Clieves Hills, near Ormskirk, on a peat lens with a rich Late Devensian arctic herb flora, lying conformably beneath Shirdley Hill Sand (Tooley 1978). The pollen count from Clieves Hills is shown in Table 2, together with a pollen count from an analogous, though undated, site from nearby Spa Lane (SD463083). The pollen spectra are similar, except that one is dominated by grass pollen and one by sedge pollen, in recording an open habitat herbaceous vegetation cover. At Mere Sands Wood (Tooley and Kear 1977) gyttja deposits with pollen assemblages similar to Clieves Hills and Spa Lane were found stratified between two Shirdley Hill Sand horizons, showing that redistribution of the sand, at least locally, was taking place even in pre-Flandrian times. Recent work has also confirmed that the initial deposition and drifting of the Sand was

TABLE 1

Pollen analysis of peat within Shirdley Hill Sand at Holiday Moss. (Pollen and spore counts expressed as percentages of the total land pollen sum.)

Betula	11	*Botrychium*	27
Pinus	<1	*Lycopodium*	<1
Juniperus	2	*Selaginella*	<1
Salix	1	*Equisetum*	<1
Gramineae	21		
Cyperaceae	16		
Ranunculus	4		
Thalictrum	4		
Caltha	<1		
Leguminosae	7		
Saxifraga stellaris	6		
Rosaceae	3		
Artemisia	14		
Cruciferae	4		
Silene-type	4		
Stellaria-type	1		
Rumex	1		
Koenigia	<1		
Labiatae	<1		
Plantago major-media	<1		
		Total land pollen sum	177

TABLE 2

Pollen analysis of sub-Shirdley Hill Sand peat from Clieves Hills and Spa Lane. (Pollen and spore counts expressed as percentages of the total land pollen sum.)

	Clieves Hills	*Spa Lane*
Betula	17	4
Pinus	1	1
Coryloid	5	1
Salix	1	10
Hippophae	2	
Artemisia	+	
Gramineae	50	7
Cyperaceae	9	74
Caryophyllaceae	1	1
Compositae	6	
Plantaginaceae		+
Filipendula	4	1
Myriophyllum	+	
Valeriana	+	
Pteridium		1
Sphagnum	+	1
Lycopodium	2	1
Selaginella	1	
Filicales		+
Total Count	340	413

a pre-Flandrian event. At Simonswood Moss and Knowsley Moss in Merseyside, Innes (unpublished) has recorded the Sand as lying below the Devensian-Flandrian biostratigraphic boundary, while Baxter (1983) has shown basal peats lying below Shirdley Hill Sand at a number of sites in this region to be Late Devensian by pollen and radiocarbon analysis.

Peat layers with carbon datings and pollen assemblages comparable with those of the Merseyside and south-west Lancashire examples have been recorded from within and below coversand deposits analogous to the Shirdley Hill Sand elsewhere in northern England (Catt 1977). Jones and Gaunt (1976) recorded a Late Devensian organic deposit from Cawood, Yorkshire, where a gyttja and peat bed twenty centimetres thick intercalated the coversand. A date of 10,469±60bp (SRR 870) was obtained from the peat, which had a Late Glacial cold environment pollen flora with *Artemisia*, *Salix*, *Juniperus*, *Betula* and much Cyperaceae pollen. Matthews (1970) reported a compact woody peat near East Moor, York which was dominated by grass and sedge pollen, with *Betula*, *Selaginella* and open ground herbs, dated to 10,700±190bp (N488). Here the coversand was sealed by a gyttja dated to 9950±180bp (N820), just after the end of the Devensian. At Messingham (Buckland 1977) a sub-coversand peat bed yielded a carbon date of 10,280±120bp (Birm-349), a herb pollen flora with *Artemisia* and *Thalictrum*, and an insect fauna indicating arctic environments. A further organic horizon within the coversand was dated to 10,550±250bp (Birm-707).

The evidence from different areas of northern England therefore strongly suggests a late Devensian Stadial (LDe III) age for initial coversand redistribution, associated with a cold, severe climate, disturbed soil conditions, bare ground and pioneer vegetation communities.

Discussion

The stratigraphic position and pollen assemblage of the Holiday Moss peat band suggests that it constitutes another example which may be added to the list of Late Devensian Age organic horizons associated with the initial coversand instability phase. The pollen flora is typical of unstable soil conditions such as were common in the late Glacial, dominated by grasses, sedges and open ground herbs like *Artemisia*, Cruciferae, *Thalictrum*, *Ranunculus*, *Saxifraga stellaris*, *Rumex*, and *Silene*-type. *Koenigia islandica* in particular is an indicator of such environments as are *Botrychium*, which is abundant, *Selaginella* and *Lycopodium*. Some birch, willow and juniper scrub also existed, presumably in more stable, sheltered locations. The identification of *Drepanocladus aduncus* as the peat-forming vegetation does not contradict this environmental interpretation, for Dickson (1973) notes that its 'presence in the last glaciation is well established by three Late Devensian and one Middle Devensian record'. In the Merseyside region itself, the moss has been recorded (as *Hypnum aduncum*) with Shirdley Hill Sand near Aintree (Travis 1909) and in similar deposits at Wallasey, on Wirral (Travis 1922).

A Late Devensian interpretation for the Holiday Moss peat is, however, contradicted by its radiocarbon date of 9120±60bp, which places it near the end of chronozone Flandrian Ib on the regional standard, radiocarbon dated pollen diagram from nearby Red Moss (Hibbert *et al* 1971), more than a millennium after the Devensian-Flandrian transition. At that date at Red Moss the vegetation was of a closed birch-pine woodland which included some hazel and a little oak and elm, very different from the tundra-type flora recorded at Holiday Moss, although the sites are only about sixteen kilometres apart. Although the *Drepanocladus* remains which form the sample are assumed to be *in situ*, they could perhaps be older, redeposited, detrital material, in which case they could only have the effect of increasing the radiocarbon age of the sample. There is no reason to suppose that the radiocarbon date for Holiday Moss is in error, but if it is, then it is much more likely to be too old than too young.

It would seem that widely divergent vegetation communities existed in the region in the early Flandrian. This is likely to have been caused by the continued local instability of the Shirdley Hill Sand after the close of the Devensian, with little chance for soil

development to take place, thus permitting the maintenance of unstable soil or bare ground plant communities upon the Sand areas. In contrast, Red Moss is in a glacial till area and soil development and the establishment of Flandrian woodland vegetation evidently progressed much more quickly upon the more stable clay deposits.

Conclusion

The evidence from Holiday Moss suggests that, while many of the basal organic horizons with open habitat herbaceous floras associated with the Shirdley Hill Sand and other coversand deposits are of Late Devensian age like Clieves Hills, some at least date from well into the Flandrian and reflect the continued instability of the coversand formations and delayed vegetation successions in these areas. It may not always be possible, therefore, to attribute a secure date to such deposits as that at Spa Lane by pollen analysis without the support of radiocarbon dating, since the comparable pollen spectra from Clieves Hills and Holiday Moss differ in age by almost one and a half millennia. It also suggests that vegetation patterns on sand and till in this region were very different in the early Flandrian, and that the coversands provided important areas of vegetation diversity. This dichotomy seems to have persisted into the mid and later Flandrian, particularly where human clearance activity brought renewed instability to the Sand formations (Tooley 1978).

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TRICHOPTERA REPORT 1987 AND 1988

About 60 species of Trichoptera have been reported for Yorkshire for 1987 and 1988, many of them captured at light traps. In vice-county 61, Mr Ezard took a female of the very local species, *Apatania muliebris* at his trap at Rudston, near Bridlington; this caddis-fly was identified by Mr Payne and confirmed by Dr Wallace. In June 1987, Mr Ezard obtained a specimen of *Hydatophylas infumatus* at Fylingdales; though widespread, this species is never abundant. The identity of *H. infumatus*, was confirmed by Dr Hiley.

In vice-county 62, *Potamophylax rotundipennis* was captured in 1976 by Mr King at his trap near Pickering. This is the first YNU record of *P. rotundipennis* since it was recorded by McLachlan in the nineteenth century. This record was unconfirmed.

In vice-county 63, Mr Maude has carried out trapping in Pennine valleys near Huddersfield. He has provided records of the rare *Rhadycoleptus alpestris*, which breeds in small temporary pools above 400m in altitude, on windswept moors. These records are from Hall Dyke Valley (1984), Bottoms Mills Wood and Netherton (1985) and Drop Clough, Marsden (1986). In vice-county 64, in the Ilkley area, trapping has been carried on by several Lepidopterists, under the leadership of Mrs F. Draper. At the same time, caddis flies have been collected at the traps, yielding 21 species of Trichoptera; all are common species, the most numerous being *Agapetus ochripes*, *Lepidostoma hirtum* and *Psychomyia pusilla*. A large swarm of *Brachycentrus subnubilus* was seen by Mrs Draper at Ben Rhydding. Though the species is widespread and common, it has never before been reported on the river Wharfe between the two known sites, one at Burnsall and the other below Pool-in-Wharfedale. The specimen captured was confirmed by Dr Hiley.

A specimen of *Mesophylax impunctatus* was captured by Mr King at Malham Tarn in 1984. This is a very rare local species, of which the only Yorkshire records are from Malham.

In May 1987, I visited Thorne Waste, and collected six species of Trichopteran larvae. One was *Holocentropus picicornis*, which has a caseless larva, and has not been recorded there before. In the spring of 1987, I obtained 10 species of caddis larvae at Askham Bog. As much of the area visited dries up in summer, some of the species breed in temporary pools. *Trichostegia minor* was the most interesting specimen taken here. For the purpose of collecting caddis larvae, visits were made during 1988 to Skipwith Common and Castle Howard. At Skipwith Common, specimens of *T. minor* were taken, and also *Triaenodes bicolor*, which, although not uncommon, has not been found there before. Castle Howard was very disappointing; only two species were obtained, both common.

In the spring of 1988, visits were also made to Bramhope Ponds, and to Ellington Pits, an army nature reserve near Ripon. At both places, *Oligotrichia striata* larvae were obtained. This caddis fly has been recorded only three times before this century, at Bubwith, Bramhope and Malham.

During 1988, I received a list of records from Mr Don Smith, which included one of *Plectrocnemia brevis*, captured at a light at Bridestones in VC 62 in August 1984. This caddis fly is extremely rare, has never before been recorded for Yorkshire, and very few British records exist at all. This specimen should have been sent for confirmation, as it is a very interesting record.

During the 1980s, we have received records of 101 Yorkshire caddis flies, but there is also a list of 30 Yorkshire caddis flies which have not been recorded during this period. During the last 30 years, very little interest has been shown in the Trichoptera of Yorkshire, and it is therefore not known whether species that have not been recorded for many years still exist here but are unrecorded (as is the case for *O. striata*), or whether they are extinct in Yorkshire. A provisional list of Trichoptera believed to be extinct or endangered in the countries of the EC has appeared in the 1988 *Trichoptera Newsletter* (**15**: 11–13). The following Yorkshire caddis flies are included in the list:

Apatania muliebris
Wormaldia subnigra
Agrypnia crassicornis
A. obsoleta
Limnephilus coenosus
L. elegans
L. nigriceps
L. incisus

W. subnigra was recorded by the YNU at Malham in 1949, and again in 1984 by Mr King. *A. crassicornis* has been found only at Malham, where it was recorded by Kimmins in 1950. *A. obsoleta* was taken by Mr D. Maude at Upper Windleton Reservoir in 1985, and by Mrs F. Draper at Thruscross in the Washburn Valley in 1988. *L. coenosus* was recorded at Ilkley and Grassington on the moors in 1982 and 1984, and in Upper Nidderdale in 1988 by Miss M. Andrews. *L. elegans* was most recently recorded in 1972 by Mr K. Payne at Skipwith, though there are old records from Malham, Austwick and Harrogate. *L. nigriceps* was recorded for Thorpe Marsh by Mr P. Skidmore in 1979, whilst *L. incisus* was recorded at Treeton Dyke Marsh in 1980 by Mr W. Ely, and by Mr D. Smith at Helmsley in 1987.

This seems scanty information on which to base a conclusion regarding the present status of Yorkshire caddis flies held to be endangered or even extinct, especially considering there are over twenty more species that have not been recorded for at least ten years. I would therefore urge any of you who have the slightest interest in the Trichoptera to work towards bringing records up to date. Please send in your records at the end of each season, and if you have a rarity, send it in for confirmation either to Dr Wallace at Liverpool Museum, or to me.

New FBA Keys to the Adults of the British Trichoptera and Cased Caddis Larvae are expected in autumn 1989 and spring 1990 respectively.

MARJORIE ANDREWS
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OBITUARIES

REV. THOMAS BASIL KITCHEN (1905 – 1987)

The Reverend Thomas Basil Kitchen, Honorary Canon of the Cathedral Church in Gibraltar and President of the Yorkshire Naturalists Union in 1953, died in Scarborough Hospital on 8 June 1987, after a period of steadily failing health and eyesight; his passing severs the last link with the Yorkshire entomologists of the early years of the century.

Basil was born in Sheffield on 11 December 1905, the only son of Tom and Nellie Marion Kitchen. At the age of seven his family moved to Leeds; Basil was educated at the Leeds Boys Modern School and throughout his life remained attached to the county of his birth and to its institutions. After leaving school he was articled to a Leeds firm of chartered surveyors and spent several years with local authorities in Leeds, Staffordshire and London until 1929 when he was accepted as a candidate for ordination and went to St Augustine's College, Canterbury, for four years. After ordination came a curacy at St Peter's, Bethnal Green, marriage to his wife Joyce and five years chaplaincy in Southern Rhodesia. After the outbreak of war he returned to Yorkshire for six years as Vicar of Brayton, Selby, followed by two years as Railway Chaplain in Bengal. Again he returned to Yorkshire, this time as Vicar and Rural Dean of Howden, where he stayed for nine years. From Howden he moved to Devon for four years as Rector of Drewsteignton and Rural Dean of Okehampton followed by two years as Vicar of St John's, Torquay.

Retirement took him to Budleigh Salterton, but for Basil retirement meant a continuing succession of temporary chaplaincies in the vast Diocese of Gibraltar. Basil and Joyce were ready to step in, sometimes at only a few hours' notice ('ready' meant that Joyce became skilled at packing the necessities for periods of six to eighteen months away from England) and go to Madrid, Oporto, Malaga, Cannes, Tangier, Tenerife, Las Palmas, Madeira, Malta, Norway, Switzerland and many other places, a phase which lasted for twenty years, almost to the end of his life. For the last nine years Basil and Joyce resided at Scalby near Scarborough – when they were not away on chaplaincy! A long, eventful life of a hard-working, caring clergyman.

But there was another part of Basil's life and over our many years of friendship I only once saw Basil wear his clerical collar. At school his interest in beetles was awakened and stimulated by that inspiring biology master J. Digby Firth and he began his life-long task of gathering his collection of British beetles. Here too he formed a close friendship with W. Douglas Hincks that endured until Douglas's early death in 1961. In 1919 he joined the Leeds Naturalists' Club and Scientific Association of which he later became a life member and so, as a member of an Affiliated Society, made contact with the Yorkshire Naturalists Union. In the Entomologist's Monthly Magazine for 1921 we read that Masters Hincks and Kitchen exhibited beetles at the Entomological Section's meeting in 1920. In 1924 at what seems an incredibly early age Kitchen and Hincks were elected joint secretaries of the Section. Hincks's active membership, as Secretary and later Chairman, lasted all the rest of his life; Kitchen's active membership became spasmodic with his long absences from the county but he maintained his interest and allegiance, becoming President of the Union in 1953.

Basil was essentially a collector, vigorously plying sweep net or pond net in the field. He delighted to go out collecting in a morning and towards midday would conveniently 'know a pub that will just suit us' and there relax and talk about the affairs of societies and pass on and receive news of old friends. He was interested in people and made friends wherever he went and these friendships he kept and valued. He liked to visit and be visited and Joyce was always the most welcoming and hospitable of hostesses. His generosity and concern for tradition were shown by his gift of a splendid leather-bound minutes book for meetings of the Y.N.U. Executive.

His entomological memorial is his collection and this has been deposited with the Leeds City Museum. It comprises seven Hill cabinets (71 drawers) and the accession details (LEEDM-C-18-1988) show that it contains 13,497 specimens of 2,782 species.

He leaves his wife, Joyce, and three sisters who have our sincere sympathy in their loss.

J. H. Flint

ARTHUR GILPIN, Hon.M.Sc., FRPS (1908–1988)

The sudden death of Arthur Gilpin on 27 November 1988 was a sad loss to all who appreciate bird and wildlife photography, not only in Yorkshire but throughout the United Kingdom and overseas.

Born in Leeds, he spent his apprentice days experimenting with various photographic techniques and subjects. He began to specialise in the photography of birds, their nests and eggs in the early 1920s, to which he eventually devoted most of his spare time. A real perfectionist, he was meticulous in his efforts to achieve the very highest standards of bird photography. Moreover, he was a dedicated ornithologist, maintaining detailed records of the birds he studied which he forwarded to the county bird recorder long before birdwatching became as popular as it is today.

Arthur Gilpin's careful and detailed work led to an invitation in 1934 to join the Zoological Photographic Club, and in the same year, he also became a member of the Nature Photographic Society. In 1935, he submitted a few photographs to The Royal Photographic Society's annual exhibition for the first time, two of which were hung, with one being reproduced in 'The Year's Photography'. The Royal Photographic Society awarded him its medal for his natural history work. After becoming an Associate and later a Fellow of the Society, he served on the Committee of the Nature Section and ultimately became Chairman of the Society. Latterly, he was Honorary Secretary of the Association of Natural History Photographic Societies. During the 1939–45 war, he served in the Royal Navy as Photographic Officer, still managing to take some wildlife photographs in his off-duty hours.

Arthur Gilpin lectured on ornithology at the Swarthmore Education Centre in Leeds for a number of years, and also gave many outstanding lectures to the Leeds Birdwatchers' Club (of which he was a founder member) and to numerous other natural history societies throughout the north of England and Scotland. He was a dedicated nature conservationist, and served as a Council member of the Yorkshire Naturalists' (now 'Wildlife') Trust and of the Royal Society for the Protection of Birds; he also served as Chairman of the Ornithological Section of the Yorkshire Naturalists' Union from 1973 to 1975.

A builder by trade, Arthur Gilpin worked at the University of Leeds as Assistant Surveyor of the Fabric. In 1973, the University conferred an honorary Master of Science degree on him in recognition of his outstanding work in natural history photography. His photographs have been exhibited in many countries, some being in permanent collections, while others were used as illustrations in books and periodicals; over recent years, his superb bird studies were a regular feature in *The Naturalist* (*vide* p. 76 of this issue). His book, 'Nature Photography' (1978) drew together his immense photographic knowledge, experience and skill, and provides detailed and comprehensive guidance for everyone with an interest in wildlife photography.

The energy and dedication Arthur lavished on his craft ensured that his work rarely fell below the very highest standards of photography. A man of warm and kindly nature, he will be greatly missed, not only by those who knew him well, but also by the countless numbers of people who attended the lectures he gave for over fifty years. Our deepest sympathies are extended to his wife, Anne, and his daughter, Wendie.

C. G. Varty

SHELDUCK USING CYLINDRICAL BALES FOR NEST SITE

P. N. JOHNSON

During May of 1988, to the NE of Doncaster, a pair of Shelduck, *Tadorna tadorna*, utilized the triangular tunnel, formed at ground level between a double row of cylindrical straw bales, as a nesting site. The bales had been stored overwinter in a grass field and were aligned in two parallel rows of eight bales along a hedge side.

Unfortunately the nest site was only noticed when the farmer was removing the bales and despite their speedy replacement, the disturbance was sufficient to cause the adult ducks to desert the clutch of eight eggs. After monitoring the site for several hours, with no further sightings of the adult birds, the eggs were removed and placed under a broody Bantam hen, which hatched four of the eight eggs, the other four eggs being addled. The surrounding area of the nest site was low-lying wet grassland, with few embankments or large undisturbed dykes. The configuration of the straw bales provided a long, ready-made dry tunnel at ground level, not likely to become waterlogged.

Though Shelduck are noted for their use of a wide range of nesting sites, this is the first recorded instance of them using this more recent type of straw stacking method for breeding purposes.

YORKSHIRE NATURALISTS' UNION EXCURSIONS IN 1987

(Continued from *The Naturalist* **113**: 163)

BRIDESTONES (VC 62), 23 August 1987 (M. A. Atherden)
A damp grey morning gave way to hazy sunshine as some 40 members gathered at the High Staindale car park in Dalby Forest. Free access to the forest drive was kindly allowed by the Forestry Commission on this occasion. The party was welcomed by Dr S. R. Eyre, chairman of the joint Yorkshire Wildlife Trust/National Trust Management Committee for this National Trust property. He outlined the main animal and plant communities of the reserve and the various management strategies which were being employed. The latter included heather cutting, bracken control and the removal of some sapling trees from the heath areas. He was supported by the vice-chairman of the Management Committee, Mr D. H. Smith, the National Trust Warden, Mr R. Dicker, and by several other members of the committee.

Bridestones is best known for its tors of Passage Beds sandstone, which form prominent features in the sides of Bridestones and Dovedale Griffs. The plateau surface is formed of these and other siliceous rocks of the Upper Jurassic, while the streams occupy valleys deeply incised into older rocks, including some good shale exposures. The valley bottoms have alluvial deposits.

Bridestones offers ample variety for naturalists and all the major habitats were studied during the day. The botanists were led by the Warden and concentrated on the outlying Staindale oak wood and the steep ravine of Egg Griff. Ornithologists, entomologists and others ranged over woodland, dry heath, bracken and streamside habitats. The expedition ended with the meeting and tea in Dalby Village Hall.

Ornithology (A. J. Wallis)
As was to be expected, the range of bird species seen within the boundary of this reserve in late August was somewhat limited, particularly as all the summer visitors had left the area.

Proof of breeding was, however, confirmed for four species. Several Meadow Pipits were present on the moor and one was carrying food and behaving in a manner typical of this species with young. A female Pheasant was flushed from the heather, and, although not seen, a brood of chicks was heard calling as they spread out in search of a hiding place. A family party of Red Grouse was disturbed on the edge of the moorland area, and a covey of seventeen Grey Partridge was also seen.

Only one other record was of any particular note: the sighting of a party of twelve Brambling by W. F. Curtis. As this species usually arrives along the Yorkshire coast in October, earlier sightings are infrequent and this would appear to be the earliest date for an autumn arrival.

Mollusca (A. Norris)

Egg Griff, and the springs and marshes of lower Dovedale Griff were examined by the conchologists and produced 28 species; this brings the reserve total to 40 species. Several of the more interesting and local species on the reserve list were refound, notably *Limax cinereoniger* Wolf 1803, *Vertigo substriata* (Jeffreys 1833) and *Zonitoides excavatus* (Alder 1830). The best find of the day was the discovery in Egg Griff of three specimens of the slug *Malacolimax tenellus* Muller 1774, this being a new vice-county record.

M. tenellus is known from only a few localities in Yorkshire, and its habitat is considered to be confined to 'old' broad-leaved or coniferous woodland. The increased interest in these small areas of relict woodland such as Egg Griff has produced several Yorkshire records in recent years, and it is possible that further localities will be found.

Other Arthropods (D. T. Richardson)

Records for the 10 km square 44(SE)89 within which the reserve lies were practically non-existent, so the opportunity to rectify this deficit in the Union's records was avidly seized upon. To this end Dovedale Wood and Griff Woodland were investigated. The acid nature of the terrain limited the variety of species which were found – all were very common and in some cases ubiquitous. All four centipedes and three harvest spiders, and six of the millipedes were additions to the above-mentioned square.

Entomology (D. H. Smith)

Although it was late in the year and the day was somewhat overcast and cool, the entomologists produced some very useful lists for the reserve. Mr R. Crossley recorded over 40 species of Diptera including the hoverflies *Xylota coeruleiventris*, recently discovered in Yorkshire, and the tiny *Sphegina clunipes*. He also recorded the empids *Rhamphomyia erythrophthalma* (a local species), *Empis scotica* (with a few scattered records) and *Clinocera wesmaelii* (new to VC 62).

Mr W. A. Ely turned up some good records in the ichneumons with *Tryphon auricularis* (the first VC 62 record of this lepidopteran parasite) and *Epistathus crassicornis* (the second Yorkshire record of this parasite of beetles). There was a further first VC 62 record, in the cynipid *Callaspidea defonscolombei*, a hoverfly parasite. He also found the nationally scarce empid *Empis praevia* and the notable *Rhamphomyia hybotina*.

Mr J. H. Flint recorded a strong colony of the tiger beetle *Cicindela campestris* on the steep slope of Needlepoint. He also noted the sawflies *Priophorus brullei* and *Croesus septentrionalis* (larvae), and *Bombus monticola*, a local bee typical of this upland area.

Mrs J. H. Payne was pleased to note the Ringlet butterfly so deep into a North Yorkshire Moors valley, together with a large colony of Chimney Sweeper. Fox, Poplar and Peppered Moth larvae were also noted. Both she and Mr Flint confirmed the continued presence of the brilliant weevil *Rhynchites cupreus* on Rowan. The writer observed that the huge tachinid fly *Tachina grossa* was still about on the heathland and after a spirited chase in Dovedale was able to record the tipulid *Crunobia littoralis*. The two ichneumons *Limerodops elongatus* and *Erigorgus cerinops* were also seen.

Flowering Plants and Ferns (N. Sykes)
An attempt was made to obtain a full list of flowering plants for the Management Committee of the nature reserve. Low Staindale Wood yielded *Quercus* and *Betula* spp., *Rubus fruticosus* agg., *Crataegus monogyna*, *Sorbus aucuparia*, *Corylus avellana* and *Fraxinus excelsior*. *Pteridium* dominated the field layer. In the lower part of Dovedale, wetland species included *Caltha palustris*, *Cardamine pratensis*, *Lotus uliginosus*, *Filipendula ulmaria*, *Epilobium palustre*, *Mentha* spp., *Galium palustre*, *G. uliginosum*, *Achillea ptarmica* and *Juncus acutiflorus*, with *Succisa pratensis*, *Galium verum* and *Stachys officinalis* in the drier parts.

Both Egg Griff and Bridestones Griff were searched in the hope of confirming previous records of some less common ferns. Only *Phyllitis scolopendrium* and *Polystichum aculeatum* were located, the latter in abundance. *Mycelis muralis* and *Chrysosplenium oppositifolium* were frequent in the griffs. On the northerly Bridestones the ferns *Asplenium adiantumnigrum*, *A. ruta-muraria* and *A. trichomanes* were found, with *Trientalis europaea* and *Vaccinium vitis-idaea* on the surrounding moor. A slightly basic area on the central moor revealed *Centaurea nigra*, *Knautia arvensis* and *Sanguisorba minor* in an area otherwise dominated by *Calluna* interspersed with *Empetrum nigrum*, *Erica cinerea*, *E. tetralix* and *Vaccinium myrtillus*.

Lichenology (M. R. D. Seaward)
Sixty-five years have elapsed since the lichens of the Bridestones and adjacent habitats were last studied (*Naturalist* 1922: 293): although a few of W. E. L. Wattam's records are questionable, nevertheless his list provides a useful insight into the nature of the lichen flora at that time. Our recent visit has revealed a marked decline in the terricolous and saxicolous floras, particularly of the Bridestones themselves, due in no small measure to abrasion of rock surfaces and trampling by visitors in addition to increased levels of air pollution. Noticeable absentees on this re-survey were *Parmelia omphalodes*, *Pseudevernia furfuracea*, *Pycnothelia papillaria*, *Sphaerophorus globosus* and *Umbilicaria polyphylla*.

However, we recorded at least 62 species on the Reserve as a whole, of which 10 were new to grid square 44/89 and a further 7 had not been recorded for the square since Wattam's visit; of particular interest were 11 species of *Cladonia*, *Graphis elegans* (on *Sorbus*), *Lepraria neglecta*, *Opegrapha* cf. *chevallieri*, *Parmeliopsis ambigua*, *Peltigera praetextata* and *Usnea subfloridana*.

Mycology (C. S. V. Yeates)
Various habitats in the area were investigated and a total of 63 species was recorded. Close to the car park, in a marshy area, *Puccinia calthicola* was found on *Caltha palustris*. On the reserve itself, dead *Pteridium* produced the discomycetes *Microscypha grisella* and *Mollisia pteridina*. *Scutellinia asperior* was found on mossy soil by a stream.

Rusts of note included *Puccinia cnici-oleracei*, found by Dr Lloyd-Evans on *Achillea millefolium*; this species has very rarely been recorded in Yorkshire and has not been recorded on *Achillea* in the county before.

The conspicuous gall-forming *Exobasidium vaccinii* was abundant on *Vaccinium vitis-idaea*. The taxonomy of this genus has been somewhat confused in the past but it is now considered to be comprised of a group of host-specific species. This would certainly explain its absence on nearby *V. myrtillus*. Unfortunately, not all the previous records of this genus have included notes on hosts, so comments on the relative frequency and distribution of the different species are not possible; that said, this species has been reported on this host from the Bridestones area in the past.

The parasitic hyphomycete *Ramularia sphaeroidea* was observed on its host *Lotus uliginosus* both within and outside the reserve. These are the first Yorkshire records, though it has been seen in other locations since. Both in the field and under the

microscope it has a superficial resemblance to a downy mildew, the spherical conidia being atypical of the form-genus *Ramularia*.

Plant Galls (Dr L. Lloyd-Evans)
Twenty-eight kinds of gall were found, adding considerably to previous records for the site. Of these, seven were caused by mites, two by aphids, thirteen by flies, three by wasps and three by fungi. Most interesting was the gall on *Vaccinium vitis-idaea* caused by the fungus *Exobasidium vaccinii* which thickens and distorts the leaves which become frosted by the white spores (see also above under Mycology).

LONG-TAILED TIT

Photo: Arthur Gilpin

Black and white in colour, apart from small pinkish areas that vary from bird to bird, and with long, narrow tails, Long-tailed Tits are very handsome small birds. Each year, before the blackthorn is in bloom, they commence building their upright, oval-shaped nests, which have an entrance hole high on one side. Each tiny piece of moss, each beakful of spider webs to bind the moss together, and each feather for the lining (sometimes there are more than a thousand) means a journey for one of the pair. It is therefore not surprising that the nest is not ready to receive the first egg before mid-April.

As the average clutch size is eight eggs, there is little spare room in the nest by the time the young are ready to leave. When they do so, they remain with their parents until the following spring. Sometimes two or more families unite, and watching a seemingly endless procession of these charming birds filtering along a hedge in winter can make one's day.

BOOK REVIEWS

Pseudoscorpions by **Gerald Legg**, with species illustrations by **Richard E. Jones**. Pp. 159. *Synopsis of the British Fauna (New Series) No. 40.* Linnean Society of London and Estuarine and Brackish Waters Science Association. E. J. Brill, Leiden. $36.00, paperback.

Nearly one third of the page space of this attractive new synopsis of false scorpions is devoted to illustrations. The general chapters contain sufficient line drawings to illustrate the text, including a nice diarama of habitats. There are sections on both external and internal anatomy, behaviour and sensory physiology. Perhaps this last section, and those on reproductive biology, growth, development and life history are the more exciting parts since these have been the fields of research of the author, the dedicatee and his students. This preliminary material occupies two-fifths of the text; it is clearly and concisely written and is backed-up by a long list of references to the original sources.

Each of the descriptions of the twenty-five British species covers three pages; one of these provides clear, finely detailed line drawings of features of taxonomic importance. For every species there are ventral views of the complex male and female genital apparatus and a map showing the known occurrence of the species in 10 km squares. Other key characteristics, e.g. the cephalothorax and its setation (in Chthoniinea and Neobisiinea), the chelicera, pedipalpal chela, some parts of the walking legs, enlarged views of setae and cuticle surface structure, are included according to need. Another two-thirds of a page is occupied by a superb drawing of the whole animal showing its general appearance; these last are the work of R. E. Jones.

There are few typographic errors, e.g. Lucetanian (p. 80) and one worrying flaw in communication: I wished to know which species used venom. On page 6 I learn they are included within the Diplosphyronida and the Monosphyronida; but which species did these groups include? The names do not appear in the check list, nor in the section on classification. A little research revealed the phantom groups in the first two bifurcations of the key. It is the lot of most naturalists to encounter false scorpions rather infrequently (how could we miss them at densities of several hundreds per square metre?), and so most of us have had little experience in naming them. This synopsis is textually and visually so appealing that the rate of discovery of these animals is bound to increase.

JGB

A Key to the Adults of British Water Beetles by **Laurie E. Friday**. Pp. 152, 10 figures, numerous text figures, 3 tables. AIDGAP, Field Studies Council, The Leonard Wills Field Centre, Nettlecombe Court, Williton, Taunton TA4 4HT. 1988. £12.50 hardback, £7.50 paperback (including postage and packing).

This latest excellent work in the AIDGAP series will be invaluable to both specialist and beginner alike. The format is entirely practical and remarkably easy to follow, despite the fact that specific identification in certain genera has always been a matter for the specialist. Although species descriptions are generally limited, valuable cross-checking is accomplished by means of the well-plotted tabular keys based on colour patterns, sizes and other gross external characters which supplement the traditional keys. By following a specimen through both keying systems and arriving at the same taxon, confidence is rapidly built up. The figures in general are quite superb, showing admirably the features alluded to in the text. The treatment of the most difficult genera (i.e. *Haliplus*, *Gyrinus*, *Hydroporus* and *Helophorus*), where genitalic characters are also amalgamated into this tabular key system, provides accurate identification quite unprecedented in all previous treatments of these genera in the British literature. Throughout

the work, inspired editorial policy ensures that the figures are closely adjacent to the references in the text. This eliminates the necessity for the physically impossible multi-dexterity which identification manuals too often place upon the frustrated user as he attempts to manipulate specimen, microscope and text simultaneously.

The reviewer has been unable to locate any shortcomings in this admirable work but was mildly amused by the sudden outbreak of seemingly uncharacteristic diffidence in the author's strong reluctance to tackle the genus *Dryops*. Of this admittedly 'knotty' little genus he merely states that since the identification depends upon male genitalic characters only, it is beyond the intended scope of the work. After Laurie Friday's quite masterly treatment of the other genera alluded to above we can only say that he is too modest! The purist may criticize the Check List at the end of the work, but it very cleverly combines this function with a codified ecological and distributional account and an index, the latter requiring an alphabetical tabulation according to generic names. However, it only includes those genera which are covered to species level in the text and omits other taxa such as *Dryops* and the various Chrysomelid and Curculionid genera for which the reader is referred to other literature.

This splendid book demands a place on the working desk of all those who are involved in the study of wetland invertebrate faunas. The excuse advanced traditionally that the study of water beetles was solely for the highest entomological elite, because of the innumerable problems of identification, is no longer tenable. The author and his team of advisers, the Field Studies Council, and especially their AIDGAP editor are to be complimented on a superb achievement.

PS

Check List of Fish and Invertebrates listed in the CITES Appendices by **Patricia C. Almada-Villela**. Nature Conservancy Council. 1988. Unpriced.

Lists of species and subspecies of fish and invertebrates, mainly corals, shells (gastropod and bivalve) and butterflies which are included in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) are given. Each species is given its Red Data Book category and details of the manner of its exploitation (for building material (corals), use as food, pets, zoos, medical research, pearls, decoration etc). Full lists of references are given. The handbook is published by NCC in its capacity as UK CITES scientific authority for animals.

JGB

Sea Life of Britain and Ireland edited by **Elizabeth Wood**. Immel Publishing, for the Marine Conservation Society. Pp. 240. £14.95.

This is a high quality book. It is worth buying for the colour photographs alone, which are quite superb and beautifully reproduced. The photographs are by a number of underwater photographers, all of whom are members of the Marine Conservation Society, as are the authors. The book is organised into chapters on various shore and underwater habitats, each abundantly illustrated with the aforementioned photographs, and line drawings. Some of the latter are, however, a little disappointing. For example, I'm sure the Mersey pilots are unaware of the two islands in Liverpool Bay (map, p. 11). Though the book is a multi-author work, the editor has succeeded in producing a unified and cohesive whole, and one is hardly aware of the several authors until reading the credits. There is, of course, a chapter on conservation issues; however, this is not written as if preaching as is so often the case, but is powerful, readable and gentle persuasion. As David Bellamy (who else?) says in the foreword, 'the authors are all divers and do not shirk their responsibilities of conservation, drawing attention to pollution, overfishing and marinarification.' (Is that last word in the new edition OED?) Since the editor, authors and photographers are all experts and enthusiasts (not always the same thing) in their field, the text is informative, authoritative and at the same time very readable.

HDJ

The Wildlife Photographer – A Complete Guide by **Bob Gibbons** and **Peter Wilson**. Pp. 160, with colour and b/w photographs and line drawings. Blandford Press. 1986. £10.95.

At last, here is a book for the average, amateur photographer with a modest income who wishes to achieve good results without undue expense. The layout of the first section, on equipment, is logical and easy to read. Format, camera, lenses, meters, priority and accessories have a number of pages devoted in great detail to each topic. Many problems, some of which the reviewer has only surmounted after a number of years of trials and disappointments, are answered here in depth.

The only omission, surprisingly, is a discussion of film types, makes and speeds; a passing, brief reference about eight times throughout the book is rather unhelpful in that each topic had different requirements. The average photographer is unlikely to be able to carry two or more camera bodies into the field. One film make is notorious for making blue skies purple and others cannot cope adequately with greens.

The remaining six sections deal exhaustively with all the problems of photographing different groups of organisms – plants, birds, invertebrates, animals and creatures of the seashore. Each group requires a different approach and the various techniques, equipment and the problems that need solving are discussed at length. Even the method, used by the reviewer, of holding flash in one hand and camera in the other finds a place in the text.

The authors are not only experienced professionals but also have the gift of being able to communicate both lucidly and comprehensively. Altogether, this is an extremely readable book and capable of solving most of the problems encountered in wildlife photography. The coloured photographs are, naturally, superb and not only present a tantalising challenge to all natural history photographers but also illustrate how the correct technique can enhance an already attractive subject.

DHS

Vegetation of the Soviet Polar Deserts by **V. D. Aleksandrova**, translated by **D. Löve**. Pp. xii + 228, 22 tables, 53 figures. **Reindeer on South Georgia** by **N. Leader-Williams**. Pp. xiv + 319, numerous figures, tables and plates. **Biology of Polar Bryophytes and Lichens** by **R. E. Longton**. Pp. viii + 391, numerous figures and tables. Studies in Polar Research, Cambridge University Press. 1988. £30.00, £20.00 and £55.00 respectively.

We are indebted to Cambridge University Press for commissioning this excellent series. Remote though they are, it is becoming increasingly obvious that even the polar regions are not immune from the influence of man. The growth of polar research activity has mushroomed over recent years; the resultant output of scientific papers has been phenomenal, but the number of works collating and synthesizing such data has been far from numerous. This series therefore fills a much-needed gap, and the titles listed above maintain the high standard set by earlier volumes.

Although there are slight differences in style and approach, each volume provides a valuable survey of the present state of knowledge in reasonably well-defined subject areas, not only through scholarly texts but also through illustrative material and very comprehensive bibliographies. Of the three titles under review, that by Aleksandrova is naturally based essentially on Russian research and publications which, since they are not easily accessible, makes this volume particularly valuable and interesting; Leader-Williams critically examines the effects of an introduced species on the native ecology, while Longton draws our attention to two most important groups of plants which dominate large areas of this otherwise inhospitable terrestrial environment; it is noticeable that the latter author, a well-known bryologist, is less happy dealing with lichens, as can be judged by the large number of misspelt Latin names, outdated nomenclature, and overlooked synonyms in text and index!

Ecologists and environmentalists throughout the world will undoubtedly look forward to further titles in this challenging and informative series.

MRDS

Flora of the British Isles by **A. R. Clapham, T. G. Tutin** and **D.M. Moore**. Pp. xxx + 688, including 82 line drawings. Cambridge University Press. 1987. £65.00.

As well as providing a revised and completely updated text, this third edition differs from its predecessors in two important respects: its authorship and its format. For thirty-five years our standard British flora has been affectionately known as 'CTW', but in future we must remember to refer to it as 'CTM'; the death of E. F. Warburg in 1966 was a sad loss to British botany, but D. M. Moore has most ably taken his place as the third author of this monumental and quite indispensable work. As regards the second change, it is no longer feasible to accommodate the increased knowledge of our flora in a small compass. As a young man, the first edition of 'CTW' was a faithful companion, accompanying me in my knapsack (it never fitted into a pocket!) on many a botanical excursion. The second edition, a weightier tome, although it had to remain in the car, was at least consulted in the field. The present edition, for reasons not only of weight and size (18 × 25 × 4 cm) but now alas also of cost, will no doubt have to remain safely left behind, unexposed to the elements, its role now confined to that of desk-top and laboratory bench reference source.

The new format, set in double columns, is easy on the eye, making comparisons of taxonomic descriptions and entries in keys easier. The nomenclature has been extensively updated, due in large measure to the appearance of the five volumes of *Flora Europaea* between 1964 and 1980.

Botanists owe an immeasurable debt of gratitude to the authors, other specialists called upon, and the publishers for providing us with a more than worthy successor to our old friend 'CTW'.

MRDS

The Weather Companion by **Gary Lockhart**. 230 pages, with numerous sketches and line drawings. John Wiley. 1988. £8.50.

This volume provides a pot pourri of snippets of weather-related information and the book's subtitle 'An album of meteorological history, science, legend and folklore' aptly describes its contents. Diverse types of weather-related ideas are loosely packaged under seven general headings: weather past; weather tools; weather phenomena; storm warnings; weather and wildlife; botanical weather; and the weather, you, and me.

Some of the snippets of information are derived from sources unlikely to be read by most meteorologists and as such are likely to stimulate thought. All too often though the explanations are somewhat dubious and arguments not coherently presented. On page 45, for example, it is stated that 'it is a well-known fact that sound travels great distances . . . (in the Arctic). Animals in these areas have small ears for they can hear a barking dog up to 15 miles away'. Might not these observations of small ears have less to do with the claims about air density and sound transmission than with the risk of frostbite? Again, the author gives a general description (pp. 63–66) of 'a miraculous cross in the sky' seen in October AD312 before the battle of Milvan Bridge, but offers no coherent analysis to explain the phenomenon.

Overall, the book presents an uncritical assemblage of bits of information. Sometimes its novelty will entertain and stimulate people who already possess a knowledge of basic meteorology, but it should not be recommended to those seeking a sound source of information which will help them understand the weather.

DEC

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The Naturalist

A QUARTERLY JOURNAL OF NATURAL HISTORY FOR THE NORTH OF ENGLAND

A decrease in Carrion Crow *Corvus corone* numbers following sheep removal and afforestation — *S. J. Petty and D. I. K. Anderson*

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Annual avian and mammalian traffic mortality along a South Yorkshire road — *P. N. Johnson*

Published by the Yorkshire Naturalists' Union

Editor **M. R. D. Seaward**, MSc, PhD, DSc, FLS, The University, Bradford BD7 1DP

Photographic Plates

Readers of *The Naturalist* will have noticed that the number of photographic illustrations has increased in recent years. Good clear photographs, suitably captioned, to accompany articles or as independent features, such as the bird portraits by Arthur Gilpin in recent issues, are always welcome.

To encourage this development, a long-standing member of the YNU, who wishes to remain anonymous, has most generously offered to make a donation, the income from which would finance the publication of a plate or equivalent illustration in future issues whenever possible. The editor, on behalf of the YNU, wishes to record his deep appreciation of this imaginative gesture.

Notice to Contributors to 'The Naturalist'

Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Volumes of *The Naturalist* for the years 1886 to 1975 have been retrospectively numbered 11 to 100 to accord with numbering before and after this period (see YNU *Bulletin* no. 3, pp. 21–22, 1985); please cite these volume numbers in all references. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

Appointment of Membership Secretary

In order to ease the workload on the Administrative Officer (Mr Don Bramley), all matters **other than subscriptions** should now be addressed to:

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Items which should be sent to the above include: all membership applications, changes of address, resignations and problems concerning non-receipt of any of the YNU's publications.

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A DECREASE IN CARRION CROW *CORVUS CORONE* NUMBERS FOLLOWING SHEEP REMOVAL AND AFFORESTATION

S. J. PETTY and D. I. K. ANDERSON
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In Britain the Carrion and Hooded Crow *Corvus corone* commonly occur on upland sheep farms. Houston (1977) in Argyll, found that during the winter Hooded Crows fed primarily on domestic animal food and carrion. In the summer, insects were their main food; these were presumably relatively easy to find in a short, heavily grazed vegetation sward. Crows may also eat the eggs and small chicks of a wide range of ground-nesting birds.

The planting of conifer forests in the uplands is often assumed to result in an increase in the density of crows (and Foxes *Vulpes vulpes*) and in their predation on the nests of moorland birds (Stroud and Reed 1986, Bainbridge 1986, Nature Conservancy Council 1986, Stroud *et al.* 1987). However, Andrén *et al.* (1985) showed the opposite in a range of Swedish forests; as the proportion of agricultural land increased so did the abundance of corvids and their predation on ground nesting birds.

In this paper we present data which show that the breeding density of Carrion Crows decreased following the removal of sheep and the partial afforestation of a previously grazed area.

Study Area

The study area consists of two adjacent upland valleys in Northumberland. Both are at the headwaters of the North Tyne (Figure 1). Prior to 1968, these valleys formed part of one sheep farm. Sheep were removed from the lower part of the Scaup Burn in September 1967 and the upper part in September 1972. Part of the lower ground was planted between spring 1969–78, mainly with Sitka Spruce *Picea sitchensis*. In 1972, a fence was erected along the watershed between Scaup Burn and White Kielder Burn to prevent sheep straying over from the latter area. Sheep remained in the White Kielder, apart from on a small area which was fenced and planted with Sitka Spruce in 1978.

The geology and vegetation of the two valleys were similar. Blanket bog covered most of the hill tops and upper slopes. Peaty gleys and surface water gleys occurred on the lower slopes and valley bottoms. In both areas the vegetation comprised largely of *Calluna vulgaris*, although a grassy vegetation occurred on the heavily grazed and flushed lower slopes. Single and small groups of mature *Betula pubescens*, *Sorbus aucuparia* and *Alnus glutinosa* and occasional *Pinus sylvestris*, occurred along the lower burns.

Methods

Crows usually nest in trees, and where these are plentiful they usually build a new nest each year. When nest trees are scarce they may re-use old nests (Hewson and Leitch 1982). In the study area, Carrion Crows nested in the scattered mature trees along the larger burns. Prior to 1967 and until 1972, the knowledge of local shepherds and bird watchers was used to identify groups of nests which formed the nesting territories of individual pairs of crows (Figure 1). The spatial arrangement of the 14 nesting territories was assessed by measuring the distance from the centre of each nest group to its nearest neighbour.

Annually from 1972 until 1986, all the crow nests were checked at least three times from April to July to locate nesting raptors. It was unlikely that nests were missed, as they were easily seen before the leaves opened on the trees. During these visits we recorded whether a crow's nesting territory was occupied or not. A territory was counted occupied once eggs were laid, either in a new nest or an old one which was refurbished.

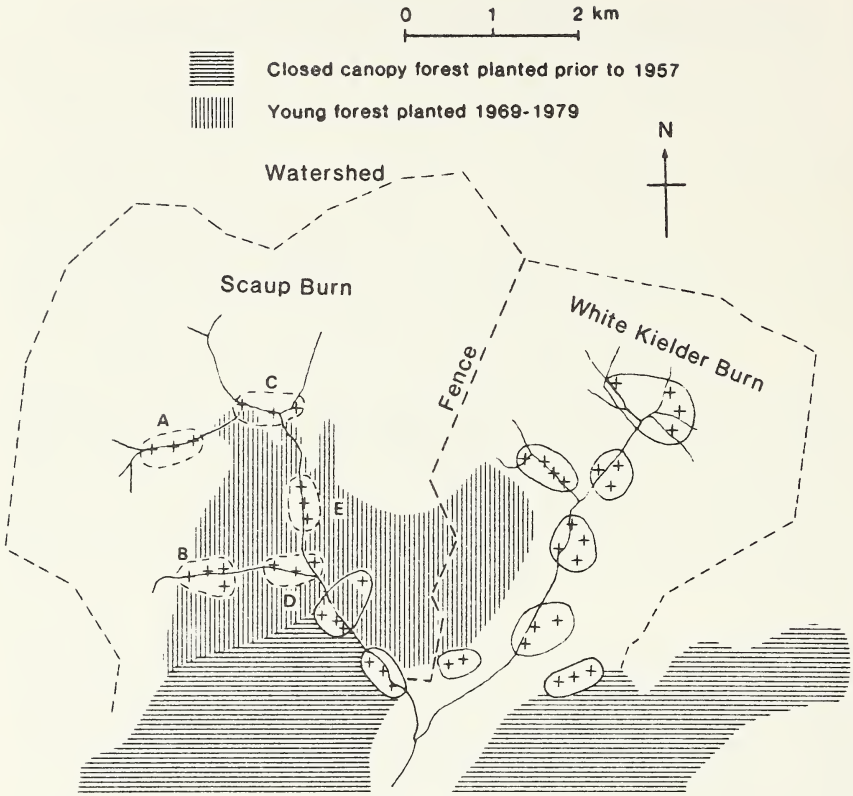

FIGURE 1

The location of 14 Carrion Crow nesting territories. The crosses mark the positions of nests. Crosses enclosed by a solid line are nesting territories that were still occupied in 1986. Those enclosed by a broken line were deserted between 1971 and 1983 in the sequence A, B, C, D and E. The white areas within the watershed are unplanted, in the Scaup catchment sheep were excluded in 1972 and the White Kielder catchment has been grazed throughout this study.

Results

Local knowledge suggested the population of crows in both valley systems was remarkably stable prior to 1967 and until 1970, with territorial pairs regularly spaced at 764 ± 28 m (mean ± S.E.). After the removal of sheep and afforestation of the low ground in the Scaup Burn, the breeding density of Carrion Crows dropped from 7 to 2 pairs (Figure 2). The first nesting territories to be deserted were high up the burns and the furthest from sheep walks. Much ungrazed moorland remained in this area and the desertion of territories occurred well before canopy closure of the conifer crop. In contrast, the seven pairs of crows along the White Kielder Burn showed no change throughout the entire period 1967–1986. None of the crows nested in young spruce trees, the oldest of which were 17 years old in 1986, although three pairs regularly nested along the edge of the older forest planted prior to 1957 (Figure 1). We had no evidence of crows ever nesting on the ground.

Discussion

The results show that afforestation of areas that were formerly grazed by domestic stock can lead to a decline in the breeding density of crows. High crow densities on grazed areas are probably maintained there by the abundance of animal feed, sheep carrion and invertebrates which may be easily found in the short vegetation. The carrying capacity for crows might therefore be expected to decline following afforestation as these food resources declined and/or became harder to find. Domestic stock are fenced off from planted areas, thus removing both the source of animal feed and sheep carrion. The luxuriant growth of ground vegetation during the establishment phase of plantation (Hill 1979) may make it progressively more difficult for crows to find invertebrates.

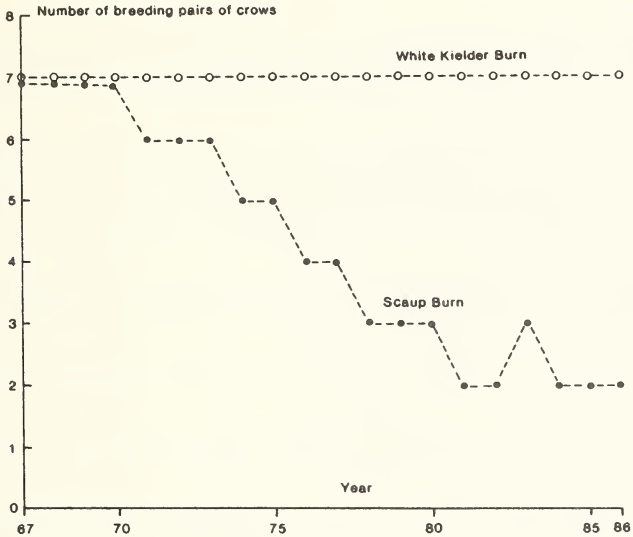

FIGURE 2

The population of Carrion Crows in the two valleys of the study area, 1967–86.

Canopy closure of the tree crop occurs from about 15 years of age and will completely prevent crows foraging over an area. The reduction in these food resources is unlikely to be compensated by an increase in other foods. A small increase in deer carrion may occur, and Field Voles *Microtus agrestis* frequently increase during the establishment phase (Charles 1981), but both of these food resources will disappear or become unavailable to crows after canopy closure. Therefore the status of crows along the forest/moorland interface may depend on how the moorland is managed, with crows possibly increasing with the intensity of grazing.

It is possible that some other cause, unrelated to land use change, might have caused the decline in the crow population along the Scaup Burn. Potential crow predators such as Peregrines *Falco peregrinus* increased in the area during the course of this study. However, if raptors or some other factor were responsible for this decline, we would have expected it to have occurred in both valley systems rather than just in one.

The results of this study show that the decline of the crow population in the Scaup area commenced soon after planting even though much ungrazed moorland remained alongside these young plantations. However, it was not possible to determine precisely whether the removal of sheep or afforestation led to the decline of crows in the Scaup area. Therefore we suggest that research should be undertaken to determine how crows react to sheep removal independently of afforestation.

Summary

The breeding density of crows is often assumed to increase following the afforestation of previously grazed areas. This paper describes the change in a population of Carrion Crows in upland Northumberland from 1967 to 1986. At the start of the study, the area formed part of one sheep farm and consisted of two adjacent valleys. Between 1967 and 1972 the sheep were removed from the whole of one valley and part of the area was planted. Prior to the removal of sheep this area constantly had 7 breeding pairs of crows. Between 1971 and 1984 the population dropped to two pairs and remained at this level until 1986. Sheep remained in the adjacent valley, and here the breeding density of crows remained at 7 pairs throughout the study.

Acknowledgements

We thank Drs M. Marquiss, M. I. Avery, P. R. Ratcliffe, A. Watson and R. Parr for their constructive comments on an earlier draft of this paper, John Williams for drawing the figures, and Lena Birchall and Diane Chadwick for the typing.

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ORIBATID MITES (*ACARI: CRYPTOSTIGMATA*) FROM ORKNEY

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Abstract
Thirty-six species of oribatid mites are recorded for Orkney, 34 of which are new records for the islands. 10 species are newly recorded for Scotland. *Ophidiotrichus tecta* is redescribed from a declared lectotype, a key provided for the British species of *Scheloribates*, and a figure for *S. pallidulus*.

Introduction

There are 133 genera and 295 species of oribatid mites (*Acari: Cryptostigmata*) recorded from the British Isles. Of these, 79 genera (59 per cent) and 129 species (44 per cent) are represented in Scotland. This relatively small proportion of the total may, in part, reflect the patchy collecting of this somewhat neglected animal group (Table 1).

Until now, Orkney could boast only two records, *Ameronothrus lineatus* from Eynhallow (Duffey 1955) and *Liochthonius lapponicus* from Mainland (Moritz 1976). This note brings the number of species to 36, most of which are ubiquitous and abundant elsewhere in the British Isles. Nonetheless, ten new records for Scotland are included which suggests that more widespread collecting would add more species to the Scottish list.

TABLE 1
Numbers of species of oribatids recorded from the administrative regions of Scotland

Borders	1	Lothian	3
Central	1	Orkney	36
Dumfries and Galloway	4	Shetland	0
Fife	1	Strathclyde	43
Grampian	2	Tayside	20
Highland	36	Western Isles	42

Collecting Locations

A. Dry moss and debris accumulated on sheltered rock cliff, South Ronaldsay (ND 463 836). 8.8. 1987 (number of individuals in sample = 15)
B. Wet moss on heather moor, Rousay (HY 404 288). 9.8. 1987 (n=652)
C. Moderately dry moss on heather moor, Rousay (HY 403 288). 9.8 1987 (n=83)
D. Dry moss on heather moor, Rousay (HY 403 287). 9.8. 1987 (n=153)
E. Turf from machair-type vegetation, Mainland Skaith (HY 377 065). 10.8. 1987 (n=98)
F. Turf at top of salt-marsh, Mainland Skaith (HY 377 065). 10.8. 1987 (n=97)
G. *Calluna* moor on hill slope, Hoy (HY 225 024). 12.8. 1987 (n=95)

Population Abundances

Total oribatid numbers per sample are given above after the locality data, but in the list below, the mite species populations are also given an arbitrary relative abundance index as in Luxton (1987a): thus 1 = <1 per cent of total oribatids in sample; 2 = 1–5 per cent; 3 = 6–10 per cent; 4 = 11–15 per cent; 5 = 16–20 per cent; 6 = >20 per cent.

Species List

* = new record for Scotland

Family Phthiracaridae

**Phthiracarus affinis* (Hull, 1914) C2 G4
Widely distributed in the British Isles.

Phthiracarus montanus Perez-Inigo, 1969 G2
Widely distributed in the British Isles (not Ireland).
Recorded elsewhere by its synonyms *Phthiracarus murphyi* and *P. rectisetosus*.

Family Brachychthoniidae
(*Liochthonius lapponicus* (Trägårdh, 1910), collected at Stromness, Mainland (Moritz 1976))
Liochthonius sellnicki (Thor, 1930) G2
Widely distributed in the British Isles (not Wales).
**Neobrachychthonius magnus* Moritz, 1976 C2
Distribution limited (Greater London; North Yorkshire). Not abundant; this record is only the third for the British Isles.

Family Hermanniidae
**Hermannia pulchella* Willmann, 1952 F2
Found throughout the British Isles; confined to salt-marsh soils and tidal debris.

Family Nanhermanniidae
Nanhermannia coronata Berlese, 1913 B1 D1
Widespread and common in the British Isles, especially in wet locations.

Family Camisiidae
Platynothrus peltifer (C. L. Koch, 1839) A3 D1 E2 F6
Widespread and common in the British Isles.

Family Nothridae
Nothrus palustris C. L. Koch, 1839 E2
Widespread and common in the British Isles.

Family Ameronothridae
Ameronothrus lineatus (Thorell, 1871) A6
(also collected on the west coast of Eynhallow (Duffey 1955)).
Common in maritime localities throughout the British Isles.

Family Carabodidae
Carabodes marginatus (Michael, 1884) B2 D3
Widespread in the British Isles (not Ireland).
Carabodes willmanni Bernini, 1975 B6 C6 D6
Widespread and common in the British Isles.

Family Tectocepheidae
Tectocepheus velatus (Michael, 1880) A4 B1 C2 D1
Among the commonest of oribatid mites in the British Isles.

Family Ceratoppiidae
Ceratoppia bipilis (Hermann, 1804) B1 G2
Among the commonest of oribatid mites in the British Isles.

Family Liacaridae
Adoristes poppei (Oudemans, 1906) G2
Widespread in the British Isles.

Family Oppiidae

Dissorhina ornata (Oudemans, 1900) C2 D3 E4 F2 G6
Among the commonest of oribatid mites in the British Isles.
**Medioppia obsoleta* (Paoli, 1908) C3 E2 G3
Widespread in the British Isles (not Wales).

Family Suctobelbidae

**Suctobelbella sarekensis* (Forsslund, 1941) C2 E2
Widespread in the British Isles.
Suctobelbella subcornigera (Forsslund, 1941) B1 C2
Widespread in the British Isles (not Wales).

Family Thyrisomidae

Banksinoma lanceolata (Michael, 1885) B1 C2 D2 G2
Widespread and common in the British Isles.

Family Ceratozetidae

Ceratozetes gracilis (Michael, 1884) G2
Widespread and common in the British Isles.
**Melanozetes stagnatilis* (Hull, 1914) B1 D2
The first new record of this species since 1916 (see redescription in Luxton 1987b). It may be a northern species, having been recorded from Cos. Mayo and Leitrim in the Republic of Ireland; North Wales; Northumberland; and Cumbria. On the other hand, it may have been confused in previous publications with the common *Melanozetes mollicomus* from which it may be distinguished by (among other things) its larger size (720–750μm as opposed to 470–590 μm).

Family Chamobatidae

**Chamobates borealis* (Trägårdh, 1902) B2 D2
Widespread in the British Isles (not Wales).
Chamobates cuspidatus (Michael, 1884) G3
Among the commonest of oribatid mites in the British Isles.

Family Euzetidae

Euzetes globulus (Nicolet, 1855) E2
Among the commonest of oribatid mites in the British Isles.

Family Mycobatidae

Minunthozetes semirufus (C. L. Koch, 1840) F2
Among the commonest of oribatid mites in the British Isles.

Family Achipteriidae

Parachipteria punctata (Nicolet, 1855) B2 C2
Among the commonest of oribatid mites in the British Isles.
**Parachipteria willmanni* van der Hammen, 1952 C3
Widespread in the British Isles (not Wales).

Family Oribatellidae

Ophidiotrichus tecta (Michael, 1884) G3 (Fig 1A, B)
Oribata tecta: Michael (1884)
Notaspis connexus var. borussicus: Sellnick (1909)
Achipteria tecta: Hull (1916)
Joelia connexa var. borussica: Evans (1952), Turk (1953)
Tectoribates tecta: Turk (1953), Delany (1956), Evans *et al* (1961)

Note: Grandjean (1932) and Evans (1954) have pointed out that Michael's original description and figure of this species contained several inaccuracies. Indeed, Grandjean (1953) perpetuated an error in continuing to assume that *O. tecta* was tridactylous. Evans (1954) compared Michael's specimens with the description of *Notaspis connexus* var. *borussicus* Sellnick, 1909 and pronounced the species synonymous, although no redescription was made. Michael's slide preparations at the British Museum (Natural History) have been re-examined and that labelled 1930.8.25.241 selected as lectotype. Only the dorsal surfaces of Michael's specimens can be observed so the description of the venter which follows has been made from the Orkney material.

Dimensions: Length 270 μm; width 180 μm (Michael (1884) gives length as 210 μm and width as 110 μm). Mean length of Orkney specimens 258 μm (range 250–270)(n=5); mean width 168 μm (range 150–180)(n=5).

Prodorsum: Rostrum with three blunt projections; rostral setae not observed. Lamellae broad, fused medially for about one third their length, expanding slightly at the level of the bothridia, sparsely punctate in anterior two thirds and lightly striate in the posterior third; cusps each with two sharp teeth. Lamellar setae robust, inserted medially on cusps and somewhat papillate; a channel runs through the lamellae posteriorly from the base of each of these setae. Interlamellar setae arise from close to the dorsosejugal suture, are fine and smooth, and extend to the posterior point of fusion of the lamellae. Bothridia cylindrical, rifled internally and projecting only slightly above the dorsosejugal suture. Sensilli directed inwards, narrow and expanding only very slightly before terminating in a point; portion out of bothridia scattered with papillae.

Notogaster: Sparsely punctate and bearing 10 pairs of fine, smooth notochaetae and 4 pairs of areae porosae. Pteromorphae ventrally declined with an undulating leading edge.

Venter (description from the Orkney specimens): Overall punctate, including genital and anal plates; lateral fields of epimera faintly striate. Apodemata 2 not joined medially, apodemata 3 and 4 fused together medially to form a broad band just anterior of genital plates. Epimeral setal formula 2-1-2-1; all ventral setae small or inconspicuous. Six pairs of genital setae arranged around the periphery of the plates; 1 pair of aggenital setae; 2 pairs of anal setae; 3 pairs of adanal setae.

Legs: Genua I and II each with a tooth-like projection bearing a seta. Monodactylous.

Remarks: Both Michael's specimens and those from Orkney had been feeding on ascospores.

Records: Distribution is patchy (Surrey; Bedfordshire; Devon; 'Forth area of Scotland'). This record is only the fifth for the British Isles.

Family Oribatulidae

Liebstadia similis (Michael, 1888) A5 D4 E6 F6

Among the commonest of oribatid mites in the British Isles.

Phauloppia lucorum (C.L. Koch, 1841) A5

Among the commonest of oribatid mites in the British Isles. This species was probably the first oribatid mite to be illustrated (in Hooke's 'Micrographia' of 1665) and has been found in a number of unlikely habitats (eg. in dust from seats of electric trains in Glasgow (Colloff 1987)).

Family Scheloribatidae

Scheloribates laevigatus (C.L. Koch, 1836) F5

Among the commonest of oribatid mites in the British Isles.

**Scheloribates pallidulus* (C.L. Koch, 1840) A3 (Fig 2)

Neither abundant nor widespread (Northamptonshire; Cambridgeshire; Dyfed).

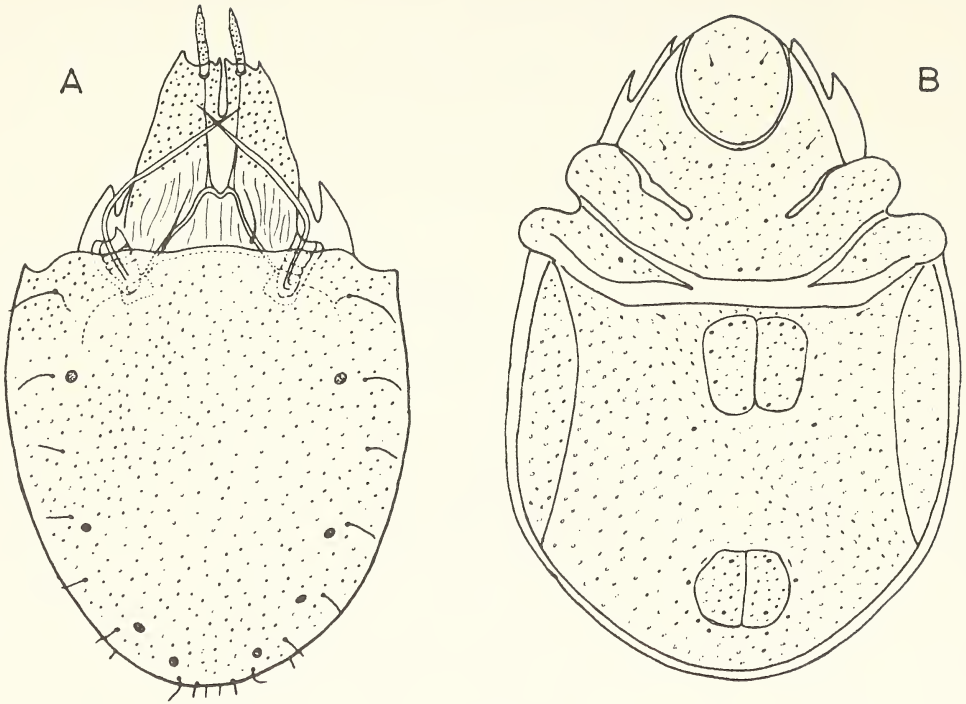

FIGURE 1
Ophidiotrichus tecta: A. dorsal view; B. ventral view (Scale bar = 100 μm)

This record is only the fourth for the British Isles. Since this might be the result of some confusion between the identity of the various species a Figure is provided and a key to the British species of the genus follows:

1 Sensilli terminating in a point . . . . *laevigatus*
- Sensilli blunt . . 2

2 Width: length ratio of body 1:1.5; pteromorphae with a concave anterior border when viewed from above . . . . *latipes*
- Width: length ratio of body 1:1.75 or 2; anterior border of pteromorphae not concave when viewed from above . . . . *pallidulus*

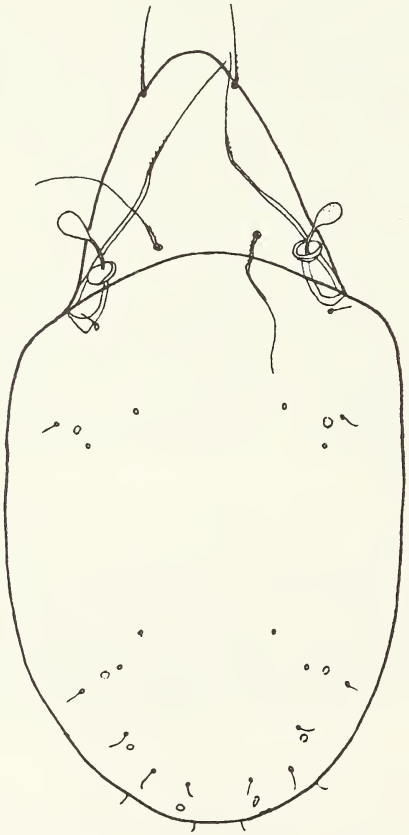

FIGURE 2
Scheloribates pallidulus, dorsal view (Scale bar = 100 μm)

Family Scutoverticidae

Scutovertex sculptus Michael, 1879 E2

Widespread in the British Isles, especially in dry habitats

Family Phenopelopidae

**Eupelops nepotulus* (Berlese, 1917) E3

Neither abundant nor widespread. The only other record for the British Isles is from C. Wexford.

Eupelops plicatus (C. L. Koch, 1836) E2 F2

Widespread in the British Isles.

Acknowledgements

I am most grateful to Dr Ian Hodkinson for collecting the samples on which this paper is based, and to Dr Matt Colloff for his advice on the identities of the achipteriid species.

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FIELD NOTE

Note on a Lapwing, *Vanellus vanellus*, with an abnormal clutch

On 12 April 1989, I erected a portable hide in a wet area of Osmotherly Moor for observation purposes. About 15 m from the hide, on a dry part of burnt moor, I found the nest of a lapwing containing 3 eggs. On returning to the hide on 15 April, I noticed that the nest now contained 5 eggs and that the eggs were cold, although there was a pair of lapwings in the area. On 17 April the nest contained 6 eggs which were being incubated. On this part of the moor the density of breeding lapwings is <1 pair/ha although in the fields adjacent to the moor the density rises to >6/ha. According to Cramp (1983), a clutch is normally 4 eggs, sometimes 3, rarely 2 or 5, and more than 5 by two females and Harrison (1975) provides similar figures; however Hosking and Newberry (1944) illustrate a nest similar to that described above, stating it to be the first recorded instance. In the light of this, there can be recorded instances of clutches with 6 eggs.

The colour and type of markings on all the eggs in this nest appeared to be almost identical. Examination of clutches elsewhere on the moor and in the adjacent fields showed that each clutch exhibited colours and markings consistent within the clutch, but varying between clutches. This consistency of egg markings, and the fact that only two birds were ever seen in the nest vicinity, suggests that all 6 eggs were laid by the same bird.

One egg hatched on 17 May, the chick remaining with one parent whilst the other bird incubated the remaining eggs.

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John E. Knight

FIRST RECORDERS OF THE GOOLE SCIENTIFIC SOCIETY, WITH PARTICULAR REFERENCE TO THOMAS BUNKER

MARTIN LIMBERT
Museum and Art Gallery, Doncaster

The First Recorders

The formation of the Goole Scientific Society in 1875 brought together and encouraged a number of able naturalists to both work their rather undervalued region at the head of the Humber estuary, and to promote its documentation. The Society's minute books and copies of its publications still survive at Goole Library and, with references from the local newspapers of the time, they depict the fortunes of the Society until its demise in 1886. A list of the Society's publications is given in T. Sheppard's *Yorkshire's Contribution to Science* (London, 1916), and an interesting retrospective account of its activities by Thomas Birks (*q.v.*) is also available (*Goole Times*, 27 October 1905). The Society's first recorders were announced in 1877 (*Ann. Rep. Cttee Goole Sci. Soc. 1876–77*: 3–7). They comprised Dr H. F. Parsons (Geology and Cryptogamic Botany), Thomas Birks (Botany), Revd R. D. Maxwell (Conchology) and Thomas Bunker (Vertebrate Zoology). With the exception of Maxwell, all were also involved with the work of the Yorkshire Naturalists' Union.

Of these four recorders, by far the most significant is Dr Parsons. He was the Medical Officer of Health in Goole from 1874–79, and was the Scientific Society's leading spirit (and Secretary) until his departure from the town in the latter year. This was perhaps the greatest single blow to the vitality and organization of the Society, which probably never really overcame so serious a loss. Almost certainly, it is significant that the Society's printed *Annual Report* for 1878–79 was its last (*Naturalist* **112**: 117–24). F. A. Lees' memorable comment in his obituary of Parsons (*Naturalist* **39**: 8–9) that only Charles Darwin had impressed him with a 'mental magic' comparable to Parsons', has ensured the latter's continuing interest to botanical historians. He was elected the first Honorary Life Member of the Y.N.U., and was clearly a botanist and administrator of lasting renown (e.g. *Naturalist* **86**: 41–43, 53–66, 145–50, 163–68; **89**: 71; **107**: 121–29; *Bull. Brit. bryol. Soc.* **38**: 38–48; R. Desmond, *Dictionary of British and Irish Botanists and Horticulturists* (London, 1977); D. L. Hawksworth and M. R. D. Seaward, *Lichenology in the British Isles 1568–1975* (Richmond, 1977)). A comprehensive study of his life and work – in and beyond Goole – would constitute a particularly worthwhile study.

Thomas Birks was another competent botanist of wide interests, and deserves a place in future editions of Desmond's *Dictionary*. He was a native of Goole, but left the town in 1885. His biography has been outlined recently (*Lapwing* **19**: 42–47), although at that time it had not been ascertained that he was a Foundation Member of the British Mycological Society, which was established at a Y.N.U. fungus foray at Selby in 1896 (*Naturalist* **86**: 53–66; **107**: 121–29; *Trans Brit. mycol. Soc.* **2**: 1; **30**: 1–16). Birks, like Parsons, contributed to the Goole Society's herbarium, now regrettably substantially destroyed (*Lapwing* **19**: 42–47).

The Revd R. D. Maxwell, a native of Beverley, was Goole's Congregationalist minister from 1868 or 1869 to 1878 (*Goole and Marshland Weekly Times*, 13 September 1878; H. Garside, *Congregationalism in Goole 1828–1951*, Goole, 1951). In 1878, he retired to Teignmouth, due to ill-health (*Goole Telegraph*, 10 September 1878, *Goole and Marshland Weekly Times*, 13 September 1878). As a 'constant supporter of sanitary and educational progress', he was one of the first to suggest the desirability of forming a scientific society in Goole, as a successor to the extinct Goole Literary and Scientific Society, which had begun life in 1841, and failed at some unknown subsequent date. Maxwell became the only conchological recorder of the Goole Scientific Society, although accounts of the early history of Yorkshire conchology (e.g. *J. Conch.* **28**: 265–93; **32**: 1–8; *Naturalist* **107**: 131–34) make no reference to him. His main significance seems to rest on the records derived from his collection and unpublished list of Goole district

mollusca (e.g. *J. Conch.* **3**: 241–56; *Trans Y.N.U. Ser. C*: Annotated List of the Land and Freshwater Mollusca known to inhabit Yorkshire). The Scientific Society's *Annual Report* for 1878–79 records that on his departure from Goole, Maxwell presented his collection of local mollusca ('52 kinds') to the Society's museum, and sent his list of the mollusca of the neighbourhood (20 miles radius of Goole), 'with localities arranged according to the "vice-counties". It contained seventy species and seven varieties.' These have probably suffered the same fate as the Society's herbarium, although over half of the taxa from the list can be gleaned from the Scientific Society's early minutes and from the Yorkshire list in the *Y.N.U. Transactions*.

Finally, of the original recorders, there is Thomas Bunker, the only one who retained his position (and, indeed, his residence in Goole) until the Society expired. The notes which follow augment a 'thumbnail' biography of him (*Lapwing* **16**: 56–60). Of all the Scientific Society's members, Bunker took the deepest interest in their district's most notable site, Thorne Moors, a part of which extends into Goole parish as Goole Moor. He was apparently introduced to the site c.1876 by Thomas Birks (*Lapwing* **14**: 18–26). Although Bunker was primarily interested in vertebrate zoology, he nevertheless had relatively wide interests, and became an acknowledged authority on the natural history of the region, especially the peat moors. His work is still full of interest, and is essential material for local researchers. As records providing a context for modern studies, or as a glimpse into nineteenth century Goole, Bunker's writing remains both instructional and enjoyable to read. He produced the first lists of Goole birds (*Goole and Marshland Times*, 22 March 1878) and fishes (*Goole Weekly Times*, 3 March 1882), and provided an early account of Thorne Moors (*Trans Hull Sci. Fld Nat. Cl.* **1**: 1–9). His manuscript narrative of the visit to Thorne Moors with Birks, c.1876, also of some lasting interest (*Lapwing* **14**: 18–26), usefully extends our insight into this threatened moorland.

Biographical Details of Thomas Bunker

The following information is derived (unless stated otherwise) from Bunker's obituary in the *Goole Times* of 16 April 1915. He was born on 2 February 1830 at Toddington, Bedfordshire. He trained for the teaching profession at St Mark's College, Chelsea, and shortly afterwards, allegedly in 1846 (although 1851 seems more likely), he took up a post as a schoolmaster at the National Schools in Goole, where he lived for the rest of his life. In 1857, he opened a private day school in a room belonging to the Scientific Hall (*Goole and Marshland Times*, 1 June 1857). From 1855, he was appointed the Collector of Rates for Goole township by the Guardians of the Goole Union (*Goole and Marshland Gazette*, 1 September 1855). He subsequently became a tax collector for the Goole Union Rural Sanitary Authority, probably from 1872 (Public Health Act 1872) until his retirement c.1890. He also acted as manager of a savings bank in Goole for many years, and was a staunch supporter of the Established Church.

Thomas Bunker's Natural History Interests

However, it is as a naturalist that Bunker is particularly recalled here, although little is known about this aspect of his life before 1875. There is, nevertheless, some indication of earlier interest. For example, he was involved in the slaughter of 23 Northern Bottlenose Whales *Hyperoodon ampullatus* Forst. in the Humber in the 1860s (*Y.N.U. Bull.* **4**: 18–19), and on the foray to Thorne Moors, c.1876, he clearly had prior acquaintance with some of the organisms encountered (*Lapwing* **14**: 18–26). However, it is odd that Thorne Moors should apparently be new to him on that occasion: 'I was anxious to learn something of the moor itself and what plants and animals were to [be] met with' (*Lapwing* **14**: 22).

From 1875, details of Thomas Bunker as a naturalist appear in much sharper focus. He held office in the Yorkshire Naturalists' Union, of which he was a long-standing member. He served terms as Secretary and President of the Vertebrate Zoology Section, and was a member of the Wild Birds and Eggs Protection Committee. In addition, he

was the Local Secretary for Goole, a permanent member of the Union's General Committee, and eventually an Honorary Life Member, 'In recognition of his services to natural history' (*Naturalist* **40**: 117).

He joined the Goole Scientific Society on 19 June 1875, soon after its founding, and remained a loyal member throughout its existence. During this time he was Recorder for Vertebrate Zoology, and he served at various times as delegate to the Y.N.U., Assistant Secretary, Vice-President and – from 1882 to 1884 – as President. Additionally, he was a corresponding member of the Hull Scientific and Field Naturalists' Club (*Trans Hull Sci. Fld Nat. Cl.* **1**: iii).

Bunker was remembered as 'a general all round naturalist' (*Naturalist* **41**: 32), though, as noted, vertebrate zoology was his preferred subject, especially fish, birds and cetaceans. This was probably encouraged, or reinforced, both by the geography of the Goole district, and by his apparent enthusiasm for shooting (*Trans Hull Sci. Fld Nat. Cl.* **1**: 7) and fishing (*Goole Weekly Times*, 3 March 1882). In his manuscript account of the visit to Thorne Moors c.1876 (*Lapwing* **14**: 18–26), many observations on vertebrates and botany are noted, and emphasising his wide interests, he wrote:

> I had filled my vasculum with many interesting plants, had caught several larvae and placed them in chip boxes. I had no net with me and had only taken one moth which we knocked down with our hats – it was the Emperor Moth; from the ditches I had filled tubes with water containing algae, and hoped to find many hours employment for my microscope the next few evenings.

The *Goole Times* of 14 August 1896 adds to this view:

> Any information respecting discoveries of bones, &c., in the peat [of Thorne Moors], or pieces of metal or stone in the sand, will be received with thanks by Mr T. Bunker, 9 East Parade, who is anxious to place on record any fact connected with the history of the moors.

Bunker's obituary in *The Naturalist* (**40**: 176–77) describes him as 'equally interested in bird, plant or insect', though he himself wrote in his paper on Thorne Moors: 'Not being an entomologist I can only name a few species' (*Trans. Hull Sci. Fld Nat. Cl.* **1**: 6–7). He also claimed no knowledge of fungi (*Goole Weekly Times*, 28 March 1881).

Bunker freely contributed manuscripts lists, records, observations and specimens, as for example a perusal of Clarke and Roebuck's *A Handbook of the Vertebrate Fauna of Yorkshire* (London, 1881), Nelson's *The Birds of Yorkshire* (London, 1907), or the pages of *The Naturalist* show. He was himself not a prolific writer, at least so far as published work is concerned. A list of his output is appended.

At the first public meeting of the Goole Scientific and Field Naturalists' Society, on 24 October 1905, Thomas Birks, as a member of the former Goole Scientific Society, travelled back to town for the launch: 'to help give the little boat a good shove off'. Birks had been a regular field companion of Bunker, the latter having proposed him as a member of the Scientific Society in 1875. Birks spoke on the work and members of the extinct Society (*Goole Times*, 27 October 1905), including Bunker, who was seemingly not at the meeting:

> Mr Bunker, who joined the society at its second meeting, has always been an active and enthusiastic member, being seldom absent from any meeting, and always doing good work, whether the society was in active existence or not, much of its work, especially in the zoological section, was carried out single-handed by Mr Bunker. His services have ever been at the call of any fellow naturalist, and few people whose business was in any way connected with natural science have visited Goole during the last thirty years without being in some way indebted to Mr Bunker. I trust that he will do equally good service to the new society.

However, although noted as a 'prospective member' (*Goole Times*, 25 August 1905), there is no evidence to suggest that Bunker became a member of, or lectured to, the new organisation. Nevertheless, the second list of Goole birds, in the Society's only

(1908–09) volume of *Transactions* (**1**: 17–19) contains many records contributed by Bunker. The list was compiled by the Society's ornithological recorder, T. G. Kirby, and was apparently based on his lecture to the Society on 20 November 1906.

Although described as 'of a retiring disposition' (*Naturalist* **40**: 177), Bunker appears to have been well regarded. He often attended Y.N.U. field excursions, possibly his last being that to Askern on 11 July 1912, when he was 82. In the account of the visit (*Naturalist* **37**: 253–58), it was noted that:

> The President, Mr J. W. Taylor . . . expressed the pleasure of the members in being favoured by the presence of Mr T. Bunker, of Goole, who for so many years had been a steady supporter of the Union, and one of its oldest members.

Early in 1915, however, Bunker fell ill; he died at his home in East Parade ten weeks later, on 10 April, having reached the age of 85. In his *Naturalist* obituary, Bunker was described as 'one of the naturalists of the old type', and it was recalled that:

> Many Yorkshire naturalists today will remember with pleasure the interest shewn in their work and the encouragement given by Mr Bunker.

In a wider sphere, his appreciation in the *Goole Times* described him as a 'highly esteemed and respected resident.' Edward Lamplough was moved to write a sonnet in his memory, and this was published in the *Transactions* of the Hull Club for 1919 (**4**: 298):

In quiet moments I have thought of you,
  Turning from Madam's Wood in sun and shade,
  From wide 'Thorne Waste', before rude Mammon's raid,
Whose tracks my boyhood's feet did oft pursue;
Whose dear 'wild things' you better loved and knew;
  Now am I far removed, and slow and staid,
By gentle thoughts are the old days repaid –
Pictured 'mid fern and moss and fair sundew,
  Bold with the spirit of the open moor,
  And that deep praise of God in nature born;
All reverent souls in nature's fields adore!
You will be remembered for the love and lore
  That binds you to the strength of stream and shore,
  So shall our laughing thoughts go with you through the corn!

Appendix: Thomas Bunker's Written Work

Bunker probably wrote a number of papers for lectures to societies, although only four manuscripts are known to have survived. He delivered papers under the title 'The Migration of Birds' to the Goole Scientific Society on 20 November 1882 (a detailed synopsis subsequently appearing in the *Goole Weekly Times* of 24 November) and to the Doncaster Microscopical and General Scientific Society on 13 February 1889 (*Doncaster Chronicle*, 15 February 1889, *D.M.G.S.S. Summary of Reports for the Sessions 1886–87, 1887–88, 1888–89, 1889–90*: 26–27). A manuscript by Bunker bearing the same title is held at Doncaster Museum; it contains dated references extending to 15 February 1890, clearly inferring that he delivered a paper under this title on at least a third occasion, though it is not known to whom, when or where, but probably in Goole as he referred to Goole Moor as 'Our moors'.

A manuscript held at Goole Library entitled 'A Visit to Goole Moors', which can be dated to c.1876, was obviously intended for publication ('my object in writing this paper is not to give your readers . . .'), though I have been unable to locate a published version. An incomplete, but apparently later draft is held at Doncaster Museum. The 'Goole' copy has been published in the *Lapwing* (**14**: 18–26), with additional notes on the 'Doncaster' draft.

Another manuscript held at Doncaster Museum, unfortunately also incomplete, is an account of Thorne Moors, apparently read as a paper (? to whom) in March 1894 ('a leading article of the *Daily News* of Saturday last 3/3/94'). Bunker had already spoken on the same subject to the Hull Field Naturalists' Society on 7 January 1892 (*Goole Weekly Times*, 15 January 1892), and did so again to the Hull Scientific and Field Naturalists' Club on 2 March 1898; this latter paper was the first to be published in the Hull Club's *Transactions* (**1**: 1–9). The published version is simply the 1894 manuscript with additions and amendments, some of them editorial. Thomas Bunker's son George (see *Lapwing* **14**: 19 and *Y.N.U. Bull.* **11**: 9–11), who inherited at least some of his father's interest in natural history, delivered a paper to the Grimsby and District Naturalists' Society, of which he was a member, on 9 November 1904, entitled 'Goole and Thorne Moors'. It was subsequently published in *Nature Study* (**14**: 7–14). It reads very much like Thomas Bunker's 1898 paper (*Naturalist* **30**: 160), but on close scrutiny appears to be based on his 1894 manuscript, not the later printed version.

Bunker wrote a number of notes and papers, and these are listed chronologically:

1877: Kingfishers, etc., at Goole. *Naturalist* **3**: 39.

1878: A list of the Birds that have been observed near Goole. *Ann. Rep. Cttee Goole Sci. Soc. 1877/78*: 1–8.
[This paper was read to the Goole Scientific Society on 27 February 1878. Details appear in the *Ann. Rep. Cttee Goole Sci. Soc.* (1877/78: 13) and *The Naturalist* (**3**: 140–41). The text appears in the *Goole and Marshland Times* of 22 March 1878, a reprint from which was incorporated into the G.S.S. report for 1877/78, as above.]

1879: Redshank at Goole. *Naturalist* **4**: 184–85.
Great Crested Grebe, etc near Goole. *Naturalist* **5**: 58.

1881: Pike with Spawn. *Naturalist* **6**: 92.
Cuckoo in March. *Naturalist* **6**: 152.
Little Bittern at Goole. *Naturalist* **7**: 66.
Bottle-nosed Dolphin at Goole. *Naturalist* **7**: 66.

1882: Bottle-nosed Dolphins. *Naturalist* **8**: 56.
Fishes and Allied Animals of the District. *Goole Weekly Times*, 3 March 1882. [This is actually a detailed abstract of a paper delivered by Bunker to the Scientific Society on 20 February 1882.]

1884: Nesting of the Twite on Thorne Waste. *Naturalist* **10**: 9.
Angler-fish at Whitgift. *Naturalist* **10**: 60.
Capture of a Rudolphi's Rorqual (*Balaenoptera borealis*) at Goole. *Naturalist* **10**: 87–88.
Rudolphi's Rorqual at Goole. *Zoologist* **8** (third ser.): 483–84.

1886: Goole Fish-notes. *Naturalist* **11**: 81.
Fishes observed near Goole. *Naturalist* **11**: 309.

1888: Capture of a Seal in the Aire at Rawcliffe. *Naturalist* **13**: 226.
Stratiotes aloides at Carlton near Selby. *Naturalist* **13**: 331.

1889: Turtle-Dove and Nightingale near Goole. *Naturalist* **14**: 182.

1890: Storm Petrel at Howden, Yorks. *Naturalist* **15**: 352.

1893: *Acherontia atropos* at Goole. *Naturalist* **18**: 332.

1898: The natural history of Goole Moor and the immediate vicinity. *Trans Hull Sci. Fld Nat. Cl.* **1**: 1–9.

1905: Note on the occurrence of the Beluga, or White Whale, in the Ouse. *Naturalist* **30**: 167–68.
Angler Fish at Goole. *Naturalist* **30**: 219.

BOOK REVIEWS

The Correspondence of Charles Darwin. Volume 4. 1847–50. Edited by **Frederick Burkhardt** and **Sydney Smith**. Pp. xxxvi + 711, including text figures, plus 13 b/w plates. Cambridge University Press. 1988. £32.50.

The latest volume of this scholarly edition (see *The Naturalist* **111**: 36 & **113**: 24) is not only a definitive work of reference but also a fitting tribute to possibly the most remarkable of all natural historians. The present volume covers a period when Darwin's scientific work was based mainly at Down House, a major part of that time devoted to the study of barnacles; the correspondence clearly shows how crucial letter writing was to his investigations, for although he attended numerous meetings in London and elsewhere and received many visitors at his home, he was nevertheless somewhat isolated at Down. A thoroughly worthwhile publishing venture.

MRDS

Heather in England and Wales edited by **R. G. H. Bunce**. Pp. v + 40, including 10 tables, 9 line drawings and 9 colour plates. Institute of Terrestrial Ecology Research Publication No. 3, HMSO, 1989. £5.90 paperback.

This booklet is described as a research report on a project carried out in 1988 to assess the spatial distribution and current status of heather in England and Wales, in response to concern over heather decline. Recent Landsat satellite imagery was used to map the distribution and to estimate the area covered by heather (defined as including *Calluna vulgaris* plus species of *Erica*), and to indicate where the heather was dominant and where managed by burning.

The report contains an introduction, details of methodology and overview of results, including a comparison with results from previous surveys by different methods and a discussion preceded by a section on regional assessments of England and Wales. Readers of *The Naturalist* may be particularly interested in the section on northern England. The causes of decline are often attributed to changes in mangement, such as reductions in grazing, burning and the removal of bracken, and also fragmentation and land-use changes. For upland heaths in northern England the major factor in heather decline is thought likely to have been overgrazing by sheep, coupled with inappropriate burning regimes. Lowland heaths are noted as having suffered a disproportionately greater heather loss than upland areas.

Different methods of assessment will always provide somewhat different estimates of the extent of heather, but the results showed a larger estimated area of heather in this survey than for 1947 for all but one region of England and for Wales, when the thrust of the publication is to discuss heather decline! The ground survey indicated a number of limitations to the method, suggesting caution is needed in interpreting the results. None the less, there is interesting and useful material contained in this report, although its format is a strange mixture of information aimed at a semi-popular market combined with a large body of tabulated data, whose major use would presumably be comparison with subsequent studies by researchers using similar techniques. The plates are attractively produced, but add little to the information contained in the report. It was unclear who the intended readership of this report was or why it was published in this format, and I also have my doubts about how many people would wish to purchase it at the price indicated.

WHGH

ANNUAL AVIAN AND MAMMALIAN TRAFFIC MORTALITY ALONG A SOUTH YORKSHIRE ROAD

P. N. JOHNSON

Abstract

Avian and mammalian road traffic casualties were recorded along a 1 km section of an A class, derestricted road in a rural environment throughout 1984. 103 casualties were recorded throughout the year, 7 mammalian species (n = 19) and 15 avian species (n = 89). Mortality was low between January and April, rising in May and June and peaked in September. In October, the number of casualties recovered fell, and remained at a lower level through to December.

The majority of species recovered were resident species, with only two winter migratory avian species recovered. The most frequently recorded avian species was *Passer domesticus* (n = 41) and the most frequently recorded mammal species was *Lepus capensis* (n = 6). The majority of casualties were recovered at two locations along the surveyed section of road, near the outskirts of a town (Askern) and near the River Went bridge.

Introduction

Throughout 1984, a 1 km section of the A19 road and its adjacent grass verges were surveyed for road traffic casualties. The aim of the survey was to record the frequency of avian and mammalian species mortality rates attributable to motor vehicle traffic in a rural environment. The survey section ran from the outer limits of Askern, G.R. 44/150 564 to the road bridge over the River Went G.R. 44/160 565. The surveyed section of road was straight, with a two metre wide grass verge: a Hawthorn (*Crataegus monogyna*) and Willow (*Salix fragilis*) hedge, 1.8 metres high and 1 metre wide at the base, separated the grass verge from the adjacent arable farmland along the length of the surveyed section.

Methods

The area was surveyed on foot twice daily throughout the year, once at first light and again in the late afternoon. Avian and mammalian road traffic casualties found were recorded and removed in order to avoid multiple recording. Some casualties were left in marked positions to test for the presence of carrion feeding species, which may possibly be removing casualties from the survey area. The exact position of each casualty found on the road was not assumed to be that of the point of impact, as relocation following impact with a moving vehicle and the transportation of casualties along the road was highly probable. No recording of traffic volume was undertaken, though it was noted that traffic volume increased between May and September.

Results

The monthly casualties are listed in Table 1, to show the seasonal variation in species composition and the frequency of occurrence and the total annual mortality for each species in the survey. It can be seen that species mortality was low between January and April. Both avian and mammalian species occur at almost equal frequencies in each month.

In May, the level of avian species recorded rose, with a high frequency of *Turdus philomelos*, and a slight increase in the numbers of mammals, with a higher recovery of *Lepus capensis*. From June to September the level of recoveries rose, peaking in September, with 24.3 per cent of the annual casualties being recorded in this month. The majority of recoveries were of small passerine species, notably *Passer domesticus*

TABLE 1
Species mortality

Species	Month												Total
	J	F	M	A	M	J	J	A	S	O	N	D	
Passer domesticus						10	8	9	11	2	1		41
Turdus merula				1		2		1		2	2	3	11
Turdus philomelos					4			1	1		1		7
Gallinulan chloropus	1	1				1				1	2	1	7
Parus caeruleus							1	1	1				3
Carduelis chloris				1					2				3
Strix aluco					1						1		2
Parus major								1					1
Prunella modularis					2								2
Perdix perdix						1	1						2
Carduelis carduelis									1				1
Passer montanus									1				1
Streptopelia decaocto							1						1
Turdus iliacus												1	1
Turdus pilaris												1	1
Lepus capensis			1		2	1	1		1				6
Felis catus		1							1	1		1	4
Erinaceus europaeus			1					1	1				3
Oryctolagus cuniculus							2						2
Mustela erminea									1	1			2
Meles meles								1					1
Domestic dog										1			1

and *Turdus merula*. Mammal recoveries increased only slightly during this period. The highest recoveries of avian species occurred between May and September, *Passer domesticus* was the most frequently recorded species (n = 41), first recovered in June and lastly in November.

Mammalian casualties were recorded at a continuous level throughout the year, with a slight rise in recoveries between July and October, the highest recoveries being in September and October. The presence in some months of *Felis catus* was due to the presence of a feral population in the area; these casualties were only recovered on the edge of the town, as was the domestic dog.

Only two migratory species were recovered throughout the year, *Turdus pilaris* (n = 1) and *T. iliacus* (n = 1). Both these winter migrants were recorded in December near a source of Hawthorn berries.

Although the position of each recovery was prone to relocation after impact, the majority of the recoveries was concentrated in two areas. The highest level of recoveries (n = 54) was from near the outskirts of the town (all within a 100 metre area); and from a 50 metre section of a road bridge passing over the River Went (n = 33). Only 16 casualties were recovered along the 845 metre straight section of road between these two points.

All of the casualties left in marked positions were removed overnight, indicating the presence of regular scavenging species along the survey section.

Discussion

The rise in avian mortality in May coincided with the breeding efforts of many resident species. Between June and September, the hedges and surrounding farmland along the

road may offer suitable nesting and food resources to breeding birds. The higher level of recoveries for predominantly granivorous avian species between July and September (Table 1), may be attributable to the presence of abundant grain and cropseeds on the road surface and in neighbouring fields, attracting species to the road environment. Hudson and Snow (1965) noted a very high recovery of *Passer domesticus* nationally, which was attributed to their flocking in corn fields between July and August. The level of *P. domesticus* mortality in this survey was comparable with the national level of 54 per cent of total recoveries being attributed to this one species. Dunthorn and Errington (1964) monitored a similar section of road in Wiltshire, on which 85 per cent of all avian recoveries occurred between April and September. This seasonally high level was comparable to this northern study, with 82.68 per cent of all mortality recorded in the same period (Table 1).

Mammals, e.g. *Meles meles*, *Orycotolagus cuniculus* and *Erinaceus europaeus*, appear to remain within defined boundaries throughout the year. This continuous presence within the road area and use of roads as crossing points over rivers, would result in year-round exposure to traffic, and may account for the continuous year-round mortality observed. The mobile *Lepus capensis*, is prone to agriculture-related disturbances on the adjacent farmland; most recoveries of this species followed the spring activities of farmers, while later recoveries coincided with harvesting and stubble burning.

Various carnivorous species were recovered on the road, e.g. *Strix aluco*, *Meles meles*, *Felis catus* and *Mustela erminea*; these species may be attracted to the road environment by the presence of regularly occurring road casualties, and the seasonal concentration of granivorous prey species. In a national survey, the high occurrence of vehicle collisions with owl species were in part attributed to their habit of carrion-feeding on the road surface and also the dazzling of owls and other nocturnal animals by car headlights (Glue 1971). The presence of scavengers along the survey section has resulted in all probability in under-recording of the true mortality levels.

The occurrence of mortality 'hot spots' was noted by Hudson and Snow (1965), where high levels of mortality were found near open clearings along uniform areas of hedgerow and woodland. Dunthorn and Errington (1964) viewed 'hot spots', resulting for example from a large number of animals crossing at a specific point, but due to topographical features which restricted the animals vision, the killing frequency was also high. 'Black spots' identified on the edge of the town and near the river bridge in this study may be attributable to either hypothesis and would require future monitoring both of animals crossing at each point and the frequency of traffic and collisions.

References

Dunthorn, A. A. and Errington, F. P. (1964) Casualties among birds along a selected road in Wiltshire. *Bird Study* **11**: 168–182.

Glue, D. E. (1971) Ringing recovery circumstances of some small birds of prey. *Bird Study* **18**: 137–146.

Hudson, N. L. and Snow, D. W. (1965) The British Trust for Ornithology road deaths enquiry 1960–61. *Bird Study* **12**: 90–99.

BOOK REVIEW

Restoration Ecology: a synthetic approach to ecological research edited by **William R. Jordan, Michael E. Gilpin** and **John D. Aber**, with 27 contributors. Pp. 342, with b/w plates and figures. Cambridge University Press, 1987. £35.

The first section explains what the authors mean by restoration or synthetic ecology: instead of merely using knowledge gained from basic research to provide the basis for successful restoration, the very process of repairing a damaged ecosystem itself offers valuable opportunities for fundamental ecological research, which in turn leads to improved restoration and management techniques.

Section two deals with the restoration of entire ecosystems. A general discussion of the problems of derelict land and the treatments needed to overcome these is followed by examples of restoration of specific ecosystems, namely prairies, forests and lakes. Each underlines the particular problems involved, such as invasion by trees, shrubs and non-native herbaceous species, the need to understand the course of succession, the minimum area which can be maintained as a successful ecosystem in the case of prairies and forests, and the problem of over-eutrophication in lakes.

Section three discusses the usefulness of 'manufactured' ecosystems. The construction of an artificial coral reef and lagoon ecosystem are described, together with the problems involved and insights gained. Studies based on experimental community assemblages suggest that the final outcome of a restored ecological community is dependent on the order in which the species are introduced.

In section four, partial restoration in the field is dealt with, including a study of animal behaviour and ecology during the re-introduction of two wren species of birds to an island in the Panama Canal, and the implications for restoration projects. A series of experiments leading to a categorisation of plant species in relation to successional communities is discussed, together with the importance of regenerative trials in determining the diversity and abundance of species in plant communities. Community ecologists study sets of populations that 'interact on a pairwise basis in three fundamentally different ways: through predation, competition, and mutualism'. It is suggested that one should know how these interactions will react if there is any drastic change in the community; restoration ecology can be used for this kind of analysis. The role of mycorrhizae in succession is considered. Comparisons made of the mycorrhizal component of topsoil removed from a native community and spread immediately on to a disturbed site, with that of topsoil stock-piled for a number of years before spreading, showed that different species colonized the two types of soil when compared with each other, and with nearby undisturbed native communities.

In section five the opportunities which restored systems provide for basic research are considered. For example, restored forests provided valuable information on species–site interactions, with nitrogen availability as the critical factor, whilst studies of degraded ecosystems, resulting from mining operations, led to an increased understanding of the phenomenon of metal tolerance and evolutionary processes in general.

Section six deals with some of the practical problems and considerations not usually encountered in traditional ecological studies, such as having to work to a prescribed scale, the size of the restoration site, minimum viable populations of species and the use of 'mechanistic' experiments dealing with some specific aspect of a single species or group of species.

The final chapter reflects on what the explicit goals of restoration should be and what benefits to the study of ecology emerge from this synthetic approach. These appear to be two-fold: restoration projects allow ecologists to work on temporal and spatial scales far greater than 'normal' research projects and they provide perturbations greater than it would be morally, legally or practicable to provide.

A thought-provoking book, but not one for the layman.

JMD

BOTANICAL REPORT FOR 1988

FLOWERING PLANTS AND FERNS

The names of contributors are given in full the first time they appear in each vice-county report and thereafter initials are used. The Recorders thank those members who have sent in records for the report.

10 km grid references are indicated by figures.

† new county record * new vice-county record.

East Yorkshire (VC 61) (F. E. Crackles)

Records are included only for those species which are new to the 10 km square and which have previously been recorded for fewer than twelve 10 km squares in the vice-county. Several of the records are the result of work done in relation to the B.S.B.I. Monitoring Scheme. The record for the hybrid between *Typha latifolia* and *T. angustifolia* is of interest as this hybrid may have been overlooked previously, being recorded as *T. angustifolia*. The record for *Puccinellia distans* at North Cave suggests that the edge of roadside verges should be examined for salt-marsh species introduced with salt for de-icing purposes. Dr Perring's record for *Bromus racemosus* at the edge of a wheat field by the River Hull raises the interesting question as to whether the species is relict from former marsh vegetation which no doubt occurred there. The species is a characteristic one of the water-meadows by the River Derwent and has also been found in former carr-land at Withernwick and Hollym in Holderness; there is an eighteenth century record for marshes near Beverley.

Dryopteris affinis (Lowe) Fraser-Jenkins ssp. *cambrensis* Fish Ponds Wood, Boynton 54/16; E. Chicken, conf. J. M. Camus.
Coronopus didymis (L.) Sm. Roadside verge, North Cave 44/83; T. Rich.
Viola hirta × *V. odorata* = *V.* × *permixta* Jord. North Grimston 44/86; E.C.
Hypericum humifusum L. The Moors, Burton Constable 54/13; Y.N.U. Excursion.
Myosoton aquaticum (L.) Moench The Moors, Burton Constable 54/13; Y.N.U. Excursion.
Chrysosplenium oppositifolium L. Holly Carrs Wood, Escrick 44/64; J. Lambert.
Bidens cernua L. The Dams, Filey 54/18; P. Dunn.
Potamogeton berchtoldii Fieb. Dew pond, near Fimber 44/86; T.R.
Sparganium emersum Rehm. Everingham Carrs 44/84; D. R. Grant.
† *Typha angustifolia* × *T. latifolia* = *T.* × *glauca* Godr. Pond, Holme upon Spalding Moor 44/83; T. Mundell, det. A. C. Leslie.
Glyceria fluitans × *G. plicata* = *G.* × *pedicellata* Towns. Hotham 44/83; E.C.
Festuca pratensis × *Lolium multiflorum* = × *Festulolium braunii* (K. Richt.) A. Camus. Near Youlthorpe 44/75; D. E. Haythornthwaite.
Puccinellia distans (L.) Parl. By roadside, North Cave 44/83; F. E. Crackles.
Bromus racemosus L. In winter wheat at Corps Landing 54/05; F. H. Perring.
Chara hispida Upper lake, Burton Constable 54/13; E.C. and D.R.G. det. Mrs J. Moore.

North-east Yorkshire (VC 62) (T. F. Medd)

* *Ceterach officinarum* DC. Boundary wall of United Reform Church, Loftus 45/71; A. Fryday.
Phegopteris connectilis (Michx) Watt Blowgill 44/59 and Danby Dale head 45/60; Mrs N. Sykes; Northdale, off Rosedale 44/79; British Pteridological Society.
Juniperus communis L. Fryup Dale head 45/70; N.S.
Trollius europaeus L. Beadale Wood, Wrelton 44/78; R. and M. Gulliver: New Wath, Goathland 45/80; N.S.
Fumaria muralis Sond. ex Koch Everley 44/98; C. Wilson: Staithes (with F. officinalis) 45/71; R. and M.G.

Hypericum elodes L. Hole Beck, Spaunton Moor 44/79; N.S.
Myosoton aquaticum (L.) Moench Nunnington 44/68; R. and M.G.
Stellaria nemorum L. Helmsley 44/68; D. Grant: Arncliffe Wood, Glaisdale 45/70; R. and M.G.
Tilia cordata Mill. Hell Bank Wood, Appleton-le-Moors 44/78; Peel Wood, Hutton Mulgrave 45/81; R. and M.G.
Lythrum salicaria L. Netherby Dale 44/88; Y.N.U. Bot. Sec. Excn.
Blackstonia perfoliata (L.) Huds. Harwood Dale 44/99; Mrs J. Gatenby.
Scrophularia umbrosa Dumort. Yearsley (growing on gravel in former quarry) 44/57; R. and M.G.
Mentha rotundifolia (L.) Huds. Helmsley 44/68; D.G.
Lycopus europaeus L. Netherby Dale 44/88; Y.N.U. Bot. Sec. Excn.
Gnaphalium sylvaticum L. Poverty Hill, Danby 45/70; R. and M.G.
Crepis paludosa (L.) Moench Beadale Wood, Wrelton 44/78; R. and M.G.
Paris quadrifolia L. Deepdale, Dalby Forest 44/99; N.S.
Epipactis palustris (L.) Crantz Dalby Forest 44/88; F. Horsman.
* *Dactylorhiza* × *claudiopolitana* (Soó) Soó = *D. incarnata* × *maculata* Dalby Forest 44/88; F.H. conf. R. H. Roberts.
D. × *kernerorum* (Soó) Soó = *D. fuchsii* × *incarnata* Dalby forest (2 sites) 44/88; F.H.
D. × *venusta* (T. and T. A. Stephenson) Soó = *D. fuchsii* × *purpurella* Ellerburn Bank 44/88; F.H.
Scirpus lacustris L. Beningborough 44/55; D.G.
Hordelymus europaeus (L.) Harz Hell Bank Wood, Appleton-le-Moors 44/78; R. and M.G.
Ammophila arenaria (L.) Link Saltwick Nab 45/91; R. and M.G.

South-west Yorkshire (VC 63) (D. R. Grant)
Phyllitis scolopendrium (L.) Newm. Sandal Castle, Wakefield 44/31; E. Thompson.
Asplenium adiantum-nigrum L. Crosland Edge, Huddersfield 44/11; J. Lucas.
Ceterach officinarum DC. Wall, Elland Bridge 44/12; F. Murgatroyd; wall, Holywell Green 44/01; F.M.
Botrychium lunaria (L.) Sw. Grass verge, Norland Moor, Halifax 44/02; F.M.
Ranunculus hederaceus L. Great Gill, Lothersdale 34/94; D. R. Grant.
Nuphar lutea (L.) Sm. Crimpsall, Doncaster 44/50; E.T.
Hypericum maculatum Crantz Arksey Ings 44/50; T. Schofield; Hexthorpe, Doncaster 44/50; D.R.G.
H. humifusum L. Rishworth 44/01; F.M.
Rhamnus catharticus L. Almholme 44/50; E.T.
Astragalus glycyphyllos L. Roman Ridge, Red House, Doncaster 44/50; D. Bramley.
Cornus sanguinea L. Notton 44/31; D.R.G.
Hydrocotyle vulgaris L. Sharlston 44/31; E.T.
Berula erecta (Huds.) Coville Old Canal, Gawber, Barnsley 44/30; Y.N.U. Excursion.
Silaum silaus (L.) Schinz and Thell. Clifton Interchange 44/12; J.L.; Gawber 44/30; Y.N.U. Excursion.
Pastinaca sativa L. Ravensthorpe 44/22; E.T.
Oenanthe aquatica (L.) Poir. Snaith 44/62; D.R.G.
Bryonia dioica Jacq. Wrenthorpe 44/32; D.R.G.
Humulus lupulus L. Barnburgh 44/40; E.T.; Smithy Brook, Middlestown 44/21; E.T.
Salix repens L. Elland Gravel Pits 44/12; F.M.
Primula vulgaris Huds. Near Elslack 34/94; D.R.G.
Hottonia palustris L. Near Goole 44/71; D.R.G.
Scrophularia aquatica L. Gawber 44/30; Y.N.U. Excursion.
Ballota nigra L. Snaith 44/62; D.R.G.
Picris hieracioides L. Cadeby Lime Works Tip 44/50; D.R.G.

P. echioides L. Near Blacktoft Sands 44/82; T.S.
Sagittaria sagittifolia L. Arksey Ings 44/50; T.S.
Hydrocharis morsus-ranae L. Arksey Ings 44/50; D.B. Confirmation of an old record.
Zannichellia palustris L. Near Thorne 44/71; D.R.G.; Castle Hills, Highfields 44/50; Y.N.U. Botanical Section Excursion.
Juncus subnodulosus Schrank Doncaster 44/50; D.R.G.
Lemna gibba L. Arksey Ings 44/50; E.T.
Scirpus fluitans L. Drain near Sandtoft 44/70; D.R.G.
Eleocharis palustris (L.) Roem. and Schult. Pugneys Lake, Wakefield 44/31; E.T.
Carex disticha Huds. Gawber 44/30; Y.N.U. Excursion.
C. pallescens L. Gawber 44/30; Y.N.U. Excursion.
Puccinellia distans (L.) Parl. West Bretton 44/21; D.R.G.; Clayton, Doncaster 44/40; D.R.G.
Catabrosa aquatica (L.) Beauv. Doncaster 44/50; I. Macdonald.
Chara globularis var *globularis* Oulton Hall, Rothwell 44/32; D. Wall, det. Br. Museum.

Mid-west Yorkshire (VC 64) (L. Magee)

A very large number of records were received from five members; these cover almost every 10 km square in V.C. 64 but only a small selection is given. Many changes are taking place in land use in the vice-county and the recorder welcomes all new records and confirmation of old records.

Thanks are given to all who made this report possible.

Ophioglossum vulgatum L. Swinsty 44/15; colony of 200 plants submerged for most of year; L. Magee; Paythorne 34/85; D. R. Grant.
Ranunculus penicillatus var. *calcareus* (R. W. Butcher) Cook R. Wharfe, Arthington 44/24; L.M.; Harewood 44/34; L.M.
R. penicillatus (Dum.) Bab. var. *penicillatus* Stream at Buckden 34/97; L.M.
Rorippa palustris (L.) Besser. subsp. *palustris* Linton Beck 34/96; H. Lefevre.
Astragalus glycyphyllos L. Old railway, Thorpe Arch 44/44; D.R.G.
Potentilla palustris (L.) Scop. Blubberhouses end of Fewston Reservoir 44/15; L.M.
Callitriche stagnalis Scop. Stream at Buckden 34/97; L.M.
Pimpinella major (L.) Huds. Nun Monkton 44/55; D.R.G.
Oenanthe crocata L. Bolton-by-Bowland 34/77; D.R.G.
Rumex longifolius DC. Arncliffe 34/71; D.R.G.
Populus tremula L. Knapton 44/55; D.R.G.; Barlow 44/62; D.R.G.
Lysimachia nummularia L. Hutton Wandesley 44/55; J. Payne.
Zannichellia palustris L. Barlow Common 44/62; D.R.G.
Gymnadenia conopsea (L.) R.Br. subsp. *densiflora* (Wahlenb.) G. Camus, Bergon and A. Camus 'Near Grassington' 34/96; F. Horsman.
Dactylorhiza maculata (L.) Soó subsp. *ericetorum* (E. F. Linton) Hunt and Summerhayes By Scarcroft Beck 44/34; Y.N.U. Excursion.
D. praetermissa (Druce) Soó Lawkland Moss 34/76; F.H. First record for Yorkshire Dales. Confirmed R. H. Roberts.
D. incarnata (L.) Soó × *D. purpurella* (T. and T. A. Stephenson) Soó Austwick Moss 34/76; F.H. A rare hybrid.
Acorus calamus L. Selby Canal 44/62; D.R.G.
Carex pallescens L. Lindley 44/25; D.R.G.
C. spicata Huds. Hetton 34/95; D.R.G.
C. dioica L. Near Embsay Reservoir 34/95; D.R.G.
Apera spica-venti (L.) Beauv. Barlow 44/62; D.R.G.

North-west Yorkshire (VC 65) (T. F. Medd)

Dryopteris carthusiana (Vill.) H. P. Fuchs Little Fencote 44/29; C. D. Preston.
Helleborus viridis L. Kirkby Fleetham 44/29; C.D.P. Confirmation of pre-1930 record.
Cochlearia officinalis L. Catterick 44/29; C.D.P.

Stellaria palustris Retz. Ivelet 34/99; D. Millward and Mr and Mrs Roberts.
Lamium hybridum Vill. Catterick 44/29; C.D.P.
Dactyloriza × *venusta* (T. and T. A. Stephenson) Soó = *D. fuchsii* × *purpurella* Mickleton 35/92; Mrs M. Burnip.

Casuals and Adventives (E. Chicken)

Since the last report I have received 34 records of 31 taxa from 11 contributors. The majority of these records are listed below. Unless stated otherwise, the contributor is taken to be the determiner in each case. I would repeat that it helps considerably if all the information for an entry can be provided. Authorities for plant names can be difficult to find and the determiner really should know. Locations should be readily traceable using a 1:50 000 Ordnance Survey map.

Lepidium ruderale L. (64) Merrion Centre, Leeds 44/33; L. Magee.
Cardaria chalepensis (L.) Hand.-Mazz. (61) Hessle foreshore 54/02; E. Chicken.
Montia perfoliata (Willd.) Howell (61) Scampston 44/87; B. Pashby per Miss F. E. Crackles.
Linum usitatissimum L. (61) Old airfield, Carnaby 54/16; E.C.
Impatiens parviflora DC. (61) Sand pit, North Cave 44/83; F.E.C.
Medicago falcata L. (61) Spurn 54/41, 1987; F.E.C.
Cotoneaster horizontalis Decne (63) Old quarry, Sprotborough 44/50; D. R. Grant.
Crassula helmsii (T. Kirk) Cockayne (62) Cayton Bay 54/80; Mrs M. Robinson conf. E.C. Presumed previously known without details, 1987, Heritage Coast workers per Mrs N. Sykes. (63) Drain near Sandtoft 44/70; D.R.G. (64) Gravel pit, Burley in Wharfedale 44/14; D.R.G.
Saxifraga paniculata Miller (64) On rocks at Beckermonds, Upper Wharfedale 34/88; Mrs F. Houseman det. A. Leslie.
Tellima grandiflora (Pursch) Dougl. ex Lindl. (62) Roadside woodland, Silpho Forest 44/99; Mrs E. J. Chicken.
Eryngium giganteum Bieb. (64) Ben Rhydding gravel lagoons 44/14; F.H.
Euphorbia dulcis L. (62) Ride in Broxa Forest 44/99; E.C.
Polygonum amplexicaule D. Don (64) Merrion Centre, Leeds 44/33; L.M.
Reynoutria sachalinensis (F.S. Petrop.) Nakai (61) Hessle 54/02, known here since 1966, but possibly not reported; E.C. conf. Miss A. Conolly.
Nymphoides peltata (S.G. Gmel.) Kuntze (64) Gravel pits, Burley-in-Wharfedale 44/14; D.R.G.
Linaria purpurea (L.) Mill. (63) Gawber near Barnsley 44/30; Y.N.U. excursion per D.R.G.
Lamium moluccellifolium Fr. (61) Wholsea Grange, S. Cliffe 44/83; D.R.G. per F.E.C.
Lonicera trichosantha L. (64) Clapham 34/76, 1984; F.H. det. A. Grenfell.
Petasites fragrans (Vill.) C. Presl (64) Waste ground, Ilkley 44/14, 1987; Mrs J. Duncan.
Hieracium aurantiacum L. (63) Roadside and field near Holme, Holmfirth 44/10; Mrs J. Lucas.
Allium roseum L. (64) Ben Rhydding lagoons 44/14; F.H.
Cyperus longus L. (64) Gravel pits, Burley in Wharfedale 44/14; D.R.G.
Tragus berteronianus Schult. (63) Field with shoddy, Rothwell Haigh 44/32; F.H.
Digitaria ciliaris (Retz.) Koeler (63) Field with shoddy, Rothwell Haigh 44/32; F.H.

BOOK REVIEWS

An Atlas of the Land and Freshwater Mollusca of Northumberland and Durham by **Ralph Lowe**. Pp. 139. Special Publication No. 4 of the Northumberland Biological Records Centre, The Hancock Museum, The University, Newcastle upon Tyne. 1989. £6.50 inc p&p. Spiral bound, A4 format.

As the title indicates, the bulk of this publication consists of 125 maps showing the distributions of the land and freshwater molluscs recorded from VC's 66, 67 and 68 on a 10 km grid basis. These are preceded by an introduction which outlines the history of mollusc recording in the area and 6 pages of very brief habitat notes on the species mapped. Each map covers a full A4 page and consists of a 10 km square grid superimposed on an outline map of the three vice-counties, species records being indicated by a large, open circle.

The habitat notes are a hotch-potch of information on each species, including references to status, localities, identification and micro-site as well as habitat preference. Most of this information would be of little use to anyone with more than a passing interest in molluscs and can be found easily enough in field guides. A discussion of the molluscan fauna of the area in the context of national distributions would have been of far more interest.

Nor are the maps without their quirks: there is no indication of their orientation, and curiously the border between Cheviotland (VC 68) and Northumberland (VC 67) is omitted while that between Northumberland and Durham (VC 66) is shown. A key map is needed, showing orientation and features such as the major conurbations and the general geology of the area to aid interpretation of the species maps. The spelling of one specific name is incorrect and the inclusion of sub-generic names for certain species only is inexplicable. There is no attempt to indicate the date of a record or impart any other information through the maps. Considering the A4 format, different symbols for pre- and post-1970 records could easily have been included.

Mr Lowe's wish to encourage fieldwork through this publication is a worthy one, but although he has obviously put a great deal of time and effort into preparing it, the final result is amateurish and will not enhance the reputation of the Northumberland BRC.

PL

The Birds of Egypt edited by **S. M. Goodman** and **P.L. Meininger**, with the assistance of **S. M. Baha El Din**, **J. J. Hobbs** and **W. C. Mullie**. Pp. 551, with 70 figures, 17 tables and 6 colour plates. Oxford University Press. 1989. £70.

An enlightened presentation of all the available information on birds and their natural habitats known to be found in Egypt between 1850 and 1988. It consists of two main parts, well supported by numerous figures, graphs, tables and magnificent colour plates.

The first part provides the reader with a wealth of information on several related introductory subjects including: a brief history of post-1930 Egyptian ornithology, the geography of the country and its three major environments, nature conservation and local bird hunting, as well as the responses of Egyptian birds to recent changes in the environment.

The second part, forming the main body of the book, gives a clear and informative account of different bird species known to have occurred in Egypt. For every species, it discusses breeding distribution within the country, period of occurrence and passage routes for migrants, abundance, geographical variation, subspecies, synonyms and breeding seasons. The book concludes with two appendixes, references, and four indexes. It is very clear and easy to follow, yet it reflects the deep understanding and enthusiasm of the authors.

I find this book important from several points of view. For the world's ornithologists, it emphasises the role of Egypt as one of the ornithologically best-known countries of Africa. For bird-watchers and bird lovers it provides an insight into a number of

Egyptian habitats which support a rich and fascinating avifauna. For the graduate and undergraduate student it brings together the many references to Egyptian birds scattered in the literature, museums and unpublished records. For researchers, government personnel and planners it provides a clear picture of the current status of Egyptian birds, suggests ways to secure this valuable resource, and discusses what still needs to be done in this area of research. I can highly recommend this book to all those mentioned above as well as those interested in exploring the wonderful world of birds in this fascinating country.

AHE-S

Dynamic Modeling in Behavioural Ecology by **M. Mangel** and **C. W. Clark**. Pp xii + 308. Princeton University Press, Princeton, New Jersey. 1988. $45.00 hardback, $15.95 paperback.

Modelling techniques in population or community biology aim to focus attention on the principal factors affecting individuals in such a population or community. First, the rigour of defining the problem may of itself bring new insights, and secondly, use of the model will enable predictions to be made, the success of which may then be tested by new experiments.

This scholarly work explains how to develop and use one particular approach involving dynamic optimisation models, with examples of their application to problems from behavioural ecology. There are three notional sections. The first has three parts, starting with an introduction to probability theory and some statistical distributions; the major part of the book introducing the dynamic modelling approach then follows; and thirdly there is an addendum on how to write a computer program in BASIC. The second section contains five chapters, each involving the development of models appropriate to different examples in behavioural ecology. The final section contains two additional topics related, but not central, to the modelling approach.

This is not an easy book to read, but repays careful study. To the less mathematically inclined, the main interest will be in section two with the application of models to biological problems, from vertical migration of aquatic organisms to clutch sizes in birds, and the insights that this provides. I found particularly fascinating the chapter on hunting behaviour in lions, and the authors' suggestions as to why hunting by lions is normally performed in groups whereas other large felines, such as leopards, hunt singly. In this example as in others, however, as the authors note, one of the most useful roles of theory in biology is to help organise one's thoughts about a particular problem. Mathematics is a useful tool, not a replacement for clear thinking!

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Eva Crackles
The Flora of the East Riding of Yorkshire

edited by Roger Arnett

A New Flora for Vice County 61.

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The Flora of the East Riding of Yorkshire

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VEGETATION CHANGES ON ILKLEY MOOR 1964–1984

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Summary

In 1970 a set of maps was published which summarized the results of an extensive survey of the vegetation of Ilkley Moor. This paper presents new maps showing the distribution of selected vegetation communities based on a detailed survey undertaken in 1983–84, and examines the changes which have occurred in the period 1964–1984.

Comparison of the maps reveals that *Calluna vulgaris* and *Pteridium aquilinum* have increased their occupancy of the moor, whilst there has been a marked reduction in the abundance of *Empetrum nigrum* and *Eriophorum* spp. These changes indicate that the degradation of the moor which was recorded during the 1960s was reversed, at least partially, between 1964 and 1984.

Introduction

Yorkshire naturalists have long taken a keen interest in aspects of the ecology of Ilkley Moor, and there is a considerable body of information detailing aspects of its geology and vegetation (Lees, 1885; Smith and Moss, 1903; Smith and Rankin, 1903; Lamming, 1969; Clouston and Partners, 1974).

Between 1961 and 1970, members of the Wharfedale Naturalists' Society published a number of useful papers which reviewed vegetation changes on Ilkley Moor (Dalby, 1961; Fidler, 1963; Fidler *et at.*, 1970; Dalby *et al.*, 1971). Fidler *et al.* (1970) include maps which provide an overview of the vegetation distribution on the moor in 1964. They highlighted the spread of *Empetrum nigrum* (crowberry) and *Pteridium aquilinum* (bracken) and attributed the changes to excessive grazing by sheep and to drainage activity which they considered was causing the moor to dry out.

During the local government re-organization of 1974, administration of the commonland on Ilkley Moor became the responsibility of Bradford Metropolitan District Council. There was a general disquiet about the state of the moor, with many people contending that *Calluna vulgaris* (heather) was in decline and *Pteridium aquilinum* rapidly spreading (Leach, 1982). It was feared that the appeal of the moor to visitors was slowly diminishing, and that its wildlife and economic value were declining owing to the disappearance of heather which was important in providing food and shelter for animal populations. Because of the need for factual information, the Manpower Services Commission provided personnel to re-survey the moor in order to assess the extent of changes taking place over recent years. A team of five people was appointed, based at the Department of Environmental Science at Bradford University, whose staff supervised the work and provided guidance and training.

The new survey of the moor was completed during the period May 1983–April 1984. This paper provides maps of the distribution of plant communities in 1984, and outlines the major changes which appear to have occurred in the period between 1964 and 1984.

Methods

Fidler *et al* (1970) do not provide full details of the procedure that they used to survey the moor in 1964, but they mention that mapping was based both on aerial photographs and field surveys. In this respect the earlier work is similar to the 1984 survey, which began by examining a series of panchromatic vertical aerial photographs taken in April 1968 by Meridian Air Maps. Areas clearly delineated on the photographs were visited and the characteristic vegetation determined. It quickly became apparent that although the

Figures 1-4 Distribution of the principal species on Ilkley Moor in 1964 and 1984
(Key • pure community, / partial cover, + selected National Grid intersections)

Figure 1 Heather

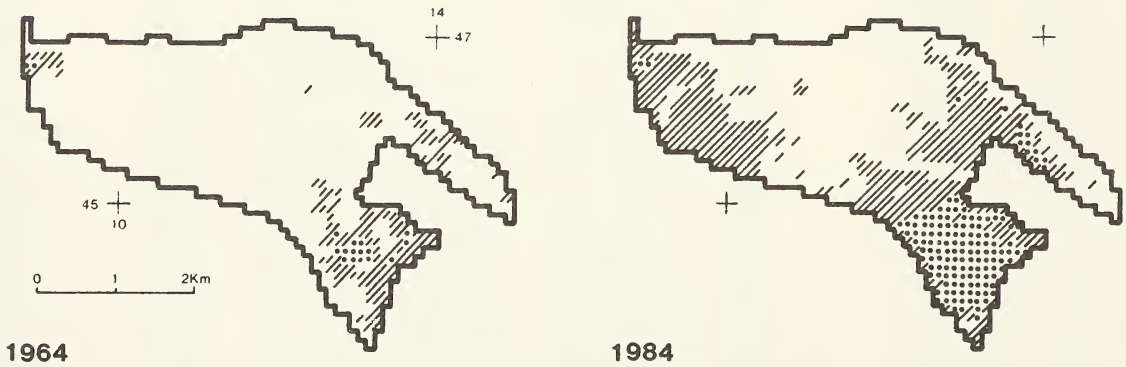


Figure 2 Crowberry

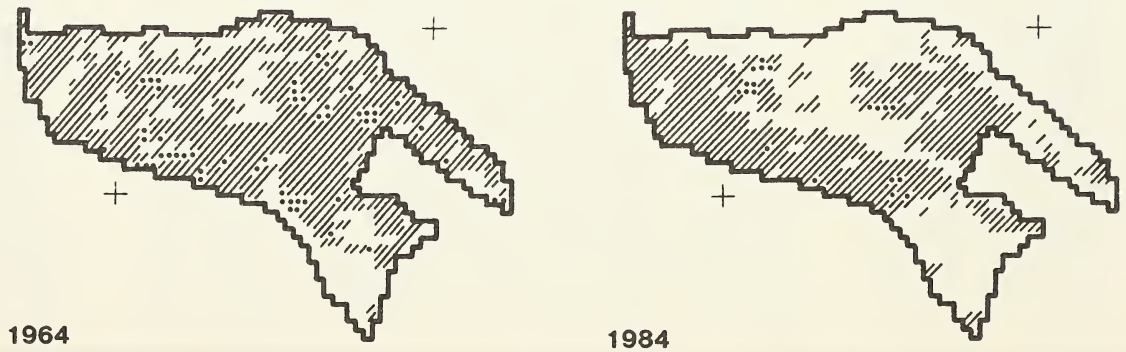


Figure 3 Bracken

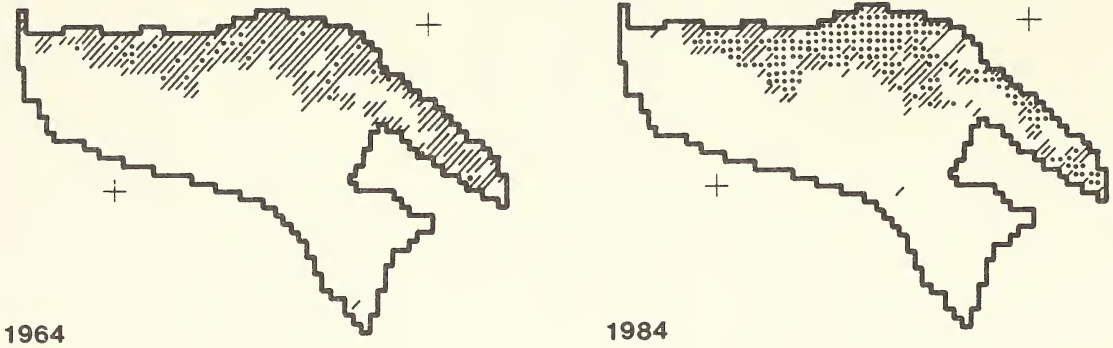
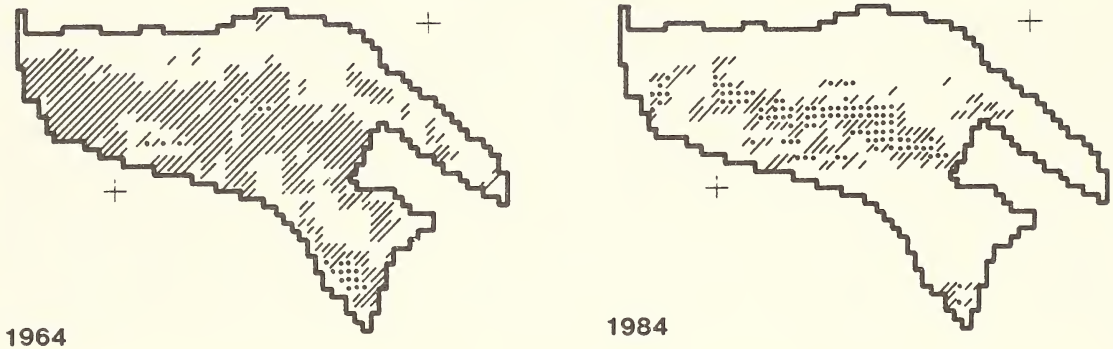


Figure 4 Cotton grass



photographs provided a useful guide, the species composition of any given tract of land could not be accurately determined on the basis of these alone. Field surveys based upon transects therefore became the primary means of acquiring data.

After considerable experimentation, it was found that a broad categorization of the vegetation into ten basic divisions enabled replicable mapping to be achieved. The ten divisions are described below.

Six categories were assigned for communities where Ericales accounted for over 50% of the vegetation cover. As *Calluna vulgaris*, *Empetrum nigrum* and *Vaccinium myrtillus* (bilberry) are the only abundant Ericales on the moor, the first three categories were allocated to each of these species respectively when any one individually comprised more than 80% of the cover for the Ericales in total. Two further categories encompassed those communities where crowberry and bilberry, or heather and crowberry, were virtually co-equal. Where there were approximately equal proportions of crowberry, heather and bilberry, the community was assigned to a further category.

The four remaining categories related to communities where the Ericales comprised less than 50% of the vegetation cover. Bracken was allocated to a discrete category whenever it was present. This emphasis on bracken was acceptable because the survey was particularly concerned with determining its extent. Moreover, it rarely occurs sparsely and where present usually overtops other species in the community. Dominance by grasses and *Juncus squarrosus* (heath rush), or by *Juncus effusus* (soft rush), were the respective criteria for two further categories, while areas dominated by *Eriophorum* spp. (cotton grasses) were assigned to the final category.

Using this categorization, a map of the vegetation was produced at a scale of 1:500. This map was then overlaid with a grid of almost 9000 points, providing a density of nine points in each 100 metre square. The maps presented here record the cover of species in each 100 metre square. A square occupied by a majority of points where one species was dominant was considered to be a pure community. Where a majority of points within the square was of other species, or a mixed-dominance category, then the species was considered to have partial cover. A square with no record of the species, or with only one mixed-dominance category record, was counted as not being represented and was left blank.

As the 1984 survey covered a slightly smaller portion of Ilkley Moor, the original maps in Fidler *et al* (1970) have been redrawn to provide a common basis for comparison.

Results

The pairs of distribution maps from 1964 and 1984 for heather, crowberry, bracken and cotton grasses are illustrated in Figures 1 to 4. Comparison of the two maps in Figure 1 reveals that there has been a notable change in the distribution of heather. In 1964 it was found in some smaller patches and primarily present in two large areas. However, by 1984 there had been a substantial expansion of the principal areas of heather, particularly in the south-eastern and north-eastern sections of the moor, where dominant heather had markedly increased. There had also been a major spread of heather in both the western and east central areas of the moor where it had not been recorded in 1964. However, in 1984 it was still largely absent in the central section of the moor.

In 1964, crowberry was almost ubiquitous, described as encroaching and was absent only where heather was dominant. On the lower northern levels of the moor, where bracken and cotton grass communities are firmly established, crowberry appears to have become much less abundant than it was in 1964. It also suffered an apparent decline in the southeast of the moor, where heather increased its dominance. However, crowberry was still present in 1984 in almost all areas where it was the dominant species in 1964, and in one area (around GR 44/105465) it appears to have increased its presence and now comprises over 40% of the cover, whereas formerly it was recorded as providing only partial cover.

In 1984, the strongholds of bracken occupancy recorded in the 1964 survey, on the lower ground which makes up the northern edge of the moor, were still being maintained.

However, though there have been some areas of expansion and some of contraction, the total area where it was recorded as being dominant had markedly increased.

In 1964, cotton grasses occupied large areas of the moor, particularly in the central section which consists of a poorly drained plateau. There was also a very strong representation in the southernmost, highest section, especially on Hawksworth Moor. The 1984 map indicates that there has been a general reduction in distribution of these species, but with a consolidation in parts of the central plateau where more favourable conditions exist. Whilst the recorded dominance in the central plateau has increased, on the higher plateau in the south, where pure and mixed heather communities have expanded, cotton grasses have undergone a substantial reduction. By 1984, there had also been some reduction on the lower levels of the moor.

Discussion

Though broad vegetation changes are clearly detectable, detailed interpretation of the results is hampered by the different methods of recording the vegetation used in the two surveys. In 1964, the vegetation was described by assigning areas to seven phytosociological communities. With the exception of *Empetrum nigrum*, these were based on the dominant species. *E. nigrum*, however, was recorded simply either as present or dominant, irrespective of whatever associates were present. In contrast, in 1984 the ten-division categorization enabled both individual species and jointly dominant species to be used to define categories, and *E. nigrum* was not given special treatment.

Interpretation is also difficult because observed changes may be attributed to various factors. For example, the observed reduction in cotton grasses may be due to the moor drying out, as suggested by Fidler *et al* (1970), or to reduced grazing pressure limiting the availability of bare ground, which these species readily colonize (Phillips, 1954). It may, however, also be accounted for by differences in recording procedure. It is not clear when the 1964 survey took place, but as cotton grass species have striking flowers, their presence would be more readily noted in an early summer survey. However, the 1984 survey took place in late summer, autumn and early spring when the plants would have been much less obvious.

While bearing these qualifications in mind, analysis of the maps from the two dates indicates that over the last two decades the nature of the vegetation on Ilkley Moor has undergone appreciable change. Fidler *et al* (1970) suggested that at the time of their survey heather might have been recovering due to a reduction in sheep grazing pressure since the mid-1950s. Many of the changes revealed by the 1984 survey support this view. Both the expansion of heather and the reduction of crowberry can be attributed to changes in grazing pressure, as removal of grazing at other sites on the Pennines is known to have produced such effects (Anderson and Yalden, 1981; Rawes, 1983). Where both species are present, sheep preferentially graze the heather. Consequently, a reduction in the number of sheep might be expected to produce a striking expansion of heather such as the one which has been recorded in the 1984 survey. Vigorous heather growth is known to overtop crowberry (Rawes, 1983) and the resulting enhanced competition could be a factor in the decline of the latter species.

Changes in the recorded dominance of the bracken stands may also be attributed to changed grazing pressure. In many parts of Britain, bracken has traditionally been controlled by heavy stocking as it is sensitive to trampling during the dormant season and period of early growth (MAFF, 1974). Whilst such trampling is best achieved by cattle, Pennine farmers sometimes use high sheep stocking rates to obtain a similar effect. It is possible that overstocking by sheep during and after the 1939–45 war effectively controlled bracken, but that when stocking rates were reduced, the species consolidated its occupancy of suitable habitats. The fact that there has been little increase in the total area which it occupies indicates that physical factors, such as exposure or drainage, may limit its distribution on the moor.

Bilberry remains a minor component of the vegetation, and a separate map for this species has therefore not been presented. There are indications that it too had expanded

its distribution, which would further support the hypothesis of reduced grazing. However, this and other aspects of change in the vegetation can only adequately be assessed by a more detailed and finer-scale analysis of the data than has been undertaken in the present paper; this is currently in progress. However, the evidence presented here regarding the vegetation of Ilkley Moor does not support the view that its status deteriorated in the period 1964–1984.

Acknowledgments

We wish to thank the members of the survey group, Mr P. Baker, Mr A. Bradford, Mr J. Brown, Mr S. Pickard and Mr S. Short, for much of the fieldwork and the Manpower Services Commission for financial support. Thanks are also due to Dr J. E. P. Currall, who helped supervise the survey work, Mrs J. E. Duncan for information regarding the earlier survey, and Mr S. Davidson for drawing the figures.

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PLANT SUCCESSION IN MIDDLE WOOD, ASKHAM BOG

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Introduction

Askham Bog is a small valley mire, about 5 km SW of York, managed and partly owned by the Yorkshire Wildlife Trust Ltd. It is surrounded and divided into compartments by dykes (Fig. 1). The history and ecology of the Bog were reviewed by Fitter and Smith (1979). Detailed studies have been carried out in Far Wood of the inter-relationships between the vegetation and the environment (Fitter *et al* 1980), the tree population (Tucker and Fitter 1981) and the role of phosphorus in vegetational differentiation (Wilson and Fitter 1984). *Sphagnum* is less dominant in Middle Wood than Far Wood (this was also the case in 1933 (Day 1933)). *Sphagnum* has been implicated as being of prime importance in

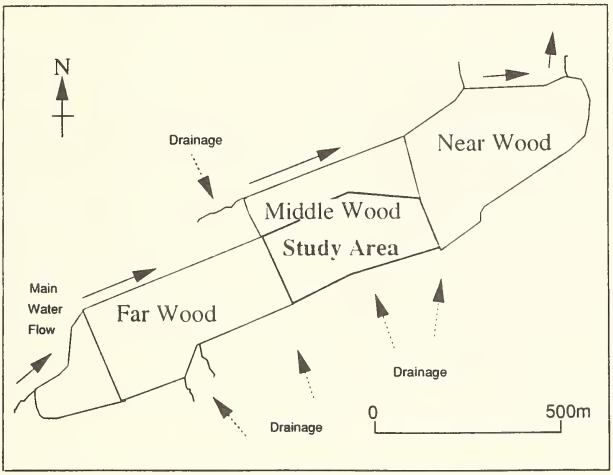

FIGURE 1
Sketch map of Askham Bog, York. Thin lines denote dykes whilst the thick lines denote the study area bounded to the north by a fence and by dykes on the other three sides.

the successional process of Far Wood (Wilson and Fitter 1984), and a study of Middle Wood provided a further opportunity to study the effect of the presence or absence of *Sphagnum* on succession. Middle Wood is also less acidic than Far Wood, possibly due to a higher water table, at least in the past. The tree cover is however similar between Middle and Far Wood. This paper reports on work carried out in the winter of 1985–86 on the tree structure and successional process in Middle Wood.

Methods

All survey work was based on the 50 m × 50 m grid present at the bog and a 25 m × 25m grid derived from this. The area studied was delimited by dykes to the south, east and west and by a fence, and the extrapolation of the fence to meet the dykes, to the north. This gave an area of 8.2 hectares. The excluded north side of Middle Wood has been more affected by man, having been grazed until the 1920s, and recent management has again

involved grazing. Fifty-six sites were selected at random, one each from the area surrounding each 25 m intersection. At each site a circular area of radius four metres was used for all sampling work. A hole was dug and the depth of the water table below the surface was measured. The pH at the water table was determined using a pH meter (Consort D314 portable digital) and the total amount of inorganic phosphate was estimated from a water sample using the single solution colorimetric method (Murphy and Riley 1962).

Vegetation survey

Data were collected on the presence and abundance (using an arbitrary 0–3 scale to record absent (0), trace (1), frequent (2) or dominant (3)) of 24 plant species which had all either previously been used as indicators of the environmental conditions (Tucker 1979) or had been suggested as playing an important or indicative role in the successional process (Fitter and Smith 1979).

Cluster analyses were performed on the data using the Clustan 1C and Clusco packages as implemented on the Dec-10 computer at the University of York. Two similarity coefficients were used in the cluster analyses: the nearest neighbour method (a single linkage method) and Ward's method (an error sum of squares method).

Tree survey

At each site the relative proportion of each species in the canopy directly above the sample site was estimated by eye. Also each live tree with the centre of its base falling within the sampling site was identified and marked on a map of the site with a record of its diameter at breast height (DBH) and status (live or dead). An estimate was made of the time since death of the tree by measuring the effort needed to compress a standard sized sample of wood a given amount. Using dead trees which had been felled at known times in the past it appeared that few trunks remained relatively intact beyond thirty years and this was used as a maximum. This crude method allowed a rough estimate, at least to within ten years, of the time since death. In order to convert the DBH data to age data forty trees of each major species were sampled using an increment borer. This indicated growth rates of 0.4 cm/year for birch (*Betula pubescens*) and oak (*Quercus robur*) and 0.55 cm/year for alder (*Alnus glutinosa*). These rates were slightly higher than those recorded in Far Wood (Tucker 1979) but this could be an experimental artefact. There were no significant differences in growth rate found between trees sampled in the acid areas and trees sampled in the fen areas.

Using the information calculated it was possible to reconstruct the age structure of birch for successive ten year intervals from 1935, but not of oak or alder since the number of dead oak and alder was very small. An age structure for birch in preceding decades before 1935 was approximated by subtracting successively older tree age classes starting with those estimated to have recruited in the 1925–1935 decade. This method was used for all decades for oak and alder; it is, however, more inaccurate, due to the lack of evidence on trees which may have recruited and then died.

Using the information on DBH it was possible to calculate the total basal area of each species present in an area for any time period. This was done for successive ten year intervals to assess the relative change in the abundance of birch, oak and alder.

Results

The physical environment

Topographically Middle Wood consisted, at the time of the study, of two raised, acidic areas separated and to some extent surrounded by an area some 20–30 cm lower (Fig. 2) with a relatively higher water table (Fig. 3) and higher pH (Fig. 4). The two raised areas can however be distinguished since the area to the east largely coincides with an area with a high level of dissolved inorganic phosphate at the water table (Fig. 5).

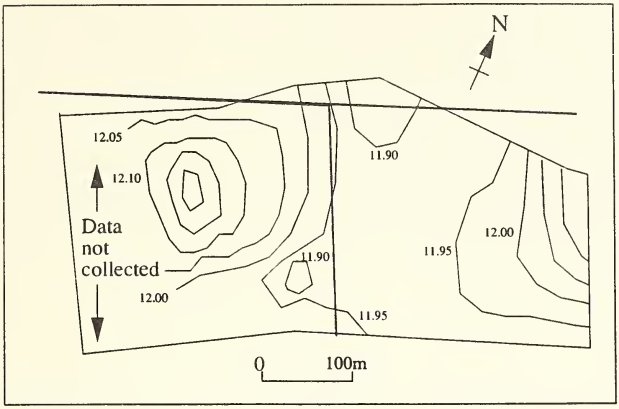

FIGURE 2
The topography of Middle Wood. Thick lines denote the position of the internal dyke system recorded in 1846 and still visible on the ground today. Contours (in metres AOD) are at 5 cm intervals. Data obtained by levelling and by direct measurement in spring 1977 when the whole bog was flooded (Fitter and Smith 1979).

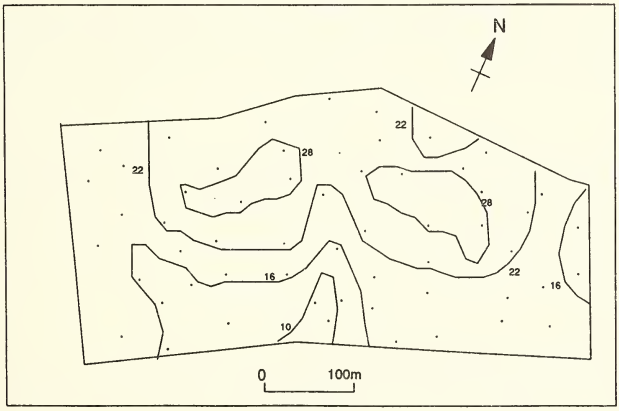

FIGURE 3
Depth of water table below the surface (cm) on 2 December 1985. Contours at 6 cm intervals. Measurement sites are indicated.

The ground vegetation and tree distribution

Although birch was dominant over most of the site, whilst oak and alder were scarce, there were differences in the tree cover between sites, which could be related to the physical characteristics. Using the results from the cluster analyses (both methods yielding similar results) the 56 sites were divided into five areas (Fig. 6). These could largely be described in terms of the twelve vegetation types described at the Bog by Fitter *et al* (1980), and showed the two main classes of vegetation: base-rich and base-poor. The two central areas both had a base-poor vegetation but they were distinguished by the number of dry-ground trees such as hazel (*Crylus avellana*), hawthorn (*Crataegus monogyna*) and rowan (*Sorbus aucuparia*) present (Table 1). They were denoted the eastern and western acid

areas, with the eastern acid area having the larger number of dry ground trees. The sites nearest to the dykes and in the lower lying central strip showed a base-rich vegetation, but again of two types: one, generally that nearest the dykes, in the wettest areas, usually had alder as the dominant tree species whilst the other contained much more birch and relatively less alder (Table 1). These two areas were termed the alder fen and fen areas respectively. There remained a number of sites in the area between the acid and fen areas which were intermediate between the two.

Birch was found over the whole area but oak clearly favoured the central, acid areas.In the eastern acid areas, hazel and rowan were also fairly common with rowan significantly associated with an inorganic phosphate level of ›2 μM ($p<0.05$, X^2 test performed on

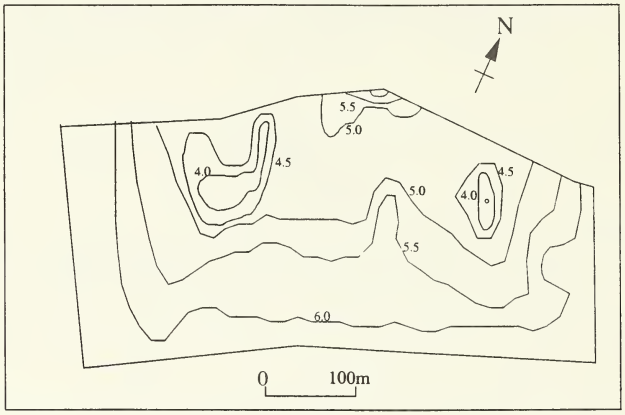

FIGURE 4
pH at the water table on 3 December 1985. Contours at 0.5 pH unit intervals. See Fig. 3 for measurement sites.

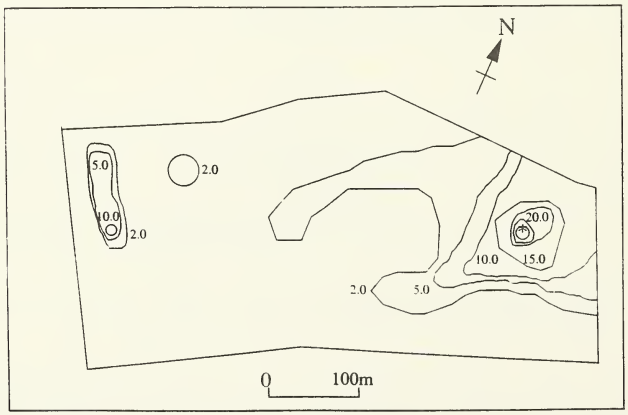

FIGURE 5
Inorganic phosphate level (μM dissolved inorganic phosphate) at the water table on 4 December 1985. Contours at 5 μM intervals except for an extra contour at 2 μM and the point marked * with a concentration of 61 μM. See Fig. 3 for measurement sites.

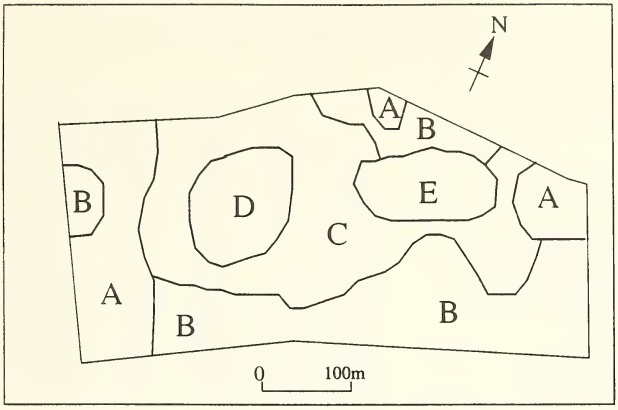

FIGURE 6
The five vegetation types into which the 56 sites were divided. A = Alder fen, B = Fen, C = Intermediate, D = Western acid, E = Eastern acid.

individual sites) and also with a water table depth of greater than 22 cm below the surface, ($p<0.05$ X^2 test performed on individual sites). Sallow (*Salix cinerea*) was common only in the western half of Middle Wood. Using these distribution data the mean constancy of plants and trees and the average physical data for each area could be calculated (Table 1).

Tree succession

When the total density of the three tree species was reconstructed for successive decades since 1925 two important features emerged (Fig. 7a). First birch had initially increased in relative density at the expense of alder (from 1925 to 1945). Secondly in the last decade birch has declined relative to both oak and especially alder. Between these two periods there was little change in the relative abundance of the species, with birch consistently the most abundant and oak and alder as minor constituents. These features were also seen in the age structures, with a poor recruitment of birch over the last twenty years (Fig. 7 d–g), but oak (Fig. 7b) and alder (Fig. 7c) are both reproducing well at present. For both birch and alder the oldest trees present were in the 90–99 year old age class, suggesting that they were older colonists than oak, since the oldest oak was in the 70–79 year old age class.

Birch has been declining and oak increasing most noticeably and most persistently in the eastern acid area (Fig 8e) and least noticeably in the fen area (Fig. 8b). In the alder fen area (Fig. 8a) it is alder that is replacing the birch. Grouping the sites according to their physical characteristics shows that the replacement of birch is favoured most at those sites with a high phosphate level (Fig. 9a), whilst at those sites with a high pH (Fig. 9c) alder alone has been replacing birch, with no oak being present. In the last ten years oak has increased most noticeably at those sites with a low pH or low water table (Fig. 9b and 9d).

The number of trees recruiting in each year since 1931 was estimated using the ages estimated for all the living trees (Fig. 10). Oak and alder showed the expected pattern of recruitment rate with a large number of trees having recruited in the last five years and a relatively constant number recruiting from 1980 back to 1931. Data was only used from live trees to avoid the double errors involved in calculating the recruitment date of dead trees. The curves shown thus represent the number of trees, currently living, which were recruited from each particular year. However since very few dead saplings of oak or alder were recorded it would appear that there has been some real increase in the recruitment rate. Birch shows a very different pattern to oak and alder in that there has been a greatly

TABLE 1

Mean constancy (% occurrence) of plants and trees and average physical characteristics at each site.

Species/Measurement	Alder Fen	Fen	Interm-ediate	Western Acid	Eastern Acid
Calamagrostis canescens	33	29	63	22	13
Dryopteris austriaca	0	21	31	67	88
Filipendula ulmaria	89	71	31	0	0
Galium palustre	56	50	13	0	0
Lonicera periclymenum	22	57	81	33	75
Lysimachia vulgaris	78	50	50	22	38
Molinia caerulea	0	14	31	56	25
Phalaris arundinacea	44	36	44	22	38
Phragmites australis	33	79	50	56	13
Poa trivialis	22	36	13	0	13
Rubus caesius	56	21	19	0	0
Rubus fruticosus	67	71	88	89	100
Solanum dulcamara	81	79	78	33	25
Sphagnum palustre	0	7	44	0	0
Thelypteris palustris	11	36	13	0	0
Urtica dioica	44	29	0	0	0
Viburnum opulus	50	43	33	11	0
Alnus glutinosa	100	21	38	0	25
Betula pubescens (live)	44	86	100	100	88
Betula pubescens (dead)	56	86	100	100	88
Corylus avellana	0	7	19	0	100
Crataegus monogyna	44	71	88	0	50
Frangula alnus	0	29	31	33	0
Quercus robur	22	29	79	78	88
Salix cinerea	56	43	13	67	0
Sorbus aucuparia	0	7	13	0	50
Water Table Depth (cm)	18.2	19.2	21.6	26.8	27.6
pH	5.9	5.3	5.1	4.1	4.5
Inorganic phosphate(μmol)	2.8	2.2	3.8	1.4	17.1

reduced recruitment rate over the last fifteen years compared to that over the previous period. So few young birch trees were discovered that an investigation was made into which sites these trees were found at. The results suggested that birch could not recruit at sites that had either a dense bramble cover or a dense alder canopy (21 out of the 56 sites), this being significant ($p<0.05$, X^2 test).

Discussion

A number of methods of studying ecological succession are available but those used here, age structure analysis combined with the use of historical data, had a number of advantages over other methods in this situation. These advantages consisted of the low cost, the lack of disturbance to the bog, and the provision of a general data base on the flora and physical conditions which could be of future use. Historical evidence alone can rarely provide sufficient evidence for a detailed successional study (see Stearns (1949) for a notable

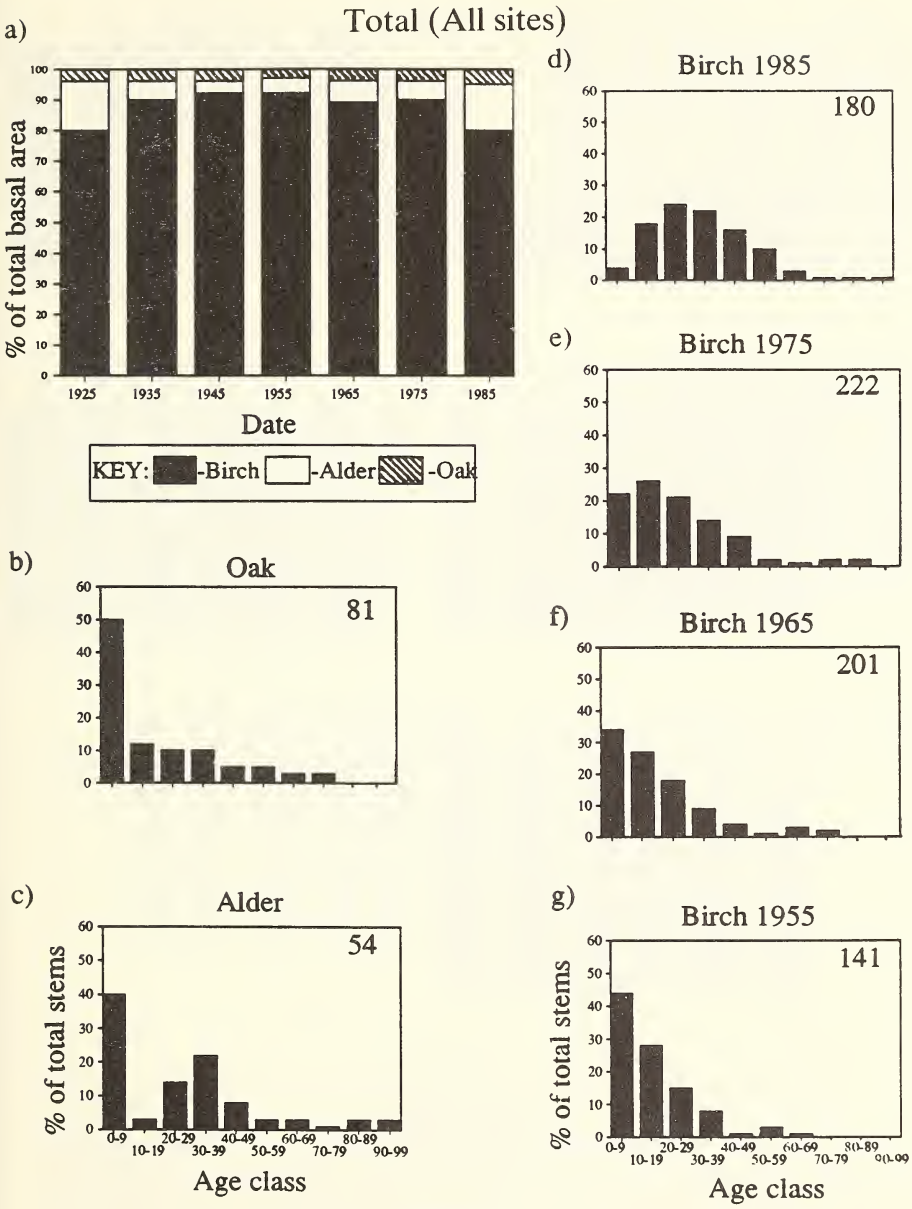

FIGURE 7
a) Total density of the three major tree species in previous years.
b–g) Age structure of the three major tree species in previous years.
Numbers at the top of the histograms represent the sample size.

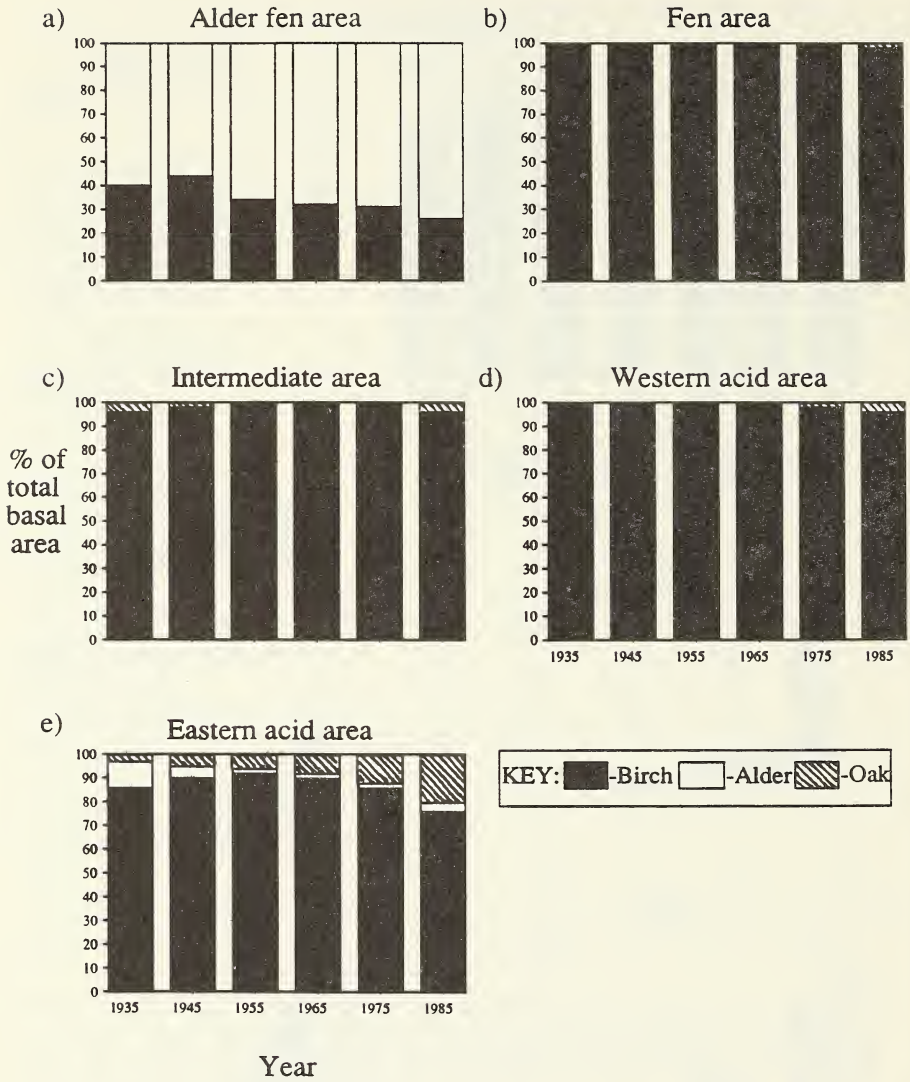

FIGURE 8
Changes in the density of the three major tree species over time according to site type.

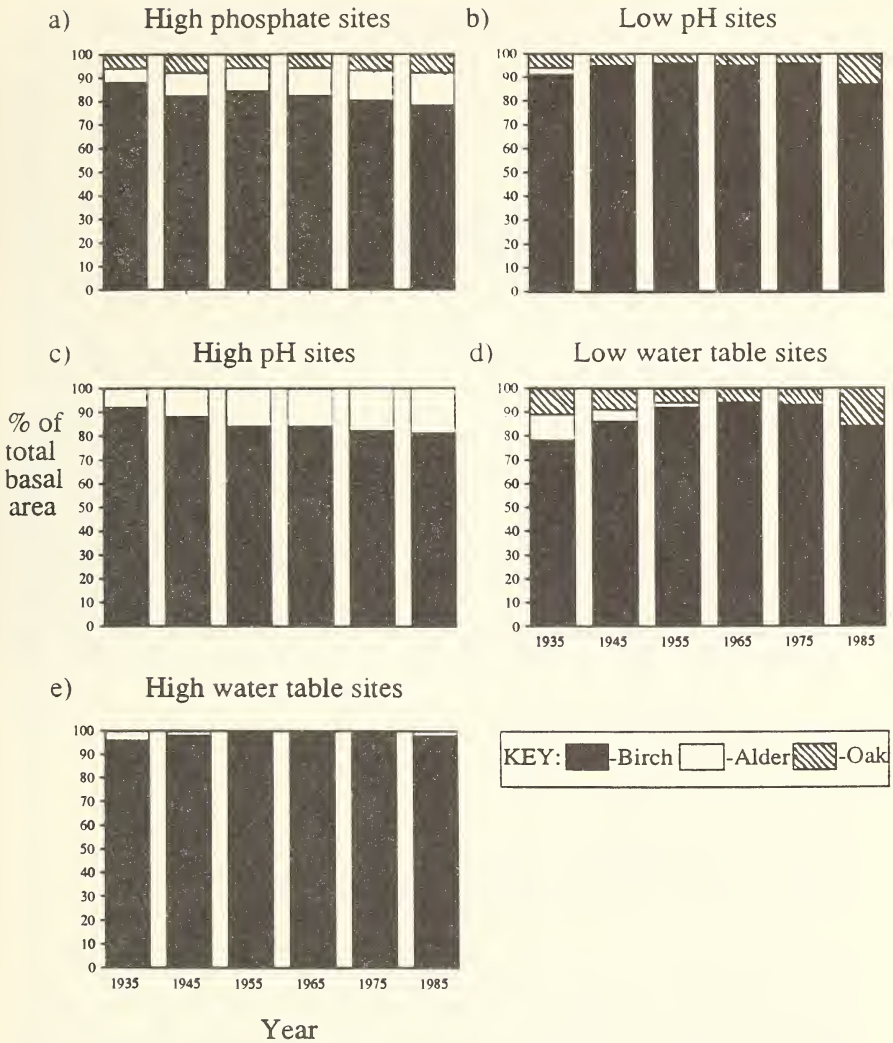

FIGURE 9
Changes in the density of the three major tree species over time according to the sites' physical characteristics.
Low pH sites: Sites with a pH greater than 5 except those with a high phosphate level, n=26. High pH sites: Sites with a pH greater than five, except those with a high phosphate level, n=20. Low water table sites: Sites with a water table greater than 27 cm below the surface, except those with a high phosphate level, n=10. High water table sites: Sites with a water table less than 19 cm below the surface, except those with high phosphate levels, n=14. High phosphate sites: Sites with a soluble inorganic phosphate concentration at the water table greater than 5 μM, n=10.

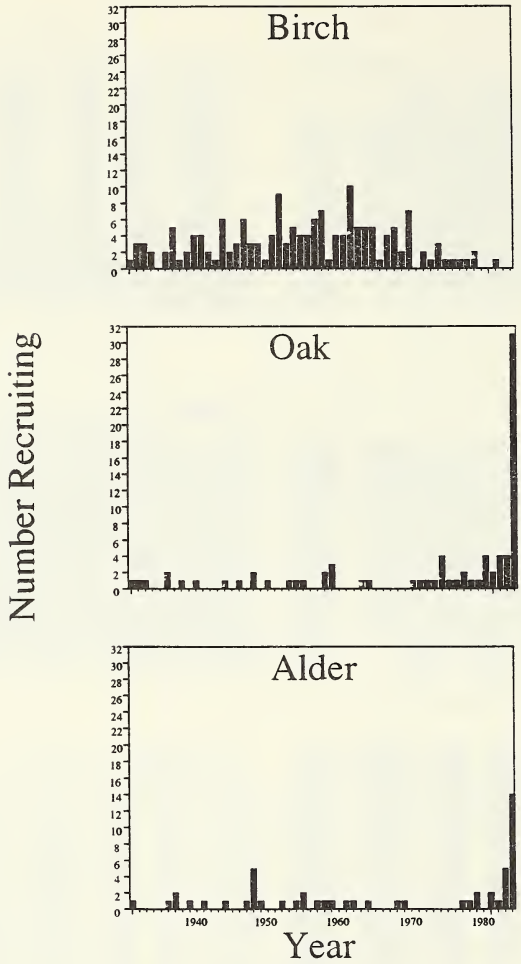

FIGURE 10
The numbers of the three major tree species recruiting in each year from 1931.

exception) but can be a useful adjunct to other studies. Henry and Swan (1974) were one of the first groups of workers to accurately reconstruct a successional sequence using evidence from both live tree age structures and from dead material. Whipple and Dix (1979) further developed the technique of inferring successional status from the current age structure. Although a number of studies have now used the technique of age structure analysis in inferring disturbance and successional change (e.g. Lorimer 1980, Tande 1979, Veblen 1979) only a few have included an analysis of the dead wood at a site (e.g. Oliver and Stephens 1977). Although the technique used to estimate the 'age since death' of the dead wood was extremely crude it is felt that the inclusion of the dead wood analysis was valuable. Even information on the species and size of fallen trunks can supplement the living age structures, especially if the maximum time since death could be independently estimated, as at Askham.

Askham Bog originally developed along a classic autogenic successional route from the exposed peat left over after the cessation of peat cutting around 1750–1770, through carr to scrub woodland (Fitter and Smith 1979). Day (1933) suggested that initial tree colonization of the bog around the start of the nineteenth century may have been caused by a temporary fall in the water level in turn due to a clearing out of the dykes and a general improvement of the drainage. This may have been done intentionally by commercial interests to promote tree growth. The early successional environment thus provided would have been highly suitable for the '*r*-strategist' trees such as birch and alder. The oldest birch currently present in Middle Wood date from around 1870, probably reflecting the maximum lifespan of birch at the bog, rather than any specific start to recruitment.

The succession of communities in the ground vegetation seems to correspond closely to that described by Fitter and Smith (1979) for Far Wood. The main differences are the relative reduction of acidophilous plants and communities and the extensive bramble-covered area in the centre of Middle Wood with several dry ground trees (eg crab apple and sycamore). These differences appear to have been due to much lower levels of *Sphagnum* in Middle Wood. This may have been due to a higher water table in the past and the presence of an internal dyke system, certainly present by 1846 and probably falling into disrepair by the turn of the century, allowing it to be more frequently flooded by base-rich water which would kill the *Sphagnum*. *Sphagnum* did colonize the western acidic area of Middle Wood at some time (Day 1933), even though it no longer occurs there, possibly because of increased drainage, which has made the present bog drier than it was one hundred or even fifty years ago (Fitter and Smith 1979). Its presence may have led to the difference between the two central areas. Small height differences may have been critical to whether *Sphagnum* became established and whether it could hold enough water to maintain itself.

The five areas defined in Middle Wood can be placed in a successional pathway analogous to that seen in Far Wood, the letters below corresponding to the codes used for vegetation sub-groups by Fitter and Smith (1979) pp 32–34 with which this scheme can be compared:

Alder Fen	Fen	Intermediate	Western Acid	Eastern Acid
C/D	E/(F)	F/A/G	(G/L)	I

The type 'I' vegetation found in the eastern acid area was found to be associated, like that in Far Wood (Wilson and Fitter 1984), with characteristically high levels of inorganic phosphate at the water table which they suggested was caused by the absence of *Sphagnum* and low water table encouraging mineralization, while the low pH reduced microbial immobilization.

Evidence from the age structure of the present community and from comparing the vegetation and tree cover currently found with that described by Day (1933) indicates that substantial changes have occurred in the tree cover of Middle Wood over the last fifty years, current age structure analysis suggesting that this has happened most rapidly in the last two decades. These changes mainly consist of a reduction in the recruitment of birch and the death of many young birch coupled with a corresponding increase in the distribution and density of oak and, in some areas, an increase in alder density. Barring a dramatic upturn in the success of birch seedlings the more central areas of the bog should progress towards oak or oak/hazel woodland whilst the more peripheral areas will continue to show alder domination. 'Pure' birch woodland will soon only exist in the fen and intermediate areas and these may also eventually be invaded by oak and/or alder leaving birch as only a minor component of Middle Wood.

Although Tansley (1939) indicated that oakwood is the likely climax community here it is still necessary to explain why the change from birch to oak is happening so quickly, when he suggested that the approach to the final oakwood is likely to be slow. In contrast to Far Wood it would appear that in Middle Wood it is the lack of *Sphagnum* which is

important. It is also suggested that in Middle Wood a progressively heavier shade from the canopy and the domination of the ground vegetation by brambles have combined not only to prevent birch germination but also to kill birch saplings that originally germinated under conditions of higher light. Gap phase regeneration of birch is prevented not only by the dense shrub cover but also by stunted oak which, having been able to survive the lower light regime, can reach the canopy more quickly when released from shade stress.

This replacement of birch is happening most dynamically in the eastern acid area. Wilson and Fitter (1984) showed that in Far Wood it was high phosphate levels that led to an improvement in the tree growth, mainly of oak. The same explanation may apply in Middle Wood since it is at the high phosphate sites that birch has been declining for the longest time, presumably having grown faster to fill the canopy quicker. Detailed examination of individual growth rings suggested that oak previously had a much faster growth rate in the high phosphate area (oak still reaches its highest densities there) compared to very similar sites with lower phosphate levels (Latto 1986). This increase growth rate presumably declined due to the increased competition.

Summary

Floristic analyses and tree species distributions were used to divide Middle Wood, Askham Bog, a small valley mire near York, into five areas for analysis. Two of these areas were base-rich, two base-poor and one intermediate. The base-poor acid woodlands occupy the higher central land, one being associated with an area of high phosphate levels. Reconstruction of the age structure of the tree species, particularly *Betula pubescens*, at various stages in the history of the wood and calculation of the changes in the overall density of the three major tree species indicated that although birch had initially increased, it is presently being replaced by *Quercus robur* and *Alnus glutinosa*. This rapid replacement is possibly due to the shade from the canopy reaching some limiting value for successful birch germination and growth and also to a dense bramble undergrowth having similar effects. Replacement is happening most rapidly in the high phosphate area, possibly because of a faster growth, and therefore more rapid succession in this area.

Acknowledgements

This work was carried out by J. L. as part of a BSc in Ecology at the University of York. We would like to thank the Yorkshire Wildlife Trust for permission to work at Askham Bog and Dr M. J. Crawley who kindly read the manuscript.

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BOOK REVIEWS

Nature's Night Life by **Robert Burton**. Pp. 160, with 63 colour and 57 b/w photographs, and 12 line illustrations. Blandford Press. 1989. £7.95.

In this book, the author draws a picture of the unseen nocturnal half of nature, with an emphasis on the fascinating life styles and patterns of behaviour of different groups of animals specially adapted for activity in darkness.

The book consists of nine chapters. The first chapter provides a detailed description of nature by night, with many examples from the animal kingdom; the second explains how animals are adapted to living in the dark; and the third discusses the various reasons for choosing this nocturnal habit. The fourth and fifth chapters contain information on birds and bats, the two most successful animals of the dark. The remaining chapters deal with the range of animals living in four of the world's natural ecosystems, namely the African savannah, the tropical forests, the deserts and the seas.

This book is well produced, easy to read, and attractive to look at. It was first published in 1982, and is now reprinted in paperback, which will make it available to a wider audience. I recommend it for both naturalists and research biologists alike.

AHE-S

Problems of Animal Behaviour by **David McFarland**. Pp. 158, with 57 figures. Longman Scientific and Technical. 1989. £12.95.

This book discusses a set of problems in animal behaviour studies which have tended to be neglected by researchers and students of the subject. The author's aim is to explore various aspects of the function-mechanism relationship, suggesting ways of describing the components of each problem in order to facilitate the task of solving for other researchers.

Each of the book's six chapters is organized as a progress of topics which lead the reader through different interesting problems. Every chapter starts with a full explanation and discussion of the problem, addresses different philosophical issues that arise throughout the discussion, and finally suggests possible solutions. The central message of the book, as stated by the author, is that 'ethologists need to overcome the tendency to investigate animal cognition in an anthropomorphic way'.

This book is well written and the ideas and discussion are clearly presented, concentrating particularly on issues of motivation and function-mechanism relationship, which should be very useful for teaching and research. There is much in this book that will be valuable to advanced students of ethology, philosophy and zoology. It is highly recommended for university libraries.

AHE-S

Evolution and the Fossil Record edited by **K. C. Allen** and **D. E. G. Briggs**. Pp. 265. Belhaven Press, London. Hardback £25.00.

The editors tell us in their preface that evolution and the fossil record are increasingly taught in undergraduate courses for geologists and biologists, and that until now there has been no obvious textbook. It is hard to understand why they should think their collection of oddly assorted chapters will fill the gap. Their book starts with a discussion of the formation of stars and planets. Next there is a chapter on the mass extinctions that have occurred from time to time during the history of life. Three later (not consecutive) chapters take up the theme, with accounts of extinctions in the history of invertebrates, vascular plants and vertebrates, but the plant and vertebrate chapters also present phylogenetic trees. There is a chapter on the rather unsatisfactory blobs and streaks that are the earliest recognized fossils and another on weird early animals, so unlike any modern animals that we have little idea of their relationship, or ways of life. There are chapters on the colonization of the land by plants and animals and on the evolution of flight by birds, bats and pterosaurs. Finally, there is a short essay on the influence of creationism on science and education.

The authors assume that their readers are already familiar with the divisions of geological time and with the major groups of fossils. They are inclined to present stratigraphic information in tedious detail and to skate over topics such as the causes of mass extinctions and the physiological problems of terrestrial life. There is some good stuff in this volume but it is not a coherent textbook.

RMcNA

Mass Extinctions: Processes and Evidence edited by **Stephen K. Donovan**. Pp. 266. Belhaven Press, London. Hardback £32.00

The dinosaurs went out with a bang seventy million years ago, probably as a result of a large asteroid hitting the earth. There have been four other major mass extinction events in the past 500 million years, and many minor ones. Here is a book about them, written by specialists for readers who already know quite a lot about the subject and want to be brought up to date. A remarkably large proportion of the references are to papers published during the past two years.

RMcNA

THE WASPS AND BEES (HYMENOPTERA: ACULEATA) OF ALLERTHORPE COMMON BEFORE AND AFTER CONIFERIZATION

MICHAEL E. ARCHER

Introduction and Methods

Allerthorpe Common, excluding York's Plantation, is a site of 2030 hectares about 10 miles south east of York (VC 62, SE 7647). It is one of the three remaining heathlands in the Vale of York. The site is overlain by fluvial sands which have also probably been moved by the wind. According to Fordham (1922), the Common was made up of dry and wet areas carrying heather, cotton grass, birch scrub and bare sandy patches and was subject to fires which were sometimes extensive. During the mid-1960s most of the Common was coniferized, so that areas of wet and dry heath became much reduced and those that remained were invaded by birch, oak and sallow unless kept open. However the rides through the planted conifers are sufficiently wide to provide nesting and foraging sites for aculeates.

A record is a specimen differing in one of the following three variables: name, sex and day of capture (or observation). During the pre-coniferization period, aculeates were collected mainly by W. J. Fordham (1920–33) but also by R. Butterfield (1927–28), J. Wood (1924–34), W. D. Hincks (1929–45) and there are a few records from G. B. Walsh (1920), T. Stainforth (1921), C. A. Cheetham (1928), A. Smith (1947), D. H. Smith (1950s) and J. H. Elliott (1950–51). The pre-coniferization records are mainly known from the Fordham Card Index but some of the specimens were found in the museums at Keighley, Leeds, Manchester, Scarborough and York. The post-coniferization records are mainly those of M. E. Archer (1970–87), with a few records from J. H. Flint (1967–71), A. Norris (1974), J. T. Burn (1983) and W. A. Ely (1984). The Archer records were collected visually with a hand-net on 76 visits mainly during the 1970s and early 1980s with visits being made in the following months: April (5 visits), May (12), June (19), July (23), August (9), September (8). Thanks are extended to curators of museums and personal collectors for access to specimens. J. T. Burn supplied the records of the Bethylidae and Dryinidae. Nomenclature is according to Kloet and Hincks (1978).

Results

167 species of aculeate wasps, ants and bees have been collected on Allerthorpe Common including 141 solitary and 26 social species. Of the social species recorded, the ants were *Myrmica ruginodis*, *Formica lemani* and *Leptothorax acervorum*, the social wasps were *Vespula rufa*, *V. austriaca*, *Dolichovespula sylvestris*, *Paravespula germanica* and *P. vulgaris*. The bumble and cuckoo bees were *Bombus lucorum*, *B. terrestris*, *B. lapidarius*, *B. jonellus**, *B. pratorum*, *B. distinguendus**, *B. hortorum*, *B. ruderatus**, *B. humilis**, *B. muscorum*, *B. pascuorum*, *Psithyrus barbutellus**, *P. bohemicus*, *P. campestris*, *P. rupestris**, *P. sylvestris*, *P. vestalis* and the honeybees *Apis mellifera*. The six species marked with an asterisk are probably no longer present on the Common. The number of records of the social species was not collected.

Table 1 shows the taxonomic distribution of the 141 solitary species that have been collected on Allerthorpe Common. 65 species found during the pre-coniferization period have not been found during the post-coniferization period, although an additional nine species (*Anteon gaullei*, *Ectemnius cavifrons*, *Lindenius albilabris*, *Gorytes quadrifasciatus*, *Andrena cineraria*, *A. subopaca*, *Lasioglossum villosulum*, *Megachile versicolor*, *Nomada goodeniana*) have been found during the post-coniferization period.

The number of records of the solitary species collected during the pre-coniferization was 800 (Tables 2, 3) and 417 (Archer 387 records) during the post-coniferization period (Tables 4, 5). Thus for the solitary species nearly twice as many records were collected during the pre-coniferization period.

Three nationally notable species (Red Data Book Category 3 species, Shirt, 1987) have been recorded, of which two are still present (*Andrena ruficrus*, *Nomada tormentillae*) and

TABLE 1

The number of solitary species in each aculeate family found at Allerthorpe Common during the pre- and post-coniferization periods

Family or Subfamily	Number of species Pre	Post	Total
Bethylidae	1	0	1
Dryinidae	2	1	3
Chrysididae	7	2	7
Tiphiidae	1	1	1
Mutillidae	1	1	1
Pompilidae	12	7	12
Eumenidae	6	3	6
Sphecidae	38	22	41
Colletinae	5	2	5
Andreninae	21	14	23
Halictinae	18	12	19
Megachilinae	9	3	10
Anthophorinae	11	8	12
Solitary Wasps	68	37	72
Solitary Bees	64	39	69

one is no longer found (*Symmorphus crassicornis*). *S. crassicornis* is only known from three Watsonian Yorkshire localities and has not been recorded since 1932. Ten local notable species (ie recorded in five or fewer Watsonian Yorkshire localities) have been found but eight species are no longer found. The two species still present are *Chrysis rutiliventris* and *Methochra ichneumonides*. Three of the species no longer found are probably now extinct in Watsonian Yorkshire: *Ceropales maculata*, not recorded since 1950, *Mellinus sabulosa* since 1952 and *Lasioglossum quadrinotatum* since 1935. *L. quadrinotatum* is an unlikely species to be found in Yorkshire but the records have been accepted because of their confirmation by H. H. Hallett, although none of the specimens can now be found.

Apart from the nationally and locally notable species a further 22 species recorded can be regarded as particularly distinctive of sandy or heathland habitats. Five of these species (*Hedychridium ardens*, *Colletes fodiens* and its cleptoparasite *Epeolus variegatus*, *Andrena lapponica*, *A. denticulata*) are no longer found. These five species, however, are found at other localities in Watsonian Yorkshire. The 35 notable and local species are indicated in tables 2, 3, 4 and 5. Flint and Flint (1976) recorded *Panurgus banksianus* and *Nomada hirtipes* from Allerthorpe Common which are now known to be errors and are respectively *Andrena tarsata* and *Nomada panzeri*.

Combining the records for the pre- and post-coniferization periods June, July and August were the months when most species were in flight, with June and July the months when most new species were encountered (Table 6).

The flight periods of the solitary species were observed as follows: during April the spring mining bees appeared although *Andrena clarkella* was even earlier, appearing in March; sometimes males, that failed to shelter underground overnight, could be found frozen to the ground in early morning. The spring *Andrena* species were usually gone by the end of May, with the rather fewer summer *Andrena* species appearing from June until August. However, *A. barbilabris* was active for an unusually long time, from April until August. *Nomada* species are the cleptoparasites of the *Andrena* species: these were also found and there were spring and summer species. *A. barbilabris* does not have a *Nomada* cleptoparasite but instead is cleptoparasitized by *Sphecodes pellucidus*. This was active from April until September.

TABLE 2

The number of records of each species of solitary wasp found at Allerthorpe Common during the pre-coniferization period.

No. Records	Species	No. Species
1	*Bethylus fuscicornis*, *Anteon pubicornis*, *A. jurineanun*, *Chyrsis impressa*, *C. rutiliventris*[2], *C. viridula*, *Trichrysis cyanea*, *Arachnospila trivalis*[3], *Ancistrocerus parietun*, *Trypoxylon attenuatum*, *Crossocerus ovalis*, *C. wesmaeli*, *C. dimidiatus*, *Psen dahlbomi*, *Passaloecus singularis*.	15
2	*Methocha ichneumonides*[2], *Astata pinguis*[3], *Trypoxylon clavicerum*, *Crossocerus elongatulus*, *C. capitosus*, *C. cetratus*, *C. podagricus*, *Pempredron lugubris*, *Mellinus sabulosa*[2], *Gorytes tumidus*[2].	10
3	*Hedychridium ardens*[3], *Priocnemis schioedtei*, *P. cinereus*, *Arachnospila spissa*, *Anoplius nigerrimus*, *Symmorphus crassicornis*[1], *Trypoxylon figulus*, *Rhopalum clavipes*, *Nysson spinosus*.	9
4	*Omalus auratus*, *O. panzeri*, *Myrmosa atra*, *Ancistrocerus trifasciatus*, *Symmorphus gracilis*, *Ectemnius continuus*, *Psenulus atratus*, *Pemphredon lethifer*, *Passaloecus insignis*.	9
5	*Priocnemis parvula*, *Ancistrocerus parientinus*, *Symmorphus mutinensis*, *Crossocerus megacephalus*.	4
6	*Arachnospila anceps*, *Anoplius viaticus*[3], *Episyron rufipes*[2], *Ceropales maculata*[2].	4
7	*Crossocerus nigritus*.	1
8	*Diodontus minutus*[3].	1
10	*Evagetes crassicornis*, *Tachysphex pompiliformis*[3].	2
11	*Crossocerus quadrimaculata*, *Agrogorytes mystaceus*.	2
14	*Priocnemis exaltata*.	1
15	*Crabro peltarius*[3].	1
16	*Ectemnius lapidarius*.	1
18	*Crossocerus tarsatus*, *Diodontus tristis*.	2
21	*Oxybelus uniglumis*[3].	1
22	*Crossocerus pusillus*.	1
26	*Crabro cribrarius*.	1
28	*Mellinus arvensis*.	1
29	*Psen equestris*[3].	1
35	*Ammophila sabulosa*[3].	1

Total no. records – 441 No. species – 68

[1] Nationally notable species
[2] Locally notable species
[3] Local to open sandy habitats

TABLE 3

The number of records of each species of solitary bee found at Allerthorpe Common during the pre-coniferization period.

No. Records	Species	No. Species
1	*Andrena helvola*, *A. lapponica*[3], *A. praecox*, *A. angustior*, *A. nigroaenia*, *A. minutula*, *Lasioglossum quadrinotatum*[2], *L. cupromicans*, *L. smeathmanellum*, *Sphecodes hyalinatus*, *S. ferruginatus*, *Osmia leaiana*, *Megachile ligniseca*[2], *Coelioxys quadridentata*[2], *C. inermis*, *C. rufescens*[2], *Nomada fabriciana*, *N. ruficornis*.	18
2	*Colletes daviesanus*, *C. fodiens*[3], *Andrena scotica*, *A. nigriceps*, *Lasioglossum leucopum*, *Sphecodes ephippius*, *Megachile willugbiella*, *Nomada striata*.	8
3	*Andrena coitana*, *Halictus tumulorum*, *Lasioglossum punctatissimum*[3], *Sphecodes monilicornis*, *Megachile centuncularis*, *Nomada marshamella*.	6
4	*Andrena fucata*, *A. chrysosceles*, *A. wilkella*, *Sphecodes gibbus*, *Nomada panzeri*, *Epeolus cruciger*[3].	6
6	*Hylaeus brevicornis*, *Andrena bicolor*, *A. saundersella*, *Nomada rufipes*[3], *N. tormentillae*[1], *Anthophora furcata*.	6
7	*Sphecodes pellucidus*[3].	1
8	*Megachile circumcincta*, *Nomada leucophthalma*, *Epeolus variegatus*[3].	3
9	*Andrena denticulata*[3].	1
10	*Hylaeus communis*, *Andrena clarkella*, *A. haemorrhoa*, *A. tarsata*[3].	4
11	*Andrena fuscipes*[3], *Coelioxys elongata*.	2
13	*Lasioglossum albipes*, *L. rufitarse*, *Sphecodes fasciatus*.	3
14	*Halictus rubicundus*.	1
16	*Colletes succinctus*[3].	1
17	*Andrena ruficrus*[1], *A. barbilabris*[3].	2
20	*Lasioglossum calceatum*.	1
22	*Lasioglossum fratellum*.	1

Total no. records – 359 No. species — 64

[1] Nationally notable species
[2] Locally notable species
[3] Local to open sandy habitats

Over-wintered male andrenids emerge in the spring with the unfertilized females, unlike most halictine mining bees where only the fertilized females appear in spring. A generation of male and female halictines are then reared to appear from late summer, when the females are fertilized and over-winter but the males die. Halictines (*Halictus*, *Lasioglossum*) could be found at Allerthorpe Common on the wing with their cleptoparasites (*Sphecodes*) over a long period eg *L. calceatum* from April until September.

The spider-hunting pompilid wasps usually appeared during June, although *Anoplius viaticus* was early, appearing in April, and lasted at least until August, with several species, eg the cleptoparasite *Evegetes crassicornis*, which lasted until September.

The other solitary wasps and bees found were really summer species and were found to be active from June until August. Very few species, eg the hunter of small flies *Crossocerus wesmaeli*, were active during May, but a few more were active during September, eg the caterpillar hunter sand wasp *Ammophila sabulosa*.

The cleptoparasitic load (CL) is the percentage of species that are cleptoparasites on other wasps and bees (Table 7). The solitary wasp cleptoparasites found were the chrysids, *Myrmosa atra*, the two pompilids *Evagetes crassicornis* and *Ceropales maculata* and the sphecid *Nysson spinosus* which cleptoparasitizes *Argogorytes mystaceus*. The bee cleptoparasites belonged to the genera *Sphecodes*, *Coelioxys*, *Nomada* and *Epeolus*. In calculating the CLs *Methochra ichneumonides*, the Bethylidae and Dryinidae have been excluded as they are parasitic on non-aculeate species. The CLs for the pre- and post-coniferization periods were similar for the solitary wasps and bees but the CLs for the solitary bees were larger than those for the solitary wasps.

The aerial nester frequency (AF) is the percentage of the host or non-cleptoparasitic species that have aerial nests (Table 8). Other host species are soil nesters which usually dig burrows in the ground or sometimes use crevices. The AFs for the solitary wasps were higher than those for the solitary bees but the AFs for the pre-coniferization solitary wasps and bees were twice the size of those of the post-coniferization period.

Discussion

A site with 100 or more aculeate species may be regarded as an excellent or first-rate site in a Yorkshire context. Thus an all-time species list of 167 is exceptional and even the now reduced list of 96 species, post-coniferization, makes it equivalent to Strensall Common with its list of 112 species (Archer, 1988). A grading based on the quality of the species can be made using the point system of the N. C. C. Invertebrate Site Survey giving 100 points

TABLE 4

The number of records of each species of solitary wasp found at Allerthorpe Common during the post-coniferization period.

No. Records	Species	No. Species
1	Anteon gaullei, *Chrysis rutiliventris*[2], *Ancistrocerus parietum*, *Crossocerus ovalis*, *Ectemnius cavifrons*, *E. continuus*, *Pemphredon lugubris*, *Diodontus minutus*[3], *Crossocerus quadrifasciatus*.	9
2	*Omalus panzeri*, *Arachnospila trivalis*[3], *Ancistrocerus parietinus*, *A. trifasciatus*, *Astata pinguis*[3], *Tachysphex pompiliformis*[3].	6
3	*Myrmosa atra*, *Methocha ichneumonides*[2], *Priocnemis exaltata*, *Anoplius nigerrimus*, *Crossocerus pusillus*, *C. quadrimaculata*, *Lindenius albilabris*.	7
4	*Arachnospila spissa*.	1
5	*Crossocerus tarsatus*.	1
6	*Arachnospila anceps*, *Anoplius viaticus*[3].	2
7	*Evagetes crassicornis*, *Mellinus arvensis*.	2
8	*Crossocerus wesmaeli*, *Psen equestris*[3], *Nysson spinosus*.	3
10	*Ammophila sabulosa*[3].	1
13	*Crabro peltarius*[3].	1
14	*Argogorytes mystaceus*.	1
16	*Oxybelus uniglumis*[3].	1
18	*Crabro cribrarius*.	1
21	*Diodontus tristis*	1

Total no. records – 193 No. species – 37

[1] Nationally notable species
[2] Locally notable species
[3] Local to open sandy habitats

TABLE 5

The number of records of each species of solitary bee found at Allerthorpe Common during the post-coniferization period.

No. Records	Species	No. Species
1	*Andrena cineraria*, *A. haemorrhoa*, *A. scotica*, *A. wilkella*, *Lasioglossum albipes*, *Sphecodes hyalinatus*, *S. monilicornis*, *Nomada goodeniana*, *N. striata*.	9
2	*Colletes daviesanus*, *Andrena clarkella*, *A. saundersella*, *A. subopaca*.	4
3	*Andrena chrysosceles*, *A. fucata*, *A. nigroaenea*, *A. ruficrus*[1], *Lasioglossum punctatissimum*[3], *Sphecodes gibbus*.	6
4	*Andrena fuscipes*[3], *Lasioglossum villosulum*, *Megachile versicolor*, *Coelioxys elongata*.	4
5	*Halictus rubicundus*, *Nomada marshamella*, *N. tormentillae*[1].	3
6	*Epeolus cruciger*[3].	1
7	*Nomada leucophthalma*.	1
8	*Megachile willugbiella*, *Nomada panzeri*.	2
9	*Sphecodes fasciatus*, *Nomada rufipes*[3].	2
11	*Lasioglossum calceatum*.	1
12	*Colletes succinctus*[3].	1
13	*Andrena tarsata*[3], *Lasioglossum rufitarse*.	2
17	*Specodes pellucidus*[3].	1
20	*Andrena barbilabris*[3].	1
25	*Lasioglossum fratellum*.	1

Total no. records – 224 No. species –39

[1] Nationally notable species
[2] Locally notable species
[3] Local to open sandy habitats

for each Red Data Book species and 20 points for each local notable species. The pre-coniferization quality would be 500 points, which has been more than halved to 240 points during the post-coniferization period. The current quality position for Strensall Common is 400 points (Archer, 1988). Since the 1960s, Allerthorpe Common has lost much, both in the number and quality of species.

Why has there been a loss of species? Is it a consequence of coniferization or is there another explanation? It might be a consequence of less collecting effort in the post-coniferization period in terms of the number of records (Table 1). The number of records per species is 6.1 for the pre-coniferization period with 5.5 records per species in the post-coniferization period. These two ratios are very similar: the pre-coniferization ratio may be higher because as the species list enlarges, it becomes increasingly difficult to find new species.

The aerial nester frequency (AF) is sensitive to changes in habitat (Archer, 1988). The AFs for Strensall Common for solitary wasps (41.5%) and bees (19.2%) (Archer, 1988) are very similar to those of the pre-coniferization period (Table 8); to be expected as both are or were open wooded heathland habitats. The large decrease in AFs shown during the post-coniferization period therefore must be due primarily to habitat change, ie coniferization, and not to less collecting effort.

The effects brought about by coniferization can be illustrated by an investigation of the species that have been lost. The cleptoparasite *Omalus auratus* has been lost with its aerial

nesting hosts, such as *Pemphredon lethifer*, whilst the cogeneric *O. panzeri* survives because its host *Psen equestris* is a soil nester. In fact, *O. panzeri* has been found swarming in large numbers at times. The aerial nesters that have been lost are three species of *Symmorphus* , three species of *Trypoxylon*, six species of *Crossocerus*, *Ectemnius lapidarius*, *Rhopalum clavipes*, *Psen dahlbomi*, *Psenulus pallipes*, *Pemphredon lethifer*, two species of *Passaloecus*, two species of *Hylaeus*, *Osmia leaiana*, three species of *Megachile* and *Anthophora furcata*. These lost species are mainly rather small sized species. In contrast, the aerial nesters

TABLE 6

The number of species of solitary wasps and bees recorded per month and new species seen each month at Allerthorpe Common.

	March	April	May	June	July	August	September
No. species	1	17	27	76	104	92	32
No. new species*	1	16	16	55	41	11	0

* Information not available for one species

TABLE 7

The relative frequency of the cleptoparasitic species in the pre- and post-coniferization periods at Allerthorpe Common.

	No. host species (H)	No. cleptoparasitic species (C)	Cleptoparasitic load (CL=100×(C/H+C))
Pre-coniferization			
Solitary Wasps	53	11	16.9
Solitary Bees	43	21	32.8
Post-coniferization			
Solitary Wasps	30	5	13.9
Solitary Bees	25	14	35.9

TABLE 8

The nesting habits of the host wasps and bees in the pre- and post-coniferization periods at Allerthorpe Common.

	Aerial nests (A)	Soil nests (S)	Aerial nester frequency (AF=100×A(A/(A+S))
Pre-coniferization			
Solitary Wasps	29	24	45.3
Solitary Bees	36	7	16.3
Post-coniferization			
Solitary Wasps	24	6	20.0
Solitary Bees	23	2	8.0

present during the post-coniferization period, *Ancistrocerus parietinus*, *A. trifasciatus*, *A. parietum*, *Ectemnius cavifrons*, *E. continuus*, *Pemphredon lugubris*, *Megachile willughbiella*, *M. versicolor*, are all larger sized species and could be flying onto the Common to forage from peripheral nest sites. The current aerial nesters are usually species known only from one or two records each.

There is also some evidence that species needing large sandy areas have been lost, eg *Pompilus cinereus*, *Episyron rufipes*, *Colletes fodiens* with its cleptoparasite *Epeolus variegatus*. Similarly *Tachysphex pompiliformis*, although still present, has become much less common and its cleptoparasite *Hedychridium ardens* has been lost.

The effects of coniferization have led to a loss of aerial nesting sites and nesting sites in large open sandy areas.

The following speculations can be made about the nine species that have only been found in the post-coniferization period. The following species: *Lindenius albilabris*, *Gorytes quadrifasciatus* and *Lasioglossum villosulum* are associated more usually with South Yorkshire, so their presence on Allerthorpe Common might be a consequence of a temporary northward extension of distribution. In contrast, the presence of *Ectemnius cavifrons* is the consequence of a long-term northward spread of distribution, which became widespread and common from the 1960s. Similarly, the presence of *Megachile versicolor*, which really only became known in the 1970s, may be the consequence of a northward spread. However, *M. versicolor* could have been missed during the pre-coniferization period because of identification problems. This was almost certainly the case for *Andrena subopaca*, which is now known throughout Watsonian Yorkshire. The capture of the cleptoparasite *Nomada goodeniana* must always have been unlikely as its host *Andrena nigroaenia* is scarce. The small colony of *Andrena cineraria* found in 1984 was also unlikely as this species is usually associated with West and South Yorkshire where it can be locally common. The Bethylidae and Dryinidae have been little collected during the post-coniferization period.

The cleptoparasitic loads (CLs) for Strensall Common for solitary wasps (18%) and bees (33.3%) (Archer, 1988) are very similar to those of both the pre- and post-coniferization periods. The CLs for the solitary species at four English sites (Archer, 1988) has now been shown to be relatively constant. Clearly, the CL is not affected by habitat change but is primarily a function of the species present. The lower value of the CL for the solitary wasps could be a consequence of food-chain relationships. The solitary wasps are secondary consumers, unlike the solitary bees which are primary consumers, so are less likely to be as numerous as individuals. Smaller host population sizes result in fewer viable populations of cleptoparasitic species.

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LATRINE TRAINING OF A BADGER CUB

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During the evening of 5 May 1989, a small social group of badgers *Meles meles*, were observed at a sett in the Doncaster area. Above ground throughout the observation, were three adult badgers and four small cubs; all the cubs were approximately 14 weeks old, though one cub was slightly larger in girth than the other three.

During the observation, one of the adult badgers walked to the latrine pit area near to the sett and was followed by the largest cub. After the adult badger had defecated into a pit, it turned to the cub and began to lick its anal area. Despite the cub's playful movements and numerous attempts to rejoin the other cubs, the adult badger confined the cub to the latrine area by nudging it with its head and continued licking the cub's anus for approximately eight minutes, until the cub squatted on the ground and defecated in the latrine area. After the cub had performed, the adult and cub rejoined the other badgers above ground.

Often cubs raised in captivity require gentle massaging around the anus to make them defecate, though the observed act of stimulating the cub at the communal latrine may be a form of social training for the cub.

I would like to thank Dr E. G. Neal for commenting on an earlier draft of this note.

POSSIBLE INCESTUOUS BREEDING BY YEARLING BARN OWLS *TYTO ALBA*

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Ralls *et al* (1986) reviewed inbreeding in birds and mammals and concluded that matings between close relatives (parent/offspring or sibling/sibling) were uncommon in natural populations. The main mechanisms involved in reducing inbreeding were sex differences in natal dispersal and behavioural avoidance of mating with close relatives. Therefore, it is of interest to document cases of possible inbreeding such as the following in Barn Owl *Tyto alba*.

On 8 April 1988 a pair of Barn Owls were caught whilst roosting in a barn in upper Liddesdale, Roxburghshire, just to the north of Kielder Forest, Northumberland. The birds were sexed on plumage characteristics and both had been ringed as nestlings at the same nest site, but in different broods, in 1987.

The barn was re-visited on 21 July 1988 when two chicks close to fledging were ringed. The age of the largest chick was estimated from its winglength by applying the growth curves for Barn Owls from Mali (Wilson *et al* 1987), and assuming a 30 day incubation period (Cramp 1985) it was estimated that the first egg had been laid around 2 May. Gains in weight and the length of the nestling period in young *T.a. affinis* in Mali appear to follow a similar pattern to *T.a. alba* from Europe (Wilson *et al* 1987; Cramp 1985).

The barn used in 1988 is a traditional nest site at 220 m elevation, with a history of being periodically occupied. The last time that Barn Owls bred at the site prior to 1987 was in 1985. That pair disppeared during the 1985/1986 winter when the Field Vole *Microtus agrestis* populations were low (Petty, in press) and the site remained unoccupied throughout 1986 and 1987.

The adult owls were reared in 1987 at a site 4.4 km NE of the barn used in 1988. The female came from the first brood of 5 chicks and the male from the second brood of 6 chicks. Using the method described earlier, the female was estimated to have hatched on 30 April and the male on 17 August. We have no evidence to suggest that the parents at the 1987 nest changed between the first and second brood, although we did not catch either bird. A number of other Barn Owls also reared two broods in southern Scotland in 1987, and there is about a 16% chance that females will change between the first and second brood (I. R. Taylor, pers. comm.). Therefore, at the time of laying in 1988, the male was around 9.5 months old and the female 12 months old. While it is not unusual for yearling Barn Owls to attempt to breed (Bunn *et al* 1982; Cramp 1985; Petty *et al* 1986), we can find no record of a yearling pair breeding successfully, especially with a male less than one year old.

This possible incestuous breeding occured when Field Vole populations were high (increasing in 1987 and declining in 1988) in adjacent areas in Kielder Forest (Petty, in press; S. J. Petty, unpublished data). This record, together with a previous one (Petty *et al* 1986), gives an insight into how unoccupied or new Barn Owl sites are colonized in sparsely populated areas. During the period 1984–1988 only two out of the three known sites close to the northern boundary of Kielder Forest were used by Barn Owls. In four breeding attempts in these sites during this period, we twice knew the history of both adults and both of these apparently involved incestuous matings, including the instance reported here. The chances of closely related birds forming breeding pairs will presumably be much greater when so few birds are available.

Acknowledgments

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YORKSHIRE NATURALISTS' UNION EXCURSIONS IN 1988

Compiled by C. S. V. YEATES and W. A. ELY

BURTON CONSTABLE (VC 61), 23 July (B. S. Pashby)
Despite a depressing weather forecast 35 members plus a party of Halifax Naturalists attended the excursion. In the event, apart from a little light rain, it remained a cloudy though very warm and humid day. Two main areas were explored, the lakes on the western side of the estate and an area of mixed woodland on the eastern side known as The Moors, possibly a derivation of 'meres'. The meeting for the presentation of reports was held in the Village Hall at Sproatley. The President, Mr I. C. Lawrence, took the chair and 23 societies answered the roll-call. Following the reports the President proposed votes of thanks to Mr J. Chichester-Constable for permission to visit the estate; to the keeper, Mr Addey, for his assistance; to Mr Blackmoor, the caravan-site manager for parking facilities at the lakes, and to the Divisional Secretary for organising the meeting.

Ornithology (A. J. Wallis)
Of the two parts of the estate visited, the area around the park lake was the more profitable for birdwatchers.

Despite the presence of a caravan site on one side of the lake, six breeding bird species were noted, all of which were tending either chicks or fledged young. Both Canada and Greylag Geese had fully fledged young in attendance and, although the species were in isolated flocks, one hybrid bird was observed among the Greylags. The Canada Goose flock numbered some 40 birds, while quite 100 Greylags were present.

Both Mallard and Moorhen were tending young, as was one pair of Coots; nearby another Coot was still incubating on its nest.

Two female Pochards had young, one had just one survivor from its brood while the other had six ducklings. This was perhaps the most significant record of the day, as J. R. Mather's *The Birds of Yorkshire* (1986), which contains known information up to 1984, did not include Burton Constable as a breeding lake for Pochard.

A single Great Crested Grebe was present and a Common Sandpiper, clearly pausing to feed while on migration, was disturbed from a muddy bay on the lake edge. A Reed Warbler, hidden in quite a small patch of *Phragmites*, would have gone unnoticed had it not sung two or three times.

In the woodland, a Grey Heron was twice flushed from a ditch bordering an area fairly recently clear-felled, but the area of mature timber explored was relatively quiet and seemingly birdless. As so often happens, there was a sudden flurry of activity as a party of small birds passed through the wood. This mixed flock comprised mainly Blue Tits, but also smaller numbers of Great and Coal Tits, and at least one Treecreeper was heard. A family party of Long-tailed Tits was also seen, Lesser Whitethroat and Blackcap were noted and a Chiffchaff sang frequently enough for almost everyone to hear it.

All the other birds were predictable for the area and the full list totalled 48 species.

Entomology (W. A. Ely)
The Moors received most attention from the entomologists, and it was not only the dedicated coleopterists who commented on the vast populations of pollen beetles (*Meligethes aeneus*) which were gathered in large numbers in almost every flower. For once I could appreciate why MAFF regards these insects as a crop pest.

At the very start of the meeting, Dr Lloyd-Evans beat a small, slender plant bug from the rhododendron bushes close to the point where we had parked our cars. This proved to be, as expected, *Neodicyphus rhododendri*, a recent addition to the British

fauna and the first record for the vice-county. The related *Dicyphus constrictus* was also found, together with the pale green *Orthotylus viridinervis*.

The damp ditches held the Emerald Damselfly, which was rather sluggish in the cool conditions. The wooded area to the west produced the attractive longhorn beetle *Leiopus nebulosus*.

The number of ditches made this area suitable for the empid and doly flies which breed in damp soil. Among those collected were a number of uncommon species. The empids included *Platypalpus ruficornis*, *Drapetis parilis* and *Chelipoda vocatoria*, while the dolies *Teucophorus signatus* (in which the male hind tibiae are adorned with a bunch of bristles), *Bathycranium bicolorella* and *Neurigona pallida*, an orange fly which lives in woodland, were found. Other flies included *Rivellia syngenesiae*, a small black insect whose wings have black stripes across them, *Themira pusilla* which breeds in decaying material, and the marsh fly *Elgiva cucullaria* whose larvae feed on snails.

Mr Denton also visited the lakes and found the water beetles *Agabus labiatus* and *Gyrinus marinus*, one of the whirligigs.

Other Arthropods (P. Lee)

The other arthropod fauna of The Moors was unexceptional, even though two species each of woodlouse, centipede and millipede were recorded as new to the 10 km square. One of these records was of the millipede *Nemasoma varicorne* C. L. Koch, a small, thread-like species which lives under the bark of dead wood, often with the very similar *Proteroiulus fuscus* (Am. Stein). The latter species is very common where suitable micro-habitats occur, whereas the former has generally been considered uncommon. As more data become available it appears that this is not the case. Careful examination of specimens is producing many more records of *N. varicorne* from around the county, a finding in agreement with the national distribution pattern, as the Millipede Survey Scheme shows the species to be much more widely distributed than previously thought.

The village of Sproatley provided easily the best records for the day. From the grounds of the village hall, in addition to two new 10km square records, there was a new vice-county record for the centipede *Cryptops hortensis* Leach and a second VC record for *Lamyctes fulvicornis* Meinert. *C. hortensis*, easily recognised as the only centipede with 21 pairs of legs, is basically a synanthropic animal and has been recorded quite often from such sites in VCs 62, 63 and 64. The lack of records from VC 61 presumably reflects collector distribution rather than a real scarcity and anyone with the inclination to investigate sites around Hull and Beverley ought to be able to produce many more records for the species.

Dr Lloyd-Evans collected a specimen of the greenish gelatinous leech *Theromyzon tessulatum* (Muller) from the lake at Burton Constable. A large number of young leeches were attached to its ventral surface. This species parasitizes waterfowl, feeding on blood through the walls of the nasal cavities of the unfortunate birds. At this time of year it has emerged from its host to breed and can be found on stones in the water with as many as 400 young attached.

Flowering Plants and Ferns (D. R. Grant)

In the morning the area adjacent to the two lakes was examined. The surrounding woodland was dominated by *Festuca gigantea*; ferns were few and only three common species were noted. The lower lake had some large stands of *Carex riparia* together with some small colonies of *Scutellaria galericulata*, *Polygonum amphibium* and *Juncus inflexus*. The waterside trees were mainly *Salix fragilis* and *Alnus glutinosa*. By contrast the upper lake, on which no boating is allowed, was rich in aquatics. There were large beds of *Myriophyllum spicatum* together with a little *Ceratophyllum demersum*. Floating plants were represented by *Nuphar lutea* and some huge rafts of *Nymphoides peltata* which is clearly an introduction. The shoreline had *Eleocharis palustris*, *Phragmites australis* and *Salix alba* but few other marginal species were observed and some, *Lycopus europaeus* for example, were surprisingly absent.

In the arable fields nearby the agricultural weeds *Agrostis gigantea*, *Alopecurus myosuroides*, *Veronica persia* and *Amsinckia intermedia* were found.

In the afternoon The Moors woodlands were investigated. Here were stands of mature broad-leaved trees together with newly-planted areas of seedling conifers. This area was dissected by drainage ditches, some fairly new and only just becoming colonized by plants. The moist sides had *Myosoton aquaticum*, *Apium nodiflorum*, *Scrophularia auriculata* and *Isolepis setacea*, along with *Carex remota* which is very scarce in VC 61. The mature woodland areas had *Acer campestre* and *Prunus spinosa*, with a small colony of *Ligustrum vulgare* and some naturalized trees of *Quercus cerris*. A disturbed area close to where the cars were parked held a single plant of *Silene noctiflora*. The damp rides had much *Odontites verna*, *Gnaphalium uliginosum* and *Carex hirta*. In the newly-planted area, the ditch sides held several colonies of *Juncus articulatus*, *Carex demissa* and *Hypericum humifusum*. *Calluna vulgaris* has been reported as being well established in a peaty part of this area. There was much evidence of the destructive effects of Dutch Elm disease; however, during the day small, apparently healthy trees of both *Ulmus glabra* and *U. procera* were seen.

Lichenology (M. R. D. Seaward)

The lichen flora of the Burton Constable estate was somewhat disappointing, due in no small measure to both a moderately high level of air pollution emanating from urban and industrial areas to the west and disturbance or loss of suitable habitats via agricultural and leisure practices. Nevertheless, a few epiphytes on ash, elder, willow and oak, other than the monotonous green of *Lecanora conizaeoides* enveloping trees, were recorded, eg *Buellia griseovirens*, *Evernia prunastri*, *Hypogymnia physodes*, *Mycoblastus sterilis*, *Parmelia glabratula* and *P. sulcata*. A variety of stone-, cement- and brickwork in and around the estate, particularly in the churchyard at Marton (54/1739), provided suitable lichen habitats, enabling a modest total of 47 species to be recorded for grid square 54/13, 22 of which were additional to the 45 listed by B. J. Coppins who lichenized hereabouts during 1967–70.

Mycology (C. S. V. Yeates)

Several significant finds were made on this meeting with several new vice-county records and two new records – both of parasitic fungi which gall their hosts — at county level.

The polypore *Abortiporus* (=*Heteroporus*) *biennis* was noted by the area where we parked, growing in typical fashion intermixed with the surrounding grass and herbage. It was presumably growing from a buried stump, though there was no evidence of this. The small white agaric *Mycena tenerrima* was found on a dead, woody herbaceous stem. There has been no record of this species from VC 61 for the last fifty years.

Fallen leaves of *Aesculus* in one area were covered with the discomycete *Hymenoscyphus caudatus*. Whilst this is not a rare species, the numbers of fruit-bodies were astonishing. *Taphridium umbelliferarum* was found on living leaves of *Heracleum sphondylium* along a ride. This is the first Yorkshire record of this distinctive and by no means inconspicuous parasite.

Two interesting smuts, one of them new to the county, were seen. Mr Savage and the writer found *Urocystis filipendulae* which galls the lower leaves of *Filipendula* species – in this instance *Filipendula ulmaria* – distorting their petioles and main veins. This is the first Yorkshire record of a fungus which appears to be genuinely rare nationally. *Farysia thuemenii* (= *F. olivacea*), which replaces the female spikes of *Carex riparia* with a mass of spores, was found at The Moors by Mr Heffernan, who reported a heavy infection. This represents the second VC 61 record, the first having been made about a month earlier by Mr Chicken near Rudston.

Three species of the parasitic hyphomycete genus *Ramularia* new to VC 61 were seen. These were *R. sphaeroidea* on *Lotus uliginosus*, first noted in Yorkshire on the previous year's VC 62 meeting; *Ramularia circaeae* was on *Circaea lutetiana*, and *R. scrophulariae*

on *Scrophularia nodosa*. Although the last-mentioned host was rare in the areas visited, while *S. auriculata* was abundant, the fungus could not be found on the latter.

Plant Galls (L. Lloyd-Evans)
A useful total of 33 species was found in a hitherto unrecorded 10 km square. In the ditches on The Moors were many examples of tassel galls on *Juncus articulatus*, caused by the jumping plant-louse *Livia juncorum*; one has to turn these galls upside-down to appreciate the resemblance to tassels.

Around the lakes, *Salix fragilis* leaves carried numerous bean galls of the sawfly *Pontania proxima*. As Arnold Darlington pointed out in his *Pocket Encyclopaedia of Plant Galls* (2nd ed., 1975), now regrettably out of print, this is one of the few hymenopteran galls with a built-in privy, the larva gnawing a hole in the floor through which droppings escape.

NETHERBY DALE (VC 62), 28 May (M. A. Atherden)
Entomology (J. H. Flint)
The weather was excellent for collecting but insects generally were rather sparsely scattered. Mr K. G. Payne, for example, spent a patient hour and a half searching the fast-flowing calcareous streams in the bottom of the valley and this yielded but three specimens of water beetle. Some species, however, such as the little empid fly *Rhamphomyia longipes*, were present in large numbers. Particular attention was paid to woodland insects and those associated with timber, and these included the beetles *Agathidium nigripenne*, *Scaphidium quadrimaculatum*, *Bythinus burrelli*, *Sinodendron cylindricum*, *Melanotus erythropus*, *Grynobius planus*, *Orchesia undulata*, the bright red cardinal beetle *Pyrochroa serraticornis*, the handsome little longhorn beetle *Pogonocherus hispidus* and the large cranefly *Tipula maxima*. This is not an outstanding assembly but is sufficient to indicate that the wood has potential. The steep-sided valley sides and the dense nature of the scrub over much of the reserve inhibited insect collecting while providing a safe retreat for arboreal insects.

Other insects which are less attached to woodland included the conspicuous, and appropriate, cockchafer *Melolontha melolontha*, the sawfly *Macrophya alboannulata* (a recent addition to the British fauna), the flies *Limonia masoni* (a Red Data Book species classed Category 3, rare, ie known from 15 or fewer 10 km squares), *L. nigropunctata*, *Epiphragma ocellaris*, *Gloma fuscipennis*, *Rhamphomyia hybotina*, *R. umbripennis* and the plant bugs *Lygus wagneri* and *Orthops basalis*. Mr Ely reports that the ichneumon *Platylabus obator* was new to Yorkshire while *Cratichneumon varipes* was the first record for the vice-county and *Phrudus defectus*, which had been collected on the Entomological Section meeting a week earlier, was the third British record. The proctotrupid *Spilomicrus pelion* also appears to be the third specimen found in Britain and is new to Yorkshire.

Other Arthropods (P. Lee and D. T. Richardson)
The triclad *Crenobia alpina* was found under stones in the spring head, where the water temperature was 9° C. This species is unable to withstand temperatures above 15° C. The only other species in this water was the ubiquitous freshwater shrimp *Gammarus pulex*.

Only two common harvest spiders were recorded. This paucity of species was not surprising considering the time of year. Although the five centipedes, seven woodlice and nine millipedes recorded were again mostly the commoner ones, they provided ten new 10 km square records. This reflects the need for much further study of these groups within the vice-county. The most notable species recorded was the millipede *Archiboreoiulus pallidus*. This small, pale blaniulid was unusually abundant under stones by the side of the footpath leading up through the woodland to the monument. It is an uncommon species, chiefly associated with calcareous soils, but on current knowledge

it appears to have a national stronghold within the county. Over 40% of the 10 km squares for which it has been reported to the Millipede Recording Scheme lie within Watsonian Yorkshire.

Mollusca (A. Norris)
The molluscan fauna of Chafer Wood is fairly typical of the areas of wet woodland to be found along the southern edge of the North Yorkshire Moors. The area is particularly interesting in having both acid and alkaline habitats in very close proximity. The presence of gardens close to the woodland has also resulted in additional species, such as *Deroceras (Malino) panormitanum* (Lessona and Pollonera, 1882) and *Helix (Cornu) aspersa* Muller, 1774, occurring on the reserve.

Flowering Plants and Ferns (D. R. Grant)
The Chafer Wood Nature Reserve is situated at the foot of the Jurassic Limestone at the southern edge of the North Yorkshire Moors. The numerous springs which emerge from the base of the limestone helped to give rise to the villages which lie on its edge, Ebberston being a typical example. The stream running through the village had many colonies of *Berula erecta*, whilst the walls were clothed with *Cymbalaria muralis*.

Chafer Wood was found to be composed mainly of broad-leaved trees and had much *Prunus avium*. It was pleasing to see a few healthy *Ulmus glabra* trees, although these were relatively young. Where the water came out of the limestone rock there were several plants of *Polystichum aculeatum* and in the water itself *Apium nodiflorum flourished. In the adjacent damp areas Valeriana officinalis* and *V. dioica* grew. Orchids were represented by *Dactylorhiza fuchsii*, *Orchis mascula* and *Listera ovata*. Other notable species were *Phyllitis scolopendrium*, *Ranunculus auricomus* and a little *Sanicula europaea*. Two surprising plants growing here were *Scrophularia auriculata* and *Lycopus europaeus*.

Shady banks within the reserve had *Primula vulgaris* and *P. veris*, along with their hybrid *P.* x *variabilis* in one area. Another dry bank held *Cerastium arvense*. Ferns were relatively few in number and variety but a small colony of *Dryopteris affinis* was discovered in the centre of the wood. As one moved northwards through the wood the ground became drier and more acid, with obvious signs of the lime being leached from the soil. At the top end of the reserve were *Ulex europaeus*, *Vaccinium myrtillus*, *Stachys officinalis* and *Hypericum pulchrum*.

Near some old earthworks a member was able to confirm the continued presence of a known stand of *Actaea spicata*. Despite a paucity of grasses and sedges, 175 vascular plant species were found in the reserve.

Later in the afternoon Troutsdale was visited. A rough hillside had a huge quantity of *Salix aurita*, whilst nearby were two or three fine specimen trees of *S. caprea* for comparison.

The best find here was *Ophioglossum vulgatum*, growing in a damp turfy area, and this site would repay further study at a date later in the year.

Bryology (T. L. Blockeel)
The woodland floor communities were dominated by *Eurynchium striatum*, but there were smaller amounts of *Plagiochila asplenioides*, *Thuidium tamarascinum*, *Cirriphyllum piliferum* and *Rhytidiadelphus triquetrus*, along with other common woodland species.

Rock outcrops had a more diverse flora, though in general the rock was not sufficiently calcareous to support some of the more strict calcicoles. This was particularly evident on the low cliff at the southern end of Chafer Wood, which was acid enough in parts for *Calypogeia muellerana*, *C. arguta*, *Cephalozia bicuspidata* and *Diplophyllum albicans*. Other species included *Riccardia chamaedrifolia*, *Plagiochila porelloides*, *Fissidens pusillus*, *Seligeria recurvata*, *Gyroweisia tenuis, Homalia trichomanoides*, *Neckera crispa*, *N. complanata*, *Thamnobryum alopecurum*, *Isothecium myurum* and *Rhynchostegium murale*. Some of these species also occurred on tree roots.

Much more calcareous were the springs at the lower end of the wood. Tufa here supported the characteristic association of *Jungermannia atrovirens*, *Eucladium verticillatum* and *Cratoneuron commutatum*; *Plagiomnium affine* was in marshy ground nearby. There was also some calcareous grassland on the fringes of the wood, with *Barbula fallax* and *Homalothecium lutescens*. An unshaded wall nearby held *Tortula intermedia*, *Orthotrichum anomalum* and *O. cupulatum*. The most interesting habitat in some respects was provided by tree trunks, especially those of *Sambucus* and *Fraxinus*. *Metzgeria furcata*, *M. fruticulosa*, *Zygodon conoideus* and *Orthotrichum affine* were frequent, and there were smaller amounts of *Bryum flaccidum*, *Orthotrichum pulchellum* and *Ulota crispa* var. *norvegica*. Several of these epiphytic species are very scarce in VC 62, though possibly under-recorded.

A total of 74 species was recorded within the boundaries of the reserve.

Plant Galls (L. Lloyd-Evans)
Fifteen galls were recorded, two-thirds of them caused by fungi. Most striking was the rust *Trachyspora intrusa*, painting the underside of leaves of *Alchemilla xanthochlora* a vivid orange. *Puccinia primulae*, a rust which attacks *Primula vulgaris*, is described as being fairly widespread in the county; there are, however, few recent records.

CAWTHORNE (VC 63), 2 July (T. Higginbottom)
Forty members met in the yard of the Spencer Arms in Cawthorne, an attractive village in a pleasant rural setting to the west of Barnsley. The main areas studied were the Coal Measures woodlands of Hugset Wood and Margery Wood and the wetland habitats at Wilthorpe Marsh and The Fleets.

In 1985 Mr J. D. Coldwell discovered the rare hoverfly *Callicera aenea* in Hugset Wood, but in 1988 it was clear that the entomological interest of the wood had been reduced. The open, sunny sites which were attractive to many insects were overgrown, in some areas by an almost impenetrable undergrowth. Margery Wood, with its wide woodland rides, was the more interesting of the two woodland habitats.

Wilthorpe Marsh proved to be a rich wetland habitat. Local naturalists had already given the impression that drainage work had seriously diminished the natural history potential of this site. The botanical and ornithological reports below indicate that in the summer of 1988 it was still a significant area. Unfortunately, recent reports from the Sorby Natural History Society show that drainage work has continued.

Ornithology (M. L. Denton)
The two woodland areas visited, Margery Wood and Hugset Wood, produced a total of 36 bird species. The greater proportion of these are common and do not merit comment. However, it was interesting to note Kestrel, Tawny Owl and Whitethroat in Hugset Wood and Kestrel, Turtle Dove, Whitethroat and Goldcrest in Margery Wood. At least five pairs of Blackcap had young in the latter and a pair of Garden Warblers was seen carrying food. A very agitated Whitethroat was probably breeding and may well have been the bird which was seen carrying food the previous week. The titmice were well represented with Great, Blue, Coal and Willow Tits all feeding flying young. In Margery Wood two occupied nest holes of Great Spotted Woodpecker were found.

The totally different habitats of Wilthorpe Marsh and The Fleets produced a constrasting avifauna, and on the areas of open water Great Crested and Little Grebes, Mute Swan, Coot, Grey Heron, Tufted Duck, Moorhen and Common Snipe were encountered. The first four species were breeding and it is quite possible that some of the others were also. The areas of scrub were ideal for warblers and five species were reported: Willow Warbler, Chiffchaff, Sedge Warbler, Whitethroat and a single Grasshopper Warbler. The last-mentioned has suffered a decline during the last decade and this sighting is therefore significant. Another species which has shown a marked decrease in recent years is the Sand Martin and, whereas twenty years ago several hundreds could well have been seen, only two were present on this occasion.

Climatic conditions in the Sahel are mainly to blame for the reduction in numbers of several of our summer visitors. However, a species which has declined due to man's activities is the Grey Partridge, a small covey of which was present in the Wilthorpe Marsh area. On the credit side, a species which is on the increase is the Kingfisher, and several members were fortunate to see this species at Wilthorpe Marsh.

With the exception of the Grasshopper Warbler and Kingfisher, none of the 56 species encountered warrants notification to the Union's Ornithological Section. The records will, however, be of value to the British Trust for Ornithology for its new breeding bird atlas and the sightings from Margery Wood will also be used by the Huddersfield Birdwatchers' Club, which at present is into the third year of a five-year survey of the six 10 km squares of its recording area, each being surveyed on a tetrad basis.

Entomology (J. D. Coldwell)

An impressive entomological contingent assembled in Cawthorne village for a meeting which offered the choice of three fairly well-worked sites – Hugset Wood, Margery Wood and Wilthorpe Marsh. Collecting conditions were not ideal and advantage had to be taken of the relatively short sunny spells in what was basically a cool and cloudy day, the afternoon ending in a downpour.

Hugset Wood was disappointing with little of note being reported. Single specimens of the local flies *Xylota coeruleiventris* and *Beris morrisii* were taken by myself and the very long-legged dolichopodid *Scellus notatus* was swept in numbers on waste ground by the entrance to the woodland, an area which yielded the only solitary wasp of the day, *Crossocerus capitosus*. Nearby, Mr Flint discoved the distinctive leaf-rolls of the small red weevil *Attelebus nitens*.

A party of coleopterists visited Margery Wood but reported few interesting beetles, the large weevil *Pissodes pini* and the longhorn *Leiopus nebulosus* being perhaps the most striking. Subsequent determination of the day's captures, however, provided two new records for the Barnsley area – the small carabid *Bembidion quinquestriatum* and the uncommon rove beetle *Quedius semiaeneus*, both found by Eric Smith.

The Fleets Pond, to the east of Wilthorpe Marsh, attracted the attention of Bill Ely and John Newbould, who turned up two uncommon soldier flies – *Oxycera rara* and *Nemotelus nigrinus* – the latter only having been recently discovered in this part of the Upper Dearne Valley. A number of notable dolichopodid flies were found at the edge of a horse-grazed field nearby with *Syntormon pumilus* and *S. monilis* being the best finds, *Dolichopus campestris* and *Teucophorus spinigerellus* also new to the Barnsley area and the uncommon *D. subpennatus*, for which there is only one other local record. They were also responsible for unearthing the scarce froghopper *Macrosteles ossiannilssoni* and the small lacewing *Semidalis aleyrodiformis*, the latter not having been recorded in Barnsley for many years.

Lepidoptera (J. A. Newbould)

Mr G. Blunt supplied a good list of moths found in Hugset Wood, while the writer recorded in the area of the Fleets Pond and Margery Wood.

Eight species of butterfly were recorded including Painted Lady, seen by Mrs Payne in Margery Wood. In Hugset Wood Mr Blunt found the larvae of Scalloped Hook-tip, an uncommon insect in the Barnsley area, on Silver Birch, and Puss Moth, not a common species on the western side of the county, on Sallow. Other species which are more common in this area included Peach Blossom and Pine Beauty in Margery Wood (the latter a larva found by Mr Flint) and Clouded Magpie in Hugset Wood.

Other Arthropods (P. Lee and D. T. Richardson)

Two species of triclad, *Dendrocoleum lacteum* (Muller) and *Polycelis nigra* (Muller), were collected from the Barnsley Canal along with the leech *Erpobdella octoculata* (L.). Some very pale specimens of the normally bright pink woodlouse *Androniscus dentiger*

Verhoeff were found under stones at the edge of the car park at the same site and provided a new 10 km square record.

The other arthropod fauna of Hugset Wood was similarly unexceptional, despite containing four species not previously recorded from the 10 km square.

Flowering Plants and Ferns (D. R. Grant)

The area around Cawthorne is situated on the Coal Measures and consists of agricultural land, old parkland and broad-leaved and coniferous woodland. To the east of the M1 motorway there is some industry, with a large amount of disused colliery shale heaps, some undergoing restoration schemes.

Margery Wood is typical of the area and in the broad-leaved part there are damp areas which are influenced by calcareous waters emerging from the shales. Growing in this area were *Hordelymus europaeus* and *Euonymus europaeus* and, in one part where the soil consists of heavy clay, a colony of *Carex pendula*.

The area around Hugset Wood has been much disturbed by open-cast mining, but there was still a large amount of *Hypericum perforatum* and *Malva moschata* at the wood margin.

Along the green lane leading from the Swallow Hill Road area to the River Dearne there were several bushes of *Viburnum opulus* and *Prunus domestica*. Drier areas by the footpath held *Malva sylvestris* and *Aira praecox*.

On the banks of the river *Myrrhis odorata*, *Conium maculatum*, *Salix viminalis*, *Scrophularia auriculata* and *Tanacetum vulgare* were growing.

The old Barnsley Canal was much silted up over large stretches, with masses of *Glyceria maxima* and *Typha latifolia*. In areas of open water *Potamogeton natans*, *Elodea canadensis* and *Lycopus europaeus* were well established. To the north of the canal Wilthorpe Marsh has a large bed of *Equisetum fluviatile* with some *Ranunculus sceleratus* and *Berula erecta*. One rich area of the marsh had a large amount of *Pulicaria dysenterica* and *Senecio erucifolius*, together with a few plants of *Silaum silaus*. There were several sedges here, the most interesting ones being *Carex disticha*, *C. pallescens* and *C. otrubae*. A small flash had *Polygonum amphibium* and *Lemna trisulca*, with a colony of *Acorus calamus* nearby.

The old dam known as The Fleets has now been turned into a fishing pond, with some disturbance of the margins, but there was still *Chenopodium bonus-henricus* and *Artemisia absinthium*, togeher with *Pentaglottis sempervirens* and *Lupinus arboreus*. In the river nearby there were some prolific colonies of *Potamogeton pectinatus*.

Some of the old colliery shale heaps have been grassed over and planted with trees, the main species involved being *Alnus incana* and *Robina pseudoacacia*. Both species were regenerating naturally, some saplings being estimated to be three years old.

During the course of the day, three separate sites were found for *Dactylorhiza fuchsii*.

Bryology (C. Wall)

Hugset Wood was visited in the morning and Margery Wood briefly in the afternoon, before a downpour rendered serious bryologizing impossible. Both woods were richly invested with impenetrable undergrowth which made even common woodland species difficult to locate. *Mnium hornum*, *Plagiomnium undulatum*, *Fissidens taxifolius*, *F. bryoides*, *Dicranella heteromalla*, *Hypnum cupressiforme*, *H. jutlandicum* and *Isopterygium elegans* were common to both woods. *Tetraphis pellucida*, *Atrichum undulatum*, *Plagiomnium affine*, *Rhizomnium punctatum*, *Plagiothecium succulentum* and *Brachythecium velutinum* were in Hugset Wood, whilst *Dicranum scoparium*, *Campylopus introflexus* and *Plagiothecium undulatum* were in Margery Wood.

The paucity of epiphytes was typical of this district, with only *Lophocolea heterophylla* and *Orthodontium lineare* being recorded.

Tiny streams were present in both woods but the luxuriant bankside vegetation gave little room for bryophytes; the aquatic *Rhynchostegium riparioides* was in Margery Wood

and *Orthotrichum diaphanum* in a culvert in Hugset Wood. There was no *Scapania undulata*, which is known from a stream in nearby Deffer Wood.

A few intersting species were found along the rides in both woods. Margery Wood in particular had wide marshy rides which held *Jungermannia gracillima*, *Pohlia carnea*, *P. wahlenbergii*, *Rhytiadelphus squarrosus*, the rare *R. loreus*, and fertile *Pseudephemerum nitidum* in good quantity on bare wet clay. Both woods had *Scapania irrigata* along the rides and Hugset Wood held *Riccardia chamaedrifolia* and *Calypogeia arguta*.

Mycology (C. S. V. Yeates)

The majority of collecting was done in The Fleets area. Attention was paid here to dead stems of *Cirsium arvense*, and amongst other species the following ascomycetes were found: *Diapleella clivensis*, *Leptosphaeria purpurea*, *Ophiobolus acuminatus*, *Mollisia clavata* and *Pyrenopeziza revincta*. Other finds in this area included the ascomycetes *Leptosphaeria typharum* on dead leaves of *Typha latifolia* and *Mycosphaerella recutita* on an unidentified dead grass, the rust *Puccinia hieracii* var. *piloselloidarum* on *Pilosella officinarum* and *Taphrina tosquinetii* on *Alnus glutinosa*.

Margery Wood also held *Taphrina tosquinetii* and *Pyrenopeziza revincta*, the latter this time on dead stems of *Digitalis*. In addition the discomycete *Lophodermium pinastri* was found on dead *Pinus* needles.

Plant Galls (J. A. Pearson)

This visit to a most beautiful and interesting area rewarded the cecidologists with a list of more than sixty galls. Most of them were recorded in Hugset Wood, the remainder being seen at Margery Wood, The Fleets and Hill End Farm.

At The Fleets galls of the mite *Aceria tuberculata* ssp. *calathina* were found. These consist of a rolling and thickening of the terminal leaves of *Tanacetum vulgare*.

The gall of *Dasineura epilobii*, which causes a marked swelling in the flower buds of *Epilobium angustifolium*, was found in Hugset Wood, where galls of *Macrodiplosis volvens*, much the less common of the two *Macrodiplosis* galls which fold the lobes of oak leaves, were recorded. Another gall midge, *Semudobia betulae*, causes galls on female birch catkins, and until recently this was the only birch catkin gall which was being recorded. Dr Lloyd-Evans drew our attention to the possibility of there being three *Semudobia* galls on such catkins. It was, accordingly, pleasing to record galls of both *S. betulae* and *S. skuhravae* in Margery Wood.

The oval-shaped gall of the gall-wasp *Andricus quadrilineatus* was found on oak catkins in Margery Wood.

HETCHELL WOOD (VC 64), 11 June (D. P. Savage)

Geology and Soils (J. Webber)

The Hetchell Wood Nature Reserve lies across the junction of outcrops of the Lower Permian (Magnesian) Limestone and the East Carlton (Millstone) Grit and this results in a range of soil types and plant habitats.

The east and upper part of the reserve including the areas known as Quarry Field, Quarry Hummocks, South Slope, Top Grassland, Far Wood and the upper part of Middle Wood, lie over the limestone although on the flatter areas at the top in Quarry Field and Top Grassland there is some deposition of Boulder Clay over the rock. Generally the limestone gives soils with pH values in the range 6.5 – 7.0, although lower figures may occur under woodland due to the accumulation of leaf-litter and leaching of lime from the surface. Limestone soils are usually free-draining and carry a rich and varied flora as exemplified especially by the South Slope. In the Quarry Hummocks area the soil is very disturbed by former quarrying so that it varies greatly in depth and composition.

The lower part of the reserve, with the exception of the narrow area bordering the beck, has soils derived from the Millstone Grit which outcrops visibly in the Crag. Over much of the Middle Wood the soils are influenced by the limestone further up the slope,

but typically gritty loams occur in the area below the Crag where the acidity and texture continue to produce a characteristic vegetation including Ling *Calluna vulgaris*.

Along the streamside is typical alkaline alder carr with a peaty soil whose high pH value is due to watering by springs coming from higher up the slope. These soils are wet throughout the year and carry distinctive vegetation whose variety has been increased in the marsh area by the creation of areas of open water.

Ornithology (I. S. Williams)

A cold northerly wind and very dull conditions resulted in quite a disappointing day for bird species, 31 being recorded in all.

Among the warblers, a Lesser Whitethroat was singing near the NE entrance to the reserve and two Chiffchaffs sang in different parts of the reserve where they had sung since early spring; breeding is suspected.

A pair of Yellowhammers had taken advantage of one of the cleared areas in the Middle Wood and a female was observed taking food to a nest. A pair of Willow Tits was also seen carrying food to young; a Marsh Tit was also seen but breeding in this case was not suspected.

A Tawny Owl was disturbed from its daytime roost, being mobbed by other birds. This species has bred on the reserve for the past three years.

The highlight of the day was without doubt a family party of Lesser Spotted Woodpeckers, the parents feeding newly fledged young in Alder trees near the spring. Although no nest hole was found it is thought that the birds bred on the reserve.

Mollusca (A. Norris)

The molluscan fauna of Hetchell Wood Nature Reserve is well known, as a full survey of all the elements of the reserve was carried out between 1968 and 1971. The results of this work were published by the Leeds Naturalists' Club in a preliminary report on the reserve in 1972. An attempt was made at this meeting to re-find all 49 species on the reserve list, and to note any additions or changes in the known distribution patterns within the reserve.

With the help of six members of the Conchological Section, we succeeded in re-finding 40 species, including most of the specialities of the reserve, such as *Zenobiella subrufescens* (Miller, 1822) and *Leiostyla* (*Leiostyla*) *anglica* (Wood, 1828). One addition to the reserve list was also made, a single specimen of *Cepaea* (*Cepaea*) *hortensis* (Müller, 1774), found in the Quarry Field area close to the road, a recent introduction probably from a known colony located at the side of the road close to the village of Thorner. Perhaps the most noticeable change to the fauna was the expansion in the size of the colonies of two species. The first is *Cochlodina* (*Cochlodina*) *laminata* (Montagu, 1803), an old woodland species which used to be rather scarce in the Quarry Hummocks, and the second, *Oxychilus* (*Ortizius*) *helveticus* (Blum, 1881), was known only from a few examples found close to the road in the Quarry Field. Both proved to be abundant throughout the quarry area.

A visit was also made to the proposed nature reserve at East Keswick to check on the molluscan fauna of that site. Several interesting species were noted, but perhaps the most interesting was the occurrence of two species, *Aplexa hypnorum* (Linné, 1758) and *Oxychilus* (*Ortizius*) *helveticus*. The former is a fresh water species with a declining distribution nationally, due to the loss of its specialized habitat requirements, whilst the latter is restricted locally by being at the extreme northern edge of its range.

Entomology (W. A. Ely)

Hetchell Wood is a well-known entomological site of great importance, due mainly to the work of Mr J. H. Flint over many years. With this proven quality in mind we expected to have a good day's investigation, and this was borne out by the results. Among a long list of insects found in the wood are many scarce species, which are mentioned here.

Mr M. L. Denton obtained a good list of beetles from a specimen of Oyster Mushroom, including the rove beetles *Euspalerum torquatum*, *Lordithon lunulatus* and *Atheta pertyi*, the latter being new to the vice-county. The grey beetle *Dascillus cervinus*, whose larve feed internally in orchids, was found on the open areas of South Slope by Mrs J. Payne, Mr J. A. Newbould and myself. The minute soldier beetle *Malthodes pumila*, which is parthenogenetic and therefore without males in the population, was found in the Marsh while the rather larger *M. fibulatus* was in Middle Wood. The raspberry beetle *Byturus ochraceus* was found in the Marsh; unlike its common relative *B. tomentosus* this beetle is only found in limestone areas.

Mrs Payne reported the Cardinal Beetle (*Pyrrochroa serraticornis*) from the southern boundary of the site. The herbivorous leaf beetles included *Mantura matthewsii*, whose larvae mine the leaves of rock-roses, found by Mr Newbould and myself on South Slope, *Batophila rubi* which breeds on brambles was found in Camp Wood and Middle Wood, and *Phyllotreta tetrastigma*, which feeds on crucifers, was in Alder Carr. Mr Denton found a single example of the tiny weevil *Apion affine*, which galls the flowers of sorrels and is now mainly restricted to south-eastern England, in Quarry Field.

Craneflies were numerous in the damper parts of the wood and included *Epiphragma ocellaris*, with patterned wings which include an RAF-type roundel, found by Mr Newbould and myself in Quarry Hummocks, and two small, yellow species from Alder Carr – *Thaumastoptera calceata* and *Gonempeda flava* (the latter also found in the Marsh). The carnivorous empids received some attention and the list included *Platypalpus tonsus* (a Red Data Book species which seems to turn up in Yorkshire rather frequently) from Quarry Hummocks and Marsh, *Micromorphus holosericeus* from Camp Wood, *Rhamphomyia umbripennis* from Camp Wood and Alder Carr, *Empis aemula* from Middle Wood and *Hilara hirtipes*, found by Mr R. Crossley. The most interesting one was *Empis rufiventris* which Mr Crossley and I found in good numbers throughout the wood. This species seems to be very scarce but it has turned up in a number of sites in Yorkshire during 1988. Mr Crossley and I also found the uncommon doly fly *Hypophyllus crinipes* in the Marsh and Alder Carr areas bordering the stream, and the orange doly *Neurigona pallida* was found in the drier areas of Quarry Hummocks and Oak Slope by Mr Newbould and myself. Hoverflies were not numerous but included *Parasyrphus punctulatus*, found in Quarry Hummocks, *Platycheirus tarsalis* from Alder Carr and the prize was undoubtedly *Sphegina verecunda*, found along the southern margin of the wood by Mr Crossley. This fly is an indicator of good quality woodland and is scarce even in the south of England, but particularly so in Yorkshire. The Marsh Flies have larvae which feed on snails (not necessarily in marshes) and three of the ones found here are nationally scarce insects which live in damp woodland – *Tetanura pallidiventris* and *Pelidnoptera fuscipennis* are most frequent in the north and Mr Newbould and I found both in Quarry Hummocks, and *Tetanocera phyllophora* was found in the Marsh.

Among the parasitic Hymenoptera were two interesting ichneumons. Species of *Adelognathus*, which belong to a subfamily of their own, are parasitic on sawfly larvae and none are yet recorded from Yorkshire. Two specimens were found during this visit, from Quarry Hummocks and the Marsh, but as both were males and only the females of this genus are currently identifiable, there are still no Yorkshire records for this subfamily! A female *Phradis polonicus* was collected from Quarry Field. The ichneumons of this group are parasitic on beetles, particularly the pollen beetles *Meligethes*, and this species was only described during the current decade. Although I have found this insect on half a dozen occasions in the southern part of Yorkshire, this is the first record from VC 64 and is probably the first published record from Great Britain. I am currently reviewing the British species of this genus and that review will indicate the differences between this species and the very similar *P. interstitialis*. Among other parasitic hymenoptera was the gall wasp *Synergus apicalis*, which lives within the subterranean galls of *Andricus quercusradicis* and was found in the streamside Alder Carr and Marsh areas.

Mycology (C. S. V. Yeates)
Several interesting and seldom-recorded species were seen on this meeting, with one new county record.

Among the ascomycetes on the reserve itself *Dasyscyphus tenuissimus* was recorded on a dead grass stem on the South Slope and *Melanogramma spilopodia*, which forms 'liquorice allsort' like banding on dead *Mercurialis* stems, was in the Quarry Hummocks area. *Hysterostegiella dumeti* which grows inside dead stems of *Rubus fruticosus* was recorded from the disused railway line. When mature, this species raises the epidermis on the stem like a small hinged lid and is easily missed; this is the second Yorkshire record. The gall-forming *Taphrina tosquinetii* on leaves of *Alnus glutinosa* was noted in both the swamp at Hetchell Wood and the marsh at East Keswick.

Two smuts of interest were observed, both on the reserve itself. *Urocystis violae* on *Viola riviniana* and *Ustilago serpens* on a grass, probably *Bromus erectus*, again on the South Slope.

The striking bright orange aecidial state of the rust *Xenodocus carbonarius* was seen on *Sanguisorba officinalis* in the marsh at East Keswick. The most interesting rust found, however, was *Milesina kriegeriana*, found by Dr Lloyd-Evans on old leaves of *Dryopteris dilatata*. With only one record for the county at the time of publication of the 1985 Fungus Flora, there has been a dramatic increase in records of this species, and indeed in records of fern rusts in general.

Among the powdery mildews, *Peronospora potentillae-sterilis* on *Potentilla sterilis*, found in the taller limestone grassland of the plateau on the reserve, was new to Yorkshire.

Ten species of aquatic hyphomycete, none of them uncommon, were noted in a foam sample taken below Pompocali. Among other hyphomycetes encountered was *Pleurophragmium acutum*, which grows on fruit-bodies of *Leptosphaeria acuta* on dead *Urtica* stems. The most interesting coelomycete seen was *Leptostroma juncacearum* on dead stems of *Juncus effusus* in the marsh at East Keswick.

SEMERWATER (VC 65), 20 August (D. Millward)
Entomology (M. L. Denton)
Due to the fact that most entomologists visited the YWT reserve in preference to the National Trust property at Stake Edge, no significant records emanated from the latter. Most orders of insects (save for butterflies which refused to appear in the abysmal weather conditions) were well represented on the reserve, and the coleopterists in particular were amply rewarded.

It was the recent flooding, which had left many areas inaccessible, that proved to be beneficial, having deposited a large amount of flood debris along the southern boundary of the reserve. By sieving this material large numbers of beetles were found. The most interesting one was the attractive striped leaf beetle *Hydrothassa hannoveriana*, which was found quite commonly in flood refuse and flooded marshland. This scarce insect has been studied by Mr Flint and this is an addition to its handful of known Yorkshire sites.

Concerning the Diptera Mr Crossley supplies the following notes. The short species list records mainly common and widely distributed flies. However a single female of an empid very near to *Hilara implicata* prompted a return visit three days later which resulted in a single male of the same species being found.

Hilara implicata is a rare fly, known in Yorkshire from several specimens collected by Mr Crossley on the beach at Sandsend in July 1985. The identification of this fly presents some problems; all the Yorkshire specimens seen so far key out to this species but there are consistent differences to the full discription in Collin (1961, *British Flies* 6 *Empididae*, Cambridge). It may be some considerable time before this little problem is resolved and until then it is proposed to record this species as *implicata* but with reservation. If it proves not to be this species, then it is undescribed as British.

The visit on the following Tuesday produced a single female of the empid *Trichina opaca* which is worthy of note, and a single male of the syrphid *Platycheirus perpallidus* which is an RDB3 species. A single male of the syrphid *Cheilosia intensa* was also taken.

That so many interesting insects can be found during such atrocious weather indicates that the YWT has acquired another fine site for the benefit of the natural world.

Mollusca (A. Norris)

The molluscan fauna of the reserve is potentially much better than the list produced on the day. The weather conditions, and the very high water level, prevented a full survey and drastically reduced the numbers of species found. Of the 23 mollusca recorded, only three could be said to be freshwater species.

A visit made to Semerwater on 10 July 1981 produced 10 freshwater mollusca, two of which proved to be new to the vice-county. The molluscan fauna should, accordingly, be in excess of 30 species and could easily be in excess of 40.

Mycology (C. S. V. Yeates)

The weather conditions and very high water levels in the lake made serious collecting well-nigh impossible. Under normal conditions an extensive wetland area like this would almost certainly prove highly productive.

There were, however, two good finds. The attractive small shaggy agaric *Phaeomarasmius erinaceus* was collected by Mr Kendall on *Salix pentandra*; there are few Yorkshire records of this species, and this is the first for VC 65.

Dead stems of *Juncus effusus* in the extensive marshy area south west of the lake produced considerable quantities of the ascomycete *Tarbertia juncina*. This minute species, little more than a fifth of a millimetre in diameter, was described as recently as 1972 from the Hebrides; this is new to Yorkshire and may well be the first English record.

BOOK REVIEWS

Land Snails of the British Isles by **A. A. Wardhaugh**. Pp. 24. with 28 figures in colour and black and white. Shire Publications Limited, Aylesbury. 1989. £1.95 paperback.

This little booklet tries, indeed in some ways quite successfully, to give a comprehensive introduction to the structure, classification, evolution, reproduction, diet and identification of most British land snails, and even includes some notes on their predators. The result is a useful, if staccato, guide for the beginner, which could help to interest more people in the subject. The text and illustrations avoid most of the pitfalls of this type of publication, my only real criticisms being confined to the identification table printed on the last three pages. I can only assume that limitations as to the space available is to blame for this section's omissions. This has resulted in a guide in which most of the rare and local species have been omitted, although it does include some localized species with a northern distribution, perhaps since the author is resident in Cleveland. The omission of some widespread and common species, such as *Cochlicopa lubricella*, *Nesovitrea hammonis* and *Aegopinella pura* is, however, unfortunate.

AN

New Generation Guide to the Wild Flowers of Britain and Northern Europe by **Alastair Fitter**. Pp. 320 with key to the codes used. Collins. 1987. £6.95.

A chance encounter with an adult beginner botanist using this reasonably priced book intelligently, has given the reviewer much more confidence in the guide than on first inspection.

For someone starting the study of wild flowers with little early botanical training, the first desire may be simply to find names for them all. In the book, the Directory of over 1,000 species has rather small-scale coloured illustrations briefly described. They are arranged in their families, which facilitates remembering names and understanding their relationships through structure; even though the small scale promotes difficulties when attempting to identify closely related species, the descriptions are sufficiently accurate to help. Furthermore, a reference for some species takes one to the Appendix of Scarce Species in Britain following the Directory. This gives an awareness of other related species which may be found and a warning not to jump to conclusions – reference to other works is advisable, but this often applies to wild flower guides.

For deeper knowledge and understanding this guide will enable the beginner to go much further than merely identifying wild flowers.

The book opens with a concise review of the Evolution of Wild Flowers, showing their place in the plant kingdom. Following the Directory and Appendix comes Part 3 on the Natural History of Wild Flowers, a mine of information for anyone of the 'new generation' without the advantage of growing up with a basic knowledge of flower structure, pollination, seed dispersal, plant adaptation, interactions and so on. In his Foreword Sir David Attenborough refers to this section as an Encyclopedia, which indeed it is, being closely linked with the Directory through references to its pages where more may be discovered about many of the species.

The assiduous student using this guide in its entirety will be led to more advanced botanical exploration and find inspiration to enjoy wild flowers to the full.

JED

An Introduction to the Physiology of Crop Yield by **Robert K. M. Hay** and **Andrew J. Walker**. Pp. xvi + 292, including numerous figures, graphs and tables. Longman Scientific and Technical. 1989. £12.95 paperback.

This book has been written as a text for degree-level teaching and it certainly provides a mine of information for students of agriculture and plant biology. The authors' thesis is that an understanding of crop production should be based upon a description of how plants function, both individually and as crops. They believe that improvement in crop production depends on the introduction of plants which are able to photosynthesize more efficiently in terms of available solar radiation, water use and fertilizer input, as well as being able to convert a greater proportion of biomass into the desired product, whether food, fibre, fuel or the precursors of medical drugs, or are better able to withstand environmental stresses.

The book is divided into three sections. The first section deals with the fundamental principles of crop physiology, with chapters on the interception of solar radiation, photosynthetic efficiency and dry-matter partitioning. The second section takes three case histories, using temperate cereals, potatoes and grassland as contrasting examples, to show how variation in crop management can influence crop yield. In the final section, the principles of crop simulation models are described, using a winter wheat model as an example. This highlights the central role that these models play in the development of crop physiology today.

While the emphasis in the book is on north-European temperature cropping, the principles established in the first section are universal, as is the approach to modelling.

The authors are to be congratulated on bringing together a mass of information packed into about 250 pages of text. Inevitably there are many places where it suffers from lack of detail which may confuse students but most of the relevant references are listed for them to follow up if necessary. I can recommend this as a very good value for money text which I hope many students will take the time to read. If they do, they will have a good foundation on which to build a thorough understanding of the physiology of crop yield.

DHSR

The Social Badger by **Hans Kruuk**. Pp. xii + 155, with 71 figures and 23 colour plates. Oxford University Press. 1989. £15.95

In this volume Dr Kruuk provides an account of his researches on badger behaviour near Oxford and more extensively in Scotland where he has been working for fourteen years. In outlining the aims of the work in Scotland the author poses several questions. These include: What do badgers eat and how are they dispersed in relation to food supply and availability? How is badger society organized and how does it respond to environmental change? In the following chapters the author sets himself the task of answering these questions and in the process carefully explaining the methodology adopted. His field studies were supported by research on a captive group or clan. There is a wealth of information, much of it only possible from long term investigation, for example, comparative studies of diet in different areas and variation in territory sizes from year to year in one locality.

There are comprehensive analyses of diet (largely earthworms) and how the badger forages for its food. The author is able to provide a detailed picture of territory size and composition and from this moves into social behaviour and organization, an area in which much still remains to be discovered. Uncertainty remains as to how the social group or clan is organized, the scientist being hampered by the badger's habit of living underground and a minimum of overt behaviour when above ground. Even so, some broad concepts are justified, including the possibly surprising conclusion that badgers 'live . . . in clans by default'. This is because the author considers they have not fully realized the beneficial potential of living together.

This is a fascinating contribution in animal behaviour, based almost exclusively on the findings of a dedicated scientist and field observer. However, I believe as a contribution to badger behaviour it would have been greatly enhanced had more of the relevant work undertaken elsewhere been included. This would have ensured a comprehensive review of the social badger. Nevertheless, as it stands, it is a useful addition for those interested in the conservation and natural history of the species.

MJD

Adults of the British Aquatic Hemiptera Heteroptera: a Key with Ecological Notes by **A. A. Savage**. Pp. 173, 81 figures including 66 line drawings. Freshwater Biological Society Publication No. 50. 1989. £11.50

From schoolchild to academic, there can be few natural historians who have never at some time in their lives come face to face with the ubiquitous water boatman. From my childhood I recall the friendly but elusive pond skaters and their sinister cousins the water scorpions, lying in wait in pondweed poised to ravage the toes of any child foolish enough to venture into the water without the protection of wellington boots. Such encounters sow the seeds of curiosity, enthusiasm, and dedication, and the author of this book clearly draws upon his own experience in offering us all a clear insight into the identification and biology of these insects.

This book offers no excuses at reworking the text and illustrations contained in T. T. Macan's 1965 Freshwater Biological Association Scientific Publication No. 16. However, the bookcover, quality of text, and line drawings are much improved on the earlier

work, and with the addition of key notes, line drawings, and biology of the group, combine to form an attractive package which will undoubtedly appeal to all with an interest in freshwater animal life.

The revised keys now include the newly described species *Corixa iberica* Jansson, 1981 and the two subspecies of *Glaenocorisa propinqua*, ss. *propinqua* and ss. *cavifrons*. An updated checklist of the British waterbugs is tabled and includes a new species together with the genera *Aquarius*, and *Paracorixa*, and the sub-genera *Subsigara*, *Vermicorixa*, *Pseudovermicorixa*, *Retrocorixa*, and *Halicorixa*. The author proposes the subspecific ranking of *Microvelia umbricola*, recently synonomized with *M. buenoi*, as *Microvelia buenoi* ss. *umbricola* based on differences between the type material and European material. Illustrations are interspersed with the keys for ease of reference, such that most users of the book should have no difficulty with identification of the majority of species. Keys to the genera *Velia* and *Microvelia* now cover the previously omitted macropterous forms and the keys to Corixid genera benefit from new and improved illustrations and notes for guidance to assist in their use.

The inclusion of ecological and behavioural notes extend the scope and interest of the book over and above preceding versions, and although the treatment of geographical and ecological distribution could have been expressed more concisely, this part of the book provides an insight into recent studies on waterbugs. The section dealing with species succession, diversity and habitat preference may be of interest to those concerned with habitat conservation and manipulation, as the author has dealt with species preferences on waterbody type, organic matter abundance, acidity, altitude, and salinity. The notes on behaviour deal with mating, oviposition, respiration, feeding, migration, and effects of predation; and provide a valuable reference for field workers.

This book will not only provide readers with up-to-date information, but will undoubtably encourage further work on this fascinating group of insects.

SF

Collins Guide to the Countryside in Winter, its Animals and Plants by **Alistair Fitter** and **Richard Fitter**. Pp. 240, with numerous line drawings, coloured illustrations and both black and white and colour photographs. Collins, 1988. Hardback £9.95.

These prolific authors must be congratulated not only for the quality of this book but also for its timing. 'Green' issues are receiving media attention on a daily basis, giving an impetus to the already increasing number of people taking an active interest in the countryside and natural history. There is however, a tendency for this interest to wane during the winter months, re-emerging as the days lengthen and the temperature rises. This book provides an insight into the many things that can be observed in winter and should give people an incentive to get out into the countryside and not just watch wildlife programmes on television.

I particularly like the line drawings: those of the twigs and buds are excellent as are those of the leaves and dead heads; the only exception is the drawing of birds' nests, some of which leave a lot to be desired. The outlines of the trees are extremely good and interesting, tree silhouettes being an obvious part of the winter landscape. The colour photographs are excellent as are the drawings and although the colour of some of the bird illustrations is a little washed out, they do provide a good guide for identification.

This is not the first book to cover the countryside in winter but it is certainly the most comprehensive that I have seen. The book is not targeted on the expert but for those people with an interest in, and love of the countryside, and I thoroughly recommend them to go out and buy it and then to go out and use it.

JEK

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Photographic Plates

Readers of *The Naturalist* will have noticed that the number of photographic illustrations has increased in recent years. Good clear photographs, suitably captioned, to accompany articles or as independent features, such as the bird portraits by Arthur Gilpin in recent issues, are always welcome.

To encourage this development, a long-standing member of the YNU, who wishes to remain anonymous, has most generously offered to make a donation, the income from which would finance the publication of a plate or equivalent illustration in future issues whenever possible. The editor, on behalf of the YNU, wishes to record his deep appreciation of this imaginative gesture.

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The Naturalist

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A review of white whales (*Delphinapterus leucas* Pallas) off the Yorkshire coast and in British waters — *C. A. Howes*

A 1907 plant list for Nunburnholme, East Yorkshire — *Eva Crackles*

Published by the Yorkshire Naturalists' Union

Editor **M. R. D. Seaward**, MSc, PhD, DSc, FLS, The University, Bradford BD7 1DP

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A FLORA OF CLEVELAND AND SOME ASPECTS OF THE PLANT DISTRIBUTION

I. C. LAWRENCE

Presidential Address to the Yorkshire Naturalists' Union, Sheffield
3 December 1988

The Need for a Flora of Cleveland

The county of Cleveland was created in 1974 by amalgamating the southern part of County Durham with the northern part of the former North Riding of Yorkshire.

A Flora of the County of Durham by the Rev. G. G. Graham has recently been published (1988); the only previous botanical record of that county was N. J. Winch's 'Flora of Northumberland and Durham', first published in 1831. The only published flora covering North Yorkshire was J. G. Baker's (1863) 'Studies of the Botany, Geology, Climate and Physical Geography of the County of North Yorkshire'. The area covered was very large, bearing in mind the limited transport facilities of those days. Only selected areas were surveyed and a list of only the rarer plants was given. No useful distribution patterns of the general vegetation can therefore be derived from this work for purposes of comparison with the status of the county's plants today.

Baker paid attention to the woods and fields around Great Ayton and listed its rarer plants, few of which can be found in that area today. Many of the rarer plants he listed for Kildale and Lounsdale along with Sleddale and the surrounding moors have also disappeared. These areas, apart from part of Sleddale, are in the present County of North Yorkshire bordering on to Cleveland. The only plant lists in Baker relating to what is now Cleveland are 'those for the woods and low marshland and sandy fields in the neighbourhood of Yarm and Stockton, the principal part of which stands upon the Durham side of the stream'. Very few of his plants are to be seen in that area on either side of the river today, although *Lepidium latifolium* still grows in the Stockton area. He then mentions the 'thriving town of Middlesbro', with its docks and blast-furnaces, which stand upon the Yorkshire shore just where the river begins to open out into an estuary'. Then follows a list of 'the rarer plants of the ballast hills in the neighbourhood of that town', along with those to be found on the sandhills and in the saltwater ditches and saltmarshes. This list is particularly interesting as it gives a fair indication of the area as it was in those days. Several of the plants he mentioned are still to be found.

No other reference to any other part of what is now Cleveland was made.

The need for a county flora would seem to be confirmed by the fact that in the *Atlas of the British Flora* by Perring and Walters (1962), two of the 10 km squares (NZ 61 and 71) which cover the east of the county are mentioned as being under-recorded.

Geological Factors

The geological deposits of the county are varied. Most of lowland Cleveland is formed from rocks of Triassic age, comprising mudstones and sandstones. These sweep south in a broad arc from Seaton Carew in the north to Darlington in the west. The north of the county in the vicinity of Hartlepool is on the edge of the Permian magnesian limestone escarpment covering East Durham. In Cleveland this is largely overlaid by thick glacial deposits. This reduces the number of calcareous species compared with the lime-rich flora of the Durham coast north of Crimdon Dene. However, the coastal grassland to the south of the Dene (which forms the county boundary) is highly calcareous, and here such plants as *Orchis ustulata* and *Arabis hirsuta* occur. The old mineral railway line from Hartlepool, in Cleveland, to Haswell, in County Durham, cuts through the limestone and has become colonised by several calcicoles including *Inula conyza* and *Clinopodium vulgare*. All these plants are unique to this area of the county, or, as in the case of *C. vulgare*, are rare elsewhere. The few limestone quarries in this northern area are largely

overgrown and are insignificant botanically. The high ground in the south of the county is largely composed of rocks of Jurassic age which support Cleveland's only examples of moorland vegetation; the Eston Hills escarpment must be included here. These rocks are also the underlying strata of the lowland areas extending south of a line from Redcar to Marton. The remainder of lowland Cleveland is mantled by boulder clays, in some places several inches thick, deposited by the retreating glaciers of the last glaciation period.

The natural soils of the county are derived from the drift deposits and from the underlying older (harder) rocks. There is a contrast between those found in the lowland areas, which are usually fine fertile loams, often over clay, and those of upland areas, which are peaty, strongly acidic, waterlogged and poor in nutrients. Other important geological deposits include glacial drift, recent alluvium and sand, and the Tertiary igneous intrusion known locally as the 'Cleveland Dyke'.

Taking into consideration the large industrial and urban conurbations which are centred on the mouth of the Tees, and which are surrounded by predominantly agricultural land, the county provides a variety of habitats and hence a wide range of plant species.

Climatic Features

Although this varied geology affects the type of plants which occur in Cleveland, it is not the primary factor. The climate is very much a controlling factor, considering Cleveland is in the north-east of England and very much influenced by the North Sea. Also, because of the topography of the region, Cleveland has its own micro-climate. The average temperature in the Tees basin is the odd degree higher than that of the higher ground to the north and south. This becomes evident in spring, when growth in the Tees Valley begins earlier than in the surrounding countryside. Both urbanisation and industry no doubt contribute to this. The occurrence of several south-eastern species in the Teesside area may well be connected with this factor. Some of these plants have their origins in southern Europe. *Hirschfeldia incana* has spread in the Riverside Park industrial area of Middlesborough during the last few years. *Lactuca virosa* first appeared thirty years ago but has increased its range since 1980. *Crepis vesicaria* has also established local colonies very recently. *Conyza canadensis* first appeared in 1986 and is now in three sites near the railway systems in the area. *Blackstonia perfoliata* has increased considerably in recent years. It is interesting to note that no significantly prolonged period of severe frost has been recorded in the area in the period during which these changes have occurred. All these species have established themselves on industrial slag or railway ballast.

It is also interesting to note that certain of our native plants are at the extreme northern edge of their range in Great Britain in the county. These include: *Rorippa amphibia*, *Epilobium tetragonum*, *Filipendula vulgaris*, *Hottonia palustris*, *Lepidium latifolium*, *Centaurium pulchellum*, *Orchis ustulata*, *Rumex palustris*, *Rumex maritimus*, *Juncus compressus* and *Puccinellia rupestris*.

Habitat Diversity

As we have seen, the varied land structure of the county gives rise to a diverse range of habitats. This is quite remarkable for a county which has only a land area of 585.5 sq.km (58,550 ha.).

Around 1,045 ha. is derelict land, the major concentration located around the lower reaches of the River Tees. Two vegetational types can be recognised on this type of habitat, pioneer urban flora and industrial waste colonisers. The latter is of interest, as it is associated with the iron and steel-making industries: the tipping of waste material from these industries has produced calcareous or acid substrates. The flora of the calcareous wastes, resulting from the tipping of basic slag, is characterised by such plants as *Diplotaxis tenuifolia*, *Blackstonia perfoliata*, *Erigeron acer*, *Sedum acre*, *Carlina vulgaris* and *Hieracium vulgatum* along with those already mentioned under climatic factors.

Acid wastes, however, are usually associated with old ironstone workings around Eston and Guisborough, and other sites in East Cleveland. These waste-tips (many of

which have been reclaimed) tend to be species-poor and are often characterised by such plants as *Senecio viscosus*, *Senecio sylvaticus*, *Arenaria leptoclados* and various ferns, especially *Pteridium aquilinum*. Where subsidence has occurred, as at Margrove Park, an interesting wetland flora has developed.

There are 3,085 ha. of woodland in Cleveland, of which two-thirds are plantation woodlands. These are mainly south of the Tees on the steeply-sloped Jurassic escarpments around Guisborough and Newton-under-Roseberry and above New Marske. Most of them are predominantly coniferous, often with a mixture of broad-leaved trees. Newton woods, however, are dominated by *Quercus robur* and have a fine display of *Scilla non-scripta*; otherwise the ground flora of these plantation woodlands is dominated by *Pteridium, Rubus* and *Urtica dioica*.

Ancient semi-natural, broad-leaved woodland occupies 910 ha. and is the county's richest and most diverse habitat. It is mainly found in the steep-sided valleys in the east. These valleys or 'gills' as they are known locally, have been formed by the fast-flowing streams which originate on the higher ground to the south and carve their way down to the sea through the rock layer and boulder clay. The slopes of these moist valley woodlands with their dense canopy, are dominated by a rich variety of ferns, especially *Asplenium scolopendrium*. Both *Polystichum setiferum* and *P. aculeatum* occur, although the latter is scarcer. The tree canopy is mainly *Quercus*, *Fraxinus* and *Ulmus*, with *Alnus* in the valley bottoms. *Corylus avellana*, *Sambucus nigra*, *Ilex aquilinum*, *Viburnum opulus* and *Euonymus europaeus* form the main understorey, with *Crataegus monogyna* and *Prunus spinosa* well represented. The herb layer is rich and varied and depends on the changing substrate and overlaying soil cover.

In these gills plants occur which are not found in other old woodlands in the county, including such species as: *Lysimachia nemorum*, *Teucrium scorodonia*, *Chrysosplenium oppositifolium*, *Luzula sylvatica*, *Luzula pilosa* and *Vicia sylvatica*. This last plant always occurs within two miles of the sea in Cleveland. Interesting occurrences in woodland in the Moorsholm/Liverton Mill area are: *Saxifraga granulata*, *Aquilegia vulgaris* and *Hordelymus europaeus*. These are the only sites within the county for these plants. The last two are indicators of primary woodland and usually occur in calcareous areas. *Saxifraga granulata* is a meadow plant! Was it a plant originally of our primary forests? *Neottia nidus-avis* has been recorded from time to time in these older woodlands of East Cleveland.

The River Leven is a tributary of the River Tees (the main waterway in the county) and more thickly wooded than the Tees Valley in Cleveland. Its woods are dominated by *Scilla non-scripta*, *Allium ursinum* and *Silene dioica* with *Campanula latifolia* and *Myosotis sylvatica* well represented. It is in the Leven Valley where *Gagea lutea* grows along with *Stellaria neglecta* and *Chrysosplenium alternifolium*.

Referring now to the Tees Valley, from where the Tees enters the county in the extreme south-west to its estuary, some of the plants of its middle reaches occur locally as far downstream as Yarm, where the tidal influence is evident. *Stellaria nemorum*, *Allium oleraceum* and *Rorippa sylvestris* are examples. *Heracleum mantegazzianum*, *Allium scorodoprasum* and *Saponaria officinalis* continue further downstream; the latter is found as far as Stockton, where salt-loving species such as *Cochlearia officinalis*, *Aster tripolium*, *Atriplex littorale* and *Spergularia marina* occur on the tidal mud of this area. *Allium vineale* is plentiful in the Stockton section of the river. The saltmarsh and mudflat lower down the river is now much reduced from what it was in the sixties. Actual saltmarsh communities are now restricted to small isolated pockets around the Tees Estuary, interspersed with brackish pools. These pools contain large stands of *Scirpus maritimus* and *S. lacustris* subsp. *tabernaemontani*. Where they dry up in the summer, they become invaded with species like *Chenopodium rubrum* and *C. glaucum*, with *Atriplex* sp. often dominant. Saltmarsh species, which at one time were widespread, are still to be found around the edges of these pools and in the slacks to the landward side of the dunes. Much of this wet area is dominated by *Puccinellia maritima*, but plants such as *Glaux maritima*, *Spergularia marina*, *S. media*, *Limonium vulgare*, *Halimione*

portulacoides, *Artemisia maritima*, *Armeria maritima*, *Centaurium pulchellum*, *Carex distans*, *C. extensa* and *Parapholis strigosa* are still to be found, although, in some species, very much reduced in numbers. The fine colonies of *Dactylorhiza* sp. and their many hybrids are thriving in these wet habitats. Some of the county's very local species occur on the fixed dunes on both sides of the estuary. These include: *Astragalus danicus*, *Cerastium arvense* and *Thalictrum minus*.

The Cleveland coastline stretches from Crimdon Dene in the north to Staithes in the south. This *c.* 38 km stretch is in itself extremely varied, from the magnesian limestone in the north to the boulder clay cliffs in the south. To the north of Hartlepool is Hart Warren Dunes, now an SSSI. It contains such plants as *Stellaria pallida* and *Myosotis ramosissima*. *Geranium sanguineum* is a feature of this coastal area. The cliffs from Saltburn southwards support several calcareous species including *Filipendula vulgaris*, *Gentianella amarella*, *Plantago media*, *Anacamptis pyramidalis* and *Gymnadenia conopsea*, with *Parnassia palustris* and *Samolus valerandi* occurring very locally in the damp hollows.

The extent of moorland in the county is around 1,690 ha. This is concentrated in the south-east of the county and forms part of the North York Moors National Park. It is only where the water table is close to the surface that a more interesting flora occurs. In and around the areas of sphagnum bog occur such plants as *Drosera rotundifolia*, *Myosotis secunda*, *Menyanthes trifoliata*, *Potentilla palustris* and several *Carex* species. Some of Cleveland's rarer plants are to be found here, such as *Listera cordata*, *Trientalis europaea*, *Hypericum elodes* and *Veronica scutellana*.

Freshwater ponds are widely distributed throughout the county. Some of these have been artificially created; others have come about through subsidence or change in land-drainage. Still others are the small ponds on farmland, which are often very rich in plant-life. Two of these farm ponds hold *Hottonia palustris*, now a much rarer water plant because of drainage and in-filling. Fortunately, agreement with the landowners will secure the two sites here in Cleveland.

The hedgerows and roadside verges in the west of the county contrast with those in the east. *Lamium album*, for example, which is widespread in the county, is rare or absent east of Guisborough, whereas *Ballota nigra*, often found in hedgerows in the west of the county, is virtually absent in the east. *Alisima plantago-aquatica* is common around ponds in much of the county but is absent from those in the south-east.

As a result of this project, I have found that the specialised requirements of many of our wild plants are much more noticeable in a small county like Cleveland, with its great variety of habitats. The resultant maps demonstrate the potential for further study of the plants and their environment.

Acknowledgements

I am grateful to the compilers of *Cleveland Wildlife Strategy* (1989), Cleveland County Council/Nature Conservancy Council, particularly Mr Alex Weir, for permission to include data from their report.

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ORIBATID MITES (ACARI: CRYPTOSTIGMATA) FROM THE ISLES OF SCILLY

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Abstract

The oribatid mites (Acari: Cryptostigmata) of the Isles of Scilly are listed. *Ramusella assimilis* and *Passalozetes bidactylus* are illustrated, both recorded for the first time from the British Isles. There are now 44 species of oribatid mites known from Scilly, 33 of them recorded for the first time in this paper.

Introduction

Random collections were made on the island of St Mary's on 16 July 1986 as part of a general survey of the oribatid mite fauna of the British Isles. The records obtained complement those of Pugh (1988) and Pugh and King (1988) who collected only in the marine littoral. There are now 44 species of oribatid mites known from Scilly, 33 of which are newly reported in this paper. Of these species, two (*Ramusella assimilis* and *Passalozetes bidactylus*) are new records for the British Isles. The total number of species recorded from Cornwall to date is 54 and this paper adds 17 (marked in the text with +) to the Cornish list.

Collecting Locations

A. Moss on soil, Hugh Town, St Mary's (number of specimens in sample = 7)
B. Dry moss on granite, Hugh Town, St Mary's (n=46)
C. Very dry moss on wall, Hugh Town, St Mary's (n=35)
D. Thin lichen and moss on soil under hedge, The Garrison, St Mary's (n=7)
E. Thin, dry moss on stones, The Garrison, St Mary's (n=33)
F. Bracken litter, The Garrison, St Mary's (n=49)
G. Clump of *Armeria maritima*, The Garrison, St Mary's (n=81)
H. Thin moss and soil on a country lane wall, St Mary's (n=49)
I. Lichen (*Parmelia saxatilis*) on a country lane wall, St Mary's (n=103)
J. Lichen (*Ramalina siliquosa*) on a country lane wall, St Mary's (n=43)
K. Lichen (*Ramalina siliquosa*) on rocks, Porthcressa Beach, St Mary's (n=13)
L. Lichen (*Xanthoria parietina*) on rocks, Porthcressa Beach, St Mary's (n=11)
M. Clump of grass etc., crevice of rock outcrop, Porthcressa Beach, St Mary's (n=35)
N. Dry tidal debris, Porthcressa Beach, St Mary's (n=55)

Population Abundances

Total oribatid numbers per sample are given above after the locality data, but in the list below the mite species populations are also given an arbitrary relative abundance index as in Luxton (1987, 1989) thus: 1 = <1% of total oribatids in sample; 2 = 1–5%; 3 = 6–10%; 4 = 11–15%; 5 = 16–20%; 6 = >20%.

Species list

* = new record for the British Isles
\+ = new record for Cornwall

Square brackets indicate records abstracted from published literature.

Family Phthiracaridae
[*Phthiracarus affinis* (Hull, 1914) — Parry (1979): St Agnes]
Widespread and abundant in the British Isles
[*Phthiracarus nitens* (Nicolet, 1855) — Parry (1979): St Agnes]
Recorded only from southern England and the Channel Islands

Family Hermanniidae
Hermannia reticulata (Thorell, 1871) D6, G2
Widespread and common in the British Isles
Hermannia scabra (L. Koch, 1879) A4 B2
Widespread and common in the British Isles

Family Camisiidae
+ *Camisia biverrucata* (C. L. Koch, 1839) G2
Widespread but not common (not Wales or Ireland)
Camisia horrida (Hermann, 1804) H2, I2
Widespread and common in the British Isles
[*Camisia segnis* (Hermann, 1804 — Pugh (1988): St Mary's and Annet; Pugh and King (1988): St Mary's]
Widespread and common in the British Isles

Family Ameronothridae
Ameronothrus maculatus (Michael, 1882) L6, M4
[Pugh (1988): Bryer; Tresco; St Martin's; St Mary's; Great Arthur; St Agnes; Annet. Pugh and King (1988): Tresco; St Mary's]
Widespread and common in the British Isles.
[*Hygroribates marinus* (Banks, 1896) — Pugh (1988): Annet]
Widespread and common in the British Isles
[*Hygroribates schneideri* (Oudemans, 1905) — Pugh (1988): Tresco. Pugh and King 1988: Tresco; St Mary's]
Limited records in the literature (not Scotland or Ireland)

Family Belbidae
Metabelba papillipes (Nicolet, 1855) F2, G2
Widespread and common in the British Isles

Family Damaeidae
Damaeus (*Paradamaeus*) *clavipes* (Hermann, 1804) F2
Widespread and common in the British Isles

Family Carabodidae
+ *Odontocepheus elongatus* (Michael, 1879) F2
Widespread and common in the British Isles (not Wales)

Family Tectocepheidae
+ *Tectocepheus velatus* (Michael, 1880) B6, C6, D4, G2, H6, M4
Widespread and very common

Family Eremaeidae
Eremaeus oblongus (C. L. Koch, 1835) A6
Common in the British Isles (not Scotland)

Family Ctenobelbidae
Ctenobelba obsoleta (C. L. Koch, 1841) A4, F3
Reasonably common (not Wales)

Family Ceratoppiidae
Ceratoppia bipilis (Hermann, 1804) F3
Widespread and very common

Family Liacaridae
Xenillus tegeocranus (Hermann, 1804) F2
Widespread and common (not Scotland)

Family Oppiidae
Dissorhina ornata (Oudemans, 1900) B6, E4, F2, G3
Widespread and very common (not Wales)
+ *Lauroppia neerlandica* (Oudemans, 1900) B3
Widespread but not common (not Wales or Ireland)
+ *Medioppia obsoleta* (Paoli, 1908) F6
Widespread and common (not Wales)
+ *Moritziella unicarinata* (Paoli, 1908) G3
Distribution limited to England and the Isle of Man
+* *Ramusella assimilis* (Mihelcic, 1956) G6 (Figure 1)

Family Suctobelbidae
+ *Suctobelbella subcornigera* (Forsslund, 1941) F2
Widespread and common (not Wales)

Family Ceratozetidae
+ *Ceratozetes gracilis* (Michael, 1884) D4, G2
Widespread and very common
+ *Humerobates rostrolamellatus* Grandjean, 1936 E3, I2
Reasonably common (not Scotland or Ireland)
Trichoribates trimaculatus (C. L. Koch, 1835) K6, L6, M6 [Pugh (1988): Bryer; Tresco; St Martin's; Great Arthur; St Mary's; St Agnes; Annet. Pugh and King (1988): Tresco; St Mary's]
Reasonably common (not Wales or Ireland)

Family Chamobatidae
+ *Chamobates cuspidatus* (Michael, 1884) F6
Widespread and very common
+ *Chamobates schuetzi* (Oudemans, 1902) B6
Widespread and common

Family Mycobatidae
[*Mycobates parmeliae* (Michael, 1884) — Pugh (1988): Bryer; St Mary's. Pugh and King (1988): St Mary's]
Distribution limited to maritime lichens (not Wales)

Family Achipteriidae
+ *Achipteria coleoptrata* (Linnaeus, 1758) B2
Widely distributed (not Wales)
Achipteria nitens (Nicolet, 1855) E3, G3, I1
Widespread in England (not recorded from Scotland or Ireland)

Family Oribatellidae
Oribatella quadricornuta (Michael, 1880) B2
Widely distributed (not Wales)

Family Oribatulidae
[*Oribatula saxicola* (Halbert, 1920) — Pugh (1988): St Mary's. Pugh and King (1988): St Mary's]
Widely distributed in maritime lichens
+ *Oribatula tibialis* (Nicolet, 1855) G4
Widespread and common (not Ireland)
Phauloppia lucorum (C. L. Koch, 1841) B2, C3, E6, G2, H6, I6, J6, K6, L6, M4 [Pugh (1988): Bryer; Tresco; St Martin's; Great Arthur; St Mary's. Pugh and King (1988): St Mary's]
Widespread and very common

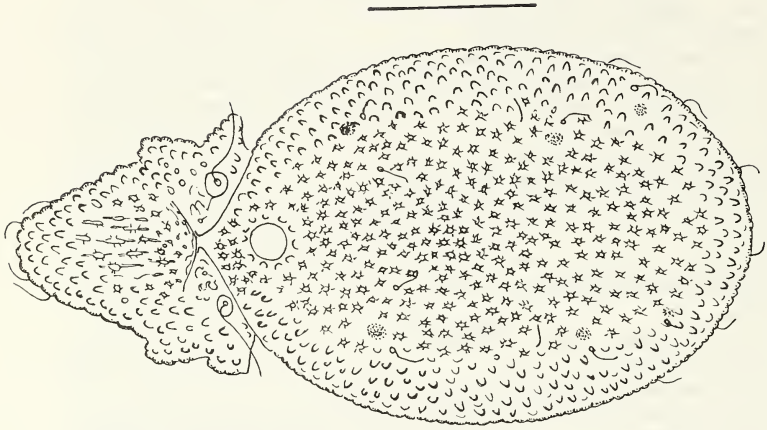

FIGURE 2
Passalozetes bidactylus, dorsal view
(scale bar = 100 μm)

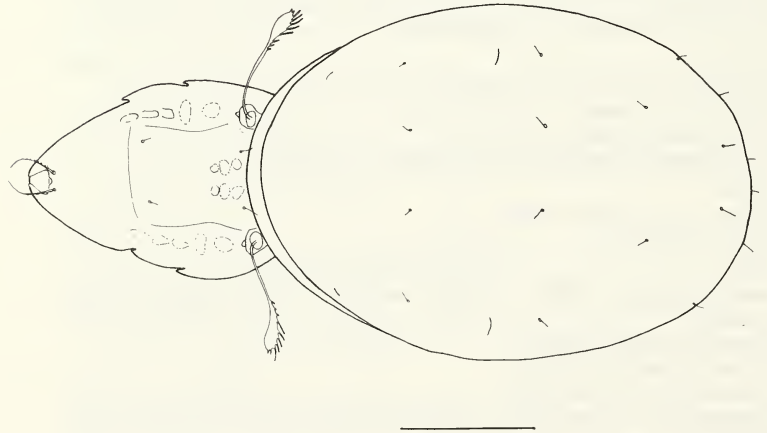

FIGURE 1
Ramusella assimilis, dorsal view
(scale bar = 50 μm)

Phauloppia pilosa (C. L. Koch, 1841) E3
Very limited southern distribution in the British Isles (Essex, Cornwall, Hampshire)
[*Zygoribatula frisiae* (Oudemans, 1900) — Pugh (1988): Annet]
Limited southern distribution in the British Isles (Bedfordshire, Norfolk)

Family Scheloribatidae
Scheloribates laevigatus (C. L. Koch, 1835) G2
[Pugh (1988): Bryer; Tresco; St Martin's; Great Arthur. Pugh and King (1988): Tresco]
Widespread and very common
+ *Scheloribates pallidulus* (C. L. Koch, 1841) L3
Rather limited distribution in the British Isles (not Ireland)

Family Passalozetidae
+ *Passalozetes bidactylus* (de Coggi, 1900) N6 (Figure 2)
Erroneously recorded for the British Isles by Willmann (1931) and Turk (1953). These records were presumably based on the *Scutovertex perforatus* recorded from an Irish salt-marsh by Halbert (1920). Halbert was right the first time (he usually was).

Family Scutoverticidae
Scutovertex sculptus Michael, 1879 A6, C2, E2, G2
Widespread and common

Family Phenopelopidae
+ *Eupelops hirtus* (Berlese, 1916) F2
Limited but wide distribution in the British Isles (not Scotland or Ireland)
Peloptulus phaeonotus (C. L. Koch, 1844) E3, M3
Widespread but not common

Acknowledgements
I am most grateful to Dr C. Perez-Inigo for confirming the identity of *Eupelops hirtus*.

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BOOK REVIEW

The Ecology of Bird Communities: Volume 1 **Foundations and Patterns**. Pp. 539, 34 tables, 131 line drawings; Volume 2 **Processes and Variations**. Pp. 316, 23 tables, 62 line drawings; by **John A. Wiens**. Cambridge University Press, Cambridge. 1989. £50.00 (vol.1), £35.00 (vol.2).

Species of hummingbirds and other nectar feeding birds probably compete with each other for resources. More species exist where there is more solar energy available.

Community ecologists have to pick their way between these poles of interest and generality to come up with robust propositions which are testable using the kind of data which it is practicable to collect.

In these two volumes John Wiens achieves an admirable balance. The first is a presentation of the principles of community ecology, using birds as examples. There are no mathematics and the theory is clearly presented with a historical development. The author begins with a general introduction, considering how we pose questions about such relatively imprecise material and why controversy should arise. The principal issue which runs through modern treatment of the subject is the importance of competition in explaining community patterns. This question is then examined at length by reviewing evidence on species abundance, niche concepts, guilds of species and other patterns. Direct evidence relating to competition can be obtained. So can data on character divergence, density compensation and other adjustments seen in closely related co-existing species when compared with the same species in localities where they live on their own. Wiens concludes that since development of communities is a dynamic process we observe a flux of events which, however, are often interpreted as if they were static patterns. Resource availability, too, fluctuates, making it difficult to measure how much it is limiting. These are two reasons why explanations are hard to find.

In Volume 2 the question of competition comes in for more scrutiny. It is sometimes, but rarely, demonstrable. Practical considerations could all too easily account for the frequent lack of evidence one way or the other. Study of long term changes, larger scale spatial patterns and the effects of parasitism and predation (often treated strictly as intra-species phenomena) can also shed light on the question of competition as a factor structuring communities. But does it structure communities? This is the right kind of questions to ask — it is not so general as to be unsatisfying and the answer has the widest implications. The book is an impressive account of the development of concepts in community ecology over the past thirty years and of the studies on birds which have done so much to inform the subject. Ecologists and ornithologists should read it. In the end, however, I found myself frustrated by its balance. The chapters end with conclusions, which tend to be that few conclusions can be drawn. Is the problem conceptual or methodological? Is there a totally new viewpoint waiting to be discovered, which will make our present approaches redundant? I can strongly recomend these volumes for what they are, even without the answer to these questions.

LC

CORRESPONDENCE

Dear Editor

With reference to the recent note concerning Shelduck using cylindrical bales for nest sites (*Naturalist* **114**: 73, 1989). This is a well known phenomenon in the Lower Derwent Valley to the south-east of York. Shelducks first colonised the area in the late 1960s and now number some 20 to 30 breeding pairs annually. Natural nest sites here are few and most of the birds have always nested in straw stacks. These are often at some distance from the favoured feeding areas on the low lying flood meadows of the valley. Birds have used cylindrical bale straw stacks since their appearance in the area in the mid-1970s. Where bales are stacked several rows high they will usually nest above ground level, presumably in order to avoid ground predators.

Yours sincerely

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A REVIEW OF WHITE WHALES (*DELPHINAPTERUS LEUCAS* PALLAS) OFF THE YORKSHIRE COAST AND IN BRITISH WATERS

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Introduction

The Beluga or White whale is a circumpolar arctic and subarctic species inhabiting inshore waters and estuaries, moving south in summer from feeding areas amongst the pack ice south to breed in the shallow warmer waters of river estuaries, though seldom venturing into latitudes where water temperatures rise above 15°C (Evans 1980, Watson 1981).

Five major populations have been identified, Watson (1981) giving the following estimates of numbers in each: 4–5,000 animals in the Beaufort Sea, 10–14,000 off Eastern Canada and Greenland, 7–10,000 in the Barent, Kara and Laptev seas, 1–2,000 off East Siberia and the Chukchi Peninsula and about 6,000 in the Sea of Okhotsk.

Estimates of world population give evidence of decline. Evans (1980), using figures based on studies published between 1964 and 1978, suggested a population of 32,000 to 58,000, though Watson (1981) judged numbers to be lower at between 26,000 and 32,000. He also speculated that annual mortality rates, including commercial hunting, at around 7,000 animals, represented about double the estimated rate of natural replacement.

Social groups outside the breeding period consist of pods of about ten animals, centred on a dominant female with several young of various ages, and masculine groups of 3–15 animals.

Aerial reconnaissances have shown that large schools gather at summer calving areas and in autumn considerable aggregations of hundreds or even thousands can be encountered migrating between breeding and feeding grounds (Mathews 1978, Watson 1981).

The white whale is a shallow water feeder, the calves foraging on the sea bed for shrimps, crabs and annelid worms (Nereis). Older animals take squid, crustaceans and a wide variety of schooling fish including capelin (*Mallotus villosus*), char (*Salveilinus alpinus*), sand lace (*Ammodytes americanus*), herring (*Clupea harengus*), salmon (*Salmo salar*) and several species of cod (*Gadidae*) (Purves 1977, Watson 1981).

Field Notes

1. On 12 June 1987, a totally white whale was observed by R. Brewer from the fishing vessel 'Arrivain' about 24 km off Scarborough. He described it as being 'about 25 ft (7.5 m) in length, too large and slow to be a shark' and 'more like a pilot whale than a sperm whale'.

The whale remained in very close proximity to the boat for some four hours feeding on the small fish escaping from the nets each time they were hauled in (*Scarborough Evening News* 15/6/1987, *Whitby Gazette* 19/6/1987).

2. At 3 p.m. on 14/6/1987 the sailing yachts 'Tack Tack' and 'Zingili' encountered a white whale with which they circled for at least 20 minutes about half a mile out from Whitby harbour mouth, between the pier ends and the bell buoy (R. Swabey pers. comm.).

R. Swabey of the 'Tack Tack' described the specimen as being about the length of a large family saloon, totally white, with a blunt bulbous head, short rounded flippers and lacking a dorsal fin.

The whale swam with, around and under the circling boats, enabling Mr Swabey to take a photograph, which featured in the *Whitby Gazette* 19/6/1987, and D. Wright on board the 'Zingili' to make a video recording. This was broadcast on Yorkshire Television's

'Calendar' programme on 17/6/1987 and showed the animal swimming at the surface and making shallow dives which demonstrated well the characteristic head shape and absence of dorsal fin.

It would seem likely that the above sightings together with a specimen seen off Hadston sand dunes, Northumberland at 12.30 hrs on 20/3/1988 (Lowrey 1988) and one filmed off Balintor, Ross & Cromarty during May 1988 (S. Anderson *pers. comm.*) refer to the same animal.

Previous Yorkshire Records

In April 1888, a local fisherman reported the sighting of a white or cream coloured whale off Flamborough (Bailey, 1888b). Sadly, remarks about the animal's dorsal fin (lacking in *D. leucas*), and its length, which exceeded that of an alleged bottle-nosed whale (*Hyperoodon ampullatus*) he had found stranded at Flamborough a month earlier, undermined the record's acceptability as *D. leucas*.

A re-examination of the description in Bailey (1888a) of the alleged *Hyperoodon* strongly suggests one of the smaller dolphins, in which case *D. leucas* becomes a possibility on grounds of size.

The first popularly accepted Yorkshire record was observed by Sir Robert Lloyd Patterson at high water on 19/8/1903 some 110 m off the sea wall at the Spa, Scarborough. The 'milk white' specimen, judged to be 5.5 to 6 m in length was seen 8 to 10 times by the observer as he walked along the sea wall parallel to the whale's course (Patterson, 1903). Evidently the specimen was also seen by the eminent Scarborough marine biologist, J. W. Clarke, who recalled the event during his illustrated lecture on 'Some Yorkshire Marine Mammals' given to the Y.N.U. Vertebrate Section meeting 26 September 1929 (Taylor, 1929).

An analysis of the catalogue of records (see Appendix) suggests that the Scarborough specimen may have been one of a social group of white whales which entered and perhaps became 'trapped' in the North Sea in the early summer of 1903, and possibly just prior to 1900. The immigration seems to have been first noticed when a specimen was seen for several days off the Banffshire coast pre-1900 (Taylor, 1900). Further south, fishermen reported sightings off various parts of the north-east (Northumberland and Durham) coastline during the summer of 1903 and an adult male specimen, illustrated in Anon (1904) and Meek (1904) was caught at the mouth of the Tyne on 10/6/1903.

The last evidence of this immigration seems to have been the white whale killed in the Ouse below Naburn Lock, south of York, in early April 1905. This animal, described as being a dirty white in colour, 3.5 m in length and weighing 349 kg, was probably a sub-adult specimen. It was illustrated in Bunker (1905) and its skeleton preserved in the Yorkshire Museum, York.

The speculated movement into British waters may not have been confined to the North Sea, since Gibson (1976) reports an unconfirmed sighting in the Kilbrannan Sound, off Arran, in August 1904.

Discussion

On the basis of the above interpretation, other immigrations, possibly associated with cold arctic currents reaching the British Isles, may be suggested. During the 1870s and 1880s, single animals which may have entered British waters as members of the same social group were reported from Loch Etive in 1878, Little Ferry, at the mouth of Loch Fleet, in 1879, the Kyle of Tongue in August 1880 and one off Dunbeath in April 1884.

The specimen sighted off Cape Clear in September 1948 may have been the same as, or associated with, the specimen which drowned in salmon nets at the mouth of the Loire, on the west coast of France in 1949.

A whale, thought to be this species, sighted off Soay in the Inner Hebrides in 1950, may have had some association with the white whale present in the Firth of Clyde off Arran in April 1952.

During the mid 1960s, white whales again appeared far south of their normal range, with sightings off the west coast of Scotland, again in the Firth of Clyde system, in Gourock Bay during the late summer of 1964 and Loch Long, off Arrocher, in November 1965. Evans (1980) suggested these sightings were of the same animal. Evidence also came from the eastern side of the North Sea with a sighting off the Dutch coast at Zuiderzee in April 1965 and an animal (possibly the same specimen) which became an international celebrity by ascending the Rhine upstream to central Germany during May and June 1966.

The natural preference for inshore waters and estuaries is reflected in the significant proportion of British specimens recorded in these situations, the most extreme examples being the specimen which penetrated the Humber and tidal Ouse for some 110 km to reach Naburn near York in April 1905 and the calf which stranded in the River Forth near Stirling, some 40 km up-stream of the Forth Bridge in October 1932.

Summary

Two recent Yorkshire records are reported on and previous county records, confirmed and conjectural, are reviewed in the light of other British occurrences. In all, evidence of 18 confirmed or alleged sightings and 9 instances of specimens killed or stranded has been assembled (see Appendix).

A review of periodicity of occurrences has enabled greater credence to be placed on hitherto unconfirmed sightings and has provided evidence of patterns of occurrence which may form a basis for the interpretation of sporadic movements of arctic sea mammals far to the south of their normal distributional range.

The use of video recordings, enabling what would otherwise have been unconfirmed sightings to be authenticated, has demonstrated the value of this 'new technology' as a practical tool in cetacean studies.

Acknowledgements

Thanks are due to Mr R. Swabey for the detailed accounts and photograph of the 1987 Whitby observation, Mr P. Davis (Hancock Museum) for details of the 1988 Hadston record, Mr A. Webb (BBC TV Inverness) and Ms S. Anderson (NERC) Sea Mammal Research Unit for the opportunity to view the video of the 1988 Balintore specimen.

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APPENDIX

Records of Beluga or White Whale (*Delphinapterus leucas* Pallas, 1776) in British Waters

* = unconfirmed record.

1. Summer 1793. 2 young stranded in the Pentland firth (ND/37) (Lydekker, 1896).
2. –/6/1815. 1 killed in the Firth of Forth (NT/–) (Lydekker 1896, Meek 1904).
3. * Summer 1832. 1 seen off Berry Head, South Devon (SX/95) (Lydekker, 1896).
4. Autumn 1845. 1 stranded on Auskerry, Orkneys (HY/61) (Lydekker 1896, Watson 1981).
5. * 1878. 1 large white cetacean, probably of this species, seen in Lock Etive (NM/93) (Lydekker, 1896).
6. 1879. 1 caught in salmon trap at Little Ferry, Loch Fleet (NH/89) (Lydekker 1896, Taylor 1900).
7. * –/8/1880. 1 seen repeatedly in the Kyle of Tongue (NC/55) (Lydekker, 1896).
8. –/4/1884. 1 caught in salmon nets off Dunbeath. Skeleton preserved in University museum, Aberdeen (ND/12) (Lydekker, 1896).
9. * pre. 1900. 1 seen for several days off coast of Banffshire (NJ/66) (Taylor, 1900).
10. 10/6/1903. 1 caught at the mouth of the Tyne (NZ/36). The skeleton is preserved in the Hancock Museum, Newcastle upon Tyne (Anon. 1903, Meek 1904).
11. * Summer 1903. North Sea. Fishermen reported sightings off various parts of the north-east coast (Meek, 1904).
12. 19/8/1903. 1 18–20 ft. (5.5–6 m) specimen seen 110 m off the sea wall, the Spa, Scarborough (TA/0587) (Patterson 1903, Taylor 1929, Fraser 1956, Spalding 1966).
13. * –/9/1904. 1 sighted off Arran in the Kilbrannan Sound (NR/83) (Gibson 1976, Evans 1980).
14. early/4/1905. 1 55 st. (350 kg) 11 ft. 8 in. (3.5 m) specimen captured below Naburn Lock on the Ouse (SE/5944). Its skeleton is preserved in the Yorkshire Museum, York (Bunker 1905, Spalding 1966, Delany 1985).

15. –/10/1932. 1 young 8 ft. 6 in. (2.6 m) specimen stranded near Stirling, 25 miles (40 km) above the Forth Bridge (NS/89) (Fraser 1934, Norman & Fraser 1977, Evans 1980, Bonner 1980).
16. * –/4/1937. 1 sighted in Upper Loch Fyne (NN/00) (Gibson 1976, Evans 1980).
17. –/9/1948. 1 sighted off Cape Clear Island, Co. Mayo, Republic of Ireland (Fraser 1974, Evans 1980).
18. –/–/1950. 1 sighted off the island of Soay, near Skye (NG/41) Fraser 1974, Evans 1980).
19. * –/4/1952. 1 sighted in the Firth of Clyde, 3 km south-east of Arran (NS/02) (Gibson 1976, Evans 1980).
20. –/10/1960. 1 sighted between Mainland Orkney and Burray (ND/49) (Evans, 1980).
21. Late summer 1964. 1 sighted by many observers in Gourock Bay (NS/27) (Gibson & Anderson 1972).
22. –/11/1965. 1 sighted off Arrochar, Loch Long (NN/29) (Fraser 1974, Evans 1980). According to Evans (1980), this may be the same individual which appeared in Gourock Bay.
23. * 12.6.1987. 1 'white whale' seen by fishermen 24 km off Scarborough (*Scarborough Evening News*, 15/6/1987, *Whitby Gazette*, 19/6/1987).
24. 14/6/1987. 1 seen about 800 m off Whitby harbour mouth (NZ/91) (R. Swabey *pers. comm.*, *Whitby Gazette*, 19/6/1987).
25. 20/3/1988. 1 watched for five minutes breaching 250–300 m off sand dunes at Hadston, Northumberland (NU/20) (Lowry 1988).
26. –/5/1988. 1 adult seen off Balintore (NH/87). Video made by A. Webb, BBC Scotland, examined by Sea Mammals Research Unit.

Other North Sea and Temperate European records

27. –/–/1949. 1 entangled and drowned in salmon nets in the River Loire, France (Fraser 1974, Evans 1980).
28. –/4/1965. 1 sighted off Zuiderzee, Holland (Slijper 1967, Evans 1980).
29. –/5–6/1966. 1 seen up River Waal, Ousle Maal and Rhine, ascending upstream to central Germany (Slijper 1967, Evans 1980, Watson 1981).

A 1907 PLANT LIST FOR NUNBURNHOLME, EAST YORKSHIRE

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Introduction

In 1907, the Revd M. C. F. Morris published *Nunburnholme, its History and Antiquities* containing a list of 139 'flowers' found in the parish.

I came across the list over twenty years ago, but finding it difficult to know which of the uncommon vice-county species were acceptable, tended to disregard the whole list and have not used them as Nunburnholme records in my *Flora*. However, having recently been asked for my opinion on the list, I have re-examined it and believe I should make my comments available.

Reasons for Doubt

I found that in some cases at least, I could not rely on the accuracy of the Latin names and did not always know which species was meant by the English name used, as the following items illustrate

Trefoil, Lesser Yellow (*Trifolium filiforme*). Common.
Violet, Dog (*Viola canina*). Common.
Camomile, Wild, or Feverfew (*Matricaria parthenium*). Common.
Meadow-sweet, or Dropwort (*Spirea ulmaria*). Common.
Celandine, Common (*Chelidonium majus*). Common.

It seems most likely that Lesser Yellow Trefoil and Dog Violet are *Trifolium dubium* and *Viola riviniana* respectively. Both are widely distributed in the vice-county, whilst *Trifolium filiforme* and *Viola canina* have always been very uncommon. As far as I know, the English names Wild Chamomile and Feverfew have always been used to describe two different species, as have Meadow-sweet and Dropwort. Dandy (1958) gives *Matricaria parthenium* as a synonym for Feverfew (*Chrysanthemum parthenium*), while Morris (1907) gives the English name for *Matricaria inodora* as Corn Feverfew, suggesting that *Matricaria recutita* rather than *Chrysanthemum parthenium* was meant. Dropwort (*Filipendula vulgaris*) is locally frequent on chalk grassland, whilst Meadow-sweet (*F. ulmaria*) would probably also be present by the beck and by drains. Both species grow in the parish at the present time, so one does not know which species was meant. One wonders too if the Common Celandine really was *Chelidonium majus* or the Lesser Celandine (*Ranunculus ficaria*), which is likely to have been far more widespread in the area than Greater Celandine.

Such items undermine one's faith in the botanical competence of the compiler of the list. It seems that in some cases the English name has been translated into the Latin one, without regard to the characteristics of the plant concerned.

The introduction to the list states that Nunburnholme was not noted for its rarities. One wonders on what grounds this declaration was made. Morris cannot have known of Robinson's *Flora of the East Riding of Yorkshire*, published only five years before. Four species on the list are not included in the *Flora*: *Anemone pulsatilla*, *Campanula trachelium*, *Dianthus armeria* and *Viola canina*, whilst there are only one or two vice-county records for *Calamintha officinalis*, *Salvia verbenaca*, *Trifolium filiforme* and *Asperula cynanchica*. One would have expected a keen botanist to have been in touch with other Yorkshire botanists, to have known of the *Flora* and to have contributed to it.

Doubtful Species

Some of the species on the list represent important records, if one could be sure that identification was correct.

The most incredible item is:

Anemone, Pasque (*Anemone pulsatilla*). Common.

There has never been any other record for this species for the Yorkshire Wolds. It is now known on chalk only very locally from Berks. to Cambs. and on oolitic limestone from Gloucester to N. Lincoln (Clapham, Tutin & Moore, 1987). However, since it was formerly on Magnesium limestone in Durham near to the N. Yorks. border, it is not impossible that the species could have occurred at Nunburnholme; it seems unlikely it could have been mistaken for any other species. If it was once locally common on the Yorkshire chalk, it would be an important record.

Other records which if correctly identified would be significant are

Bell-flower, Nettle-leaved (*Campanula trachelium*). Fairly common.
Orchis, Butterfly (*Habenaria bifolia*). Rare.
Pink, Deptford (*Dianthus armeria*). Fairly common.
Cotton Grass (*Eriophorum vaginatum*) Rare.

There is one early vice-county record for *Campanula trachelium*, namely for Heslerton (Teesdale, 1794). It is generally regarded as not occurring north of the R. Humber (Clapham, Tutin & Moore, 1987), but we have one authentic record. It occurs in

Millington Wood. So again the record is not impossible, but the closely related *Campanula latifolia* which is locally frequent on the wolds and has been recorded recently for at least three places in the parish is not on the list.

Robinson (1902) gave four records for Lesser Butterfly-orchid. The only post-1930 record is a recent one, for a single plant on Skipwith Common. The species is most likely to have occurred on marshy ground on heaths in the vice-county, although it can occur in calcareous flushes and even less commonly in open woodland on calcareous soil. The Greater Butterfly-orchid (*Platanthera chlorantha*) has always been rare in the vice-county, but occurs on the wolds near Great Givendale and at Tibthorpe, the plants at the last locality being first recorded as *P. bifolia*. So again one cannot be sure which species was meant.

There has been no vice-county record at any other time for *Dianthus armeria* which, as a native, only occurs in the south of Britain where it is rare.

It is difficult to believe there was a suitable habitat for *Eriophorum vaginatum* at Nunburnholme. It occurs in damp peaty places. It is uncommon in the vice-county, all records being for the Vale of York, except for one 'near Beverley' (Baines, 1840).

Acceptable Species

Most of the acceptable species on the list are known to have been widely distributed in the types of habitat to be found in Nunburnholme. Of the rest, Herb Paris (*Paris quadrifolia*) and Traveller's Joy (*Clematis vitalba*), both described as fairly common, are acceptable. Herb Paris has been seen in small quantity in Bratt Wood in the parish in recent yers.

Other species which there seems no good reason not to accept are:

Calamint, Common (*Calamintha officinalis*). Fairly common.
Clary, or Wild Sage (*Salvia verbenaca*). Fairly common.
Woodruff, Small (*Asperula cynanchica*). Fairly common.

Robinson (1902) gave two records for *Calamintha officinalis* and there have been none since, the species being believed to be now extinct. *Salvia verbenaca* was rare at the beginning of the century, except as an alien on Hull docks (Robinson, 1902) and is still rare. Robinson (1902) gave one record for *Asperula cynanchica*; we still know it in the same locality and in one other. Records for these three species are significant.

Then and Now

On the list are arable weeds which are no longer in the area:

Corn Blue-bottle (*Centaurea cyanus*). Common.
Crowfoot, Corn (*Ranunculus arvensis*). Common.
Marigold, Corn (*Chrysanthemum segetum*). Common.
Corn-cockle (*Agrostemma Githago*). Rare.
Shepherd's needle, or Venus's Comb (*Scandix pecten*). Rare.

In Morris's day, *Centaurea cyanus* was described as frequent in corn fields and both *Ranunculus arvensis* and *Scandix pecten-veneris* as occurring in every corn field (Robinson, 1902). Five localities only were given by Robinson (1902) for *Chrysanthemum segetum* and only one locality, other than Hull docks, for *Agrostemma githago*, which had been a troublesome weed (Baines, 1840). *Chrysanthemum segetum* is still locally common on sand and peat, but scarce on the wolds. *Centaurea cyanus* and *Ranunculus arvensis* are now very rare in the vice-county whilst *Agrostemma githago* and *Scandix pecten-veneris* were last seen in 1957 and 1970 respecrively. The diminution or loss of these species is mainly due to the use of cleaner grain.

Summary

There are species on the 1907 Nunburnholme plant list which undermine one's confidence in the botanical competence of the author. As a result, there are serious doubts about some species listed, notably *Anemone pulsatilla* which was described as common. Of the

acceptable species, a few have always been uncommon or rare in the vice-county, whilst some of the arable weeds listed have become rare or extinct since Morris's time.

Conclusion

This list, compiled at a time when the wolds were largely unexplored botanically, is not the important contribution to East Riding plant records and botanical history which it ought to be. There are lessons to be learnt. Accurate identification my means of Latin names is essential. Voucher specimens deposited in the herbarium of a museum would have removed all doubt. Notes on habitat and precise localities would have been helpful.

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BOOK REVIEW

The European Garden Flora. Volume III, Casuarinaceae to Aristolochiaceae. Edited by **S. M. Walters et al**. Pp. xvi + 474, Cambridge University Press. 1989. £65.00.

With such a large number of prestigious editors, advisers and contributors, and the full co-operation of staff at Edinburgh, Kew, Cambridge and Glasnevin Botanic Gardens, as well as the Royal Horticultural Society Gardens at Wisley, *The European Garden Flora* is bound to be a major reference source for botanists and horticulturalists. This latest volume maintains the high standard set by its predecessors (see *Naturalist* **111**: 144, 1986).

Concise but lucid descriptions are given for families, genera and species, with a clarity of expression suited to both amateur and professional. Keys to all species are provided; although some criticism has been levelled at 3-column layout for works of this kind, in the reviewer's opinion this does not detract from their use in this instance since the typography and arrangement of the keys are so clear. Details are also provided of each plant's origin and some guidance is given at generic level on cultivation requirements both out-of-doors and under glass.

This volume contains accounts of the first 49 dicotyledonous families, including those containing many familiar trees (e.g. Betulaceae, Fagaceae, Salicaceae and Ulmaceae), aquatics (Nymphaeaceae), and succulents (Aizoaceae and Cactaceae), as well as the major flowering families of Ranunculaceae and Caryophyllaceae. The whole work when completed will form an invaluable compendium of up-to-date taxonomic and practical information, its usefulness extending far beyond Europe to all those throughout the world seriously concerned with horticultural matters.

VAH

TWO SPECIES OF *MELANOTUS-AGARICALES* NEW TO YORKSHIRE

JERRY COOPER
145 Wycliffe Road, Abington, Northampton NN1 5JJ

Members of the genus *Melanotus* are infrequently encountered by British mycologists. Bramley's 'Fungus Flora' (1985) lists two species for Yorkshire, *Melanotus horizontalis*, which was found during the British Mycological Society foray at Bramham Park in 1983 and *Melanotus phillipsii* (as *Crepidotus phillipsii*). The latter is perhaps the most commonly encountered species and is found on dead leaves and on grass stems in damp places. Two additional species have recently been added to the Yorkshire list, both associated with manufactured materials, and both probably adventive.

The genus *Melanotus* is characterised by species with small fruitbodies, a short excentric stem, purple-brown spores, and encrusted cap hyphae. The majority of the known species

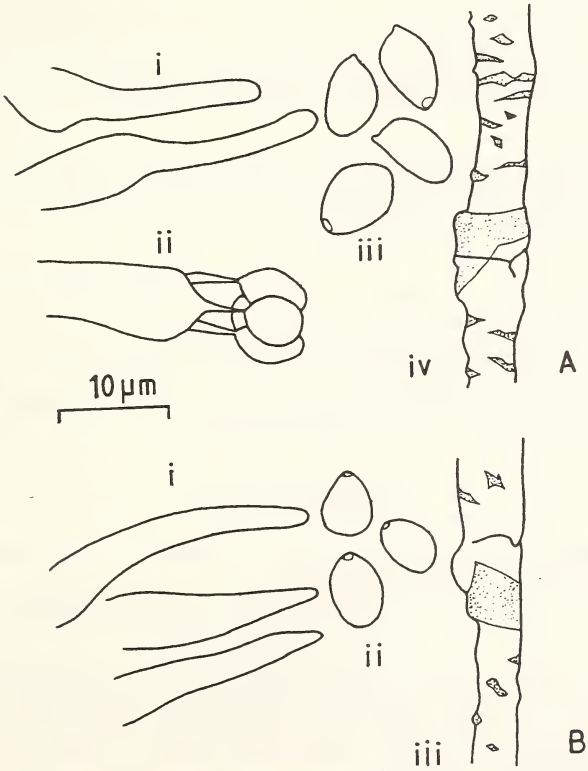

FIGURE 1
Microscopic characters of *M. textilis* and *M. hepatochrous*.
A *M. textilis*, i cystidia, ii basidium, iii spores, iv cap hypha.
B *M. hepatochrous*, i cystidia, ii spores, iii cap hypha.

are most common in equatorial regions and all are saprophytes growing on dead organic material (Horak, 1977).

In July 1987 a species of *Melanotus* was collected in Hull, TL 070290, growing on a rotten discarded carpet. The collection was identifed as *M. textilis*, originally described from North America (Redhead, 1984). This fungus has a taste for manufactured materials and has been collected from car seats, chairs, mattresses, rugs and 'blue jeans'! There is at least one other British record of this fungus, from Dunfermline, where it was found growing on a door-mat of South-east Asian origin. It is likely that both these collections are the result of spores introduced from abroad on the substrate material.

The second species new to Yorkshire was collected by Adrian Norris in May 1989 during the YNU VC65 meeting at Condenser Wood, SE 077915. The substrate in this case was the decaying remnant of a paper sack used for packaging pheasant grain feed. Macroscopically, the fungus was very similar to *M. textilis*, differing only in some microscopic characteristics. The collection was identified as *M. hepatochrous* for which there are at least three other British collections (Watling & Gregory 1987), two from Devon and one from Lancashire. *M. hepatochrous* seems to have less stringent requirements and has been found growing on wood and leaves as well as on old rope. Again, it would seem likely that this species has been introduced.

From my observations, it would appear that these two similar species are most easily separated by the form of their gill edge cystidia and the wall thickness of the spores (Figure 1). The cheilocystidia in *M. textilis* have a distinct neck whereas those of *M. hepatochrous* are uniform in outline. The spores of *M. hepatochrous* are thin walled, so thin in fact that the collection from Condenser Wood showed many spores that had collapsed.

Acknowledgements

I would like to thank Dr Derek Reid, Royal Botanic Gardens, Kew for his comments concerning *M. textilis*, and Dr Roy Watling, Royal Botanic Garden, Edinburgh for confirming the identity of the collections.

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BOOK REVIEW

Atlas of Prehistoric Britain by **John Manley**. Pp. 160, with 101 b/w and coloured plates, and 38 figures and maps. Phaidon. 1989. £22.50.

As one who has visited many of the sites illustrated so magnificently here, I can vouch for the accuracy of the way in which the prehistoric monuments are portrayed in their settings. The author gives a convincing account of the historical and environmental contexts in which monoliths, dolmens and stone circles were erected, and through excellent photography, line drawings and highly detailed maps, throws considerable light on this most mysterious period of our history. Since so many of the most outstanding examples so evocatively illustrated in this book are located in Ireland, it is somewhat unfortunate that this is not reflected in the title.

This work maintains the high standard we have come to expect from one of this country's leading art publishers, and although the text is insufficiently detailed for the scholarly archaeologist, the book will appeal to those interested in our landscape and our prehistory.

NOTES ON THE ECOLOGY OF A WINTERING DRAKE SMEW

J. LUNN and D. J. STANDRING

Introduction

The Smew *Mergus albellus* is an uncommon winter visitor to Britain, mainly occurring in East Anglia and south-east England, and its typical winter population is likely to be no more than a hundred birds (Lack, 1986). In Yorkshire, Smews reflect this pattern and are uncommon visitors in small numbers which can and do occur at any water, particularly inland (Mather, 1986). Occasionally, hard-weather influxes from the continent provide more numerous records. e.g. in early 1979 (Chandler, 1981), and in general 'redheads' (females and immature males) far outnumber adult males.

A 'redhead' Smew which arrived at Ingbirchworth Reservoir in January 1980 and subsequently as an adult drake every winter until 1987 provided both a welcome pleasure on many a dull winter's day for local ornithologists, and an opportunity to report some aspects of the species' wintering ecology.

Habitat Preferences

In all winters, the Smew spent most of its time at Ingbirchworth and Scout Dyke reservoirs, two of a trio of impoundments constructed for drinking water or river balancing storage, on the eastern shoulders of the southern Pennines between Barnsley and Huddersfield.

Ingbirchworth Reservoir (254 m above S.L., maximum depth 18m) is situated in an open and exposed landscape of stone-walled upland pasture, its only shelter being afforded by a belt of trees, predominantly Sycamore *Acer pseudoplatanus*, on its southern boundary. It has gently shelving stony shores, but marginal vegetation is sparse, with only occasional Goat Willow *Salix caprea*, Amphibious Bistort *Polygonum hydropiper* and Shoreweed *Littorella uniflora*.

Scout Dyke (222 m sbove S.L., maximum depth just over 12 m) is a smaller and narrower reservoir three kilometres south-east of Ingbirchworth in a more sheltered position in a natural valley. Further shelter is afforded by a fringe of Goat Willow and Sallow *Salix cinerea*, though in contrast to Ingbirchworth it is subject to recreational disturbance (angling and sailing). The third impoundment, Royd Moor Reservoir, lies midway between the other two but has a different character, probably being more acidic with a peaty substrate. It was little used by the Smew.

Typically the bird favoured the stream-fed inlet bays of both Ingbirchworth and Scout Dyke reservoirs. Wildfowl regularly interchange between all the sites, but have distinct preferences. The Smew's preference was also shared by Goldeneyes *Bucephala clangula* which favour the same inlets, and to a lesser extent by Tufted Ducks *Aythya fuligula*, Pochard *A. ferina* and Great Crested Grebes *Podiceps cristatus* which tend to use the whole of the same two reservoirs. Royd Moor Reservoir in contrast tends to be favoured by Mallards *Anas platyrhynchos* and Teals *A. crecca*.

Site Fidelity and Local Hard-weather Movements

The Smew remained faithful to the two reservoirs for seven successive winters, and even where severe weather caused the waters to freeze solid and the Smew was forced to emigrate, it returned to the sites when milder weather prevailed. Since drake Smews are locally rare, and the region is well covered by birdwatchers, it was possible to follow the bird's movements during these inclement periods. Locally it was seen at Gunthwaite Dam (5 km east), a small (less than 2 hectares) pool kept open by a strong stream inflow, and at Cannon Hall Park (8 km east north-east), where the Cawthorne Dyke is intercepted by a series of weirs to provide a chain of small ornamental lakes. This is one location where the bird did not look too out of place amongst the captive wildfowl collection!

Further afield the Smew was seen at Wentworth lakes (40 km south-east) in January 1984, and almost certainly this bird was on the River Don at Thrybergh in January 1982 and at Thrybergh Reservoir in January 1984, a further 5 km and 7 km east of Wentworth respectively. All these locations are at much lower altitude and remained open when the upland reservoirs froze.

Migration

Since the reservoirs are well-watched by local ornithologists, it was possible to obtain accurate arrival and departure dates which are given in Table 1. These are given as mean Julian day with standard deviation. The first observation was omitted from the calculations since the bird atypically arrived in January and could have been in the country some time before finding conditions at Ingbirchworth suitable for its stay.

	Arrival n=7	Departure n=8
Mean Julian day ± SD	326.6 ± 14.8	92.4 ± 14.3
Mean date	22 November	2 April
Earliest date	2 November	11 March
Latest date	14 December	20 April

TABLE 1
Arrival and departure dates for a wintering Smew *Mergus albellus* in Yorkshire.

Longevity

The Smew was aged as an immature male on first arrival in January 1980, hence it would have fledged the previous summer. Its last recorded date was in April 1987, giving a minimum age of just under eight years, though of course there is a possibility that it may have survived longer by using other locations in succeeding years.

Behaviour

The bird mostly remained alone, but was not unduly wary and could often be observed for long periods when feeding or resting. It tended to take flight with other wildfowl, especially at Scout Dyke where disturbance often forces birds to quit the inlet end of the reservoir.

Perhaps the most interesting aspect of behaviour was observed in early spring, when on a number of occasions it was seen displaying with courting groups of Goldeneyes, throwing its head back and raising its crest in typical style. At these times it also behaved aggressively to the drakes.

Discussion

Most of these observations accord with Cramp and Simmons (1977) although longevity and site fidelity are not specifically discussed. Arrival and departure dates fit into the periods given by Mather (1986) for Yorkshire, especially arrival, the main period of which he gives as November, although the Ingbirchworth bird stayed longer in spring than Mather's average March departure. The latest departure date (20 April) appears to be the third latest recorded in the county.

It is however interesting to note that winter site fidelity has also been recorded in Yorkshire before, at Almholme near Doncaster during five winters from 1968 to 1973

(Rhodes, 1988). Then a female was present for four winters, and a drake also for the last two of these. The drake then returned briefly again the following year without the female. There, arrival dates ranged from 31 October to 21 December (mean 3 December ± SD 22.2), and departure dates 19 March to 13 April (mean 4 April ± SD 8.3) though sample sizes are small (n=4). However the mean arrival and departure dates compare favourably with those of the Ingbirchworth bird, especially the latter.

SUMMARY

A drake Smew *Mergus albellus* spent seven successive winters at Ingbirchworth Reservoir, Yorkshire. Observations regarding habitat, site fidelity, hard-weather movements, migration, longevity and behaviour are discussed. Most aspects conform to present understanding of the autecology of the species, though wintering site fidelity and longevity are of particular interest.

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Y.N.U. BRYOLOGICAL SECTION: ANNUAL REPORT 1988–1989

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Sectional meetings during 1988 and 1989 have been held as follows:

Spring 1988 — Thorne Moors (VC 63), 30 April

Summer 1988 — Thorpe Hall, Braithwaite, Coverdale (VC 65), 3 September

Spring 1989 — Bridestones (VC 62), 29 April

Summer 1989 — Kiplingcotes and Wharram Quarry (VC 61), 9 September.

As usual, these meetings have been reported separately (Blockeel and Wall 1989, Blockeel 1990).

RECORDS

Recording continues at a low level in the county. The following list includes all new vice-county records and additional records of uncommon species. Recorders' initials: TLB = T. L. Blockeel; PCB = P. C. Bowes; DG = D. Grant; CW = C. Wall. An asterisk indicates a new vice-county record or amendment to the *Census Catalogue*.

Riccia fluitans: (63) 44/50 Arksey Ings, Doncaster, DG, Aug 1988.

Lophozia bicrenata: (63) 43/19 Thin soil on grit rock, Cranberry Clough, Upper Derwent Valley, TLB, Nov 1988.

L. incisa: (63) 43/19 Wet shale, Cranberry Clough, Upper Derwent Valley, TLB, Nov 1988. Second recent record for the vice-county.

Tritomaria exsectiformis: (63) 43/19 Peaty soil on flushed moorland bank, Upper Derwent Valley, TLB, Mar 1988. Second recent record for the vice-county.

Plagiochila spinulosa: (64) 34/97 On side of huge limestone boulder, Hagg Beck, Raisgill, Upper Wharfedale, TLB, Sept 1989. This is a western species commonly occurring on non-calcareous rock in the main part of its range. In Yorkshire it has a few stations on limestone at moderate altitudes in the north-west, and also occurs on pre-carboniferous rocks in the Ingleton and Sedbergh districts.

Odontoschisma sphagni: (63) 44/60 Hatfield Moor, CW, 1987.

Cladopodiella fluitans: (62) 44/89 Fen Bog, PCB, Jul 1988; (63) 43/19 Among *Sphagnum papillosum*, small bog near Slippery Stones, Upper Derwent Valley, TLB, Mar 1988. Second recent record for the vice-county.

Scapania compacta: (63*) 43/19 Peaty soil among grit rocks on boulder-strewn slope, Cranberry Clough, Upper Derwent Valley, TLB, Nov 1988. This species has very few records in the county, being commoner in southern and western Britain. Only a small quantity was present at this new site.

Calypogeia neesiana (63*) 43/29 On friable gritty soil in crevice of grit rocks, near to *Schistostega*, Agden Dyke, TLB, Feb 1988.

Ptilidium pulcherrimum: (63*) 44/71 On *Salix* in wet carr woodland, Thorne Moor, CW, 1988.

Frullania tamarisci: (63) 43/19 In small quantity on slightly base-rich grit boulder, Cranberry Clough, Upper Derwent Valley, TLB, Nov 1988. Second recent record for the vice-county. The other station is nearby in the Abbey Brook clough.

Marchesinia mackaii: (63) 43/58 On shaded Magnesian Limestone, Moses Seat, Lindrick, TLB, Jan 1989. Second record for the vice-county, the only other station being nearby at Anston Stones.

Lejeunea lamacerina: (63) 43/19 In small quantity under wet rock ledge under trees in lateral clough, Upper Derwent Valley, TLB, Mar 1988.

Cololejeunea rosettiana: (63) 43/58 On shaded Magnesian Limestone, Moses Seat, Lindrick, TLB, Jan 1989. Second record for the vice-county. This occurrence is parallel to that of *Marchesinia*: both species are associated at Anston Stones.

Sphagnum riparium: (64*) 34/86 In carr, among *S. palustre*, at NW of Malham Tarn, M. E. Newton, 1988 (*Bull. Br. bryol. Soc,* **54**: 24).

Dicranum fuscescens: (63) 44/71 Epiphytic on tree trunks in wet carr woodland, Thorne Moor, CW, 1988.

Octodiceras fontanum: (62*) 44/55 Submerged on stone embankment of R. Ouse, York, TLB, Sept 1988.

Tortula virescens: (63*) 43/59 At base of church wall, Tickhill, TLB, Jan 1988.

Tortula latifolia: (63) 44/40 On stone steps at edge of churchyard, Hickleton, TLB, Jul 1988. Although it usually occurs on the banks of rivers, this species is occasionally found away from water, on stonework, asphalt and similar substrates; 44/61 On concrete by sluice gate, R. Went, near confluence with R. Don, CW, 1989.

Tortula intermedia: (63) 43/59 On Magnesian Limestone, Maltby, TLB, Jan 1988. An occurrence on natural rock.

Aloina brevirostris: (65*) 44/28 On ledge of old quarry cutting, Well, north of West Tanfield, TLB, Sept 1988.

Aloina rigida: (65*) 44/28 On ledge of old quarry cutting, Well, north of West Tanfield, TLB, Sept 1988.

Aloina aloides var. *aloides*: (65) 44/28 On ledge of old quarry cutting, Well, north of West Tanfield, TLB, Sept 1988. The occurrence together of these three *Aloina* species at the same site is most unusual. The quarry floor has been restored to cultivation but some of the marginal rock faces are intact.

Phascum curvicolle: (63) 43/59 On soil among Magnesian Limestone rocks, Maltby, TLB, Jan 1988.

Leptobarbula berica: (62*) 44/65 On stonework at base of the Minster walls, York, TLB, Sept 1988.

Racomitrium aquaticum: (63*) 44/00 On sloping flushed grit rocks by stream, Marsden Clough, Holmfirth, TLB, Jun 1989.

Mielichhoferia elongata: (62) 45/50 and 45/60 In good quantity at Ingleby Greenhow, CW, Feb 1989. This is the known station, but it is encouraging to know that the plant continues to flourish in its only English locality.

Rhodobryum roseum: (62) 45/50 On roadside bank, among *Thuidium tamariscinum*, Ingleby Bank, Cleveland Forest, CW, Feb 1989.

Plagiomnium affine: (62*) 44/98 In wet marshy ground, Chafer Wood, G. Heffernan *et al.*, May 1988.

Rhizomnium pseudopunctatum: (63) 44/19 In very wet boggy flush, Upper Derwent Valley, TLB, Mar 1988.

Orthotrichum sprucei: (61) 44/76 On *Salix* by R. Derwent, Howsham Bridge, TLB, Apr 1989.

Ulota bruchii (*U. crispa* var. *norvegica*): (61*) 54/16 On *Salix* by pond, Thorpe Hall, Rudston, TLB, Aug 1989; (62*) 44/98 On Ash trunk, Chafer Wood, TLB *et al.*, May 1988; (63*) 44/71 On *Salix* in wet carr woodland, Thorne Moor, CW *et al.*, Apr 1988.

Revision of *Andreaea*

A full revision of British material of the genus *Andreaea* has been published by Murray (1988). It is clear from Murray's paper that the recorded distribution in the county of *A. rothii*, *A. rupestris* and *A. alpina* is substantially correct, with the qualification that all material previously referred to *A. crassinervia* should be included with *A. rothii*. *A. crassinervia* in fact is not reliably recorded from any British locality. Two additional species are reported from single localities in the county. These are *A. mutabilis*, which is likely to occur in further stations, and *A. frigida*, a surprising record of a species otherwise known in Britain only from a single locality in the Lake District and two in the Cairngorms.

The following records have been confirmed by B. M. Murray:

A. alpina:
(64) 34/77 Ingleborough, leg. Black, 1854 (BM).
(65) 34/69 Howgill Fell, leg. West, 4.1881 (BM); 35/82 Cronkley Hill, leg. Spruce, 6.1843 (E); Upper Teesdale, leg. Wesley, 6.1879 (BM); 35/82 Cronkley Scar, leg. Rowlands, 5.1928 (NMW).

A. rupestris var. *rupestris*:
(62) Cleveland, leg. G. Dixon, no date (BM).
(59 or 63) 34/92 Nr. Todmorden, leg. Wood, 1847 (BM).
(64) 34/67 Ingleton, leg. Cheetham, 12.1912 (E); 34/67 Ingleton Glens, leg. Duncan, 5.1926 (BBSUK); 34/76 Austwick, Ingleton, leg. L. H. Pegler, 5.1926 (BM); 34/77 Ingleboro, leg. Hooker, 1804 (E, BM); 44/26 Brimham, leg. Baker, 3.1856 (BM).
(65) 34/69 Howgill Fell, leg. West, 4.1881 (E); 34/69 Cautley Spout, leg. Ingham, 8.1909 (BM); 35/82 Cronkley Hill, leg. Spruce, 6.1843 (E); 35/82 Holwick Fell, leg. Ingham, 6.1897 (BM, E, NMW, DBN); 35/82 High Force, leg. Ingham, 6.1897 (BM, NMW, DBN); 35/82 Cronkley Scar, leg. Horrell, 8.1899 (S); 35/82 High Force, leg. R.B., 8.1904 (NMW); 35/82 High Force, leg. Trotter, 9.1958 (NMW); 35/92 Holwick Scar, anon., 6.1873 (BBSUK); 35/92 Holwick Scar, leg. D.V.M., 6.1933 (BBSUK).

A. mutabilis:
(65) 34/69 Cautley Crags, leg. West, 5.1905 (BM).

A. frigida:
(65) 35/82 Cronkley Scars, leg. Black, 9.1854 (BM).

A. rothii var. *rothii*:
(63) 43/29 Strines Reservoir, leg. Blockeel, 5.1981 (BBSUK).
(64) 44/15 Beamsley Fell, nr. Ilkley, leg. Baker, 5.1868 (BM).
(65) 35/80 Birkdale Tarn, leg. Milsom, 5.1937 (BBSUK).

A. rothii var. *falcata*:

(62) 45/50 Ingleby Greenhow, leg. Mudd, 1851 (BM).

(63) 34/92 Stansfield Moor, leg. Lawson, 4.1846 (BM); 34/92 Hebden Bridge, leg. Hunt, 6.1865 (BM); 34/93 Hebden Water, High Greenwood, leg. Blockeel, 12.1977 (BBSUK).

(64) 34/67 Ingleton, leg. Cheetham, 12.1912 (E); 34/76 Austwick, leg. Bellerby, 4.1915 (BM); 34/77 Ingleborough, leg. Hooker, 1804 (BM, E); 34/77 Ingleboro, leg. J. McAndrew, 5.1893 (E); 34/87 Pennigent, leg. Sadler, 1842 (E); 34/87 Pen-y-Ghent, leg. Whitehead, 6.1868 (E, DBN): 34/87 Pen-y-Ghent, leg. West, 3.1880 (NY); 34/87 Arco Wood, Ribblesdale, leg. Cheetham, 4.1914 (NMW): 34/87 Horton-in-Ribblesdale, leg. Cheetham, 12.1914 (E); 34/87 Ribblesdale, nr. Horton, leg. Milsom, 1.1923 (BBSUK); 34/87 Arcow Wood, leg. Milsom, 9.1930 (BBSUK).

(65) 35/82 Cronkley Fell, leg. Spruce, n.d. (E); 35/82 Cronkley, leg. Braithwaite, n.d. (E); 35/82 Mazebeck Scars, leg. Baker, n.d. (BM); 35/82 Mazebeck Waterfalls, leg. Baker, 6.1856 (BM); 35/82 High Force, leg. Black, 9.1854 (BM).

I am grateful to Mr D. G. Long (Royal Botanic Garden, Edinburgh) for details of these records.

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BOOK REVIEW

Atlas Florae Europaeae edited by **Jaakko Jalas** and **Juha Suominen**. Part I (pp. vi + 121, 47) £30.00; Part II (pp. vi + 122, 69, 129) £40.00; Part III (pp. vi + 168, 241) £50.00. Cambridge University Press. 1988.

Originally issued between 1972 and 1986 as seven separate volumes in paperback, these distribution maps have now been republished in three parts in a format matching that of *Flora Europaea*, which will be much more convenient for library use. They form a valuable adjunct to the *Flora*. Part I covers the Pteridophyta and the Gymnospermae, and Parts II and III cover the Angiospermae as far as the Caryophyllaceae.

As a result of its publishing history, the work so far is somewhat confusing to use, particularly in terms of pagination and indexes; this is bound to make difficulties when completed, as the final composite index will have to refer to pages within volumes, within parts! The relatively minor cost of renumbering the original pages would surely have been more than justified. Future errors in citation seem inevitable.

Since only about 10% of the flora has yet been mapped, this work will not be completed for many years, and alas, by that time, many of these first maps, some already nearly 20 years old, will certainly need major revision. Will this ever be feasible, as even now the cost will put the complete work largely beyond the reach of any but reference and research libraries? Nevertheless, for taxonomists, ecologists and phytogeographers throughout Europe (and elsewhere), this is an essential reference tool.

MRDS

OBITUARIES

FRED STUBBS

With the death of Fred Stubbs on 28 December 1988, the Yorkshire Naturalists' Union lost an outstanding naturalist. His father was a leading official of the Yorkshire Naturalists' Union and Fred became a member at an early age. He was educated at Oldham and gained a science degree at Manchester University where he made friends with such leading naturalists as Reginald Wagstaffe, curator of Stockport museum, Harry Britten and Douglas Hincks of Manchester museum. His teaching career led him to Durham where he served the County Conservation Trust for twenty years and was secretary of the Witton-le-Wear Nature Reserve.

On retirement, Fred moved to Wensleydale where he became a founder member and first Chairman of the Yoredale Natural History Society, stimulating interest in wildlife in a relatively under-recorded part of the county. For eight years he served the Yorkshire Naturalists' Union as Regional secretary, organising field meetings in VC 65. He also looked after the Leyburn Old Glebe Reserve for the Yorkshire Wildlife Trust.

Fred took a special interest in butterflies and moths and the moth-trap in his garden at Harmby provided many new records for north-west Yorkshire. Plant galls had always fascinated him and friendship with Arnold Darlington and Kit Rob inspired him to start a study group in Yorkshire; this flourished and expanded, leading to the establishment of the British Plant Gall Society at a meeting of the Entomological Section at Rotherham in 1985 with Fred as founding Chairman. His organising ability, infectious enthusiasm and genial friendliness will be sadly missed.

Our sympathy goes to his wife, Hilda and his daughters, Sheila and Hilary.

LL-E

FLORENCE HOUSEMAN

It was with a great sense of sorrow that we learned of the death of Mrs Florence Houseman, known to may of us as 'Flo'. Although some of us knew that she had not been well, it still came as a great shock. Flo was a most dedicated botanist, as was apparent to us all when she attended the field excursions. She had been active right up to the very end.

We all have many fond memories of Flo 'in the field' with her beloved flowers. She was tireless in her determination to find new plants. Many of us helped her in this pursuit, as she was at a disadvantage without her own transport. Taking Flo to find a new plant was a most exhilarating experience. We all learned from her and shared her enthusiasm.

She had a tremendous knowledge of the West Yorkshire flowers and had given help and advice for the updating of the Flora of the West Riding, especially concerning the wool aliens which she studied for many years. She was also the recorder for Alien Plants for a considerable time.

Many people would come to see her from all over the country and nothing pleased her more than showing new plants in her native area. As well as being a member of the Y.N.U., she was also a very active member of the Wild Flower Society and the Botanical Society of the British Isles.

She kept the most accurate and detailed notes of every place she visited. Her happy hunting ground was in the Highlands of Scotland, where she would not only 'shoot up a mountain side' to find one plant but would just as enthusiastically join in the spirit of things in the evening after a hard day's climb.

Her passing is like the end of an era. We shall all miss her.

ICL

BOOK REVIEWS

Finding and Identifying Mammals in Britain by **G. B. Corbet**. Pp. 56, illustrated with numerous line drawings and 19 colour plates. 2nd ed. British Museum (Natural History). 1989. £4.95 paperback.

The book comprises two main sections: how to find mammals and when found, how to identify them. The former includes guidance on techniques such as direct searching, signs (e.g. footprints, nests, burrows, food remains, droppings), road casualties, bird pellet analysis and trapping. The identification of mammals is achieved through descriptions of external features and skull characters. This section is appropriately very well supported by no fewer than 93 line drawings. These are a most vital adjunct to the text and of very considerable assistance in ensuring accurate identification. Many have been chosen with great care to highlight particular diagnostic features although possibly the inclusion of more scales would be helpful. I also feel the author could have amplified the differences between the females of the deer species.

Dr Corbet is to be congratulated on compressing so much useful information into so small and inexpensive a volume. This is an invaluable field guide which comprehensively covers every species of British mammal.

MJD

Whales of the World by **W. Nigel Bonner**. Pp. 191, 34 colour and 23 b/w photographs, and 60 line drawings. Blandford Press. 1989. £14.95.

In 1980 Nigel Bonner published 'Whales' in the Blandford Mammal Series. Nine years later, the same author and press have produced a successor, 'Whales of the World'. If you liked the first you will almost certainly enjoy the sequel; the two are complementary. If you do not know the first, the second is a worthy successor, and indeed a better book. It is more concise and mature, less self-conscious, better illustrated and wider- ranging in its treatment of species. The first chapter introduces whales great and small, running briefly over material that is dealt with at greater length in 'Whales'. Subsequent chapters cover in sequence the rorquals, right whales, bowheads, grey whales, sperm whales, oceanic dolphins, killer whales, arctic narwhals and belugas, beaked whales and river dolphins. The final chapter, on whales in the modern world, points out that the end of commercial whaling does not end man's killing of whales. Many thousands of dolphins drown accidentally in fishing nets each year; others die in polluted waters, and others again are driven ashore and slaughtered by fishermen who resent their competition. A good book, with much information packed between its covers.

BS

Polar Bears by **Ian Stirling**. Pp. 220. University of Michigan Press, Ann Arbor. 1988. $39.50

Ian Stirling works for the Canadian Wildlife Service. A first-rate field biologist, he has for many years studied polar bears in the Canadian Arctic and represented their interests in the corridors of government where their future is determined. He writes well — far more readably than most scientists or bureaucrats — and with complete conviction. He knows polar bears, has the greatest respect for them, and is firmly on their side. Read this book and I guarantee you will be on their side too. Picturesque even when scavenging a town rubbish dunp, polar bears are nobody's pets. Once past the cub stage, they are determined opportunists that survive by their wits. Without an ounce of sentimentality Stirling tells us of their life and times — often hard times in the harsh, uncertain environment of the Canadian north. He has chapters on techniques ('How do you study a polar bear?'), on their distribution, abundance, reproduction, behaviour, conflicts between polar bears and humans, conservation and environmental concerns. His account is stunningly illustrated by photographer Dan Guravich, in close-ups

revealing that he is clearly a brave man. Altogether this is a beautiful book on polar bears; I know of several others, but I do not know of a better one.

BS

The Barn Owl by **Iain R. Taylor**; **The Blackcap and the Garden Warbler** by **Ernest Garcia**; **The Nightjar** by **Peter Tate**; and **The Song Thrush** by **Eric Simms**, Pp. 24, with numerous line diagrams, black and white and colour photographs. Shire Natural History Publications, Princes Risborough. 1989. £1.95 each.

Four new publications in the well known, and excellent, Shire series. Although not intended to be comprehensive monographs written for the specialist ornithologist, they do provide a stepping stone between the general interest bird books and the full length textbooks.

Each is written by an expert, in clear, concise English, with well chosen photographs and interesting charts complementing the text. These books could act as a catalyst to turn the mildly interested bird watcher into a keen ornithologist and should come high on the list of presents for any budding naturalist, young or old. The price is less than that paid for some ephemeral magazines or a week's newspapers!

JEK

The Moths and Butterflies of Great Britain and Ireland. Volume 7, Part 1. Hesperiidae — Nymphalidae: The Butterflies edited by **A. M. Emmet** and **J. Heath**. Pp. 370, with 24 colour plates, 74 maps, and 22 b/w figures. Harley Books, Colchester. 1989. £49.50.

This is an exceptionally good book, combining the means for identification of British butterflies with much up-to-date authoritative natural history information. The professional, amateur-expert and amateur will all enjoy this book. Some 30 authors have been involved, including the late John Heath, who wrote up the accounts of the Purple Hairstreak and Large Copper. Basil Harley writes an appreciation of John Heath and the history of the preparation of the present volume.

This volume, like others in the series, contains more general review chapters. It deals with the vernacular names and early history of British butterflies and the re-establishment of insect populations, with special reference to butterflies. The historical account starts at 1634 and goes on to give some prominence to the work of Petiver who was active from the end of the seventeenth century. The workers of the eighteenth century are covered in detail, including the adoption of the Linnaean system by John Berkenhout in 1799 and of the higher classification of Fabricius by William Lewin. Lists of early vernacular and biological names used by Petiver and Lewin are also given in detail. The second review chapter covers re-establishments and introductions of butterfly populations and its account of such examples makes very interesting reading; the pros and cons of such activities are considered at length. The need to study the resource requirements and mobility of each species is particularly stressed. About three-quarters of British butterflies are fairly sedentary (i.e. adults do not fly more than 10 km) so that as suitable habitats become more patchily distributed, re-establishment may be the only means of getting a population back to a suitable yet empty habitat. Some butterflies have very special resource requirements. Thus the Heath Fritillary was lost from Blean Woods NNR for several years when coppicing ceased. The implications for the management of reserves are considered. Finally, a section deals with the need for the recording of re-establishments and introductions and examples are given of how this might be done.

Most of the book deals with the individual species. The check list, which is unusually detailed, seems to deal with 111 species and a further four subspecies of butterflies. The treatment of the Skippers (Hesperiidae) illustrates how the species are treated: 12 species are considered, including eight native species, the adventive species the Large Chequered Skipper, now breeding in Jersey since 1946, and three adventive non-breeding species: Mallow and Oberthur's grizzled Skippers from Europe and Fiery

Skipper from North America. First a description of the family is given, with a key to the nine breeding species. Then after a brief description of each subfamily and genus, each species is fully treated as follows: biological names and authorities, description of imago with major variations, pre-imaginal descriptions and phenology, including the plant species on which the eggs are laid. For the imago, further details on flight periods in different parts of the country, behaviour in terms of dispersal, flowers visited and habitats frequented are given. Then follow geographical distributions as illustrated by 10 km maps, histories of such distributions and reasons for changes in status, besides comments on vernacular names. The maps divide records into three periods: pre-1940, 1940–1969 and 1970–1988, except for Ireland where records are recorded for two periods, before and after 1960. Fine line drawings are provided for the genitalia of the Small and Essex Skippers, which are otherwise very similar. For the three adventives only details relating to the history of the captures are given. The adults, including the three adventive species, are fully illustrated in colour by Richard Lewington. Although each species is treated very fully, the pre-imaginal stages are not illustrated and very few of the varieties of each species are mentioned or illustrated. Thus of the aberrations of the Chequered Skipper, four aberrations are mentioned and two illustrated, while Howarth (1973) mentions 21 aberrations. For many species, vice-county maps are sometimes given for early records, including the number of records for each vice-county. For the common immigrant species, vice-county maps are also often given for notable invasion years, e.g. the Clouded Yellow year of 1983. There are 16 pages of references, including a special list of recent national and regional surveys. Other indices are a glossary of terms, authors of the systematic section, and host plants, besides the general index. The colour plates are very good and add greatly to the authority of the book. Overall, an outstanding volume that will be the standard reference book on the British butterflies for many years to come.

MEA

Local Lists of Lepidoptera, or a bibliographical catalogue of local lists and regional accounts of the butterflies and moths of the British Isles by **J. M. Chalmers-Hunt**. Pp. 247. Hedera Press/E. W. Classey, Uffington, Oxfordshire. 1989. £21.00.

The author has been collecting material for the present book for some thirty years and this has culminated in a list of over 3,000 titles of county, regional and the more substantial of local lists of lepidoptera within the British Isles and Ireland. Following a page of bibliographical references and a short introduction the work consists of a list of numbered references in alphabetical order of authors. Each entry provides name(s) of author(s), date of publication, title, pagination or a reference in the case of a serial publication and abbreviations denoting the counties covered by that item. Watsonian counties have been used throughout; thus the entries for Yorkshire include all that territory comprised in vice-counties 61 to 65 and therefore fully compatible with the boundaries used in the recently published 'Butterflies and Moths of Yorkshire'. Additional details are given regarding scarce, manuscript or annotated items, together with their current location.

The work ends with a list of counties and the serial numbers of items in the main list relating to that county. Thus the reader can tell that there are 144 references relevant to Yorkshire which can then be easily located in the text. The book contains a few errors which have escaped the proof reader; these include two instances of incorrect initials of authors (including those of the reviewer). These minor flaws do not detract from the value of this work, which contains an enormous amount of information which is otherwise unobtainable, and greatly simplifies the task of locating published records.

HEB

The Butterflies. The Pieridae by **Michael Easterbrook**. Pp. 24, with 32 plates, 25 in colour. Shire Natural History Publications, Princes Risborough. 1989. £1.95.

This book deals with the 12 species of the white and yellow butterflies of the British Isles, including the extinct Black-veined White and the recently recognised Berger's

Clouded Yellow. An introductory section deals with folklore, natural enemies and how adults choose food-plants for laying their eggs. Each species is then considered in turn, covering the following topics: recognition of adults and earlier life-stages, food-plants for the caterpillars, adult phenology, distribution, habitats and the harmful effects of man. The species accounts often refer to research by the I.T.R. into resource requirements, which are important in the conservation of species. A later section introduces methods of studying, breeding, conserving and monitoring the distribution of Pierids. Finally, some further reading is suggested and addresses of relevant organisations are given. The coloured plates, mainly of adults in natural poses, also include some earlier stages. Some of the plates are not quite in focus. Overall, a lot of information in a few pages and good value for money.

MEA

Lizards of the British Isles by **Peter Stafford**. Pp. 24, with 21 plates, 15 in colour. **Newts of the British Isles** by **Patrick J. Wisniewski**. Pp. 24, with 18 plates, 14 in colour. Shire Natural History Publications, Princes Risborough. 1989. £1.95 each.

The first work deals with the three native species besides the green and wall lizards of the Channel Islands, although seven other species are mentioned. After an introductory section, the lizard species are considered in turn with details of recognition, habitats, habits and food requirements besides 10 km^2 maps for the native species. (The Spurn record of the sand lizard is given.) Further sections cover the general life-cycle characteristics of lizards, conservation via habitat control and legislation and details of relevant societies with further reading.

The second work deals with the three native and five introduced newt species. The introductory section covers their characteristics, habits and folklore, followed by details of adult recognition (including a useful text table summarising the main differences of the adults), habitat and food requirements, enemies and defensive methods, besides an introduction to their elaborate courtship behaviours. A final section looks at conservation issues, including recent declines, special nature reserves for the crested newt, the importance of garden ponds and methods for estimating population numbers. A list of further reading is also given.

The colour plates in both books are mainly of adults to aid in recognition. Good value for money and a useful introduction to the British newts and lizards.

MEA

Animals in Primary Succession. The Role of Fauna in Reclaimed Lands. Edited by **J. D. Majer**. Pp. xii + 547, including 16 half-tones, 85 line diagrams and 62 tables. Cambridge University Press. 1989. £60.00.

Far too much of our world has become a waste land as a result of human exploitation. If we are to make any recompense it is essential to know as much as possible about the first steps in reclamation, the primary succession. From the theoretical point of view, too, these steps are of importance. What are the features which equip particular groups of plants and animals to thrive in apparently unfavourable conditions? Do these features necessarily make them poor competitors, so that they give way to later successional stages? Can the position of a species in the succession be predicted from examination of the distribution of energy between various functions and the relation of 'standing crop' to metabolism.

These questions, as well as the practical ones of ecological management, have most usually been addressed to plant associations. *Animals in Primary Succession* is a multi-authored collection of chapters on the fauna. The intention is to review the various ways in which animals influence the developing ecosystem on relaimed land. It is geared towards practical considerations of land reclamation. In Chapter 1 the editor reviews the problem and the general ways in which different administrative bodies have approached it. This is followed by two sections (eleven chapters by different authors) on functional

aspects, such as the influence of introduced fauna and other components of community, and practical considerations of what can be done to achieve the desired ecological patterns. Five chapters of case studies on successful reclamation projects follow. We hear a good deal about the negative effects of industrialisation in eastern Europe; one of these chapters outlines the work which has led to rehabilitation of large areas of land subject to open-cut coal mining in the German Democratic Republic. Others deal with similar problems in Australia, the Netherlands and the U.S.A. This section is followed by a chapter summarising and synthesising the themes of the book. It emphasises particularly the role of fauna in regulating nutrient cycles, dispersing seeds, reconstituting soils and diversifying the community so as to reduce the tendency of single species of plants or of animals to predominate with the risk of their achieving pest status.

The tone of the book is pragmatic. It provides a wealth of examples and an encouraging sense of optimism. It will be of great value to practical ecologists engaged in the kind of study discussed. For those without a broad knowledge of animal systematics, the bibliography, reference list and descriptive taxonomic list will be extremely useful, as will the accounts of parallel experiences of similar organisms by different authors in different places. The book does not answer the general ecological questions I raised at the outset, nor does it set out to do so, but it provides an important source of factual information bearing on them. At the price, however, this is a book for libraries rather than individuals.

LMC

Seas and Oceans by **Barbara Charton**. Pp. 458. Collins Reference Dictionary. Collins, Glasgow. 1989. £5.95. **The Oceans: A Book of Questions and Answers** by **Don Groves**. Pp. 203. John Wiley & Sons, Chichester. 1989. £8.50.

In the field of natural history, the late 1980s will be remembered for many reasons, due to the changing attitudes of both public and politicians to some of the most pressing matters currently affecting our planet. Pollution, the urban environment, nuclear power, acid rain, loss of habitats and many other urgent matters have concerned us over the past decade, but perhaps the most important issue is the state of our oceans and all the animals and plants which inhabit that environment.

Several books have recently been published on this subject, some of which will become important reference books whilst others will never be seen again. The two books discussed here are both intended to be works of reference for 'the man in the street', and not for academics. However, comparison of these two books shows differences in attitudes towards their intended readers. The *Collins Reference Dictionary* is factual, with good, soundly based information, in both the tradition of Collins and that of their standard dictionaries; it also contains appendices (geological time-scale; chronology of significant events since the seventh century BC; taxonomic classification of plants and animals). The second book seems to be more in the tradition of American television quiz shows, with over-simplified answers to questions most people would not even dream of asking.

Both of these books have their place, but as far as I am concerned the Collins will be used as a reference book, whilst I consider the other to have little more scientific value than a door-stop.

AN

The Names of Plants by **D. Gledhill**. Pp.vi + 202 with 7 figures. 2nd ed. Cambridge University Press. £22.50 hardback, £8.95 paperback. **The Identification of Flowering Plant Families** by **P. H. Davis** and **J. Cullen**. Pp.x + 134 with 8 figures. 3rd ed. Cambridge University Press. £20.00 hardback, £6.95 paperback.

Both these books are revised editions of previously published works and the fact that new editions have been called for is indicative of their usefulness. The problem of achieving uniformity in plant names and how a universally acceptable scheme for the standardisation of the specific naming of plants has been arrived at, together with

the rules governing botanical nomenclature, are clearly described in the first part of Dr Gledhill's book. The second part consists of a comprehensive glossary giving the meanings of more than 5,000 generic names and specific epithets.

Davis and Cullen's book consists of a brief explanatory section on floral structure and the use of the keys which follow. These keys are devised for the identification of all flowering plant families found either wild or in cultivation (outside or under glass) throughout northern temperate regions. The construction of such keys is fraught with difficulties and their reliability can only be proved by repeated testing with a wide range of species. The second edition incorporated many improvements resulting from such continued testing by classes of students. Since in the present edition the keys have been further modified to take account of 'errors and difficulties in use that have come to notice since 1979', we may safely conclude that they are now as free from pitfalls which beset the pathway of key construction as can well be achieved.

WAS

Morphology of Flowers and Inflorescences by **F. Weberling**, and translated by **R. J. Pankhurst**. Pp. 348, with 193 figures. Cambridge University Press. 1989. £55.00.

This book deals with flower and inflorescence structure of angiosperms and how this may vary according to their origin, development and position. The text is divided into three main sections. The first section deals with the shape of flowers as a whole and their individual parts. There is a strong emphasis on the developmental morphology and scientific terminology used to describe the different types of flower construction. The second section has much the same emphasis, but it covers the morphology and structure of mainly dicotyledonous inflorescences. The biology of pollination and seed dispersal is covered in less detail in the final section.

The detail and research into flower and inflorescence structure described within this book illustrates the thorough approach with which Weberling has dealt with this subject. There are many instances where the sentences in the text are rather difficult to understand, due partly to the number of technical terms and also the sentence construction. This illustrates the problem in translating such a technical work and I have a great deal of admiration for R. J. Pankhurst for translating such a difficult text. The numerous and clear figures do however help one to understand the points made and terminology used in the text.

Although this book is not about the systematics of flower and inflorescence structure it does, however, give many examples of individual species and families. There is more of an emphasis on the dicotyledonous flowers and no mention of two of the temperate regions, largest families, the *Gramineae* and *Cyperaceae*. The fact that this subject is generally out of fashion as a scientific subject is illustrated by the dates of the quoted texts. There is clearly a need for the careful scientific description of flower and inflorescence structure and I am sure it will become a useful textbook. The complexity and terminology of the subject of this book will, however, make this a choice for only the serious student of plant taxonomy and morphogenesis.

ADH

Developmental Biology of Fern Gametophytes by **V. Raghaven**. Pp. 361, with 81 figures and plates. Cambridge University Press. 1989. £40.00.

This book was written with biologists in laboratories, not landrovers, in mind, but has much to commend it to the latter. The author has competently and comprehensively reviewed current knowledge of the developmental biology of gametophytes, and draws our attention to this often neglected phase of the fern life cycle. He makes reference to field observations, and the significance of breeding systems with relation to fern biology, but concedes that our understanding of the role and behaviour of gametophytes

in natural conditions is sadly minimal. The focus of the text is therefore on the physiology, cytology and biochemical bases of gametophyte biology which have been revealed almost exclusively through study of ferns in culture. The sequence of spore, to multicellular gametophyte, and finally young sporophyte, is described in a simple and well-written way, with reference made to familiar, unusual and rare species. The enthusiastic style carries the reader through the more complex biochemistry involved in spore germination, to the fascinating ways in which different ferns construct their sexual stages. The still widely accepted myth that fern gametophytes are hermaphrodite, self-fertilising organisms which produce highly polyploid sporophytes is neatly exposed; ferns which produce sporophytes without any sexual stages (and their problems and potential) are discussed. The only regrettable omission I could find (apart from the absence of a glossary) was that of recent studies which have shown at least some gametophytes are more resistant to environmental extremes (and, indeed, more widespread) than their sporophytes; hopefully, this book will prompt more field biologists to look out for these important organisms.

ES

Cumbrian Woodlands: Past, Present and Future edited by **J. K. Adamson**. Pp. 88, with 4 colour plates, 2 b/w plates, many figures and tables. HMSO. 1989. £7.10.

This publication, which originates from the Institute of Terrestrial Ecology, deals with all aspects of the broadleaved and coniferous woodlands of Cumbria, be it related to employment (farming, forestry, recreation) or nature and landscape conservation. The chapters of particular interest to natural historians are those dealing with the history, biotic composition and nature conservation interests of woodlands. In developing a nature conservation policy, the importance of the historical factor is stressed besides the criteria of diversity, rarity and naturalness. Cumbria has a wide range of woodland types, varying from woodlands on the calcareous lowlands to the very acid exposed uplands. The importance of the high altitude oak woods and of the moss, liverwort and lichen flora is particularly noted. However, it is also shown that only about 8% of the area is wooded, of which just over 2% is ancient or ancient semi-natural woodlands so that very little has survived from the past. Other chapters are concerned with the economics of the various management and harvesting options available. The importance of various management systems are studied in terms of rural populations, effects on water quality and woodland amenity and recreation. An interesting chapter explores how particular mixtures of mycorrhizal species may be used in the future to increase nutrient release for the benefit of the trees and thus reduce or even eliminate the need for the application of fertilisers. A final chapter considers various agroforestry options which when applied seem generally to increase wildlife diversity. There is a great deal more of interest in this book for the natural historian than you might suspect on a cursory glance.

MEA

Plant Names of Mediaeval England by **Tony Hunt**. Pp. 334. Boydell & Brewer, Woodbridge, Suffolk. 1989. £35.00.

About half the English names of plants to be found in popular flower books today were coined in the nineteenth century. Of the remainder, the earliest listed in the *Oxford English Dictionary* are said to have originated in the sixteenth century. In this scholarly book Tony Hunt has put into print for the first time more than 1,800 vernacular names from the previous three centuries, extracted from more than sixty mediaeval medical manuscripts, the earliest of which is dated 1280. Over one third of these are not in the OED, and 89 of those that are turn out to be much earlier than stated therein.

As the author points out in his preface, he has approached the subject as a linguist, not as a botanist. The vernacular names are listed here in the form of a dictionary

under alphabetically arranged Latin headwords. Immediately following the headword is a botanical identification, which as the author says 'is the most hazardous part of the study'. He is cautious about his identifications, often proceeding no further than genus, and elsewhere making liberal use of question marks in cases of doubt. There follow the vernacular names each with a sign referring back to the list of manuscripts that is given in the introduction where full bibliographical information is provided.

The dictionary is the main part of the book, followed by indexes of vernacular and botanical names. As an example, when *Rubus fruticosus* is looked up in the botanical index, the reader is referred to seven Latin headwords. On consulting these it appears at once that the same names were used for mulberry and blackberry, perhaps because apothecaries regarded the fruits as interchangeable in prescriptions. It is interesting that the English words 'brambell' and 'brere' (also applicable to *Rosa* spp.) and the French word 'ronce' were in use very early; bramble leaves were known as 'ciouns de ronce'.

Hunt carried out the research reported in this work in the course of writing another book on *Popular Medicine in Thirteenth Century England* which is to be published shortly. In order to understand mediaeval medical MSS a trilingual dictionary is needed, which accounts for some 400 of the vernacular names listed here being French. There is an interesting section in the Introduction on the sources of mediaeval botany, and a bibliography of dictionaries and glossaries and books on related subjects. The book will be of interest to linguists and other people who like to know about the names of plants; it has made the reviewer look forward to the forthcoming book on mediaeval medicine.

FHB

Sir Joseph Banks 1743–1820 by **Harold B. Carter**. Pp. xii + 671, with numerous b/w plates, line drawings, and coloured frontispiece. British Museum (Natural History), London. 1988. £45.00.

This scholarly and handsomely produced work is a fitting tribute to its subject. Sir Joseph Banks was almost certainly the foremost influence on biological sciences during his lifetime, and indeed for many years afterwards; the effects of his many enterprises are still in evidence today, as for example the results of his management of the Royal Botanic Gardens at Kew, his introduction of new plant species to this country, his establishment of natural history collections and scientific institutes, and his initiation of all kinds of scientific investigations.

His influence did not stop at our own shores: his multifarious activities embraced much of the known world of his day, not only through his own travels and the other expeditions he furnished, but through his very extensive correspondence; he made the whole natural world his province. A great traveller, he will be best remembered for his role as resident scientist on 'Endeavour' with Captain Cook on his first voyage to the Pacific, as a result of which Banks formed a lasting association with Australia. His own travels and botanical expeditions and those of others he inspired to follow him form an important part of Australian history, and lasting traces of them, such as the names of plants and places, are frequently encountered by the modern traveller; he was also instrumental in the introduction of both convicts and Merino sheep to Australia.

Harold Carter brings this innovative and industrious man to life, providing insights into his background, his development, and his influence over half a century upon his contemporaries in many spheres of life. He paints an excellent picture of this exciting period of British scientific and geographic discovery, dealing ably with the complex mass of material, particularly Banks's vast correspondence. The whole is amply supported by a wealth of illustrative matter in the form of plates, maps and tables, together with an outstandingly detailed index, and, on the final endpapers, a chronological chart of his life which clarifies his periods of residence and travelling.

A remarkable book on a remarkable man.

MRDS

The Search For Natural History. The Origin of the Darlington and Teesdale Naturalists' Field Club by **Barry Hetherington**. Pp. 46. The Arkle Press, Arkengarthdale. 1987. £2.00 paperback.

The history and work of the founders of our Natural History Societies is becoming of increasing interest as shown by the recent articles about the Goole Society and Thorne Moors. This little booklet deals with the early members and their work in the Darlington club from 1891 to 1920. It also gives some of the few remaining records from two earlier societies, one founded in 1860 and another known to be already active in 1793. The information on this latter society is derived from a book on its work in 1793 and 1794 which included a catalogue of rare plants in County Durham. This list, which includes lichens and fungi, gives in many cases both the locality and habitat and could be of use to modern workers.

The modern Darlington club, although founded in 1891, amended its name to the Darlington and Teesdale Naturalists' Field Club in 1896 in view of the scope of the work being carried out in the Tees Valley. This work included the study of the glacial geology of the area at a time before the chronology of the Ice Ages was understood.

Various visits and meetings of the club are described in the booklet as well as the work of the more interesting members. Whit-Monday of 1892 saw the first joint meeting with the Yorkshire Naturalists' Union at Barnard Castle and the Darlington club was elected to the Union on that date.

There are lists of specimens in this booklet covering different subjects from Butterflies to Land and Freshwater Shells. The booklet will be mostly of local interest but is well written and shows the enthusiasm and ability of the early Darlington Natural Historians.

MJY

Thinking Green edited by **M. Allaby**. Pp. xii + 260. Barrie & Jenkins, London. 1989. £14.95.

This book is a collection of articles and extracts which aims to illustrate the development of thought about environmental matters and also to provide a background for understanding current environmental issues. The extracts come from a series of influential writers, such as the 1798 essay on population by Thomas Malthus and the 1968 article by Garrett Hardin on the tragedy of the commons, or from reports addressed principally to governments, such as the Brandt Report and the World Conservation Strategy, both from 1980.

This is a good introduction to environmental issues and writings on the subject (though I would dispute that it contains 'all the great writing on ecology and the environment', as the cover publicity maintains). The book's main title is appropriate, however; this is a book to make one think about environmental subjects. The principal thought that the reviewer was left with was that if so many current problems had been foreseen, for example by Marsh as long ago as 1864, why have responses to these problems still not been adequately developed?

WHGH

A Neotropical Companion by **John C. Krichner**. Pp. xii + 436. Princeton University Press. 1989. $45.00 hardback, $16.95 paperback.

This book is intended as an introduction to the biology of tropical Central and South America. It provides excellent basic information on the tropics, even including how to avoid the hazards of travelling there!

The author gives an initial overview of the different tropical ecosystems, but most of the book is devoted to the structure, function and evolution of tropical rain forests. Most examples are from the animal kingdom, birds being particularly well covered, but there is also a separate chapter on tropical drug-plants. The epilogue outlines the threats towards

tropical vegetation and points out the need for quick action for conservation in this region. The book is recommended as a most readable primer, and although this reviewer would have liked more botanical examples, the interested reader can easily remedy this by using the extensive reference list.

PMJ

Taming the Flood: A History and Natural History of Rivers and Wetlands by **Jeremy Purseglove**. Pp. xii + 307, with 29 colour and 72 b/w photographs, 24 maps and 44 line drawings. Oxford University Press. 1989. £9.95 paperback.

This attractively produced volume combines practical information, ecological knowledge, aspects of history, poetry and forceful argument to explain how and why the wetlands of England and Wales have changed so dramatically over the past 400 years.

The first seventy pages describe the interaction between mankind and British rivers and outlines the history of river management until the Second World War. The work then moves on to examine the economics of drainage and explains why ecologically damaging practices have developed. There is a long and fascinating section on the wildlife associated with osiers, reed beds, pollarded willows, watermeadows, haymeadows and other aquatic habitats which also emphasises their economic importance. The book closes by examining various drainage proposals of the 1970s and 1980s in order to show the issues involved and how the tide of opinion has changed as more people were alerted to the wildlife and landscape losses which occurred when drainage schemes were implemented.

Many facets of the conflict of interests between farmers, drainage authorities and conservationists are clearly set out, but it is always clear where the author's sympathy lies. Indeed, it could be claimed that the case against the farming interest is sometimes overstated. Nevertheless, the work makes a very useful contribution to the growing debate on how wildlife can be conserved in the British countryside. There is a wealth of references which will be of use to students and academic readers, whilst the light, lively style should appeal to a wide range of natural history enthusiasts and others who cherish our countryside.

DEC

The British Museum Book of Cats: Ancient and Modern by **Juliet Clutton-Brock**. Pp. 96, fully illustrated in colour, b/w plates and line drawings. British Museum, London. 1988. £9.95 hardback.

The Domestic Cat: The Biology of its Behaviour edited by **Dennis C. Turner** and **Patrick Bateson**. Pp. x + 222, with numerous b/w plates, line drawings and tables. Cambridge University Press. 1988. £35.00 hardback, £15.00 paperback.

The 'domestic' cat has a long history of co-existence with man, but its particular fascination for us lies in the fact that it has never been completely domesticated; it accepts home comforts but behaves in an apparently independent fashion, always capable of reverting to a feral state if occasion arises.

As Clutton-Brock's well chosen illustrations show, the cat's elegant appearance and air of enigmatic mystery have appealed to artists of all nations throughout the ages. This book will give pleasure not only to admirers of cats, but also to all those who appreciate fine art.

Turner and Bateson are to be heartily congratulated on bringing together a wide-ranging and thought-provoking collection of review articles, arising from an international symposium held in Zurich in 1986. Although a work of solid science, the twenty-one contributors have admirably succeeded in fulfilling their brief that articles should not only serve as up-to-date reference sources for scientists, but should also be accessible to the layman interested in animal behaviour, especially the cat owner and breeder. Following a short introduction, there are sections on: Development of young cats, social life, predatory

behaviour, and cats and people. A postscript addresses itself to answering some of the many puzzling facets of cat behaviour, such as why do cats purr and do cats think? The whole work is supported by a long and detailed bibliography. Both books, in different ways, are strongly recommended.

VAH

Henderson's Dictionary of Biological Terms edited by **Eleanor Lawrence**. Pp. x + 637. 10th edition. Longman Scientific & Technical. 1989. £17.95.

A new edition of this well-known reference work is most welcome, since although reprints and paperbacks have been available, it is ten years since the previous edition, and biological knowledge since then has advanced very considerably, notably in such areas as biotechnology (particularly genetic engineering) and cell biology.

The editor and publisher are to be warmly congratulated for up-dating this highly respected and essential reference work.

Dictionary of Biology edited by **W. G. Hale** and **J. P. Margham**. Pp. viii + 565, including line drawings. Collins. 1988. £4.95 paperback.

This inexpensive reference source is primarily intended for the undergraduate and upper secondary school student, but is also likely to be a useful and affordable dictionary for the general public. It contains 5,600 entries, more than 300 of which are illustrated with line drawings.

Chambers Biology Dictionary edited by **Peter M. B. Walker**. Pp. xii + 324. W. & R. Chambers/Cambridge University Press. 1989. £8.95 paperback. **Chambers Science and Technology Dictionary** edited by **Peter M. B. Walker**. Pp. xvi + 1008. Chambers/Cambridge University Press. 1988. £30.00 hardback, £16.95 paperback. **Chambers Concise Dictionary of Scientists** compiled by **David Millar, Ian Millar, John Millar** and **Margaret Millar**. Pp. 461, including numerous b/w plates. W. & R. Chambers/Cambridge University Press. 1989. £14.95 hardback.

Chambers, the well-known publisher of dictionaries and encyclopaedias, has joined forces with Cambridge University Press to provide us with three useful titles. The advent of the electronic database has revolutionised production of this type of reference work and one would therefore expect to see reasonably frequent up-dated editions at affordable prices.

The *Biology Dictionary*, extrapolated from the database of the *Science and Technology Dictionary* contains *c.* 10,000 descriptions and will be of great use to those engaged in a wide range of biological disciplines, since such areas as chemistry, biochemistry, medicine, behavioural studies and statistics are covered, as well as botany, zoology and genetics. Numerous important topics, such as the photosynthetic pathway, the genetic code, and radiation, are given fuller coverage.

The parent work, the *Science and Technology Dictionary*, with 45,000 entries, embraces not only the biological component of the above dictionary, but also much more besides, with coverage of engineering, architecture, physics, astronomy, geology, computing, etc., and a more extensive treatment of chemistry, medicine and behavioural studies.

The title, *Concise Dictionary of Scientists*, is slightly misleading, in that the conciseness lies in the number of scientists included, rather than particularly concise entries for each scientist. It has to be said that the compilers' choice of subjects is somewhat eclectic; naturally, in a work containing only 1,000 entries, many well-known names are inevitably omitted, and therefore the usefulness of this work as a true 'dictionary' is thereby diminished.

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A QUARTERLY JOURNAL OF NATURAL HISTORY FOR THE NORTH OF ENGLAND

The pipistrelle bat (*Pipistrellus pipistrellus* Schreber) on the Vale of York — *M. J. A. Thompson*

The feather-wing beetles of Yorkshire (Coleoptera: Ptiliidae) — *Colin Johnson*

The lichen flora of industrial Teesside — *M. R. D. Seaward*

Published by the Yorkshire Naturalists' Union

Editor **M. R. D. Seaward**, MSc, PhD, DSc, FLS, The University, Bradford BD7 1DP

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Photographic Plates

Readers of *The Naturalist* will have noticed that the number of photographic illustrations has increased in recent years. Good clear photographs, suitably captioned, to accompany articles or as independent features, such as the bird portraits by Arthur Gilpin in recent issues, are always welcome.

To encourage this development, a long-standing member of the YNU, who wishes to remain anonymous, has most generously offered to make a donation, the income from which would finance the publication of a plate or equivalent illustration in future issues whenever possible. The editor, on behalf of the YNU, wishes to record his deep appreciation of this imaginative gesture.

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THE PIPISTRELLE BAT *PIPISTRELLUS PIPISTRELLUS* SCHREBER ON THE VALE OF YORK

M. J. A. THOMPSON

Presidential Address to the Yorkshire Naturalists' Union, Scarborough 2 December 1989

Historic Perspective and Classification

Little is known about bat evolution, but well preserved bat fossils from the early Eocene and Oligocene periods, some 55 million years ago, have been discovered. These fossils differ little anatomically from present day Michrochiropteran bats.

The word 'bat' is probably derived from the Scandinavian 'ledhrblaka' or 'leather-flapper'. The old Norse name is from 'blaka' to flap, hence one gets such local varients as back, backie, bakke to name but a few (Barrett-Hamilton 1910). The Rev. J. C. Atkinson in his book *Forty Years in a Moorland Parish*, published in 1891, describes vividly a conversation he had, in broad Yorkshire, with a local character from North York Moors. The individual in question called a bat, which had woken him one night, as a backbearaway or black-bear-away. Other words, used to describe bats, are derived from the Dutch word 'vlinder' or to flitter, which can be compated with the German word 'fledermaus' (Barrett-Hamilton 1910),

Until the mid-nineteenth century, the Pipistrelle bat in Britain was known as the Common Bat and the species name *Vespertilio murinus*, given by Linnaeus in 1757, is generally accepted by naturalists. The name 'pipistrelle', used more commonly on the Continent, came in later, and was of French-Italian origin derived from the Latin 'vespertilio' or vesper 'the evening' (Barrett-Hamilton 1910).

The first classified description of a bat in British natural history literature is in Christopher Merret's Pinax, published in 1667. Named a flittermouse or rear mouse, he places it in Rerum Naturalium Britanicum Conteneus under Aves Britannica, the bird section. By 1693 John Ray in his Synopsis Quadrupedum states of the bat or flittermouse 'Quadrapeda multifida vostro-breviose anomala et primo volatica seu vespertilionis'. Here was a first attempt to classify the bat as a four legged animal and in a section called Vespertilio.

Shortly after Linnaeus's classification, L. J. M. Daubenton's contribution to Buffon's *Histoire Naturelle*, edited by E. L. Clerc, gave the first description of a pipistrelle bat (Daubenton 1760). Gilbert White, in a letter dated 9 September 1767 to his friend Thomas Pennant, wrote 'At present I know only of two species of bats, the common *Vespertilio murinus* and *Vespertilio auribus*'. Of the latter species he was referring to the long-eared bat. In the previous year Thomas Pennant had illustrated what he called the Short-Eared Bat in *British Zoology*. Gilbert White's Natural History of Selbourne was first published in 1789. Well before that date in 1775, the German naturalist, J. C. D. von Schreber, first recognised Daubenton's description of the bat in *Histoire Naturelle* — as La Pipistrelle. Hence, Schreber's name is appended to the pipistrelle's species name. *V. murinus* Linn. has subsequently been used in the classification of the parti-coloured bat.

Various other attempts were made to classify the pipistrelle, including W. E. Leach's description in the *Zoology Journal* in 1825 of what appeared to him to be a new species of pipistrelle, the one specimen of which he sent to the Conductors of the Journal, was a female with active mammary glands. He named it *Vespertilio pygmaeus*, but from the specimen taken from Spitchweek, near the Forest of Dartmoor in Devon, he was handling, I think, a specimen of *Pipistrellus pipistrellus*. The controversy over the classification of the pipistrelle bat in Britain was finally settled on 3 February 1829, when the Reverend Leonard Jenyns read a paper to the Zoological Club of the Linnean Society

entitled 'Some Observations on the Common Bat of Pennant: with an Attempt to prove its Identity with the Pipistrelle of French Authors'. He accepted, like others, the species name *Vespertilio pipistrellus*, which was later changed to *Pipistrellus pipistrellus* as the taxonomy of the small British bats was more fully understood, and all were placed in the family Vespertilionidae. *P. pipistrellus* is in the Genus *Pipistrellus*, which is widely represented throughout the world, with four species found within Europe.

Problems over classification rumbled on in Europe well into that century. In most of these early classifications, once a mistake in identification had been made, it was often perpetuated by succeeding authors, without any serious attempts to come to terms with the animal's taxonomy. Barrett-Hamilton (1910) assembled the first comprehensive reference list for the pipistrelle bat. The majority of volumes or papers on that list I was able to consult at the Linnean Society library in London, and this historical perspective is based on them.

Description

The pipistrelle is a small sized bat, with short ears containing a short curved blunt tragus and post calcar lobe. The pelage is variable, but predominantly medium to dark brown, or even black, on the back, with a paler underside. Dark orange pelages have been described. Juvenile bats are usually darker brown or grey, especially the underparts. The wing membranes, ears and face are very dark brown, or sometimes black. The muzzle is short, and with glandular swellings. The wing membrane, when held to the light, is opaque; the wing itself being narrow, compared with other species of bats (Stebbings 1977).

Measurements

As with other bat species, there is a wide range in body measurements. Of these, one of the most important is the forearm length, which can be used in situations of doubt when identifying small bats. Table 1 gives this field measurement on female adult bats (range 28–35 mm), taken by a number of authors.

TABLE 1
Field measurements of female adult pipistrelle bats.

Region or district	Sample (n)	Mean in mm	Stand. dev.	Author
Dorset	40	31.51	0.507	Stebbings 1968
North Yorkshire	136	32.6	0.7	Thompson 1977
Southern Sweden	502	31.3	0.76	Lundberg 1989

Stebbings (1973), working on forearm size clines with *P. pipistrellus*, concluded that there are substantial size differences between female colonies in Britain, and that these correlated with temperature, relative humidity and saturation deficit and, possibly, wind speed. The forearm length growth in juvenile pipistrelles is completed at 5 weeks old, and the young fly at 3 weeks old (Kleiman 1968).

Other measurements consist of head and body length 35–45 mm, wingspan 190–250 mm, ear 8–11 mm and condylobasal length 11–12 mm. There are considerable variations in weight in the pipistrelle bat, depending on age, sex and time of year. At the end of hibernation, females weigh about 3.9 g and males 3.7 g, whereas autumnal pre-

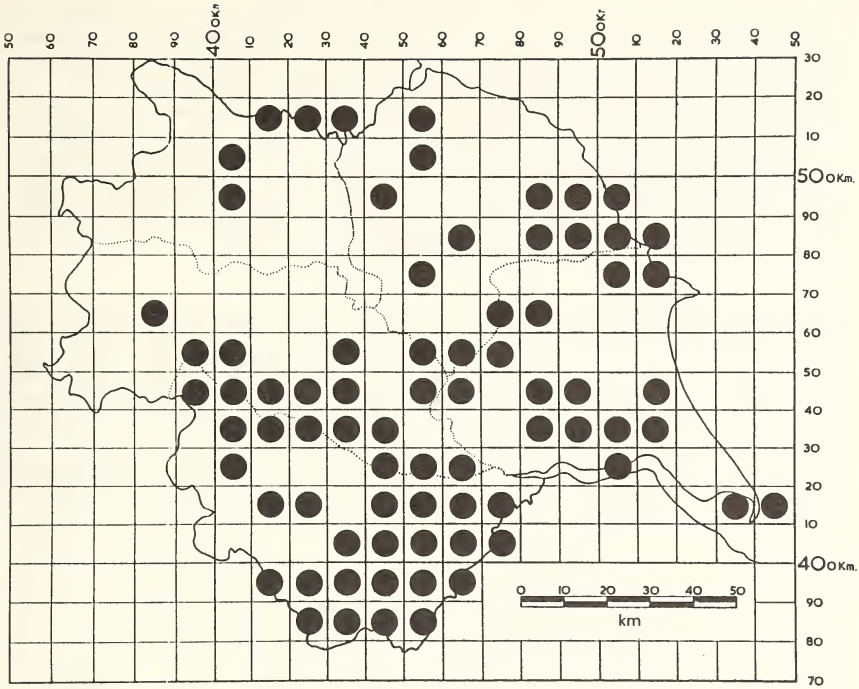

FIGURE 1
Ten Kilometre Square distribution map for Pipistrelle bat *Pipistrellus pipistrellus* for Yorkshire 1979–1989 (C. A. Howes).

hibernation weights are meaned at 6.8 g for females and 6.3 g for males (Stebbings 1977). Anti-partum females can weigh up to 7.0 g. In analysing of weight differences between juvenile bats on the Vale of York, Thompson (1984) found a highly significant difference ($p = 0.009$), males being lighter than females.

Distribution

Besides being the smallest and most abundant British bat (Stebbings 1977), the pipistrelle is the most widely distributed in Britain (Arnold 1984). It is also found throughout the Western Palaeartic. In Yorkshire the pipistrelle is the most recorded species (Figure 1 — Ten kilometre square distribution map for *Pipistrellus pipistrellus* for Yorkshire. C. A. Howes 1989). Historical records for Yorkshire indicate that it has always been a common species (Thompson 1985). Clarke and Roebuck (1881) describe it as being generally distributed and abundant.

Between 1985 and 1987, an attempt was made to get some measurement of abundance of *P. pipistrellus*. Ringing returns around York indicated that pipistrelles have discrete nursery colonies. Hence, within a 12.6 kilometre radius from York Minster, which makes up an area of 500 square kilometres, as many colonies as possible were located. The maximum numbers of bats emerging at dusk, at each colony, were counted. The numbers were calculated for adult females only, before the juvenile bats were flying at the beginning of

July. It was estimated that there were between 26 and 30 discrete colonies around York, giving an average of 84 bats per colony. Assuming that males were present in equal numbers within the same area, although this is unlikely, it was calculated that the average density was one bat in 10.7 (± 1.0) hectares (Walsh, Stebbings & Thompson 1987),

This is not a useful figure at this stage, for it needs others to do similar survey work in other parts of Britain to make comparisons. York, for instance, within its central core, has high urban development, an unfavourable habitat for bats. Nevertheless, over a period of time, such an annual figure could be an indicator of increasing or declining numbers. Gaisler (1979), using a simple Lincoln index or derived statistical procedures, based mostly on mark and recapture data, came up with a figure of 3 bats per hectare at a site in Rumania, which is far highter density than that for York.

Longevity and Survival

Using a cone or funnel trap (Kunz 1988), bats were trapped as they emerged from their nursery roost at dusk. Between 25 and 35 bats were taken at each trap session, and a light magnesium-aluminium alloy band or ring, marked with a unique number and 'London Zoo', was applied to the forearm. Ringing was done under licence (Conservation of Wild Creatures and Wild Plants Acts 1975 and, subsequently, the Wildlife and Countryside Act 1981). The bands were issued by the Mammal Society.

Between 1977 and 1988, 2,983 pipistrelle were ringed around York, with four main study colonies being regularly surveyed, namely Wheldrake, Sutton-on-Derwent, Haxby and Huntington (see Figure 4). Table 2 shows the total numbers of rings.

TABLE 2
Ringed pipistrelle bats for the area around York, 1977–1988.

Colony	Grid. ref. no.	Total rings	Adult fem.	Immat. fem.	Juv. fem.	Juv. males
Wheldrake	SE/686452	405	269	18	67	49
Sutton	SE/707464	169	125	21	12	11
Haxby	SE/606587	379	293	15	45	26
Huntington	SE/617564	196	151	18	19	8
		1149	838	72	143	94
Other Colonies (n=22)		1834	1472	133	118	99
Totals		2983	2310	205	261	193
Totals in %			77.5	7.3	8.5	6.4
(includes 14 adult males 0.4%)						

Ninety adult females were ringed in 1977 at Wheldrake and Haxby, and from caputre, release and recapture date life tables for an unaged female cohort were constructed. From the cohort tables for adult female pipistrelles (Begon & Mortimer 1981), a fitted regression on an age-specific curve, for the first seven years of the study, is shown in Figure 2 ($P > 0.001$, $r = 0.98$). In the unaged cohort, the survival rate is calculated from the antilog of the slope. On the Vale of York the survival rate is 0.64; that is 64% of unaged adult female bats survive from one year to the next. These calculations, which include

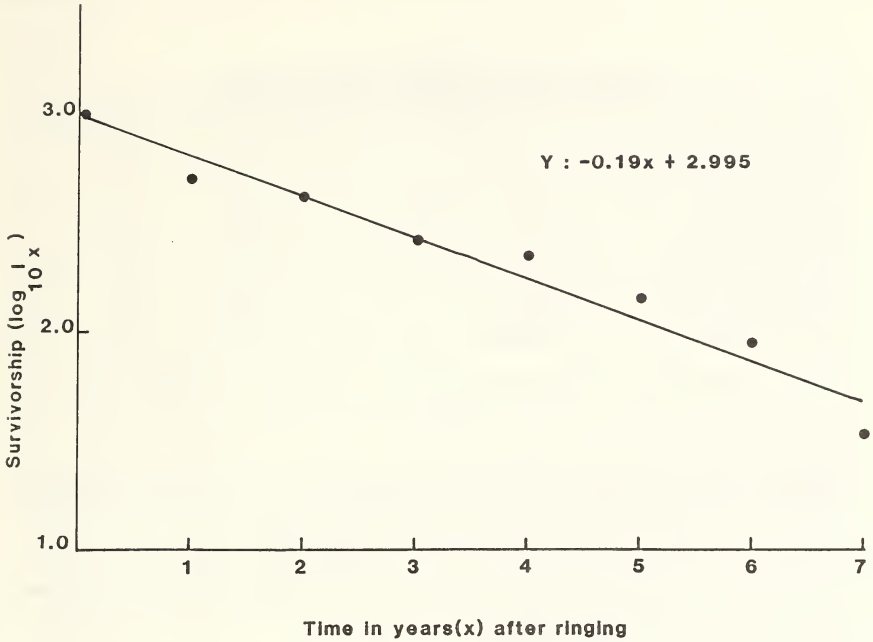

FIGURE 2
Fitted regression showing rate of survival calculated from cohort life tables for adult female pipistrelle bats for the years 1977–1984 ($P > 0.001$, $r = 0.98$). Average annual survival rate (1977–1984) = 0.64.

life expectancy, may be real or they may be misleading, due to the loss of rings or by not sampling long enough. Obviously, bats are not recaptured at every sampling session, so that some of those bats that are apparently dead may well turn up at a future sampling date (Thompson 1987).

From a variety of broadly comparable studies of unaged cohorts of different species of bats, carried out by various field workers, Tuttle and Stevenson (1982) quoted a wide range of annual survival rates (from 0.38–0.98). Most of these studies are on hibernating populations, and are based on different methods of sampling and different assumptions. The York study is one of the few on a nursery colony and summer ringing, and shows a broadly comparable survival rate, in the middle of the range of the previous estimates.

For small mammals, bats, including the pipistrelle, are long lived. By 1989, seven adult female bats, recaptured on the Vale of York, were eleven years old, and eight were ten years old. These findings, along with the fact that four of the eleven old bats were also pregnant, would suggest that this species will survive into its twelfth or more years, and approach nearer to the Czechoslovakian longevity record of 16.5 years (Hurka 1986). Longevity records in years for Europe of *Pipistrellus pipistrellus* are shown in Table 3.

Examples of longevity in other larger vespertilionid bats in Europe are Whiskered bat *Myotis mystacinus* 19.5 years and Daubenton's bat *Myotis daubentoni* 18.0 years (Stebbings 1977).

TABLE 3
Longevity records for pipistrelle bats in Europe.

Country	Author(s)	Year	Age
Czechoslovakia	Gaisler & Hanak	1969	8.5
United Kingdom	Stebbings	1977	11.0
German Fed. Rep.	Roer	1981	9.0
Czechoslovakia	Hurka	1986	16.5
United Kingdom	Thompson	1989	11.0

HABITAT

Originally cave or tree roosting mammals, pipistrelles are generally found roosting in buildings, due to loss of habitat, especially hollow trees (Thompson 1985). Such an adaptation has occurred over the past few centuries. Sometimes, such roosts are in very confined spaces. The pipistrelle exploits the defects created by poor workmanship on modern buildings. They often roost on the periphery of cities or villages. Roosts are described as those places in which bats collect to rest, sleep, feed or hibernate either singly or in groups and sometimes in large colonies.

On modern housing estates, breeding or nursery roosts may be established within a year of the completion of the house. The bats usually find access to these roosts between the soffit of the eaves and the gable end of the house. The roost is usually situated in the cavity wall or above the soffit, but if there is a gap between the roof felt and the inner breeze blocks the colony can find its way through to the loft space. Other entrances to roost sites in modern buildings can be between ill-fitting warped wooden fascia boards or facing tiles. In some of these situations, the size of the colony seems to be related to the available space. Each roost has one or more exit holes, which can usually be located by staining on the soffit or the adjacent brick work, or by the faecal droppings on the walls, window sills or the ground below. These droppings consist of chewed and partially digested insect remains, and, in the case of the pipistrelle, are dark brown. Nursery colonies of this species can also be found in churches and hollow trees (Thompson 1981). Unlike other bats, pipistrelle bats do not share their nursery colony sites, as their aggressive behaviour drives out other species. However, in 1978 a single pregnant female whiskered bat *Myotis mystacinus* emerged from the exit hole of one of the study area pipistrelle nursery colony roosts (Thompson 1979). Compared with hibernation sites, in which individual bats may not be in contact with each other, the bats in a nursery colony are often found huddling together to conserve heat and energy.

Feeding habitats are variable, but rich in insect life. Pipistrelles, like other species of temporate climate bats, are specialist feeders, feeding entirely on insects. The best feeding habitats are around riparian vegetation, nettle beds, watermeadows, open water and trees, especially oaks. Swift (1985) found that pipistrelles did not forage over exposed areas, like open hills or moorland. Feeding habitats are not far from the nursery roost, for, in energy terms, it is not cost effective for the adult females, especially when they are lactating, to travel too far. The foraging areas can usually be found by following the bats along their well established flight paths, passing fixed land marks, such as hedgerows and trees. Once there, the bats forage on a regular circuit, often in groups or in a solitary manner (Racey & Swift 1985, Thompson 1984).

Behaviour

Summer

In the summer adult female pipistrelles form large colonies, mostly in buildings. These colonies, known as nursery colonies, can sometimes be very large, with counts of 1,000 bats being not unusual (Stebbings 1977). The largest known colony in the Vale of York is at Kirkham Abbey, with counts of 750 in 1986 and 820 in 1987. With such good feeding on the River Derwent at this site, the bats appear to have used one roost site only. In 1986 the Wheldrake colony, which is the most studied in the Vale, reached 300 individual adult females, with declines in 1987 and 1988 (Thompson 1988, unpub.). According to Stebbings (1977), three hundred bats is the more usual size. In the Vale of York, stable colonies usually contain 50 to 100 bats, which in good years may reach 200, which is lower than the national average. Bat field workers believe that when pipistrelle bat nursery colonies reach a particular size, which may depend on available roost sites and food resources, young mature females may leave their colony of origin and establish new colonies (Thompson 1985).

Colony counting, as a field exercise, is not always accurate. Not all the bats emerge each night, and, as each colony usually has several roosts, the colony may be fragmented (Thompson 1984). Bats may emerge from a number of different roosts, some of which may not be known to the observer. In spite of fluctuating numbers in any one season for each colony, there appears to be a build up of numbers at the beginning of the summer, followed by an apparent decline, probably due to mortality and non-breeding females lea-

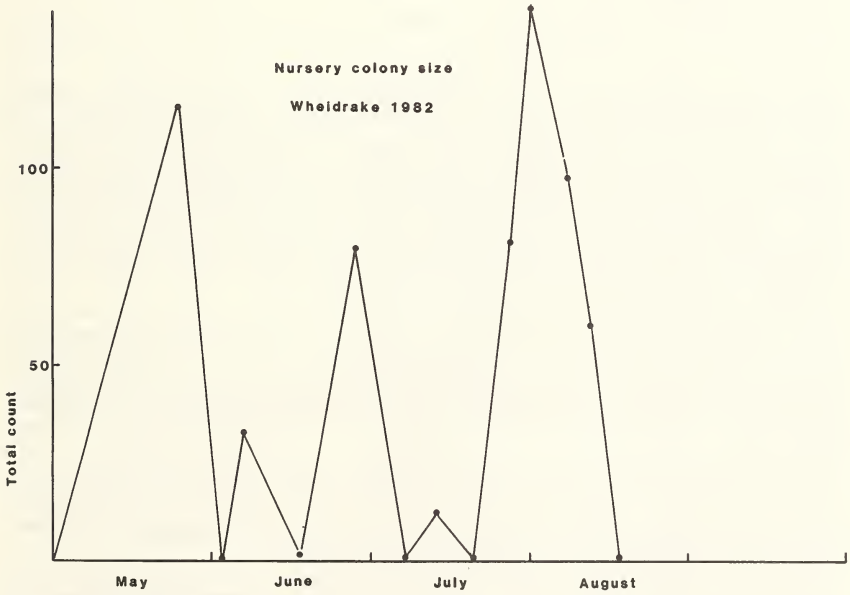

FIGURE 3
Total colony counts for Wheldrake (44/687452) for 1982, showing double peaking.

ving the colony. A second peak occurs when the young bats fly, whilst the adults are still present. This double peaking is shown for counts taken at Wheldrake in 1982 (see Fig. 3, Thompson 1984).

Female pipistrelles show remarkable fidelity or philopatry to their nursery colony, and this is shown also by the ringing returns of the juvenile bats. This philopatry, in the Vale of York, is clearly demonstrate by % ringing recoveries, translocation experiments and migration. Table 4 shows ringing recoveries, from 37 trap sessions, for the four main study colonies ringed from 1977–1983, but with bats from those colonies being recaptured from 1978 to 1989.

TABLE 4
Ringing recoveries for pipistrelle bat.

Colony	Tot. fem.	Adult fem.	Immat. fem.	Juv. fem.	Tot. RC	% RC
Wheldrake	265	200	19	46	139	52.5
Sutton	124	97	15	12	74	59.7
Huntington	123	107	12	4	58	47.2
Haxby	209	172	12	25	84	40.2
Totals	721	576	58	87	355	49.2

This gives a recapture rate (RC rate) of 49.2% of female pipistrelles either at their colony of origin or elsewhere, and includes 46 (6.4%) bats recaptured three times, 19 (2.6%) four times and 8 (1.1%) five times. Excluding those fifteen bats from this series which have been moved into or out of these colonies, the overall fidelity recapture rate becomes 47.2%. This is a remarkably high recapture rate for any field study survey, and shows a high level of roost fidelity (Thompson 1989, unpub.). Similar data is presented for the greater horseshoe bat *Rhinolophus ferrumequinum* (Ransome 1968). Comparing the pipistrelle with other flying animals, the swift *Apus apus* also shows a high level of site fidelity amongst established breeding birds (Roselaar 1985).

In 1982 a small translocation experiment was carried out between the main study colonies, in which female bats were removed from their colony of origin and released later that evening outside the exit hole of a neighbouring colony. The donor bats were released when bats of the recipient colony were flying around their roost entrance. The distances involved were small, and, when pregnant females were released, then they were translocated at the end of May early in their pregnancies. Table 5 shows the results of this experiment.

No translocated bats have been recaptured at their recipient sites. One immature bat, not shown in Table 5, was recaptured elsewhere. Ten of the 16 recoveries at the donor sites occurred within 2 years of being translocated, most of them pregnant. Four juveniles and one immature bat returned to their colony of origin.

Homing experiments have been carried out in Germany, Czechoslovakia, and in the United States. Haensel (1979) and Roer (1981) in Germany showed that *P. pipistrellus* had considerable homing abilities over large distances. Of 682 released bats in 1977, 62 km north of their colony of origin, three females returned within 4 days and a further two within 7 days. The York experiments were carried out on a smaller scale than on the Continent, but in some ways they are more interesting. The fact that there does not appear to

TABLE 5
Translocation data for pipistrelle bat.

Date	Age	Nos.	Don. site	Recip. site	Dist. in km	Recov. Don. site	%
28.5	adults	10	Sutton	Wheldrake	2.1	6	60
26.5	2 immat. 8 adult	10	Haxby	Haxby (Site 2)	1.0	3	30
29.5	1 immat. 9 adult	10	Huntington	Haxby	2.8	3	30
2.8	juven.	10	Wheldrake	Sutton	2.1	4	40

Totals 27 adults/3 immatures/10 juveniles translocated.
Mean recovery rate = 40.00% at donor sites.

TABLE 6
Recoveries of female pipistrelle bats.

Age	Colony of origin	Recipient colony	Distance travelled in km
A	Hull Rd. York	Huntington (× 2)	10
J	Stockton	Wheldrake	12
A	Oaken Gr., Haxby	Swarthmore, Haxby (× 2)	2
A	South Ln., Haxby	Oaken Gr., Haxby	1
A	South Ln., Haxby	Greenway, Haxby	1
A	Oaken Gr., Haxby	Wheldrake	16
I	Huntington	Springfield, Haxby	3
J	Wheldrake	Sutton (× 2)	2
J	Wheldrake	Knaresborough	33
I	Sutton	Wheldrake	2
A	Springfield, Haxby	Huntington/Earswick	2
A	Springfield, Haxby	Wheldrake	19
A	Greenway, Haxby	Oaken Gr., Haxby	2
A	Nether Poppleton	Skelton (× 2)	2
A	Wheldrake	Nether Poppleton	16
J	Strensall	Pocklington	20
A	Dunington	Wheldrake (× 2)	8
J	Angram	Wheldrake (× 3)	17
A	Gate Helmsley	Dalby Forrest	34
A	Wheldrake	Oaken Gr.,Haxby	16

be mixing between two adjacent colonies, such as Wheldrake and Sutton which are only 2.1 km apart, when forced to do so, is good evidence of colony philopatry (Thompson 1984).

Unlike birds, bats generally do not migrate. There is a certain amount of migratory movement amongst the larger bats, such as noctules *Nyctalus noctula* moving south in Russia for the winter (Strelkov 1969, quoted by Stebbings 1977). However, in Britain this appears not to be the case, most bats hibernate close to their summer roosts. Nevertheless, there appears to be some summer movement of females, between nursery colonies, albeit small in numbers. Some of these movements will depend on the availability of landscape features, such as trees and hedgerows, by which small bats, such as pipistrelles, can navigate by (P. Lina 1989, *pers. comm.*). Table 6 shows some of the recoveries of female bats recaptured away from their colony of origin.

Of the 32 bats, twenty nine had moved only within the study area; three moved out and travelled the longest distances. Figure 4 shows the dispersal of some of those bats. The British record for longest movement for *P. pipistrellus* is 69 km. (Stebbings 1977). Table 7 compares the Vale of York study with a similar study in Sweden (Lundberg 1989).

TABLE 7
Movements of pipistrelle bats.

Area	Sample (N)	Distance moved in km	Mean distance moved in km	% Displaced
York	32	33/34	9.5	1.2
Sweden	8	30	11.6	0.38

The two sets of results are not quite comparable, because the Swedish sample contains two male bats. However, both studies show a remarkably low migration or displacement rate. Evidence would seem to suggest that only a small amount of displacement or migration amongst randomly selected individuals will ensure an adequate genetic mix and prevent inbreeding (Hartl 1980, quoted by McCraken 1987).

Winter

Most pipistrelles go into hibernation by November or early December (Racey 1973). These bats usually hibernate in buildings, such as churches, or trees. Since 1977, no major hibernation roost, with several bats being present, has been found in the Vale of York. Only single hibernating bats have been found, in a variety of sites during the winter. However, at Scotton Bank Hospital, near Harrogate, which is on the edge of the Vale of York, a major hibernation site has been located. The pipistrelles, mostly males, are wedged between the brick walls and the outer wooden fascia boards of the single storey buildings. This site is regularly monitored, with ambient temperatures being recorded, by the Harrogate Natural History Society (R. Deaton 1987, *pers. comm.*). The lack of hibernation sites in the Vale of York, would suggest that either inadequate searches have been made for them, or the bats move off south to find more favourable conditions during the winter.

Pipistrelles usually emerge from hibernation by the end of March or early April within the study area. Flights during the winter, especially on mild days, and often during the day, are not uncommon. On 11 December 1977 pipistrelles were reported to be flying around in daylight from Easingwold, Bootham School, York and Fountains Abbey. Avery

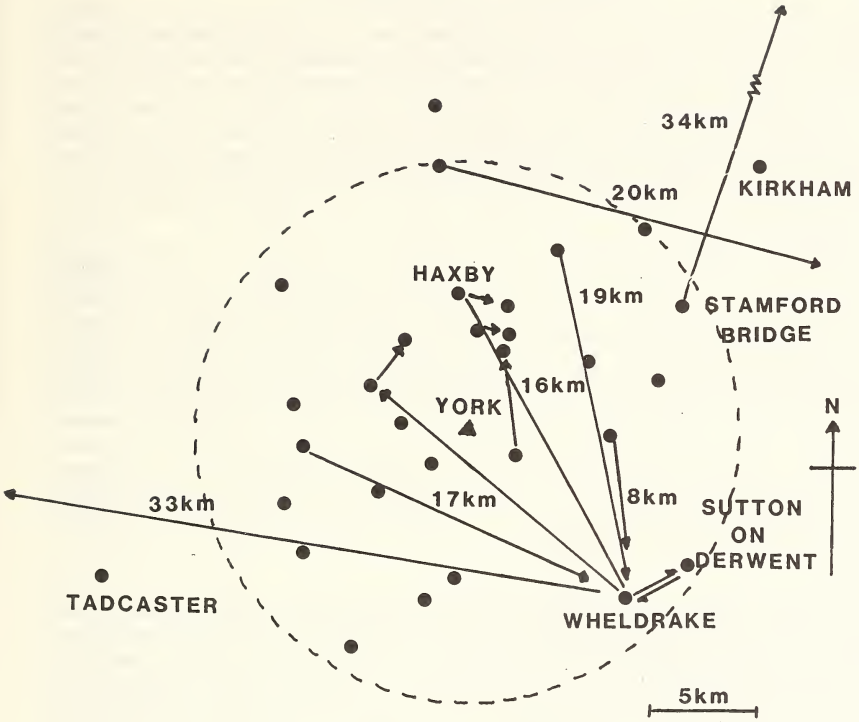

FIGURE 4
Dispersal of some of the migratory pipistrelle bats in the Vale of York 1977–1989.
The circle represents the outer margin of the study area,
the black dots the discrete colonies.

(1985) showed that bats will leave hibernation sites throughout the winter to feed, and most of this activity would occur on warm calm nights, with males being more active than females.

Food and Feeding Behaviour

From the analyses of faecal pellets, Swift (Swift, Racey & Avery 1985) discovered that 56.4% of the diet of the pipistrelle consisted of the family of non-biting midges Chironomidae, followed by caddis flies Glossomatidae (23.4%). These relative abundances corrolated significantly with samples taken in insect traps. Besides the insect orders Diptera and Trichoptera, the diet also consisted of small numbers of Lepidoptera, Coleoptera, Ephemeroptera and Neuroptera. Unlike the long-eared bat *Plecotus auritus*, which takes a large portion of its prey items to a feeding perch (Thompson 1982), the pipistrelle kills and consumes most of its prey whilst in flight. However, in 1979, a pipistrelle feeding perch was found in the loft of a bungalow. This site, which was part of a nursery roost, was discovered at Stockton-on-Forest, near York and would appear to be unusual. Poulton (1929) did not find such pipistrele feeding perches in his Oxford study.

Once on its feeding site, a foraging bat will feed on a regular beat, which it does not appear to defend (Racey & Swift 1985). Pipistrelles emerge from their roosts about 35

minutes after sunset, and Swift (1980) also found there was a strong linear relationship between colony size and the average rate of emergence (r = 0.99). In the Vale of York it was not possible to confirm this relationship, partially because frequent trapping of bats interfered with emergence times, but, nevertheless, it was noted that the bats emerged in rapid outbursts, interspersed with quiet periods (Thompson 1984). Like Swift's study in north-east Scotland (1980), female pipistrelles in the York area were observed leaving the roost on a continuous night's foraging flight whilst they were pregnant, but, once they were lactating, their flight pattern became bimodal, the adults returning to the nursery to roost to feed their young, before re-emerging for a pre-dawn flight coinciding with a pre-dawn flight of insects.

Climate can influence emergence times. Although no attempt was made during the York study to monitor weather conditions at the times of emergence, on a few occasions it was noted that wind and rain prevented bats from leaving their nursery roosts. Similar observations were made by Stebbings (1968). Heavy rain does not appear to interfere with bat feeding, although mist and fog, according to Sale and Pye (1974), absorb the ultrasound produced by bats and so causes reduction in hunting efficiency. Although extensive weather data was obtained from the Meteorological Office, RAF Linton-on-Ouse, during the study period, no statistically significant relationship could be establishesd between adverse weather conditions and pipistrelle bat colony reproductive performance. However, there was some indication of the effect of rainfall (Thompson 1984). In temperate latitudes, according to Racey (1982), ambient temperatures rather than rainfall appears to be the important factor determining bat reproductive success. To test these factors a long run of data would be necessary.

Breeding

Females start to collect in their nursery colonies abut mid-May, and by the end of that month the colony is well established, when the householders become aware of the colony. The earliest date of establishment in the Vale of York was 18 May 1982 at Sutton on Derwent, and it was difficult on that occasion to be quite sure all the females examined were pregnant. Each colony has several roosts. At Wheldrake 16 such roosts are known, in close proximity to each other. From observations of roost movements and selection in the Wheldrake and Haxby colonies, over a long period of time, two facts emerge. Firstly, although the bats have several roosts available, the colony tends to collect in one or two more favourable sites. What factors are responsible for these movements are not understood, but they may involve such things as the number of bats in the colony, available space, food supplies, social interaction and disturbance. Secondly, the bats may use the roosts according to their temperature requirements, as the females tend to be heterothermic early in pregnancy, using north facing roosts, and homeothermic during mid-pregnancy and lactation and, therefore, use south facing roosts.

The majority of matings occur in the autumn, but mating can occur throughout the winter. Both male and female pipistrelles are capable of sperm storage during the winter (Racey & Potts 1970, Racey & Tams 1974). Fertilisation occurs in the spring, with the majority of births within the colony being synchronised, so that all the young born in the colony do so within a week of each other (Tuttle & Stevenson 1982). What physiological mechanism actually triggers birth synchrony is not fully understood, but, as with other mammals, many factors, including pheromones, may play a part (D. M. Stoddart 1982, *pers. comm.*). The average period of gestation for the pipistrelle is 44 days, but in adverse weather conditions the bats become torpid, and can extend the length of their pregnancies (Racey 1982). The dispersal dates in August, when the colony consists mostly of juveniles, are between 6 and 17 August, depending on climatic conditions and availability of food. However, bats were caught at Wheldrake on 8 September 1979, well after these dispersal dates. The adult females leave the colony first, presumably to reduce the competition between themselves and the juveniles for food (Stebbings 1968). The majority of young first fly around 21 July in the York area, but in 1981 it was on 13 July (Thompson 1984).

TABLE 8
Pregnancies of recaptured pipistrelle bats.

Colony	Total RC	Preg. × 1	× 2	× 3	× 4	× 5	× 6	Total No. preg.
Wheldrake	139	22	67	23	14	8	0	134 (321)
Sutton	74	14	41	8	8	2	0	73 (162)
Huntington	58	6	29	14	7	1	1	58 (145)
Haxby	84	14	46	17	5	1	0	83 (196)
Totals	355	56	183	62	34	12	1	348 (810)

Table 8 shows the total number of pregnancies, per recaptured bats, in the four main study colonies ringed between 1977–1983, but recaptured between 1978 and 1989.

The figures in brackets in Table 8 indicate the total number of pregnancies from 348 bats (seven bats in the sample were not pregnant at any time). Hence, from 348 recaptured bats the minimum pregnancy rate is 810/348 = 2.3 pregnancies per bat. It is difficult to calculate the maximum pregnancy rate because, in some years, the females do not breed and that individual bats are not recaptured at each sampling session. Taking the 47 female bats, which have had four or more pregnancies (Table 8), then in Table 9 the relationship between age in years, from four onwards, and total pregnancies is shown (Thompson 1989, unpub.).

From this Table it can be seen that only 6 bats (five 4 year olds and one 5 year old) had pregnancies on an annual basis. Thirteen bats in the sample have had five pregnancies (3.7% of the total). However, it would appear that most of these 47 females probably had annual pregnancies. According to Racey (Humphrey 1975, Humphrey & Cope 1970, quoted by Racey 1982), once puberty has been reached, reproductive rates among vespertilionids frequently approach 100%. Rakhmatulina (1972, quoted by Racey 1982), recorded 100% pregnancy rates amongst *P. pipistrellus*, but, yet, Deansley and Warwick (1939) and Hurka (1966, quoted by Racey 1982) found that 11% and 28% respectively of the females of this species were not pregnant during their studies.

TABLE 9
Relationship between age and pregnancies in pipistrelle bats.

Age	4	5	6	7	8	9	10	11	
Total preg.									
4	5	2	3	8	7	3	2	3	= 33
5	0	1	1	2	4	3	1	1	= 13
6	0	0	0	0	0	1	0	0	= 1
	5	3	4	10	11	7	3	4	= 47

Of the 721 ringed female bats, in the four study colonies, 87 were juveniles and 58 immatures at the time of their original ringing (Table 4). Analysis of the time of mating shows that 56% of those recaptured young female bats (n = 58) had mated, one or more times, by their second autumn or winter, with 12.9% of the juveniles mating in their first autumn. Racey (1982) suggests that for some female vespertilionid bats sexual maturity is attained within their first autumn, compared with the greater horseshoe bat *R. ferrumequinum*, which reaches maturity in 3 to 7 years.

The birth ratio between males and females is one to one (Stebbings 1968), but as Table 2 shows fewer males are ringed, as a deliberate policy. The chances of recapturing a ringed male is small. Of the 193 ringed males in the Vale of York, only two have been recaptured. Originally ringed in 1982 at Wheldrake as a juvenile, one of the males was recaptured 400 m from its nursery colony in 1986. This record is the only one suggesting that the minimum longevity of male pipistrelles is four years. The second male, a two year old, was found dead in 1989, a short distance from its colony of origin.

The majority of solitary pipistrelle bat specimens, received dead or alive from the general public within the centre of York, are males (Thompson 1977). Using bat boxes, Gurell and Lundberg (1985) in Sweden studied male mating roosts, in which each individual male defends a box. The male advertises his presence with a 'songflight' display, starting in the summer and ending in the autumn. The flight display is not dissimilar to that of a foraging bat. The song, part of which is audible to human hearing, was noted at Skelton, near York, on 30 August 1980, but no mating roost was subsequently located. Females are attracted to such roosts. Male pipistrelles are polygynous, several females mating with one male.

Ectoparasites

Although a number of pipistrelles have been found to be heavily infected with ectoparasites, particularly mites, only the fleas *Ischopsyllus octactenus*, of both sexes, were removed for positive identification. This was carried out by Dr Michael Usher of the Department of Biology, University of York.

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I would like to thank Prof. John Lawton and Dr Robert Stebbings for help in all aspects of the work involved, over the years, in preparing this address, and Prof. Paul Racey for valuable discussion. Also, to thank Prof. Mark Williamson for reading the manuscript and making useful suggestions. Throughout the study, I have been helped by various members of the Yorkshire Mammal Group, but particularly Rod Anness, Sheila Walsh, Lesley Helliwell and Edna Shann. Without their help nothing would have been possible, and I would like to thank them, along with various householders, for their forbearance and hospitality during field work. Finally, I would like to thank Miss Gina Douglas, Librarian and Archivist at the Linnean Society Library, for her help in searching out early bat references from the literature.

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BOOK REVIEW

Ladybirds by **Michael Majerus** and **Peter Kearns**. Pp. 103, many text figures, 4 colour and 4 b/w plates. Naturalist's Handbook no. 10, Richmond Publishing. 1989. £7.75 paperback.

This scholarly book aims at outlining what is known about the British species of ladybird and stresses areas of scientific ignorance, which it does admirably. Throughout the book, emphasis is put on those 24 species which would normally be thought of as the true ladybirds, although a key to all British coccinellids is included. The nine chapters encompass the whole spectrum of ladybird biology as well as study techniques and variations in colour patterning. The three dichotomous keys cover 1) the true ladybirds, 2) all the coccinellidae and 3) the larvae. Well illustrated throughout, keys 1 and 2 are very easy to follow and make identification a relatively straightforward task and, as the authors state, a × 10 hand lens should be sufficient for specific determination. I have not had the opportunity to work the key to larvae but, due to the excellent illustrations, this should prove to be relatively easy. Although emphasis is placed on field identification of live specimens, sections on making a collection and genital examination are included.

The main plates, by Sophia Allington, are very lifelike and almost make the keys to adults unnecessary. What a pity, however, that all could not have been produced in colour.

This book not only gives the reader an opportunity to identify adult larval ladybirds, but also a fascinating insight to their life history, and much more. Not only will the specialist benefit from this book but it will also bring an absorbing group to the notice of the interested layman. As this book goes far deeper than most, I can do no other than highly recommend it to anybody interested in British ladybirds.

MLD

THE FEATHER-WING BEETLES OF YORKSHIRE (COLEOPTERA: PTILIIDAE)

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Introduction

Feather-wing beetles or ptiliids are our smallest beetles, ranging from 0.4–1.1 mm in length. The name is derived from their unusual wing structure, in which the wing is reduced to a long and very narrow membrane fringed by long hairs. Ptiliids are mould feeders and are always to be found in humid microhabitats. They can be collected easily by sieving techniques, and often occur in large numbers in suitable substrates. Mouldy and fermenting grass traps can be used to trap a number of species, especially in woodland.

The identification of such minute beetles has long been difficult, and only during the last thirty years has the identification of European species been placed on a sound basis with the works of Sundt (1958, 1971) and Besuchet (1971). Our knowledge of the British fauna is largely due to my own work over the last quarter century, the results of which are scattered in numerous publications. Currently, I recognise 73 British species, which contrasts markedly with the 48 species enumerated by Joy (1932) with the help of Britten. Accurate identification is still difficult, and in many cases it is essential to dissect out and study the genitalia, something unheard of in Joy's time.

As part of my systematic studies, I have gathered records of all specimens which I have identified for collectors and most of our museums in the British Isles, with a view to publishing a distributional atlas of the family. The early appearance of such a work still remains somewhat uncertain. However, due to increasing interest in Yorkshire ptiliids, it was decided to write an account of the fauna based upon this work, since all collections known to contain Yorkshire specimens had already been revised. Acceptable records are those based upon existing specimens and/or those identified by present day techniques. This by definition excludes most older records which are unsupported by specimens, e.g. from literature, collector's lists or YNU files. I have accordingly looked over YNU files and incorporated in the present work all possible records, rejecting others. It is extremely important that any person running a data bank should be aware of the difference between authentic records based on scholarship, and unacceptable ones.

Notes on the List

Bionomics. Broad habitat and microhabitat preferences are given for each species, together with distribution and abundance. Seasonal information is not given separately as it can best be summarised in general terms. Ptiliids which live especially in dead wood, farm dungheaps, haystacks, compost heaps, dead leaves, moss and grass tufts, can be found throughout the year. Those which live at river edges, in marsh debris, carcases, rotting fungi, woodland grass traps, ants nests, animal dung and old seaweed mostly occur between spring and autumn when there are optimum conditions for dispersal and colonisation.

Collectors. All names are abbreviated to their initials, a full list of which is given after the species list. Collectors are listed in order of collecting for sites with multiple collector records.

Dates. Pre-1960 records have a dagger (†) after the collector's initials; all other records are 1960–1989. Brevity precludes more precise dates.

Grid Squares. 100 km squares are arranged alphabetically as follows: NY, NZ, SD, SE, SK, TA; 10 km squares numerically. The grid for old records is only an approximation having been taken from the Ordnance Survey Gazetteer (1972).

Localities. Arranged alphabetically within grid squares.

Manuscript Records. These are indicated by 'ms' after the collector's name, and are of recent records accepted although not seen by myself.

Unsupported Records. Old records unsupported by specimens from the YNU files are indicated by square brackets [].

Vice-counties. Vice-county boundaries are rigidly interpreted according to the Watsonian system as defined by Dandy (1969). Typomap symbols are used alphabetically for them as follows:

EY: N-E Yorks. (VC62)

MY: M-W Yorks. (VC64)

NY: N-W Yorks. (VC65)

SY: S-E Yorks. (VC61)

WY: S-W Yorks. (VC63)

List of Yorkshire Ptiliidae

1. *Ptenidium fuscicorne* Erichson

Wetland species, mostly in river ings and brackish marshes; in flood refuse, marsh litter and at the roots of grass tufts. Very local and scarce.

EY: TA08 – Scarborough (TW†).

SY: SE63 – Bubwith (RJM), Aughton Ings (RJM ms). SE73 – Bubwith Bridge (RJM). TA21 – Sunk Island (RJM). TA41 – Spurn (SS†) (WDH †).

2. *Ptenidium gressneri* Erichson

Woodland species, characteristic of damp to wet decayed cavities inside trunks and boughs of old broad-leaved trees. Only a single old Yorkshire record.

MY: SE26 – Studley Park (EAW†).

3. *Ptenidium intermedium* Wankowicz

Wetland species. Mostly in marsh litter and ing flood refuse, but also in mole nests and occasionally amongst damp river shingle. Very local and scarce.

EY: TA08 – Scarborough (TW†).

MY: SE26 – Studley (CJ). SE54 – Askham Bog (CJ) (RJM).

SY: SE63 – Bubwith (RJM). SE74 – Wheldrake Ings (CJ).

WY: SE50 – Cusworth Park (RJM). SE51 – Shirley Pool (CJ). SE82 – Blacktoft Sands (WAE).

4. *Ptenidium laevigatum* Erichson

Occurs in a range of habitats — woodlands, wetlands, grasslands and gardens, but mostly in the first two. In damp litter or moss, especially in rodent burrows and mole nests, occasionally in garden compost. Widespread and frequent; often abundant in mole nests.

EY: NZ81 – Whitby (HB†), [Sandsend (HB†)]. SE68 – Helmsley (EWA), Duncombe Park (RJM). SE89 – Saltergate (HB†). SE98 – Raincliffe (GBW†). TA08 – Seamer (GBW†).

MY: SE26 – Fountains Hall (EAW†). SE43 – South Milford (CJ). SE45 – Askham Bog (CJ) (EWA). SD64 – Whitewell (CJ).

NY: NZ10 – Ravensworth (GBW†).

SY: SE83 – Manor House (AN). TA41 – Spurn (SS†).

WY: SE11 – Farnley Tyas (EWA), Honley (CJ), Huddersfield (CJ). SE12 – Elland (EJS). SE20 – Langsett (CJ). SE30 – Worsborough Reservoir (CJ). SE40 –

Darfield (CJ) (DRN). SE50 – Bentley Tilts (CJ), Melton Wood (RJM). SE51 – Shirley Pool (CJ). SE71 – Thorne Waste (CJ). SK38 – Little Matlock Wood (ASL). SK39 – Greno Wood (CJ). SK49 – Wickersley Wood (WAE).

5. *Ptenidium nitidum* Heer

In a wide range of mostly open habitats such as grasslands, gardens, moorland and heath. Especially in animal dung, but frequent in a range of other microhabitats. Widespread and common.

EY: NZ62 – Saltburn (MLT†). NZ70 – Stonegate (CJ). NZ71 – Ugthorpe (CJ). NZ80 – [Beckhole (HB†)], Skelder (CJ). NZ81 – Lythe (CJ), Mulgrave (CJ). NZ90 – Robin Hood's Bay (CJ). SE89 – [Saltergate (HB†)]. TA08 – Scarborough (TW†) (GBW†) (CES†).

MY: SD64 – Bashall Eaves (CJ). SD67 – Ingleton (GWC†). SD86 – Malham Tarn (CJ). SD95 – Skipton (SAW). SE05 – Bolton Abbey (SAW). SE14 – Ilkley (GWRB†). SE25 – Hampsthwaite (SAW). SE26 – Fountains Hall (EAW†). SE54 – Askham Bog (RSK).

NY: NZ10 – Ravensworth (GBW†).

SY: SE63 – Aughton Ings (RJM ms). SE64 – Wheldrake (CJ). SE73 – Aughton Ings (RJM), Breighton Meadows (RJM), Bubwith (GBW †) (RJM) (CJ). SE74 – Ellerthorpe Ings (RJM), Thornton Ellers (RJM).

WY: SE10 – Holmbridge (CJ), Langsett (EJS ms), Shepley (EWA). SE11 – Dalton (EWA), Farnley Tyas (EWA), Hall Dike (DM), Honley (CJ), Huddersfield (CJ), Ravensknowle (EWA), Woodsome (EWA†). SE12 – Elland (EJS). SE20 – Langsett (CJ). SE30 – Rockley Abbey (CJ), Worsborough Reservoir (CJ). SE31 – Wintersett (CJ). SE42 – Mickletown Ings (CJ). SE50 – Melton Wood (RJM), Sprotbrough (RJM), Thorpe Marsh (CAH). SE51 – Shirley Pool (CJ) (RJM). SE52 – Eggborough (RJM). SE60 – Rossington Bridge (RJM), Sandall Beat (HHC†). SE61 – Phippin Parks (CJ), Sykehouse (CJ), Thorne Waste (EWA). SE71 – Thorne Moors (RSK). SK39 – Greno Wood (CJ). SK69 – Misson (CJ).

6. *Ptenidium punctatum* (Gyllenhal)

A well-known maritime species occurring amongst decaying seaweed on the coast (Fowler, 1889). Recent Yorkshire records are inland ones from old dungheaps by farms. Local and scarce.

EY: NZ62 – [Saltburn (RSB†)]. NZ70 – Stonegate (CJ). SE58 – Thirsk (RJM). TA09 – Scalby (GBW†).

NY: SE29 – Bolton-on-Swale (CJ). SE39 – Thrintoft (CJ).

SY: TA41 – [Spurn (GBW†)].

WY: SE01 – Blackmoorfoot (MLD). SE30 – Hermit Hill (CJ). SE40 – Billingley Green (CJ). SE51 – Fenwick (CJ). SE52 – Hensall (CJ). SE61 – Sykehouse (CJ).

7. *Ptenidium pusillum* (Gyllenhal)

In a wide range of open habitats, especially grasslands. Occurs in all kinds of plant refuse from farms and gardens, including dungheaps, although rarely in animal dung. Widespread and very common.

EY: NZ42 – Middlesbrough (MLT†). NZ70 – Stonegate (CJ). NZ71 – Ellerby (CJ). NZ80 – [Beckhole (HB†)], Skelder [(HB†)](CJ). NZ81 – Lythe (CJ), Whitby (HB†). NZ90 – Robin Hood's Bay (CJ). SE89 – [Saltergate (HB†)]. TA08 – Scarborough dist. (GBW†).

MY: SD64 – Bashall Eaves (CJ). SD74 – Waddington (CJ). SD84 – Gisburn (CJ). SD86 – Malham Tarn (CJ). SD95 – Skipton (SAW). SE05 – Bolton Abbey (SAW). SE14 – Otley (RC). SE25 – Hampsthwaite (SAW). SE26 – Fountains Hall (EAW†), Studley (CJ). SE35 – Harrogate (SAW). SE37 – Queen Mary's Dub (CJ). SE43 – South Milford (CJ). SE54 – Askham Bog (EWA) (RSK).

NY: SE29 – Bolton-on-Swale (CJ).
SY: SE63 – Aughton (CJ), Aughton Ings (RJM). SE64 – Wheldrake (CJ). SE74 – Thornton Ellers (RJM ms). TA41 – Spurn (SS†) (RJM).
WY: SD92 – Todmorden (CJ). SE11 – Dalton (EWA), Ravensknowle (EWA). SE20 – Cawthorne (CJ), Hoylandswaine (CJ), Langsett (CJ). SE21 – Kirkburton (EWA), Mirfield (EJP). SE30 – Hermit Hill (CJ), Rockley Abbey (CJ). SE31 – Wintersett (CJ). SE40 – Billingley Green (CJ), Sprotbrough (RJM). SE41 – Thorpe Audlin (CJ). SE50 – Arksey (CJ), Melton Wood (RJM), Sprotbrough (RJM). SE51 – Fenwick (CJ), Norton Common (PS), Thorpe-in-Balne (RJM). SE52 – Eggborough (RJM), Hensall (CJ). SE60 – Hatfield Lings (CJ). SE61 – Phippin Parks (CJ), Sykehouse (CJ). SE62 – East Cowick (CJ), Gowdall (CJ), Snaith (CJ). SE71 – Crowle (RSK). SK28 – Rivelin Valley (JL). SK29 – Stocksbridge (CJ). SK38 – Stannington (ASL). SK39 – Greno Wood (CJ). SK58 – Langold Holt (RJM).

8. *Ptenidium turgidum* Thomson
Woodland species, characteristic of damp to wet decayed cavities inside the trunks of old broad-leaved trees. The recent Yorkshire records are of single specimens from elm.
EY: SE68 – Duncombe Park (RJM).
MY: SE26 – Studley Park (RJM).

9. *Actidium aterrimum* (Motschulsky)
In damp fine sand and shingle at the edge of rivers and streams. Very rare in Britain and difficult to find. No recent Yorkshire records, although attempts to find it on the River Skell where it was originally discovered by E. A. Waterhouse (Waterhouse, 1871), have been made by a few coleopterists.
MY: SE26 – River Skell, Spa Gill (EAW†).

10. *Oligella foveolata* (Allibert)
Grassland species in old dungheaps by farms. Very local; frequent to locally common.
MY: SE43 – South Milford (CJ).
SY: SE64 – Wheldrake (CJ).
WY: SE20 – Hoylandswaine (CJ). SE30 – Hermit Hill (CJ). SE41 – Thorpe Audlin (CJ). SE51 – Fenwick (CJ). SE61 – Sykehouse (CJ). SE62 – Gowdall (CJ), Snaith (CJ). SK39 – Greno Wood (CJ).

11. *Oligella intermedia* Besuchet
In grass trap in broad-leaved woodland. This is an extremely rare species in Britain (Johnson, 1976), of which the single Yorkshire specimen (Marsh, 1988) represents only the second British one, the first this century.
WY: SE50 – Melton Wood (RJM).

12. *Ptilium horioni* Rosskothen
In grass traps in broad-leaved woodland, also in garden compost heaps. Very local and rare.
WY: SE50 – Melton Wood (RJM), Sprotbrough (RJM).

13. *Ptilium minutissimum* (Ljungh)
Grassland species in old dungheaps by farms. Very local and scarce.
EY: NZ71 – Ellerby (CJ).
NY: SE29 – Bolton-on-Swale (CJ).
WY: SE20 – Hoylandswaine (CJ), Langsett (CJ). SK39 – Greno Wood (CJ).

14. *Ptilium myrmecophilum* (Allibert)
Woodland, myrmecophilous species. In coniferous plantations, broad-leaved and mixed woodlands, in nests of the northern wood ant (*Formica lugubris* Zetterstedt). Very local and mostly scarce.

EY: SE68 – [Riccaldale (GBW†)]. SE99 – Barns Cliff (GBW†), Harwood Dale (GBW†), Helwith Beck (HB†). TA08 – Scarborough (TW†) (GBW†).
WY: SD92 – Hardcastle Crags (SB). SE20 – Denby Dale, Kaye Wood (EWA†).

15. *Euryptilium saxonicum* (Gillmeister)
Woodland species, especially in broad-leaved woodland. Mainly associated with putrefying substances, e.g. animal carcases, but usually collected with grass traps. Very local and rare, nationally little-collected.
WY: SE11 – Farnley Tyas (CJ), Honley, Hey Wood (CJ).

16. *Ptiliola kunzei* (Heer)
In a range of woodland and open habitats including moorland, grassland and gardens. Mostly in putrefying substances including animal dung, old dungheaps, carcases, grass traps and sometimes compost heaps. Local and frequent.
EY: NZ70 – Stonegate (CJ). SE58 – Thirsk (RJM).
MY: SD74 – Sawley (CJ). SD86 – Malham Tarn (CJ). SE14 – Ilkley (GWRB†).
SY: SE74 – Thornton Ellers (RJM ms).
WY: SE00 – Holme Moss (CJ). SE01 – Slaithwaite (EWA†). SE11 – Dalton (EWA), Farnley Tyas, Mollicar Woods (EWA), Ravensknowle (EWA). SE31 – Wintersett (CJ). SE50 – Melton Wood (RJM).

17. *Ptiliolum fuscum* (Erichson)
Mostly grassland species, but also often in woodlands and gardens. Mainly in animal dung, sometimes in grass traps and compost heaps. Widespread and common. First recorded from Britain by Johnson (1968a), who gives two Yorkshire records.
EY: NZ62 – Saltburn (MLT†). NZ71 – Ugthorpe (CJ). NZ81 – Mulgrave (CJ). SE58 – Thirsk (RJM). SE68 – Duncombe Park (RJM). SE97 – Sherburn Bridge (EWA). SE98 – Raincliffe Wood (GBW†), Snainton (EWA). TA08 – Scarborough (TW†).
MY: SD86 – Malham Tarn (CJ). SD96 – Conistone (CJ). SE26 – Fountains Hall (EAW†). SE33 – Leeds, Lime Hills (WDH†). SE35 – Harrogate (EWA). SE54 – Askham Bog (CJ).
NY: SE18 – Jervaulx (WDH†).
SY: SE73 – Aughton (CJ).
WY: SE11 – Dean Wood (MLD), Farnley Tyas (CJ), Storthes (EWA), Thurstonland (EWA). SE20 – Gunthwaite (EWA). SE30 – Worsbrough Reservoir (CJ). SE31 – Wintersett (CJ). SE50 – Melton Wood (RJM). SE51 – Shirley Pool (RJM). SE60 – Sandall Beat (HHC†).

18. *Ptiliolum marginatum* (Aubé)
Woodland species, in cow dung and probably other putrefying substances. This very rare species was first recorded in Britain from the New Forest (Johnson, 1968a), and I have only seen specimens from two other areas in southern and eastern England.
WY: SE30 – Worsbrough Reservoir (CJ).

19. *Ptiliolum sahlbergi* Flach
Yorkshire's most outstanding Ptiliid, with a boreo-alpine continental distribution. In grass cuttings at the edge of lawn and trees, rare. The species was first discovered in Britain at Malham Tarn in 1967 (Johnson, 1968b), and I have subsequently seen a specimen from the Scottish Highlands.
MY: SD86 – Malham Tarn (CJ & AB).

20. *Ptiliolum schwarzi* (Flach)
Woodland species, found in broad-leaved woodland in grass traps and other putrefying substances. Rare species, nationally little-collected.
WY: SE11 – Farnley Tyas, Mollicar Woods (EWA) (CJ).

21. *Ptiliolum spencei* (Allibert)

Mostly grassland species, mainly in old dungheaps and haystacks by farms. Local and scarce. Published records of this species prior to 1968 are highly unreliable due to confusion with *fuscum*. Specific characters and a Copgrove record are given by Johnson (1968a).

EY: NZ90 – Robin Hood's Bay (CJ). SE58 – Thirsk (RJM). SE68 – Duncombe Park (RJM).

MY: SD64 – Bashall Eaves (CJ). SD86 – Malham Tarn (CJ). SE36 – Copgrove (CJ). SE37 – Queen Mary's Dub (CJ).

NY: SE19 – Constable Burton (EWA).

WY: SE11 – Dalton (EWA). SE20 – Langsett (CJ). SE30 – Rockley Abbey (CJ). SE41 – Thorpe Audlin (CJ). SE50 – Melton Wood (RJM), Sprotbrough (RJM). SE51 – Fenwick (CJ). SE61 – Sykehouse (CJ). SK39 – Greno Wood (CJ).

22. *Ptinella britannica* Matthews

Wetland species occurring in mole nests; very local and rare. Nationally a very rare species with few, mostly southern, records.

MY: SE54 – Askham Bog (CJ). SE65 – York, roman sewer (PB).

23. *Ptinella cavelli* (Broun)

Woodland species, under tight bark of dead broad-leaved and coniferous trees. Local and scarce, although sometimes in numbers. This New Zealand species was first recorded from Britain by Johnson (1975), who gives six Yorkshire localities.

EY: SE99 – Beast Cliff (KNAA).

MY: SD86 – Malham Tarn (CJ) (KNAA). SE26 – Studley (CJ), Studley Park (RJM) (KNAA). SE36 – Copgrove Park (CJ).

WY: SE10 – Holmbridge (CJ). SE11 – Farnley Tyas (EWA), Honley Wood (MLD/DM ms), Netherton (MLD). SE12 – Elland (EWA). SE21 – Stocksmoor (EWA). SK38 – Loxley Valley (ASL).

24. *Ptinella denticollis* (Fairmaire)

Woodland species, under tight bark of dead broad-leaved trees. Two of the records are from willow bark but this is probably not significant. Very local and rare.

MY: SE33 – Leeds, Lime Hills (WDH†).

WY: SE50 – Carcroft (CJ). SE51 – Shirley Pool (CJ).

25. *Ptinella errabunda* Johnson

Woodland species, under tight bark of dead broad-leaved and coniferous trees. Widespread and common. This immigrant species, thought to come from New Zealand, was described and figured by Johnson (1975), who gives ten Yorkshire localities.

EY: SE66 – Strensall (EWA). SE68 – Duncombe Park (CJ).

MY: SE26 – Studley (CJ) (RJM). SE36 – Copgrove Park (CJ). SE54 – Askham Bog (EWA†).

NY: SE39 – Thrintoft (CJ).

WY: SD92 – Hardcastle Crags (SB). SE00 – Holme Moss (CJ). SE10 – Holmbridge (CJ). SE11 – Farnley Tyas (EWA). SE21 – West Bretton (EWA†). SE30 – Rockley Abbey (CJ), Worsbrough Reservoir (CJ). SE31 – Chevet Park (CJ). SE40 – Darfield (CJ). SE51 – Shirley Pool (CJ). SE60 – Sandall Beat (CJ). SK39 – Greno Wood (CJ). SK58 – Roche Abbey (PS).

26. *Ptinella taylorae* Johnson

Woodland species, under tight bark of dead broad-leaved and coniferous trees. The single Yorkshire specimen is from willow bark and is unfortunately a male, this sex being difficult to separate from *aptera*. In Britain *taylorae* is another immigrant New Zealand species which is not uncommon in some western English and Irish localities (Johnson, 1977).

NY: SE39 – Thrintoft (CJ).

27. *Pteryx suturalis* (Heer)
Woodland species, under bark and in rotten wood of dead broad-leaved trees, rarely coniferous. Local and scarce.
EY: SE98 – Forge Valley (EWA). TA08 – Scarborough (RL†).
MY: SD84 – Gisburn (CJ). SE26 – Fountains Hall/Spa Gill Wood (EAW †), Studley (EAW†). SE54 – Askham Bog (WDH†) (EWA) (RJM).
NY: NZ10 – Richmond (EWA).
WY: SD92 – Hardcastle Crags (SB). SE41 – Wentbridge (EGB†). SE50 – Melton Wood (RJM). SE51 – Brocodale (EGB†).

28. *Baeocrara variolosa* (Mulsant & Rey)
Woodland species, mostly in dung, rarely in other putrefying substances. Only a single specimen is known from Yorkshire, although the species can occur in numbers.
MY: SD86 – Malham Tarn (CJ).

29. *Smicrus filicornis* (Fairmaire & Laboulbène)
Mostly in old dung heaps by rivers. There is an old and unconfirmed Yorkshire record (Fowler, 1889) for this nationally little-recorded species.
EY: SE67 – [Nunnington, River Rye (AM†)].

30. *Nephanes titan* (Newman)
Grassland species in old dungheaps by farms; occasionally in other microhabitats such as garden compost and horse dung. Widespread, locally common.
EY: NZ71 – Ellerby (CJ). SE58 – Thirsk (RJM). SE88 – Thornton Dale (GBW†). SE99 – Barns Cliff (GBW†). TA08 – Cayton (EWA).
MY: SD64 – Bashall Eaves (CJ). SD84 – Gisburn (CJ). SE37 – Queen Mary's Dub (CJ). SE43 – South Milford (CJ). SE54 – Askham Bog (RSK).
NY: SE29 – Bolton-on-Swale (CJ). SE39 – Thrintoft (CJ).
SY: SE63 – North Duffield (RJM), Skipwith (CJ). SE64 – Wheldrake (CJ). SE74 – Ellerthorpe Ings (RJM), Thornton Ellers (RJM ms). SE86 – Wharram-le-Street (RSK). TA21 – Sunk Island (RJM).
WY: SE11 – Ravensknowle (EWA†). SE20 – Hoylandswaine (CJ). SE30 – Hermit Hill (CJ). SE31 – Wintersett (CJ). SE41 – Thorpe Audlin (CJ), Wentbridge (HHC†). SE50 – Melton Wood (RJM), Sprotbrough (RJM). SE51 – Fenwick (CJ). SE61 – Sykehouse (CJ). SE62 – Gowdall (CJ), Snaith (CJ). SK39 – Greno Wood (CJ).

31. *Acrotrichis atomaria* (Degeer)
Occurs in a range of habitats — woodlands, wetlands and grasslands, in all kinds of damp vegetational litter and moss. Widespread and common.
EY: NZ60 – Kildale (MLT†). NZ70 – Stonegate (CJ). NZ80 – Skelder (CJ). NZ81 – Mulgrave Woods (HB†). SE75 – Buttercrambe Moor (CJ). SE89 – Newton Dale (EWA). SE98 – Forge Valley (GBW†). TA08 – Cayton Bay (DAL), Scarborough (TW†) (GBW†).
MY: SD64 – Whitewell (CJ). SD74 – Sawley (CJ). SD84 – Gisburn (CJ). SD86 – Malham Tarn (CJ). SD87 – Horton-in-Ribblesdale (WOS†). SD96 – Grass Woods (CJ). SE25 – Hampsthwaite (SAW). SE26 – Studley (CJ). SE46 – Upper Dunsforth (PJH). SE54 – Askham Bog (EWA) (CJ) (RSK) (RJM). SE62 – Drax (EJS).
NY: NY80 – East Ghylls (WOS†), West Stonesdale (WOS†). NZ10 – Ravensworth (GBW†). SD98 – Semerwater (RJM).
SY: SE73 – Aughton Ings (CJ) (RJM), Bubwith (CJ), Bubwith Bridge (RJM). SE74 – Thornton (RJM), Wheldrake Ings (RSK). SE82 – Gilberdike (EWA). SE86 – Wharram-le-Street (RSK), Wharram Percy (RSK).
WY: SD92 – Todmorden (CJ). SE10 – Holmbridge (CJ). SE11 – Dean Wood (MLD), Huddersfield (EWA) (CJ). SE11 – Elland (EJS). SE14 – Ilkley

Bridge (EWA). SE30 – Worsbrough Reservoir (CJ). SE50 – Denaby Ings (CJ), Melton Wood (RJM), Sprotbrough (RJM). SE60 – Hatfield Chase (CJ), Hatfield Lings (CJ), Rossington Bridge (RJM), Sandall Beat (HHC†). SE61 – Thorne, Warp Farm (EWA). SE71 – Rawcliffe (WAE), Thorne Moors/-Waste (CJ) (EWA) (RJM) (EJS). SK38 – Broomhall (ASL). SK48 – Spring Wood (WAE). SK58 – Langold Holt (RJM), Roche Abbey (WAE).

32. *Acrotrichis chevrolati* (Allibert)

Grassland species in old dungheaps by farms. Very local and rare, only three specimens collected recently. (The oft-quoted Lawson record for Scarborough is very dubious — neither *Nephanes* nor other smaller *Acrotrichis* were recognised in the brief VCH list (Bayford & Thompson, 1907)).

WY: SK39 – Greno Wood (CJ).

33. *Acrotrichis cognata* (Matthews)

Woodland species, sometimes in other shaded places such as hedgerows; in all kinds of putrefying substances especially animal dung, rotting fungi, carrion and grass traps. Widespread and fairly common. A north American species first recorded from Britain in 1967 (Easton, 1967; Johnson, 1967).

EY: SE68 – Duncombe Park (RJM).

MY: SD86 – Malham Tarn (CJ). SE26 – Studley (CJ). SE54 – Askham Bog (RSK).

SY: SE63 – Riccall (MDD), Skipwith (CJ), Skipwith Common (RSK). SE73 – Aughton (CJ).

WY: SE00 – Holme Moss (CJ). SE01 – Drop Clough (DM). SE11 – Farnley Tyas (CJ), Huddersfield (CJ). SE12 – Elland (EJS). SE20 – Cawthorne (CJ), Langsett (CJ). SE30 – Rockley Abbey (CJ), Worsbrough (CJ). SE31 – Wintersett (CJ). SE50 – Melton Wood (RJM), Sprotbrough (RJM). SE51 – Brocodale (WAE). SE53 – Bishopwood (RJM). SE61 – Sykehouse (CJ). SK28 – Rivelin Valley (JL). SK29 – Ewden Beck (CJ). SK39 – Greno Wood (CJ). SK58 – Lindrick Common (WAE).

34. *Acrotrichis danica* Sundt

In a wide range of open habitats such as grassland, moorland and heath, but also extending through scrub into woodland edges. Mostly at the roots of vegetation, in moss, amongst dead leaves, etc., sometimes in grass cuttings. Widespread and fairly common. Recorded from three Yorkshire vice-counties earlier (Johnson, 1967).

EY: SE58 – Rye Dale (PJH). SE98 – Forge Valley (GBW†). SE99 – Scar Wood (DAL). NZ60 – Esklets (MLT†). NZ80 – Skelder (CJ). NZ81 – Lythe (CJ). TA08 – Scarborough (TW†) (GBW†), Scarborough Mere (EWA), Throxenby (EWA).

MY: SD84 – Gisburn (CJ). SD86 – Malham Tarn (CJ) (AB). SD87 – Fountains Fell (WOS†), Horton-in-Ribblesdale (WOS†). SE26 – Studley (CJ). SE35 – Harrogate (SAW). SE54 – Askham Bog (EWA).

NY: NY80 – East Ghyll, Keld (WOS†).

SY: SE73 – Aughton (CJ). SE86 – Wharram Percy (RSK). TA14 – Hornsea Mere (RJM).

WY: SD92 – Todmorden (CJ). SE00 – Chew Valley (HB snr †). SE01 – Drop Clough (DM). SE11 – Farnley Tyas (CJ). SE12 – Elland (EJS). SE21 – Stocksmoor (EWA). SE30 – Wilthorpe Marsh (RJM), Woolley Beck (WAE), Worsbrough Reservoir (CJ). SE31 – Chevet Park (CJ). SE60 – Hatfield Chase (CJ), Sandall Beat (HHC†). SK49 – Thybergh Reservoir (RJS). SK58 – Langold Holt (RJM).

35. *Acrotrichis dispar* (Matthews)
Woodland species, in putrefying substances such as animal dung and rotting fungi. Only a single old Yorkshire record.
WY: SE60 – Sandall Beat (HHC†).

36. *Acrotrichis fascicularis* (Herbst)
Grassland species occurring in all open habitats, but also in woodlands. In heaped plant refuse from farms and gardens, often in various other putrefying substances. Widespread and common.
EY: NZ42 – Middlesbrough (MLT†). NZ80 – Beckhole (HB†), Skelder (CJ). NZ81 – Mulgrave (CJ). SE58 – Thirsk (RJM). SE68 – Duncombe Park (RJM), Kirkdale (EWA). SE98 – Raincliffe (GBW†), Raincliffe Wood (GBW†). TA09 – Scalby (GBW†).
MY: SD84 – Gisburn (CJ) (AB). SD86 – Malham Tarn (CJ). SD95 – Skipton (SAW). SE05 – Bolton Abbey (SAW). SE06 – Grassington (WDH †). SE07 – How Stean (WAE). SE26 – Studley (CJ). SE27 – North Stainley (EWA). SE33 – Leeds, Lime Hills (WDH†). SE35 – Harrogate (SAW). SE36– Copgrove (CJ). SE46 – Upper Dunsforth (PJH). SE53 – Bishop Wood (RJM). SE54 – Askham Bog (WDH†) (EWA) (CJ) (RSK) (JP) (RJM).
NY: NY80 – Easy Ghyll, Keld (WOS†). SE39 – Thrintoft (CJ).
SY: SE63 – Aughton Ings (RJM), Skipwith (CJ). SE64 – Wheldrake (CJ). SE72 – Asselby Island (RSK). SE73 – Aughton (CJ), Aughton Ings (CJ), Breighton Meadows (RJM), Bubwith (GBW†). SE74 – Thornton (RJM), Wheldrake Ings (RSK). SE84 – Londesborough Park (AN). SE86 – Thixendale (RSK), Wharram Quarry (RGB). SE93 – Drewton Dale (AN). TA02 – Hessle Quarry (RSK). TA41 – Kilnsea (SS †), Spurn (SS†).
WY: SD92 Todmorden (CJ). SE01 – Drop Clough (DM). SE10 – Hades (MLD). SE11 – Dalton (EWA), Dean Wood (MLD), Farnley Tyas (CJ), Huddersfield (CJ), Ravensknowle (EWA). SE12 – Elland (EJS), Elland Park Wood (WAE), Kirklees (EJP). SE20 – Cawthorne (CJ), Langsett (CJ). SE30 – Rockley Abbey (CJ), Worsbrough Reservoir (CJ). SE31 – Wintersett (CJ). SE40 – Denaby Ings (RJM), Edderthorpe (CJ). SE50 – Denaby Ings (CJ), Melton Wood (RJM). SE51 – Shirley Pool (PS). SE52 – Eggborough (RJM). SE60 – Armthorpe (PS), Sandall Beat (CJ). SE61 – Sykehouse (CJ), Warp Farm, Thorne (EWA). SE71 – Thorne Waste (EWA) (CJ). SE82 – Blacktoft Sands (CJ). SK39 – Greno Wod (CJ), Wentworth Park (PS). SK48 – Norwood (WAE). SK58 – Roche Abbey (PS). SK59 –Conisbrough (RJM). SK69 – Potteric Carr (PS).

37. *Acrotrichis grandicollis* (Mannerheim)
Grassland species occurring in all open habitats, but also in woodlands. In animal dung and other putrefying substances. Widespread and common.
EY: NZ62 – Saltburn (MLT†). NZ71 – Ugthorpe (CJ). NZ80 – [Sleights (HB†)]. NZ81 – Mulgrave (CJ). SE68 – Duncombe Park (RJM). SE98 – Forge Valley (GBW†) (EWA ms), Raincliffe Wood (GBW †). TA08 – Scarborough dist. (GBW†).
MY: SD84 – Gisburn (CJ). SD86 – Malham Tarn (CJ) (AB). SD96 – Conistone (CJ). SE14 – Ilkley (GWRB†). SE46 – Upper Dunsforth (PJH). SE54 – Askham Bog (WOS†) (EWA) (RSK) (RJM).
NY: NZ10 – Ravensworth (GBW†).
SY: SE63 – Aughton Ings (RJM), Skipwith (CJ). SE73 – Aughton (CJ), Bubwith (GBW†). SE92 – Elloughton Hall (RSK). SE93 – Newbald Marsh (RSK). TA02 – Hessle (RSK). TA03 – Beverley (EWA).
WY: SE01 – Drop Clough (DM). SE11 – Dalton (EWA), Dean Wood (MLD), Farnley Tyas (EWA). SE12 – Elland (EJS). SE20 – Gunthwaite (EWA), Langsett (CJ). SE30 – Rockley Abbey (CJ), Worsbrough Reservoir (CJ).

SE31 – Wintersett (CJ). SE42 – Mickletown Ings (CJ). SE50 – Bentley Common (PS), Melton Wood (RJM), River Don (RJM). SE51 – Shirley Pool (RJM). SE60 – Hatfield Lings (CJ) (PS), Wheatley (HHC†). SE61 – Sykehouse (CJ). SK29 – Ewden Beck (CJ).

38. *Acrotrichis henrici* (Matthews)

Wetland species, in marsh litter. Local and scarce, although sometimes in numbers. This north American species was first recognised in Britain from Denaby Ings (Johnson, 1967).

SY: SE73 – Aughton (CJ), Bubwith (CJ) (RJM). TA14 – Hornsea Mere (RH).

WY: SE30 – Wilthorpe Marsh (RJM). SE40 – Denaby Ings (RJM), Edderthorpe (CJ). SE42 – Mickletown Ings (CJ). SE50 – Denaby Ings (CJ) (EWA), Sprotbrough (RJM). SE51 – Rushy Moor (RJM), Shirley Pool (RJM). SE71 – Thorne Moor (PS).

39. *Acrotrichis insularis* (Mäklin)

Woodland species occurring in a range of putrefying substances, especially grass traps, rotting fungi, dung, carrion etc. Widespread and frequent. This is another north American species, first recognised in Britain from Roche Abbey (Johnson, 1966).

EY: NZ80 – Skelder (CJ). NZ90 – Robin Hood's Bay (CJ). SE68 – Duncombe Park (RJM). SE75 – Buttercrambe Moor (CJ). SE99 – Langdale Rigg (RSK), Ravenscar (RSK).

MY: SE36 – Copgrove (CJ). SE54 – Askham Bog (JP).

SY: SE64 – Wheldrake (CJ). SE83 – Newbald Marsh (RSK).

WY: SD92 – Todmorden (CJ). SE11 – Farnley Moor (EWA), Farnley Tyas (CJ). SE12 – Kirklees (EJP). SE20 – Cawthorne (CJ). SE21 – Mirfield (EJP). SE31 – Chevet Park (CJ). SE50 – Melton Wood (RJM), Sprotbrough (RJM). SE60 – Sandall Beat (CJ). SK39 – Greno Wood (CJ). SK58 – Roche Abbey (CJ).

40. *Acrotrichis intermedia* (Gillmeister)

Woodland species, characteristic of leaflitter from broad-leaved trees, rarely in conifer plantations. Widespread and very common.

EY: NZ61 – Moorsholm (CJ). NZ80 – Skelder (CJ). SE68 – Duncombe Park (RJM). SE75 – Buttercrambe Moor (CJ). SE98 – Raincliffe Wood (GBW†). SE99 – Beast Cliff (RSK).

MY: SD64 – Whitewell (CJ). SD84 – Gisburn (CJ). SD96 – Grass Woods (CJ) (RJM). SE25 – Hampsthwaite (SAW). SE36 – Copgrove Park (CJ). SE46 – Upper Dunsforth (PJH). SE54 – Askham Bog (EWA) (CJ).

NY: NZ10 – Ravensworth (GBW†).

SY: SE63 – Riccall (MDD ms), Skipwith (CJ).

WY: SD92 – Todmorden (CJ). SE00 – Holme Moss (CJ). SE01 – Drop Clough (DM). SE02 – Broadhead Clough (RJM).SE10 – Holmbridge (CJ). SE11 – Elland Park Wood (WAE), Farnley Tyas (CJ), Hey Wood, Honley (CJ), Huddersfield (CJ), Storthes Hall, Farnley (EWA). SE12 – Elland (EJS), Kirklees (EJP). SE20 – Cawthorne (CJ), Denby Dale (EWA), Langsett (CJ), Lower Denby (EJS), Margery Wood (RJM). SE30 – Hood Green (CJ), Rockley Abbey (CJ), Worsbrough Reservoir (CJ). SE31 – Chevet Park (CJ). SE33 – Temple Newsam Park (CAH). SE40 – Frickley Park (RJM). SE50 – Carcroft (CJ), Melton (RJM), Melton Wood (RJM), Sprotbrough (RJM). SE52 – Brayton Barff (RJM). SE53 – Bishop Wood (RJM). SE60 – Armthorpe (PS), Sandall Beat (CJ) (RJM). SE71 – Thorne Moors/Waste (CJ) (EJS) (RJM). SK29 – Agden Reservoir (EJS),Ewden (EJS), Ewden Beck (CJ), Wharncliffe (EJS). SK38 – Little Matlock Wood (ASL), Reaps

Wood (EJS), Whirlow Brook (CJ). SK39 – Greno Wood (CJ). SK48 – Deane Plantation (WAE), Norwood (WAE). SK49 – Wickenlay Wood (C & T). SK58 – Roche Abbey (CJ).

41. *Acrotrichis lucidula* Rosskothen
Wetland species, mostly in wet moss affected by spring water trickles or seepages in woodland. Very local, often in numbers.
EY: SE98 – Forge Valley (GBW†).
WY: SK29 – Salt Springs, Ewden (EJS).

42. *Acrotrichis montandoni* (Allibert)
Occurs in a range of habitats — woodlands, grasslands and gardens. Microhabitats are also varied and include old dungheaps, farm and garden plant refuse, decayed tree cavities and woodland grass traps. The species is also a well-known myrmecophile, in nests of the northern wood ant (*Formica lugubris* Zett.). Widespread and fairly common.
EY: NZ60 – [Farndale (GBW†)]. NZ71 – Ellerby (CJ). NZ80 – [Beckhole (HB†)]. NZ90 – Robin Hood's Bay (CJ). SE68 – [Riccaldale (GBW†)]. SE98 – East Ayton (EWA). SE99 – Barns Cliff (GBW†), Harwood Dale (GBW†), [Helwith Beck (HB†)], Scar Wood (DAL). TA08 – Scarborough (GBW†).
MY: SD95 – Skipton (SAW). SE36 – Copgrove (CJ).
SY: SE63 – Skipwith (CJ). SE64 – Wheldrake (CJ). TA41 – Spurn (WDH†) (SS†).
WY: SE20 – Denby Dale (EWA), Langsett (CJ). SE30 – Hermit Hill (CJ), Rockley Abbey (CJ), Worsbrough Reservoir (CJ). SE50 – Melton Wood (RJM), Sprotbrough (RJM). SE60 – Hatfield Lings (CJ). SE61 – Phippin Parks (CJ), Sykehouse (CJ). SK38 – Whirlow Brook (CJ). SK39 – Greno Wood (CJ).

43. *Acrotrichis norvegica* Strand
Mostly grassland species in old haystacks. Very local and rare. The species is already recorded from Studley (Johnson, 1967).
MY: SE26 – Studley (CJ). SE36 – Copgrove (CJ).
WY: SE61 – Phippin Parks (CJ). SE62 – Snaith (CJ).

44. *Acrotrichis parva* Rosskothen
Woodland species occurring in putrefying substances, but mostly in grass traps. Very local and rare. The species was recorded from Malham Tarn when it was first recognised from Britain (Johnson, 1976).
MY: SD86 – Malham Tarn (CJ).
SY: SE84 – Pocklington Canal (WDH†).
WY: SE11 – Farnley Tyas (CJ). SE30 – Worsbrough Reservoir (CJ).

45. *Acrotrichis pumila* (Erichson)
In old dungheaps by farms, and also in piles of leaf compost in town parks. Very local and usually rare, but once in large numbers.
SY: SE64 – Wheldrake (CJ).
WY: SD92 – Todmorden (CJ).

46. *Acrotrichis rosskotheni* Sundt (=*fraterna* Johnson)
Woodland species in leaflitter from broad-leaved trees, occasionally in piled leaf compost or haystack bottoms in grassland or gardens. Widespread; rare to frequent. Five Yorkshire localities were listed for this species as *fraterna* (Johnson, 1975), which name was later synonymised with *rosskotheni* (Johnson, 1987b).
MY: SD64 – Whitewell (CJ). SD86 – Malham Tarn (CJ). SD96 – Grass Woods (CJ). SE26 – Studley (CJ).SE36 – Copgrove (CJ).
WY: SE11 – Dean Wood (MLD), Farnley Tyas (CJ). SE30 – Hood Green

(CJ). SE50 – Melton Wood (RJM). SE60 – Sandall Beat (CJ). SE61 – Phippin Parks (CJ). SK58 – Roche Abbey (CJ). SK69 – Barrow Hills (RJM).

47. *Acrotrichis rugulosa* Rosskothen

Woodland species, in putrefying substances such as animal dung, decaying fungi and grass traps. Very local and scarce, although once in large numbers.

EY: NZ81 – Mulgrave (CJ). SE98 – Raincliffe Wood (GBW†).
MY: SD86 – Malham Tarn (CJ) (AB).
WY: SE11 – Farnley Tyas (CJ). SK29 – Ewden Beck (CJ).

48. *Acrotrichis sericans* (Heer)

Grassland species in animal dung and old dungheaps by farms, occasionally in garden compost. Widespread and common.

EY: NZ70 – Stonegate (CJ). NZ81 – Lythe (CJ), Mulgrave (CJ), [Whitby (HB†)]. SE58 – Thirsk (RJM). SE98 – Brompton (EWA).
MY: SD64 – Bashall Eaves (CJ). SD84 – Gisburn (CJ) (AB). SD86 – Malham Tarn (CJ). SD96 – Conistone (CJ). SE14 – Ilkley (GWRB†). SE25 – Hampsthwaite (SAW). SE26 – Brimham Rocks (MLT†), Studley (CJ) (EWA). SE43 – South Milford (CJ). SE54 – Askham Bog (RSK). SE62 – Drax (EJS).
NY: SE39 – Thrintoft (CJ).
SY: SE63 – Aughton Ings (RJM), Skipwith (CJ). SE64 – Wheldrake (CJ). SE73 – Aughton (CJ). SE97 – Potter Brompton (RJM). TA21 – Hawkins Point (WAE), Sunk Island (RJM).
WY: SE01 – Drop Clough (DM). SE11 – Farnley Tyas (CJ). SE31 – Wintersett (CJ). SE50 – Arksey (CJ), Bentley Common (CJ), Melton Wood (RJM), Sprotbrough (RJM). SE51 – Fenwick (CJ), Shirley Pool (RJM). SE60 – Bessacarr (HHC†). SE61 – Sykehouse (CJ), Warp Farm, Thorne (EWA). SE62 – Snaith (CJ). SK39 – Greno Wood. SK58 – Rotherham (WAE). SK69 – Potteric Carr (PS).

49. *Acrotrichis silvatica* Rosskothen

Woodland species occurring in putrefying substances, but usually in grass traps. Very local and scarce. Two Yorkshire localities were given when the status of this species was clarified in Britain (Johnson, 1976).

EY: NZ80 – Skelder (CJ).
SY: SE63 – Skipwith (CJ), Skipwith Common (RSK).
WY: SE10 – Holmbridge (CJ). SE11 – Farnley Tyas (CJ), Hey Wood, Honley (CJ). SE30 – Worsbrough Reservoir (CJ). SE50 – Melton Wood (RJM).

50. *Acrotrichis sitkaensis* (Motschulsky) (=*fratercula* auctt.)

Wetland species, in all kinds of marsh litter from ings, bogs, reservoirs, ponds etc. Widespread and common.

EY: TA08 – Throxenby (EWA).
MY: SE26 – Studley, River Skell (CJ). SE54 – Askham Bog (WDH†) (SS†) (CJ) (EWA) (RSK) (JP).
NY: SE29 – Great Langton (CJ). SE39 – Thrintoft (CJ).
SY: SE63 – Aughton Ings (RJM) (CJ), Riccall (RSK). SE64 – Wheldrake (CJ), Wheldrake Ings (AN) (RGB). SE73 – Aughton (RJM), Aughton Ings (CJ), Bubwith (GBW†) (CES†) (RJM) (CJ). SE74 – Wheldrake Ings (CJ) (RSK). SE83 – Manor House (AN). TA41 – Spurn (SS†).
WY: SE30 – Worsbrough Reservoir (CJ). SE31 – Chevet Park (CJ). SE40 – Denaby Ings (RJM), Edderthorpe (CJ). SE42 – Mickletown Ings (CJ). SE50 – Cusworth Park (RJM), Denaby Ings (CJ), Sprotbrough (RJM). SE51 – Rushy Moor (RJM), Shirley Pool (CJ) (PS), Shirley Wood (RJM). SE60 – Rossington Bridge (RJM). SE61 – Thorne Moor/Waste (CJ). SE71 – Thorne

Moor (CJ) (EJS). SE82 – Blacktoft Sands (CJ). SK49 – Rawmarsh (EJS). SJ58 – Langold Holt (RJM). SK59 – Conisbrough (RJM). SK69 – Misson (CJ).

51. *Acrotrichis strandi* Sundt

Wetland species, in all kinds of marsh litter from ings, bogs, pools, reservoirs etc. Very local and scarce. The first recognised British specimens were from Askham Bog and Throxenby (Johnson, 1967).

EY: TA08 – Throxenby (EWA).

MY: SD84 – Gisburn (CJ). SE54 – Askham Bog (WDH†) (CJ) (EWA) (RSK) (RJM).

SY: SE63 – Bubwith (RJM). SE73 – Aughton (RJM), Aughton Ings (CJ), Bubwith (CJ) (RJM). SE84 – Londesborough Park (AN).

WY: SE30 – Worsbrough Reservoir (CJ). SE51 – Shirley Pool (CJ) (PS), Shirley Wood (RJM ms).

52. *Acrotrichis thoracica* (Waltl)

Grassland species in animal dung and old dungheaps by farms, occasionally in garden compost. Widespread and common.

EY: NZ70 – Stonegate (CJ). NZ71 – Ellerby (CJ). NZ80 – Skelder (CJ). NZ81 – Lythe (CJ). NZ90 – Robin Hood's Bay (CJ). SE58 – Thirsk (RJM). SE98 – East Ayton (EWA), West Ayton (EWA). TA08 – Scarborough (GBW†).

MY: SD64 – Bashall Eaves (CJ). SD84 – Gisburn (CJ) (AB). SD86 – Malham Tarn (CJ). SD95 – Skipton (SAW). SE05 – Bolton Abbey (SAW). SE25 – Hampsthwaite (SAW). SE27 – North Stainley (EWA). SE35 – Harrogate (SAW). SE54 – Askham Bog (RSK).

NY: SE19 – Constable Burton (EWA). SE29 – Bolton-on-Swale (CJ). SE39 – Thrintoft (CJ).

SY: TA41 – Spurn (WDH†) (SS†).

WY: SE11 – Farnley Tyas (EWA). SE20 – Langsett (CJ). SE30 – Hermit Hill (CJ), Rockley Abbey (CJ). SE41 – Thorpe Audlin (CJ). SE50 – Sprotbrough (RJM). SE51 – Fenwick (CJ). SE60 – Hatfield Lings (CJ), Sandall Beat (CJ), SE61 – Sykehouse (CJ). SE62 – Gowdall (CJ). SK28 – Rivelin Valley (JL). SK39 – Greno Wood (CJ). SK69 – Potteric Carr (PS).

The following species have been recorded from Yorkshire in the past in error: (a) *Nossidium pilosellum* (Marsham) — Bayford's specimen is only *Pteryx suturalis* (Heer). (b) *Ptinella aptera* (Guerin-Ménéville) — all records refer to *errabunda* Johnson.

Yorkshire's ptiliids currently comprise 71% of the British fauna — a good proportion. Another 10% might be expected, as they occur in neighbouring counties, if but rarely.

Collector's Names and Abbreviations

† pre-1960 collector

AB	A. Brindle	CT	Crittenden & Twigg
AM	A. Matthews †	DAL	D. A. Lott
AN	A. Norris	DM	D. Maude
ASL	A. S. Lazenby	DRN	D. R. Nash
CAH	C. A. Howes	EAW	E. A. Waterhouse †
CES	C. E. Stott †	EGB	E. G. Bayford †
CJ	C. Johnson	EJP	E. J. Pearce

EJS	E. J. Smith	PS	P. Skidmore
EWA	E. W. Aubrook (†)	RC	R. Crossley
GBW	G. B. Walsh †	RGB	R. G. Booth
GWC	G. W. Chaster †	RH	R. Hawley
GWRB	G. W. R. Bartindale †	RJM	R. J. Marsh
HB	H. Britten jnr †	RL	R. Lawson †
HHC	H. H. Corbett †	RSB	R. S. Bagnall †
JL	J. Lee	RSK	R. S. Key
JP	J. Parry	SAW	S. A. Williams
KNAA	K. N. A. Alexander	SB	S. Bowestead
MDD	M. D. Darby	SS	S. Shaw †
MLD	M. L. Denton	TW	T. Wilkinson †
MLT	M. L. Thompson †	WAE	W. A. Ely
PB	P. Buckland	WDH	W. D. Hincks †
PJH	P. J. Hodge	WOS	W. O. Steel †

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BOOK REVIEWS

Butterflies and Moths of Yorkshire, Distribution and Conservation, edited by **S. L. Sutton** and **H. E. Beaumont**. Pp. xi + 367, 40 line drawings and 5 maps. Yorkshire Naturalists' Union. 1989. £15.00 paperback.

Twenty years have elapsed since the publication of the last Yorkshire list of butterflies and moths and during this time there has been a considerable increase in the recording done in the county. The much greater availability of literature, the enthusiasm generated by the national mapping scheme and the greater mobility of recorders resulting from the surge in car ownership have contributed to this increase and the need for a new up-to-date account was increasingly felt. This need has been splendidly met by the volume reviewed here. It can be considered in three parts.

Introductory chapters cover the influences that shape the fauna and the diversity and distribution of the species and these make fascinating reading that will appeal to many naturalists besides lepidopterists. Topics range widely over climate, landscapes and indicator species, migration and dispersal, fluctuations in numbers, collecting and voucher specimens, rearing, identifying, recording and much else. It is cheering to learn that the records indicate that, excluding the microlepidoptera, in the past 20 years while the range of 25 species has contracted in the county that of 128 others has expanded and these latter include the beautiful Purple Hairstreak and the handsome Lime Hawk-moth. All is not necessarily doom and gloom. The chapter on conservation is marred by some statements, unsupported by examples, that are open to challenge. That 'prime Lepidoptera habitats are to be found in National Nature Reserves on the Ingleborough massif' (p.54) is at variance with the earlier statement that 'the carboniferous limestone is not rich in species compared with acid lowland sites' (p.21). However, such statements must not be weighed too heavily against the solid sense of the whole.

The main part of the work is the systematic list of the 1,591 species recorded from the five Watsonian vice-counties, 61-65, that comprised the old Yorkshire county. This list includes the microlepidoptera and it occupies 198 pages. The information given under each species ranges from a brief 'widespread and common. Recorded from all five vice-counties' to many named localities, e.g. 54 for the Brown Rustic, together with dates, recorder's initials and comments. Clearly a very great deal of field work and recording has gone into the making of this account and the result is comprehensively set out here.

Last come the bibliography, appendices and indexes, and these occupy a substantial 87 pages. Lists of recorders and initials used, lists of all sites named in the text with OS grid references, collecting and conservation codes, locations of collections and indexes to chapters and to the systematic list complete the account.

It is a handsome volume, beautifully illustrated by some fine black and white line drawings, accurately detailed, by David Green and Veronica Blakeley. There are very few perceptible errors, 'East Cottingham' instead of East Cottingwith in Appendix 2, p.300 being the only significant one that I noticed. Common English names are used throughout the chapters and greatly facilitate the use of the book by a large number of readers who would be put off by the use of scientific names alone. There is much sensible guidance for beginners; indeed, the book is aimed at everyone with any interest at all in the butterflies and moths. Lucky beginners of today! What would I not have given to have had such an account and guide to help me when I first turned my attention to these beautiful and fascinating creatures?

JHF

Great Walks: Dartmoor and Exmoor by **John Weir** and **Brian Le Messurier**. Pp. 176, with 70 colour plates and 38 sketch maps. Ward Lock. 1988. £9.95.

This book consists of a selection of 25 walks from 3–23 miles in length with sketch maps and instructions in the text. The introduction briefly outlines geology and pre-history and picks out a few features specific to Dartmoor and Exmoor. Advice on access and safety have been placed in an Appendix. The photographs are superb, although the atmosphere of the moors has often been sacrificed for dramatic contrast. The book may be a useful introduction for walkers unfamiliar with Dartmoor and Exmoor and for those who like to have a planned route. However, the sketch maps have inconsistent orientation and some quirks which need ingenuity to unravel. It is not a pocket guide and though written as a practical book it is rather large for use in the field.

BB

THE LICHEN FLORA OF INDUSTRIAL TEESSIDE

M. R. D. SEAWARD

Introduction

Considerable data exist linking the decline of the lichen flora throughout Europe and elsewhere over the past two centuries to an increase in air pollution, and no more so than for Teesside: the very extensive lichenological investigations in Cleveland by William Mudd (1830–1879) and George Dixon (1812–1904) during the 1850s and 1860s (Seaward 1987) provide us with a very clear picture of the former richness of its lichen flora. Their local records of three *Lobaria* species, *Usnea articulata*, etc., are indicative of a pure atmosphere comparable to that obtaining today in the north-west of the British Isles. For example, the 10 km × 10 km grid square 45/51 centred upon Great Ayton, where they both lived, and which in their time had a lichen flora of more than 330 species, today supports only 93 species. Many of these early records appear in Mudd's *A Manual of British Lichens* published in 1861, a milestone in British lichenology, and his very extensive lichen collections are to be found in many major herbaria throughout the world.

Since that period, quantitative and qualitative changes in air pollution have differed both spatially and temporally; this is particularly true of the past two decades, when changes in national energy policies, economic factors and implementation of clean air legislation have resulted in atmospheric regimes having markedly different effects on the lichen flora (Seaward 1987a).

On the one hand, relatively small areas experiencing improved air quality have been reinvaded by a limited number of species which exploit selective habitats, such as the colonisation by saxicolous lichens of high pH substrata which buffer potentially harmful atmospherically-derived pollutants. On the other hand, dilution of emissions, adopted by some authorities as a solution to local air pollution, has resulted in blanket pollution over major geographical areas, with profound effects on the lichen flora. Even a small rise in sulphur dioxide levels can cause a decline in diversity, species responding according to their sensitivity to this pollutant. More recently, the differing effects on lichens of both wet and dry acidic deposition have been detected in the field, but as yet little experimental work has been carried out to substantiate these observations.

Lichens have been extensively employed to monitor the extent or spread of air pollution, particularly sulphur dioxide, and bioindicational scales based on species diversity and/or simple phytosociological analyses have been developed for this purpose (e.g. Hawksworth and Rose 1970). There is a clearly defined negative relationship between species diversity and sulphur dioxide when the latter is more-or-less stable or increasing in concentration, with anthropogenic factors clearly overriding such factors as climate and topography (Seaward 1976b).

However, the implementation of the 1956 and 1968 Clean Air Acts in the United Kingdom has resulted in dramatic reductions in particulate and sulphur dioxide levels, and lichen species diversity counts and distribution patterns no longer demonstrate a clear relationship with sulphur dioxide.

Although multivariate analyses have shown that other factors are involved in such circumstances (Seaward 1976b), the destructive role of other atmospheric pollutants, and indeed other factors, has been insufficiently appreciated due to the inadequacy of monitoring equipment. The synergistic effects of the sum total of factors involved will in all probability never be fully appreciated by means of multivariate analyses, but a representative spectrum of implicated pollutants has recently been subjected to this type of analysis (Ammann *et al.* 1987). Recent advances in physiological and analytical techniques have revealed the very wide range of elements, compounds and radionuclides accumulated by lichens, certain of which are undoubtedly implicated in their decline.

Air Pollution Mapping in the Teesside Area

The study of lichens in areas affected by air pollution has largely been based on distributional studies. These have enabled the construction of zonal maps, in which the distribution of one or more species correlates well with prevailing levels of pollution, and the formulation of bioindicational scales for evaluating air pollution levels. In most polluted areas, the inner limit for the distribution of many lichen species is quite clearly defined; the ecological factors operating in such areas at, or immediately preceding, a particular date are critical for the lichen's performance or even for its existence. However, when investigating incipient changes in the inner distributional limits, care should be taken in interpreting which species survive in microclimatic niches by chance establishment, which are relicts, and which have responded to a change in atmospheric pollution. The importance of microhabitats for the survival of lichens in atmospheres subjected to fluctuations in level and content of pollutant load is widely recognised.

In Teesside, during the earlier stages (*c.* 1985) of this investigation, sulphur dioxide pollution zones were delimited on the basis of the epiphytic lichen flora (Figure 1). As can be seen from this work, a mean winter (September–March) sulphur dioxide level in excess of 100 μg m^{-3} is to be found along a SW–NE axis from Darlington to West Hartlepool, with Billingham on its eastern boundary. The lichen flora improves significantly in an easterly direction: Wilton lies on the eastern boundary of the 80 μg m^{-3} contour, with the 60 and 40 μg m^{-3} isopleths occurring at distances of *c.* 8–13 and 24 km respectively to the south-east. This pollution pattern is consistent with known major sources of emission and wind-directional data, but the levels do not accord well with local authority measurements which are considerably lower for the Teesside area at that time. From more recent data (Figure 1), it is clear that Teesside is experiencing amelioration.

Depending on the species, lichens take several to many years to respond to ameliorating conditions, whereas a sudden increase in air pollution produces a much more rapid effect. The time-lag between pollution levels dropping below an identifiable threshold and the successful colonisation of a lichen has therefore to be credibly established before any effective use can be made of lichen maps for monitoring amelioration.

In areas implementing clean air legislation, it is difficult to identify a direct relationship between ambient pollution levels and the success of lichens, and recently collected data may be ineffective in demonstrating any relationship between species diversity and air pollution levels (Seaward 1976b, 1979). However, the undoubted improvement in some lichen floras during recent years, as illustrated by species diversity relative to the distance from pollution sources, has been clearly demonstrated (Henderson-Sellers & Seaward 1979; Skye 1980; Seaward 1981; Hawksworth & McManus 1989). Similar trends have been observed for Teesside in recent years: however, although Figure 1 shows an overall improvement in air quality in terms of sulphur dioxide, with no levels reaching 100 μg m^{-3} and significant reductions to the east of Wilton (denoted by C & D) and to the west of the study area (denoted by A), there is an easterly shift of the 80 μg m^{-3} isopleth (denoted by E); the latter, determined from synoptic monitoring using tar spot fungus (*Rhytisma acerinum*) of sycamore, is probably a short-term effect. The role of other factors involved in such improvements has not been fully explored. Alkaline dusts clearly affect the composition of epiphytic floras (e.g. Gilbert 1976); soil fertilizers can produce similar changes, but where excessively used they adversely affect the lichen floras, as do numerous other agrochemicals. The recent spread of some species (e.g. *Ramalina farinacea*, *Xanthoria polycarpa*) into city suburbs and elsewhere may be prompted by windborne nutrient-enriched dusts.

It is clear from this investigation, particularly that concerned with long-term monitoring of epiphytes at Lovell Hill (see below), that nutrient-enrichment of the environment, directly resulting from the widespread use of agrochemicals and/or from industrial emissions, is responsible for significant qualitative changes in the nature of the lichen flora: amelioration, in terms of sulphur dioxide reduction, has not necessarily promoted lichen

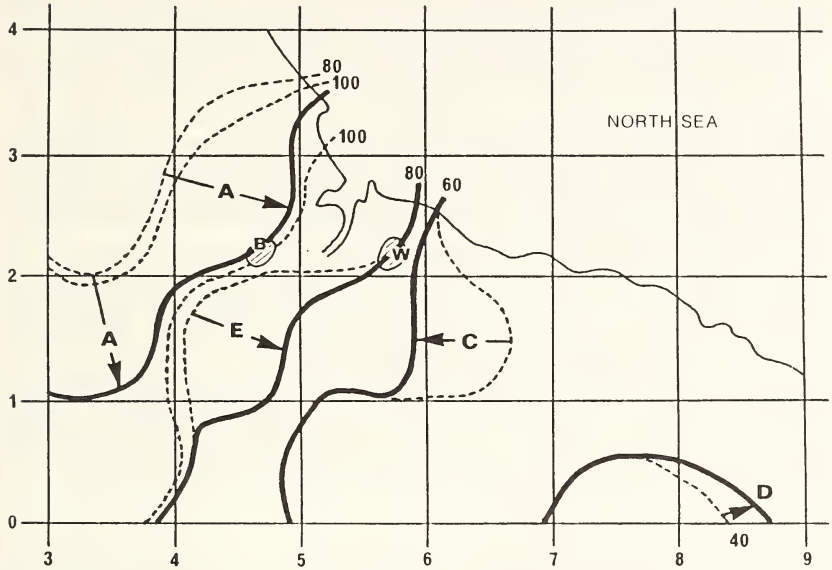

FIGURE 1
Distributional changes in mean winter sulphur dioxide levels ($\mu g\ m^{-3}$) in Teeside between 1985 (– – – – – –) and 1989 (————) as determined from lichen and tar spot surveys.
10 km × 10 km grid squares indicated; B = Billingham; W = Wilton.

assemblages akin to those of the pre-industrial era. A rich nitrophilous lichen flora on a wide range of substrata is to be observed at numerous sites throughout the study area.

Lichen Flora of Industrial Sites

Not only is it necessary for lichens to colonise man-influenced and man-made substrata in order to succeed, but they must also tolerate constantly changing environmental factors, some species being more sensitive to short-term extremes and others to more long-term enhanced pollution levels. The strategy of toxitolerant species in adapting to the multiplicity of problematic factors operating in polluted environments varies considerably; their reproductive spores and propagules readily colonise certain substrata, particularly those which can buffer or neutralise potentially harmful acidic deposition.

Epiphytic flora

Immature, and to a lesser extent mature, trees are occasionally to be found within, or close to, Teesside industrial sites; some trees have been planted as part of a landscaping programme and have now attained a size capable of supporting a diverse lichen flora. However, from an ever-present rich air spora, only a few species are capable of surviving the crucial stages of establishment, germination and development. Once established, such species are often aggressive, and, under conditions of amelioration, have generally proved to be highly competitive, to the exclusion of those species which would otherwise normally be growing under such regimes. Substrata are dominated by a very few lichen and algal species, and often only a single species prevails. Once established, such

strongly competitive species, with a high reproductive capacity and a tenacious hold on the substrata they colonise, can create monovegetational cover, even when a reduction in air pollution level would presuppose reinvasion by formerly successful species.

Lecanora conizaeoides exemplifies this strategy: its rise to dominance throughout major geographical areas of Europe over the past half century is without parallel. Air-polluted environments provide an ideal milieu for the spread of this taxon, and even amelioration, resulting from the implementation of clean air policies, has not yet broken its monopoly of substrata. The monotonous verdure created by such a species, which coats the few available trees in and near to industrial sites, has profound effects on the invertebrates which feed on, shelter in, and are camouflaged by epiphytes (Gerson & Seaward 1977; Seaward 1988).

Bases of a few trees (particularly *Salix*) within or near to Billingham (Figure 3 D, E & F) are impregnated with dusts that encourage a hypertrophicated flora (see above) including *Xanthoria* spp. as would be expected, together with taxa more commonly to be found on calcareous saxicolous substrata, such as *Lecanora dispersa*, *Phaeophyscia orbicularis*, *Rinodina gennarii* and *Scoliciosporum umbrinum*.

Both atmospheric amelioration and hypertrophication at Lovell Hill (45/596.188) have promoted a diverse flora, including such species as *Cetraria chlorophylla*, *Evernia prunastri*, *Hypogymnia physodes*, *Platismatia glauca*, *Ramalina farinacea*, *Usnea subfloridana*, *Xanthoria candelaria* and *X. polycarpa* on *Fraxinus* and *Salix*; the continued upgrading of this flora is currently being monitored in detail (see below).

Lignicolous flora

At numerous industrial sites, particularly Bamlett's Wharf (45/481.220), dusts (often nutrient-enriched) impregnate woodwork, enabling it to support a saxicolous-type flora including *Candelariella vitellina*, *Lecanora dispersa*, *L. muralis*, *Rinodina gennarii*, *Xanthoria candelaria* and *X. polycarpa*. Decaying woodwork, tree stumps, etc., provide suitable habitats for several of the above species, together with *Placynthiella* (*Lecidea*) *icmalea* and *Trapeliopsis* (*Lecidea*) *granulosa*.

Saxicolous flora

The range of saxicolous habitats available for lichens is limited to relatively new, man-made surfaces, many of which provide suitable substrata for the establishment of a lichen mosaic characteristic of many other industrial sites.

Calcareous substrata are more favourable than non-calcareous ones for lichen colonisation, and the high pH of such substrata as mortar and asbestos-cement provides a buffering effect from the toxicity of vitiated atmospheres. It would appear that acidic deposition has to be counteracted by a substratum with an artificially high pH if lichens are to succeed in a polluted environment. This is borne out by field observations: distinctive distributions of lichen species can be correlated with the pH of the saxicolous substratum colonised and the ambient air pollution level (Seaward 1976a).

The local input of dusts enriched with nitrogen and phosphorus encourage a hypertrophicated lichen flora composed of such taxa as *Caloplaca* spp. (particularly *C. decipiens*), *Lecanora muralis*, *Phaeophyscia orbicularis*, *Rinodina gennarii* and *Xanthoria* spp. Habitats of particular interest are wall capstones, bridge parapets and abandoned cement-paving footpaths; a particularly rich saxicolous flora is to be found in industrial sites to the south-east of Billingham. Stonework within environments otherwise hostile to lichens, such as the North Tees Brinefields at Greatham Creek (45/509.254), often furnish interesting species lists.

Terricolous flora

Occupancy of land by active industrial plant, roadways, offices, etc., at many Teesside industrial sites provides little opportunity for the establishment of terricolous species.

The few areas unused (rarely abandoned) were too disturbed to allow lichen succession; only occasionally do scattered pebbles, rubble and woodwork in such habitats provide substrata for lichens. Although stable grassy banks in the Greatham Creek area (45/50.25), despite the high salinity, are theoretically capable of supporting terricolous lichen species, none appear to be in evidence as yet.

Lovell Hill

This site on the Wilton Estate (45/59.18) was singled out for special attention, not only in order to be lichenologically evaluated in terms of its conservation, but also for it to be used to monitor environmental changes on a long-term basis. On both these counts, a detailed inventory of its epiphytic lichen flora was a prerequisite. Although this site proved of only limited interest when first surveyed in 1985, it became apparent from the many visits over the next four years that the lichen flora was increasing in luxuriance and diversity; furthermore, the nature of the establishment, succession and survival was more complex than at first appreciated. As a result of this pioneer research, data from this work are being incorporated into an Anglo-French programme instigated by this author to monitor atmospheric amelioration by means of lichens.

Detailed measurements of foliose and fruticose lichens on 28 *Salix* trees (tagged for identification) have been made every six months since May 1986 to determine succession, growth rates and survival. At the commencement of the project, 22 of the trees bore at least one foliose or fruticose lichen thallus; after two years, this had increased to 23. Not only do growth rates of thalli of a particular species vary from season to season and from year to year, but they also differ considerably in terms of survival. Numerous thalli thought to be well established on several trees have below average growth rates, or have degenerated, or indeed disappeared during the course of the three-and-a-half years of investigation. Whether natural or synanthropic factors have been solely or jointly responsible for these short term variations can only be determined from a longer study; undoubtedly the effects of hypertrophication are pronounced on several trees.

A list of lichens on *Salix*, *Fraxinus*, *Crataegus*, *Ulex* and lignum at Lovell Hill is as follows:

Buellia punctata, *Cetraria chlorophylla*, *Cladonia coniocraea*, *Evernia prunastri*, *Hypogymnia physodes*, *Lecanora conizaeoides*, *L. expallens*, *Lepraria incana*, *Micarea nitschkeana*, *Parmelia glabratula*, *P. subaurifera*, *P. sulcata*, *Physcia tenella*, *Placynthiella icmalea*, *Platismatia glauca*, *Ramalina farinacea*, *Scoliciosporum chlorococcum*, *Trapeliopsis granulosa*, *Usnea subfloridana*, *Xanthoria candelaria*, *X. parietina*, *X. polycarpa*.

Concluding Remarks

The lichen flora for the area under study was well understood in the mid-nineteenth century, but it has received limited attention during the past 120 years; therefore, although it is possible to determine in broad terms the impact of air pollution resulting from urban and industrial development in Teesside between these two periods, the nature and rate of the expansion could not be evaluated from a knowledge of the changes in the lichen flora until the current investigation which commenced in 1985. Nothing was known, for example, regarding the improvement of the lichen flora consequent upon environmental amelioration as a result of implementing the Clean Air Acts of 1956 and 1968.

Input to the British Lichen Society's computer database at Bradford University derived from recent lichenological fieldwork by the author and several other researchers throughout the region testifies to dramatic reductions in air pollution. However, reinvading lichens build up assemblages inconsistent with those which have died out; such phenomena are undoubtedly due to qualitative as well as quantitative changes in air pollution, and considerable evidence is provided in this paper to support the hypothesis that agrochemicals and other nutrient-enrichments of the environment are responsible for some of these changes.

Work in the Teesside area has added significantly to our knowledge of the region's lichen flora and the nature of the environment, and sufficient data have been assembled to provide an acceptable baseline for future monitoring programmes, one component of which it is hoped to continue at the Lovell Hill site. Profitable lines of enquiry into determining the effects on lichens of the new air pollution regimes should include such long-term field techniques, involving stringent ecological and phytogeographical criteria. To a large extent, such studies have been made possible by ICI's support of this project. However, even such complex systems must be supported by extensive field studies in a wide range of selected habitats in critical areas where more immediate changes can be scientifically diagnosed by means of bioindicational techniques complemented by adequate monitoring equipment. Unhappily, the current situation regarding atmospheric pollution may be too urgent to allow sufficient time for relatively long-term investigations, and reliance will have to be placed on short-term evaluations.

Acknowledgements

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BOOK REVIEWS

Flora of the British Isles by **A. R. Clapham, T. G. Tutin** and **D. M. Moore**. Pp. xxiv + 688, including 82 line drawings. Paperback edition (with corrections). Cambridge University Press. 1989. £25.00.

This is the paperback edition of the 1987 hardback third edition of the standard British flora, previously known by the initials of its authors as 'CTW'. The third edition has already been reviewed in *The Naturalist*, 1989, **114**: 80, and elsewhere. In some quarters it received considerable criticism. Many of the errors which led to criticism appear to have been subject to correction in this edition. However, of necessity it remains a revised work.

The nomenclature is based on *Flora Europaea*, but since this work is itself being revised and the new British List is expected within a year or two, there will no doubt be further changes before long. The index is good and gives authorities with the plant names. These are so often missing in popular works and field guides.

The treatment of critical groups is always a problem. That of *Rubus* spreads over eight pages, compared with more than 270 pages, excluding plates and distribution maps, in the recent monograph by Edees and Newton (1988). This is inevitable, but it is a pity that the bibliography starts with the statement 'Monographs of plant groups now available are not cited'. Some are given in the text, but in the case of the *Dryopteris filix-mas* group, for instance, the treatment is stated to be based on Jermy (1978) *Fern Atlas of the British Isles*, but the subspecies described are not given in that work. Considering that this is a reference work for the study, it could be more useful and up to date in this respect.

This reviewer assumes that by now any errors in the identification keys of earlier editions have been eliminated, and keys for revised groups such as the Water Crowfoots are a great improvement over those in the second edition. The choice of which aliens should have been included or excluded may depend on personal experience. The distribution of species is stated to be based, *inter alia*, on *The Critical Supplement to the Atlas of the British Isles* which is now 22 years old, and no indication is given of any later source of information.

Despite the criticisms made here, every serious botanist has little option but to possess a copy of this standard work, and this edition at least brings the price down from £65 to £25, though its bookshelf life may not be a long one.

EC

Modern Methods in Orchid Conservation: The role of Physiology, Ecology and Management edited by **H. W. Pritchard**. Pp. x + 173 with figures. Cambridge University Press. 1989. £22.50.

This book is based on the proceedings of a national symposium. It comprises 'a series of articles on orchid conservation . . . in relation to physiology, ecology and management'. Although they all relate to orchids, they do not together define any 'role' as the title suggests. Rather, they might well have appeared individually in a variety of

journals. 'The effects of the composition of the atmosphere on the growth of seedlings of *Cattleya aurantiaca*' or 'Host-fungus relationships in orchid mychorrhizal systems' exemplify contributions with but tenuous links with conservation.

Popular imagination only focusses upon endangered species, when these are spectacular, easily recognised and not perceived as 'nasty'. Many tropical orchids fall into this category but in Britain only *Cypripedium calceolus* is 'politically worth its weight in gold' (Jeffrey J. Wood, see below). However, the presence of rare orchids in a community leads all too often to its desecration: 'plants of lizard, military, monkey, ghost, early spider, lady, early purple and bee orchid were dug up over a three year period' write Lynne Farrell and Ro Fitzgerald; '. . . practical protection measures must operate so that individual plants can continue to survive and multiply so that future generations can also have the pleasure of seeing these remarkable life-forms'. Conservation in these terms is the equivalent of preservation of rare animals in zoos where, in reality, both viewers and viewed are captive. Further, the pleasure of 'seeing' must be forfeit to many through restriction of access, or even as a result of the removal of flowers, by the guardians of a secret place, to render plants less conspicuous.

The articles on 'Orchid propagation by tissue culture techniques &c.' and 'Factors influencing the germination and storage characteristics of orchid pollen' presage the total loss of accessible and extensive species-rich communities; the first sentence of the latter article includes the words 'as an adjunct to seed storage for genome preservation', a reminder of the threat of extinction facing not only many orchids but innumerable other species throughout the world.

This reviewer must confess an objection in principle to ecological management 'for' individual species when complete ecosystems are threatened. The pertinent article by Jeffrey J. Wood puts 'British orchids in their European context'; as he points out, 'A large proportion . . . of our present orchid flora is either rare or endangered. Many of these are . . . at the edge of their distribution in the British Isles'. It may well be a misuse of resources to preserve as a priority such species here when they are abundant across the Channel. Their possible differences 'in slight details from their Continental neighbours', whilst of interest to evolutionists, cannot be sufficient reason.

Environmental management to conserve just one component of a community might amount to no more than gardening. Likewise the genome management of 'the hybridist wishing . . . to introduce wild genome contributions into cultivated taxa . . .' (H. W. Pritchard and F. G. Prendergast) is not conservation. In an article on 'Import and export of orchids and the law' Sabina G. Knees recounts the origin of the Convention on International Trade in Endangered Species . . . (CITES) and concludes that 'much progress has been made' during the twelve years it has been in force. This is encouraging, as is the existence of the UK Endangered Species (Import and Export) Act 1976. But the 'total fine' of only £1,800 imposed on a nurseryman for offences relating to importation of orchids and *Cyclamen* species suggests that illegal activities in this field are not particularly 'endangered'.

The articles are all 'about' orchids and are mostly of interest to orchid enthusiasts who are also biologists; they are not 'all about' conservation.

DJH

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Additional records of British mites of the subfamily Parasitinae (Mesostigmata: Parasitidae) — *Keith H. Hyatt*

Some Backhouse discoveries in Upper Teesdale — *Frank Horsman*

Entomological reports for 1988–1989 — Coleoptera: Staphylinidae (Aleocharinae) — *M. L. Denton*

An historic ornithological letter — *Martin Limbert*

Recorder's third report on the aculeate Hymenoptera in Watsonian Yorkshire — *Michael E. Archer*

A survey of hibernating bats in Drewton Railway Tunnel — *A. C. Lane and R. H. Denton*

Published by the Yorkshire Naturalists' Union

Editor **M. R. D. Seaward**, MSc, PhD, DSc, FLS, The University, Bradford BD7 1DP

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Readers of *The Naturalist* will have noticed that the number of photographic illustrations has increased in recent years. Good clear photographs, suitably captioned, to accompany articles or as independent features, such as the bird portraits by Arthur Gilpin in recent issues, are always welcome.

To encourage this development, a long-standing member of the YNU, who wishes to remain anonymous, has most generously offered to make a donation, the income from which would finance the publication of a plate or equivalent illustration in future issues whenever possible. The editor, on behalf of the YNU, wishes to record his deep appreciation of this imaginative gesture.

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ADDITIONAL RECORDS OF BRITISH MITES OF THE SUBFAMILY PARASITINAE (MESOSTIGMATA: PARASITIDAE)

KEITH H. HYATT
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SYNOPSIS
Records are given of all parasitine mites from the British Isles received by the author between the completion of his revision of the subfamily (Hyatt 1980) and his retirement in January 1989. Twenty-nine species are listed and 48 new county records are given. *Vulgarogamasus halophilus* (Willmann, 1957) is figured from the type material which is considered conspecific with a male from the Isles of Scilly, recorded by Pugh (1988) and constituting the first British record.

INTRODUCTION

Ten years ago (Hyatt 1980) I published a review of the Parasitinae in the British Isles and the Channel Islands. Thirty-six species were recorded of which one was new to science and fourteen were new to the British fauna. Between completion of the 1980 revision and my retirement from the British Museum (Natural History) in January 1989, I received a considerable amount of additional material which has been incorporated into the National Collection. Amongst this material was a new species, *Poecilochirus britannicus* Hyatt, from South Yorkshire (Hyatt 1986), and *Parasitus americanus* (Berlese) and *Parasitus nolli* (Karg) from Co. Kildare and Leicestershire respectively (Hyatt 1988). Details of all this additional material are given here and new county records are shown in **bold**. The opportunity is also taken to figure the type specimens of *Eugamasus halophilus* Willmann, 1957 as this species has now been recorded from the British Isles (Pugh 1988).

The classification and arrangement are based on Hyatt (1980).

THE RECORDS

Parasitus coleoptratorum (Linnaeus)
14 samples – 98 deutonymphs (DNN), 1 Female.
ENGLAND Isles of Scilly, Cornwall, Devon, Hertfordshire, **Oxfordshire**, Buckinghamshire, Essex, Cambridgeshire, Yorkshire.
WALES Gwynedd (Caernarvonshire).
IRELAND No locality. J. N. Halbert Coll. D79(G).
Mostly from beetles of the genera *Geotrupes*, *Aphodius* and *Nicrophorus*.

Parasitus americanus (Berlese)
1 sample – numerous DNN, Males, Females.
IRELAND **Kildare**.
A widely distributed species known previously from the USA, South America, Australia, USSR, Israel and Germany. The Irish specimens, from mushroom compost, are the only material that I have examined from the British Isles (Hyatt 1988).

Parasitus beta Oudemans and Voigts
6 samples – 5 DNN, 1 Male.
ENGLAND **London**, **Yorkshire**, **Northumberland**, Cumbria (**Westmorland**).
One Yorkshire deutonymph from *Nicrophorus humator*, remainder from soil.

Parasitus consanguineus Oudemans and Voigts
4 samples – *c.* 132 DNN, 3 Males, 1 Female.
ENGLAND **Hertfordshire**.
WALES Dyfed (Cardiganshire).
IRELAND **Clare**.
All from rotting vegetable matter.

Parasitus evertsi Oudemans
2 samples – 2 Males, 1 Female.
ENGLAND Cornwall.
WALES South Glamorgan (**Glamorganshire**).
The Cornish sample is from salt marsh whilst the Glamorgan sample is from a greenhouse plant.

Parasitus fimetorum (Berlese)
6 samples – 8 DNN.
ENGLAND Suffolk, Northumberland.
SCOTLAND Dumfries and Galloway (**Wigtownshire**).
IRELAND **Clare, Galway**.
Two samples (4 DNN) from the J. N. Halbert collection (D85(G)) are from rotting seaweed, Ardfry, Co. Galway, June 1916. Hyatt (1980) noted that Halbert (1920) did not mention this species in 'The Acarina of the Seashore'. The remaining samples are from moss, debris and sheep dung.

Parasitus insignis (Holzmann)
1 sample – 1 Male.
ENGLAND **Sussex**.
From orchid compost.

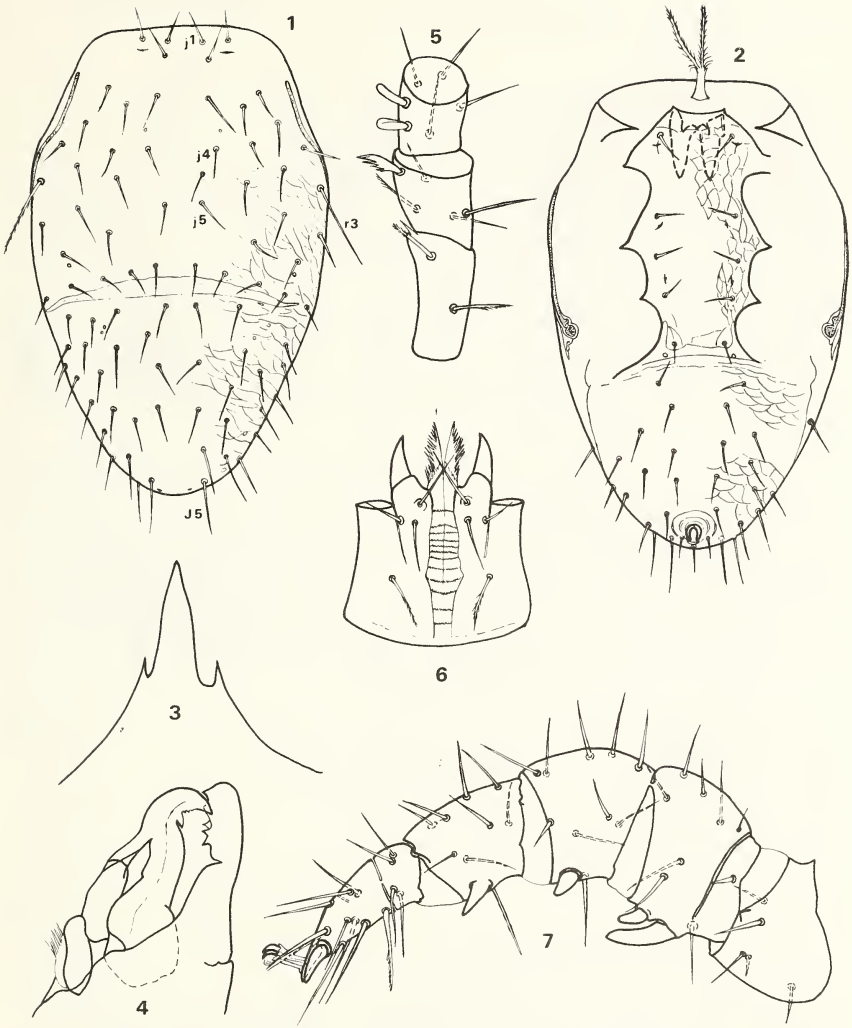
Parasitus kempersi Oudemans
5 samples – many DNN, Males, Females.
SCOTLAND **Fife**, Dumfries and Galloway (**Wigtownshire**, **Kirkcudbrightshire**).
From rotting seaweed and other seashore debris.

Parasitus loricatus (Wankel)
5 samples – 2 DNN, 3 Males, 5 Females.
ENGLAND **Buckinghamshire**, Hertfordshire, Kent, Suffolk, Derbyshire.
All from organic habitats.

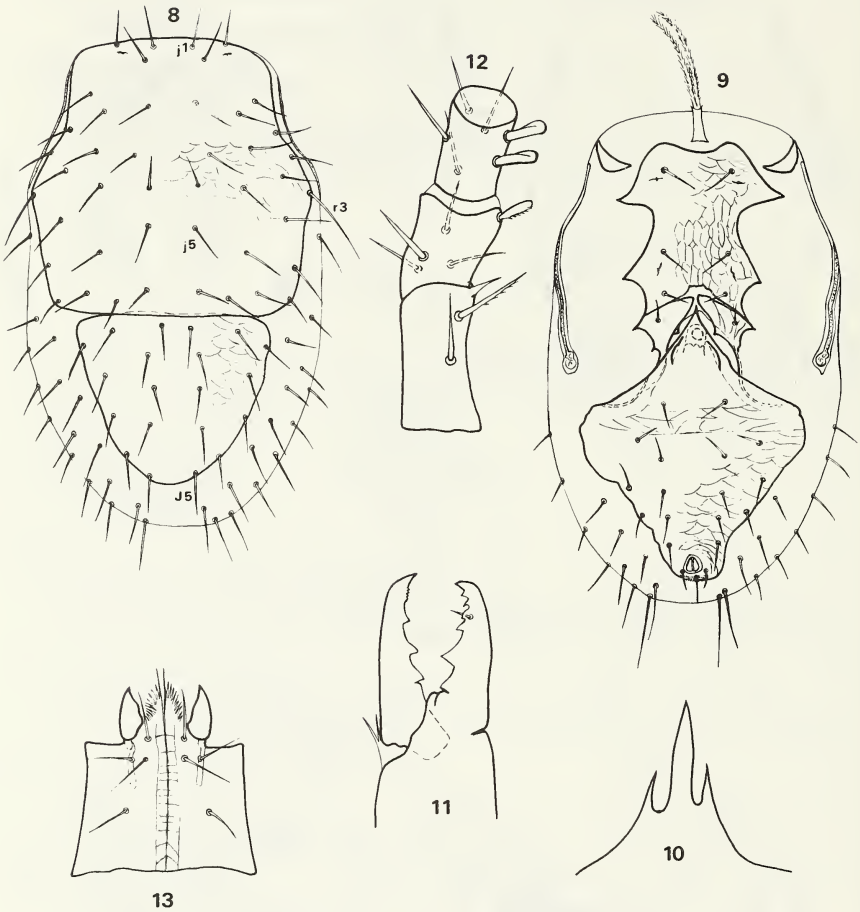
Parasitus mustelarum Oudemans
1 sample – 1DN.
ENGLAND Isles of Scilly.
On *Geotrupes stercorarius* (L.).

Parasitus nolli (Karg)
1 sample – 4 protonymphs (PNN), 8 DNN, 2 Males, 2 Females.
ENGLAND **Leicestershire**.
The single sample from compost at Sutton Bonington, Leicestershire (Hyatt 1988) is the first record of this species since Karg (1965) described it from compost in a cucumber bed under glass near Berlin.

Vulgarogamasus halophilus (Willmann)
Eugamasus halophilus Willmann, 1957: 27. Sweden, Male, Female.
Vulgarogamasus halophilus: Pugh, 1988: 937, comb. nov.
1 sample – 1 Male.
ENGLAND **Isles of Scilly**.
A single male collected from supralittoral lichens at Poppleston, Bryher, Isles of Scilly, 12 July 1986, constitutes the only British record (Pugh 1988). Through the courtesy of Dr E. Popp (Munich), I was able to examine the syntypes of *Eugamasus*



FIGURES 1–7
Vulgarogamasus halophilus (Willmann), **male**, 1, dorsum; 2, venter; 3, tectum; 4, chelicera; 5, palp trochanter, femur and genu; 6, venter of gnathosoma; 7, leg II.



FIGURES 8–13
Vulgarogamasus halophilus (Willmann), **female**, 8, dorsum; 9, venter; 10, tectum; 11, chelicera; 12, palp trochanter, femur and genu; 13, venter of gnathosoma.

halophilus Willmann, 1957 and compare the males with Pugh's specimen. I consider them to be conspecific.

The figures have been made from the permanent slide mounts of Willmann's specimens.

Brief description from type series:

MALE Idiosoma strongly sclerotised, recticulated, measuring 500–530 μm long × 320–340 μm wide, divided dorsally by a median transverse suture (Fig. 1). Podonotal region with 23–24 pairs of setae mainly without traces of pilosity, although *r3* may be slightly pilose. Setae *j1* *c*.40 μm, *j5* *c*.45 μm, *r3* *c*.75 μm and *J5* *c*.62 μm in length, remaining setae *c*.38 μm. In the figured specimen there is an additional unpaired seta between *j4* and *j5*. Tritosternum with paired, pilose laciniae (Fig. 2). Sternal setae I *c*.32 μm in length. All ventral setae simple, paranals *c*.16 μm in length and postanal *c*.20 μm. Tectum trispinate, median prong strong and broad (Fig. 3). Chelicerae as in Figure 4, movable digit *c*.80 μm in length. Chaetotaxy of palp trochanter, femur and genu as in Figure 5. Venter the gnathosoma as in Figure 6, corniculi strong, only palpcoxal setae pilose. Leg II is shown in detail in Figure 7, majority of setae simple, femur with two curved ventral spurs, the larger measuring 45 μm, genu with a short, conical spur and tibia with a slender, tapered spur, tarsus with a terminal spur.

The male collected on the Isles of Scilly is slightly smaller than Willmann's specimens, the idiosoma measuring 460 × 290 μm.

FEMALE Podonotal shield (340–350 μm long × 350–360 μm wide) reticulated, bearing 22 pairs of simple setae (Fig. 8). Setae *j1* *c*.50 μm, *j5* *c*.43 μm, *r3* *c*.77 μm. Opisthonotal shield (200–210 μm long × 230–240 μm wide) also reticulated, bearing 10 pairs of simple setae, *J5* *c*.63 μm. Tritosternum with paired, pilose laciniae (Fig. 9), sternal shield strongly sclerotised, sternal setae I 47–53 μm in length, genital shield triangular, genital setae 38–40 μm. Paranal setae *c*.23 μm, postanal seta 28–32 μm. Tectum (Fig. 10) similar to the male. Chelicerae as in Figure 11, movable digit *c*.126 μm. Chaetotaxy of pedipalp as in Figure 12. Venter of gnathosoma as in Figure 13, all setae simple.

Vulgarogamasus immanis (Berlese)

4 samples – 1 DN, 4 Females.

SCOTLAND Dumfries and Galloway (**Wigtownshire**).

WALES Gwynedd (Caernarvonshire: Menai Straits).

IRELAND Galway.

This species is found only on the seashore — mainly under stones, but also occasionally amongst rotting seaweed (Hyatt 1980: 295–297).

Vulgarogamasus kraepelini (Berlese)

7 samples – 3 DNN, 1 Male, 13 Females.

ENGLAND Lancashire, Cumbria (Cumberland), Northumberland.

SCOTLAND Dumfries and Galloway (**Wigtownshire**), Tayside (Perthshire), Borders (Roxburghshire).

All from rich, humusy litter.

Eugamasus magnus (Kramer)

1 sample – 1 Female

ENGLAND **Cambridgeshire**.

From the stomach of a shrew *Sorex* sp. See Hyatt (1980: 310–313) for discussion on the identity of this species.

Eugamasus berlesei Willmann

8 samples – 3 DNN, 2 Males, 9 Females.

ENGLAND Hertfordshire, **Essex**, Cumbria (**Cumberland**), **Co. Durham**, **Northumberland**.

IRELAND **Westmeath** – omitted from Hyatt (1980), **Limerick**.
See Hyatt (1980: 316) for comments on the occurrence of this species.

Eugamasus crassitarsis (Halbert)
2 samples – 1 Male, 1 Female.
ENGLAND Humberside (Yorkshire), North Yorkshire.
Both from grassland, a favoured habitat.

Porrhostaspis lunulata Müller
11samples – 1 PN, 6 DNN, 4 Males, 10 Females.
ENGLAND **Berkshire**, **London**, Cambridgeshire, North Yorkshire, Northumberland, Cumbria (Cumberland).
SCOTLAND Dumfries and Galloway (**Wigtownshire**).
WALES Gwynedd (Caernarvonshire).
IRELAND **Kerry**.
All samples are from leaf-litter.

Cornigamasus lunaris (Berlese)
6 samples – 9 DNN, 1 Male.
ENGLAND Hampshire, Berkshire, **Northamptonshire**, Northumberland.
IRELAND Clare.
Two samples from flies, the remainder from organic vegetable debris.

Parasitellus fucorum (De Geer)
12 samples – *c*.106 DNN, 3 Females.
ENGLAND Berkshire, Middlesex, Surrey, Kent, Essex, Oxfordshire, **Warwickshire**, Cheshire.
SCOTLAND Arran.
Three samples from honeybees *Apis*, the remainder from *Bombus*, the most usual host (Hyatt 1980: 331).

Parasitellus talparum (Oudemans)
1 sample – 1 Male, 1 Female.
ENGLAND Berkshire.
From *Bombus pascuorum* nest.

Gamasodes spiniger (Trägårdh)
6 samples – 6 DNN, 2 Females.
ENGLAND Cambridgeshire, **Warwickshire**.
SCOTLAND Dumfries and Galloway (**Dumfriesshire**), Strathclyde (**Argyllshire**).
IRELAND **Clare**.
From damp, mouldy habitats.

Gamasodes fimbriatus Karg
2 samples – 17 DNN, 1 Male.
ENGLAND Isles of Scilly.
SCOTLAND Dumfries and Galloway (**Kirkcudbrightshire**).
From seashore debris.

Poecilochirus carabi G. and R. Canestrini
12 samples – 131 DNN.
ENGLAND Cornwall, **Isles of Scilly**, Surrey, **Warwickshire**, North and South Yorkshire, **Isle of Man**.
WALES Gwynedd (**Anglesey**, Caernarvonshire).
IRELAND **Wexford, Wicklow**.
Most, as would be expected, from beetles of the genus *Nicrophorus*, whilst one from the burrow of a puffin *Fratercula arctica* and another from a dead sparrowhawk *Accipiter nisus* were almost certainly linked with the presence of *Nicrophorus*.

Poecilochirus austroasiaticus Vitzthum
1 sample – 3 DNN, 1 Male.
ENGLAND **Yorkshire**.
From mink *Mustela vison*, but probably associated with silphid beetles.

Poecilochirus britannicus Hyatt
1 sample – 2 Males, 3 Females.
ENGLAND **Yorkshire**.
Known from the type series from the nest of *Dolichovespula silvestris* (Hymenoptera), Rotherham, 1 August 1982 (Hyatt 1986).

Poecilochirus davydovae Hyatt
3 samples – 17 DNN.
ENGLAND **Cheshire**.
WALES Gwynedd (**Caernarvonshire**).
IRELAND **Wexford**.
Two samples from *Nicrophorus* and one (Cheshire) from dead bees.

Poecilochirus subterraneus (Müller)
5 samples – 17 DNN.
ENGLAND Cheshire.
WALES Gwynedd (**Caernarvonshire**), **Glamorganshire** — both omitted from Hyatt (1980).
IRELAND **Wexford**.

Trachygamasus sp.
2 samples – 2 DNN.
ENGLAND Kent.
Single deutonymphs from chloropid and psychodid flies, Leeds Castle, Maidstone, July–August 1973, do not appear to be either of the two species recorded by Hyatt (1980), viz *Trachygamasus ambulacralis* (Willmann) or *T. gracilis* (Karg).

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BOOK REVIEWS

Animals of the Surface Film by **Marjorie Guthrie**, with illustrations and plates by **Peter Hayward**. Pp. 87. Richmond Publishing, Naturalists' Handbooks 12, Slough. 1989. £12.00 hardback, £5.95 paperback.

A remarkably diverse assortment of animals is associated with the surface film of water. Some are rigorously restricted to this environment and either roam over it or in a variety of ways hang suspended from it: others have a more transient association with it. The neuston, as the assemblage is called, is a well-chosen subject for one of the 'Naturalists' Handbooks' that are designed to introduce school pupils, students and amateur naturalists to taxonomic or, as here, habitat groups and to encourage them to make their own investigations. The result is, however, somewhat disappointing.

Short chapters on the nature of surface forces and how animals exploit them are a logical introduction but, before the reader is introduced to the animals involved, he is treated to a somewhat confusing account of food sources, the microneuston (which includes an irrelevant section on the reproduction of rotifers), and predation, in that order. He is expected to know what the animals involved are like. Then come sections on the various major groups of the larger neustonic animals, such as water bugs, which are well treated, whirligig beetles and flies. No reference is made in these sections to the colour plates that illustrate these animals. The section on adult flies in particular, where the innocent reader encounters names such as Dolichopodidae, Sciaridae and Sphaeroceridae, as well as various generic and specific names, will mean little to the uninitiated, to whom a visual aid is in fact available, though the flies concerned must all look rather similar and their familial attributes will not be apparent. Suggested topics for investigation and a short chapter on pollution, which can affect the surface film, follow.

About half the text is devoted to identification, aided by keys. Some of the keys, as to bugs and whirligig beetles, are helpful: others, such as that for beginners which separates 'a tadpole', 'a snail', 'insect larvae or pupae', and 'insects', or leads to 'rotifer egg, mosquito egg or polyzoan statoblast' are pointless. (Incidentally the reader is not told what either a polyzoan or its statoblast is). A page of drawings would serve better. Many of the keys do not discriminate even at the generic level and are therefore not particularly helpful, though they often refer to keys that may be consulted elsewhere. It is not much help to be told to 'consult a specialist for advice'. Not everyone knows where to find a specialist on the larvae of the Ptychopteridae or Stratiomyidae!

Hints on how to go about an investigation and seven pages of references and useful addresses round off the work.

This little book has so much potential that one is sad to have to point out its shortcomings. Nevertheless one hopes that it will attract students to this fascinating assemblage of organisms. It will help them, but it could have done so much more than it does.

GF

Great Walks: North York Moors by **Malcolm Boyes** and **Hazel Chester**, with photographs by **David Ward**. Pp. 176, with numerous coloured plates and 49 maps. Ward Lock. 1988. £9.95 paperback.

The 25 walks of varied length are described in detail along with sketch maps and OS references. Much interesting background information is included and the colour plates are excellent. The 8 in. × 10 in. format is not the best for a field guide but looks well on the coffee table.

ARC

SOME BACKHOUSE DISCOVERIES IN UPPER TEESDALE

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Introduction

A manuscript written by James Backhouse Jnr (1825–1890) dated 8 June 1852, has just come to light. It describes the discoveries of *Polygala amarella* Crantz and *Myosotis alpestris* F. W. Schmidt on Cronkley and Mickle Fells in Yorkshire by himself and his father, James Backhouse Snr (1794–1869) on 24 and 25 May 1852 respectively. *P. amarella* was new to the British Isles, and *M. alpestris* had been recorded only once before in the British Isles, by the great botanist George Don (1764–1814) on Ben Lawers in Scotland. The first hand accounts of these discoveries, written whilst still fresh in Backhouse Jnr's mind, are of particular interest. The manuscript is discussed, and the other most famous Backhouse discoveries in Upper Teesdale, namely, *Minuartia stricta* (Swarz) Hiern, *Viola rupestris* Schmidt, and *Woodsia ilvensis* (L.) R.Br. are re-examined. The joint discoveries are dealt with in chronological order.

The Discoveries

Hanbury (1890) summarises an untraced manuscript written by Backhouse Jnr 'which gives in a rough chronological order the dates of their (Backhouse, father and son) journeys either alone or together, and the more important botanical discoveries which they made'. Hanbury's summary gives the impression that Backhouse Snr discovered *Helianthemum canum* (L.) Bamg., *Minuartia verna* (L.) Hiern, *Dryas octopetala* L., *Potentilla fruticosa* L., *Saxifraga hirculus* L., *Sedum villosum* L., *Epilobium alsinifolium* Vill., and *Gentiana verna* L. in Upper Teesdale, which he did not, nor did he ever claim to have done (F. Horsman, in prep.). Indeed, this impression is flatly contradicted by Backhouse Jnr's article in *The Naturalist* for 1884 entitled 'Teesdale Botany: Historical and Personal Recollections'.

The manuscript to which Hanbury refers indicated that both Backhouses botanised together from 1843 to 1865. However, Backhouse and Backhouse Jnr (1844a) refer to joint visits to Upper Teesdale in 1842 as well as 1843. Thus, in 1844 they were well equipped to lead an excursion into Upper Teesdale, their party being made up of John Tatham Jnr, of Settle and his son-in-law Silvanus Thompson of York, and George Stacey Gibson of Saffron Walden (Backhouse Jnr, 1844b). All the party were Quakers (Whitwell 1893, Desmond 1977); furthermore, they all contributed to *The Phytologist*, the first series of which (1841–1854) was edited by Edward Newman, also a Quaker (Desmond, 1977). Thompson took up a post as a schoolmaster at The York Friends' School in Lawrence Street in 1841, the year Backhouse Jnr left; however, they 'came into close contact through the closed community of the Society of Friends at that time, and it is obvious that J. B. (Jnr) frequently visited the school and went on natural history outings with the boys' (C. J. Smith, pers. comm.; Whitwell, 1893). One would expect Thompson to have introduced Backhouse Jnr to his botanist father-in-law, John Tatham.

The party left York on 28 June 1844 (Backhouse Jnr, 1844b). On the following day they visited 'Widdy-bank' fell. On the top of the fell, a plant they thought to be *Spergula saginoides* was found. Backhouse Snr had 'made the acquaintance of Sir William Hooker, and sometimes shared his botanical rambles' (Baker, 1869) whilst he was working in Norwich from 1813 to 1815 (Davis, 1989). This was the start of a life-long association. Indeed, Backhouse Snr wrote to Hooker on 29 July 1865[1], just before Hooker's death on 12 August 1865. It is not surprising, therefore, that Backhouse Snr sent Hooker, then Director of the Royal Botanic Gardens, Kew, a specimen of the plant for determination. On 4 July 1844[2], Backhouse Snr wrote to Hooker: 'In the course of our Teesdale visit this season, we have met with the accompanying little plant, which we

supposed to be *Spergula saginoides*. What is thy opinion of it?' Hooker identified the plant as *Spergula stricta* (*Minuartia stricta*) (Davis, 1989). The plant was 'previously only known as a native of Lapland'[3]. Backhouse Jnr (1884) credits the discovery to Gibson: 'We were together, and I believe saw the plant almost at the same moment; but he first said "What is that?" Fixing my attention specially upon it'.

Backhouse Jnr (1844b) emphasises that it is very difficult to detect *M. stricta* because it grows among *Minuartia verna* (L.) Hiern 'which, when out of flower, bears considerable resemblance to it, . . .' The first record for *M. verna* from Upper Teesdale was made by Christopher Hunter (1675–1757), a correspondent of Martin Lister, in 1699. He found it on 'Widdy bank' (F. Horsman, in prep.).

Thus, at the age of only 18, Backhouse Jnr was associated with the discovery of a plant new to the British Isles, an auspicious start to his association with Upper Teesdale.

The York Friends' School moved to another site in York in 1846 from which date it was known as Bootham School (C. J. Smith, pers. comm.). Allen (1986) describes Bootham School as '. . . that great nursery of Quaker naturalists, . . .' Past scholars of Bootham and its precursor were encouraged to send in written contributions to the School. Backhouse Jnr's manuscript dated 8 June 1852, was one such contribution: . . . it may have appeared in one of a succession of hand-written journals that were probably compiled by Silvanus Thompson and circulated around the members of the Bootham School Natural History Society, which included many naturalists associated with the School. Very few of these journals survive . . . Both Backhouse Jnr and Thompson were Ministers in the Society of Friends (C. J. Smith, pers. comm.). In 1841, the same year that Thompson took up his post at The Friends' School and Backhouse Jnr left, Backhouse Snr returned from a ten-year absence in Australia, Mauritius and South Africa where he had been a Quaker missionary (Davis, 1989).

The manuscript describes the events of 24 and 25 May 1852[4] (Hanbury, 1890):

> . . . we agreed to ascend a streamlet which here falls over the crag, (White Force) as, though apparently uninviting, (passing merely through a moorland region), we had never examined it and there was 'no telling what *might* be'. Half a mile up, a lateral track entered the stream, which skirted some low limestone hillocks, and looked more promising. Almost immediately both of us casually gathered a small *Polygala* which, looking different from P. vulgaris, was safely stored away. We were then at some distance from each other, but it induced a passing remark when we met, and we pursued our course together without however finding any more of it. Soon we came upon a bank beautifully scattered over with a variety of *Primula farinosa* hitherto unknown to both of us. It was stemless: the heads of flower being closely seated in the leaves. The plant not forming runners, must have been produced and propagated by seed; showing that it was *there* a permanent variety (*Primula farinosa acaulis*). Reaching our inn (High Force Inn) we examined the Polygala carefully and ascertained that it was not P. vulgaris. This induced us to revisit the stream on which occasion we discovered another grassy hillock scattered over with the Primula. After a long and almost despairing search we found the Polygala, in moderate abundance though bad to see, from its minuteness and the herbage with which it was intermixed. Having satiated ourselves and the day being exquisitely clear, we wandered far back to the foot of Micklefell intending to gain it's summit for the sake of the almost unparalled view it commands. On its slope, at an elev^{n} of 2500 ft. we found a plant of the beautiful *Myosotis suaveolens* (M. alpestris (Schmidt)) hitherto known only (?) in Britain on the Breadalbane Mountains in Perthshire. Its deep brilliant blue flowers satisfied us that it was different from all the forget me nots *we* had gathered before in this land. Another specimen near it, was in bud, which we took with a root, and have since proved it to be the plant referred to by many points of strong distinction. It (*sic*) sweet scent (from which the name is given) adding additional certainty. So one thing leads to another even in botanical affairs, and the discovery of this plant will probably open out a

remote district which may produce much more . . . Our Polygala proves to be entirely new to the country: the *Polygala uliginosa* (Reichenbach) P. amara v: austriaca (Koch). The true P. amara has not yet been met with.

The manuscript includes single pressed specimens of *Primula farinosa* L. and *P. amarella* labelled '*Primula farinosa*, var. *acaulis* discovered in Teesdale, 5 Mo. 1852 by Ja^s Backhouse Senr & J^r. Not before described', and '*Polygala uliginosa* (Reichenbach) discovered in Teesdale, 5 Mo. 1852 by the same friends. New to Great Britain'.

The flowers of *P. amarella* are pink, blue or white. Plants with white flowers are not known from Upper Teesdale (Clapham, 1978). Blue flowered plants were first found in Upper Teesdale on Widdybank Fell in the spring of 1862 (Hanbury 1890, Clapham 1978). Hanbury (1890) does not make it clear if these plants were found by Backhouse Snr or Jnr, or both. However, it is certainly a Backhouse discovery. The colour of the flowers of the pressed specimen in the manuscript is now indistinguishable (C. J. Smith, pers. comm.), but it is clear that originally they must have been pink.

The genus *Polygala* and its native British members had not been fully worked out at this time. Indeed, it is evident from the manuscript that the Backhouses had sought help in determining the plant. Backhouse Jnr (1850) states 'Not having the works of that author (Reichenbach) to refer to, I sent it (*Spergula macrocarpa*) to C. C. Babington, who has always most kindly assisted me in the determination of species, when my own sources of information have failed'. The Backhouses first met Babington at the 'High Force Inn' in Upper Teesdale on 4 July 1842 (Backhouse Jnr, 1884, Babington, 1897). Charles C. Babington FRS became Professor of Botany at Cambridge in 1861 (Desmond, 1977) and the foremost authority on the British Flora (Allen, 1986). Babington (1853a) states that 'The discovery of *Polygala uliginosa* of Reichenbach, a probable variety of *P. austriaca* of Crantz, upon the elevated mountain limestone of Teesdale by my valued friends Messrs. James Backhouse, sen. and jun., has led me to a more careful examination of the plants referable to that genus that are natives of Britain, . . .' He adds 'Much difficulty attends all the supposed species of *Polygala*, and probably their number will ultimately be much reduced, but we are not yet in a position to do so satisfactorily'. There can be little doubt from his discussion of *P. austriaca* (Crantz) that Babington determined the Backhouses' *Polygala*. Having made his determination prior to 8 June 1852, on 10 February 1853, he read the results of his 'more careful examination of the plants referable to that genus (*Polygala*) that are natives of Britain, . . .' to the Botanical Society of Edinburgh (Babington, 1853a). It is interesting to note that *P. amara* auct. and *P. uliginosa* Reichenb. are now treated as synonyms of *P. amarella* Crantz, which includes *P. austriaca* Crantz (Clapham *et al.*, 1987).

Babington (1853a) makes brief reference to the Backhouses' discovery of *Myosotis alpestris* on the same excursion. Babington (1853b) explains why he had been of the opinion that *M. alpestris* Schmidt was a mountain form of *M. sylvatica* (Hoffm.) and specifically separate from *M. suaveolens* (Kit.). 'Having now acquired much fuller information on the subject, I find *M. alpestris* of Schmidt and *M. suaveolens* of Kitabel must be considered as identical . . .' It will be noted that Backhouse Jnr refers to '*Myosotis suaveolens* (*M. alpestris* (Schmidt))' in his manuscript. The name in 'English Botany' is *M. rupicola*; George Don employs *M. alpina*[5] and Hooker (1821) *M. alpestris*. There can be little doubt that Babington determined the Backhouses' *Myosotis* and came to his conclusion that *M. alpestris* was the same as *M. suaveolens* almost immediately on receiving material from Backhouse Jnr. Indeed, Backhouse Jnr (1884) states 'Prof. Babington regards the Teesdale plant as specifically identical with *M. alpestris* Schm.'

Thus, not only did the Backhouses add to our knowledge of the composition of our flora, but they also helped in clarifying its taxonomy by seeking authoritative determinations of the discoveries they made of which they were unsure. This was, of course, supplementary to their pioneering work on the *Hieracea* of the British Isles.

At the desire of the Backhouses, Babington drew up a statement entitled 'VIOLA ARENARIA, De Cand., AS A BRITISH PLANT' which appeared in volume I of the

Journal of Botany, the volume for 1863 (Babington, 1863). 'For several years past, Messrs. James Backhouse, father and son, have noticed a small and remarkable-looking Violet growing upon what is called, from its appearance, the Sugar Limestone, at the upper end of Teesdale, on the north side of the river. In 1861, the younger of those gentlemen first observed the flowers of this Violet, and transplanted some of it to his garden at York.' There follows a description and discussion of *Viola arenaria* (*V. rupestris* Schmidt) which De Candolle first described in 1805 in 'Flore François'. Babington (1863) records that whereas Fries described the corolla as lilac and Grenier blue, 'Mr. Backhouse says pale slaty-blue . . .' There can be little doubt that Babington also determined *V. rupestris* for the Backhouses. In a letter dated 30 January 1864, Backhouse Jnr wrote to Sir Joseph D. Hooker, then assistant to his father, Sir William J. Hooker, who was Director at Kew: 'I also enclose specimens of *Viola arenaria* from Teesdale discovered by my father and self 2 years ago'.[6]

Hanbury's summary of Backhouse Jnr's manuscript suggests that the last (joint) visit Backhouse Snr made to Upper Teesdale was in the spring of 1862. His last visit to Scotland was in July 1861.[7] Baker (1869) states that 'He kept his activity of body and mind scarcely impaired till past 70 . . .' In June, 1865, on his last visit to Wales[8] he gathered *Poa balfourii*, *P. nemoralis* and *P. alpina* on 'Rocks above Llyn Dulyn, Caerns. 6 mo. 1865. Gathered (by Backhouse Jnr) in company with J. Backhouse Senr. when he was nearly 71 years of age: the walk lasting about 11 hours and involving 5000 ft. of climbing (two ascents of ridge)'.[9]

No account of the famous Backhouse discoveries in Upper Teesdale is complete without due mention of *Woodsia ilvensis*. Justly proud, Backhouse Jnr (1884) describes the events leading up to his father's discovery of this fern on Falcon Clints in 1821:

> Many years afterwards (after 1811) when the first figure of *Woodsia* was published, from a specimen found in Scotland, my father instantly recognised it as a fern which he had seen in Teesdale. His botanical friends and relatives 'did not believe it', but he declared that it was 'certainly there', and that he would 'go and fetch it'. He did so; and I possess the specimen — a fine example of *Woodsia ilvensis* R.Br., with several fronds (one of which is 3½ inches long) — having the words attached, in his handwriting:– 'Foot of Cauldron Snout, Teesdale, 1821, first found there.

This specimen so labelled is in the herbarium of the Royal Botanic Garden, Edinburgh. The first three quotations in this extract are almost certainly taken from Backhouse Snr's manuscript autobiography entitled 'Recollections of past life', written at the end of his life.[10]

Returning to the discovery, there is a problem here. The first figure of *Woodsia* published from a specimen found in Scotland was that in 'English Botany' for 1809 (Fig. 1). The specimen had been sent by George Don from Ben Lawers and it was *Polypodium hyperboreum* (Sowerby and Smith, 1809) (*Woodsia alpina* (Bolton) S. F. Gray). On 17 November 1812, Robert Brown, '. . . perhaps the greatest figure in the whole history of British botany' (Gilmour, 1944), read a paper entitled 'On Woodsia, a new Genus of Ferns' to The Linnean Society of London (Brown, 1813). He described two species, *Woodsia ilvensis* (L.) R.Br. and *Woodsia hyperborea* (Lilj.) R.Br., and gave *Polypodium hyperboreum* as a synonym of the latter. *W. hyperborea* is now treated as a synonym of *W. alpina* (Bolton) S. F. Gray. Brown (1813) figures *Woodsia hyperborea*, drawn by Francis Bauer, but does not state the origin of the specimen, which may well have been abroad. Brown (1813) admits:

> These two plants (*W. hyperborea* and *W. ilvensis*) are indeed so nearly related, that I find myself unable to construct for them clear specific characters; and therefore, in proposing them here as distinct species, I am, from want of sufficient materials to determine the question, rather following the prevailing opinion than my own.

FIGURE 1
The figure in English Botany for 1809 which sent James Backhouse Snr back to Falcon Clints in Upper Teesdale in 1821 to discover *Woodsia ilvensis*.

In 1821 William Hooker's 'Flora Scotica' was published. It is not illustrated. The introduction by the author is dated 10 April 1821, that is, before *W. ilvensis* matures in July–August. Only one species of *Woodsia* is included and described, namely *Woodsia hyperborea*. Reference is made to the Sowerby and Smith (1809) and Brown (1813) figures.

Backhouse Snr sent Sir James E. Smith *W. ilvensis* from Falcon Clints but named it *W. hyperborea* (Smith, 1830). Smith (1830) comments, under *W. ilvensis*,

> Mr Wilson first determined this species when he gathered it in Wales, in 1824 and 1825; our English specimens having been sent under the name of the following (*W. hyperborea*); a very excusable error, when it is considered how nearly the plants are related.

Backhouse Snr visited Upper Teesdale in 1810, 1811 and 1820.[11] He included the 'English Botany' page number on his 1810 Upper Teesdale herbarium sheets. In a letter from Backhouse Snr to Nathaniel Winch, received by Winch on 12 August 1811, Backhouse Snr states 'Thou wilt find enclosed a specimen of *Saxifraga platypetala* from the Falcon Clints Scar near Cauldron Snout'.[12] In a further letter to Winch dated 13 September 1811, Backhouse Snr writes 'The small *Cyatheae* with large fructification were gathered in Harriman's habitat of *Cyathea dentata*. Can it be his plant?'[13] Harriman's habitat was 'on rocks between Widdybank and Cauldron Snout' (Winch *et al.*, 1805).

Backhouse Snr could well have seen *W. ilvensis* on Falcon Clints in 1811, when he was only 17 years of age. Between 1813 and 1815 he began a life-long association with William Hooker, whose 'Flora Scotica' appeared in 1821. In the circumstances, it would be surprising if Backhouse Snr had not studied it. Given the impression the fern he had found 'Many years . . .' earlier (Backhouse Jnr, 1884) had clearly made upon him, it would be equally surprising had Backhouse Snr not studied Hooker's description of *W. hyperborea* and checked James Sowerby's beautiful coloured figure in 'English Botany'. On seeing thie figure, I believe Backhouse Snr '. . . instantly recognised it as a fern which he had seen in Teesdale'.

Clearly, and deservedly, a legend grew up around this discovery which occurred four years before Backhouse Jnr's birth and which Backhouse Jnr related, in print, 15 years after his father's death, in his article 'Teesdale Botany: Historical and Personal Recollections'.

Acknowledgements

I should like to thank Clifford J. Smith, Keeper of the Bootham School Archives, for finding this manuscript and for all his help and kindness in dealing with my enquiries. My thanks are also due to H. J. B. Birks for drawing my attention to certain Backhouse Snr and Jnr letters in the correspondence of Sir William J. Hooker and Sir Joseph D. Hooker respectively at the Royal Botanic Gardens, Kew, and to certain Backhouse herbarium sheets at the Royal Botanic Garden, Edinburgh, and to Gina Douglas, Librarian and Archivist of The Linnean Society of London, for access to the Winch Correspondence. I am grateful to W. Arthur Sledge for critically reading my manuscript and for his continuing help and encouragement in my historical studies of Upper Teesdale.

Notes

1. Official Correspondence. English letters, Kew. (*77*, 260). Subjects: Cumberland mountains and Teesdale.
2. Sir Wm J. Hooker Correspondence, Kew. (*21*, 36).
3. Note in Backhouse Snr's hand on label of specimen sent to Hooker now in the herbarium of Yorkshire Museum.
4. The specimen of *Mysotis alpestris* in the herbarium of the Royal Botanic Garden,

Edinburgh, is labelled by Backhouse Jnr: '*M. rupicola* ('English Botany' name) Micklefell, Teesdale, first found in England 25.5.1852'.

5. George Don's 'Herbarium Britannicum' began to appear in 1804; from then onwards four fasciculi, each of twenty-five plants and containing a due proportion of rare mountain species, were to be issued yearly. *M. alpestris* is included as *M. alpina* (Raven and Walters 1956, Clarke 1897).
6. Official Correspondence. English letters, Kew. (77, 263).
7. Specimen of *Cystopteris montana* in the herbarium of the Royal Botanic Garden, Edinburgh, labelled 'Moel Ghyrdy - moist mossy ledges of the northern spur overlooking a branch of Glen Lyon. With J. B. Senior on last trip to Scotland. J. Backhouse (Jnr.) 7 mo. 1861'.
8. Specimen of *Isoetes lacustris* in herbarium of Royal Botanic Garden, Edinburgh, labelled 'Rocky margins of Llyn Dulyn, a wild mountain lake, hemmed in by the precipices of Y Foel Fras, Carnarvanshire. Gathered with J. B. Senior's assistance, during his last journey in Wales. J. Backhouse (Jnr.). 6 mo. 1865'.
9. Backhouse sheet in the herbarium of the Royal Botanic Garden, Edinburgh.
10. The author has established that this manuscript, which runs to 215 pages, was sold at Sotheby's, London on 11 December 1935, to Bernard Halliday, a Leicester bookseller. There the trail stops. Can anyone help, please?
11. Backhouse Snr herbarium sheets at the Royal Botanic Garden, Edinburgh, confirms these visits.
12. Winch Correspondence, Linnean Society of London (No. 2. 118).
13. Winch Correspondence, Linnean Society of London (No. 2. 120).

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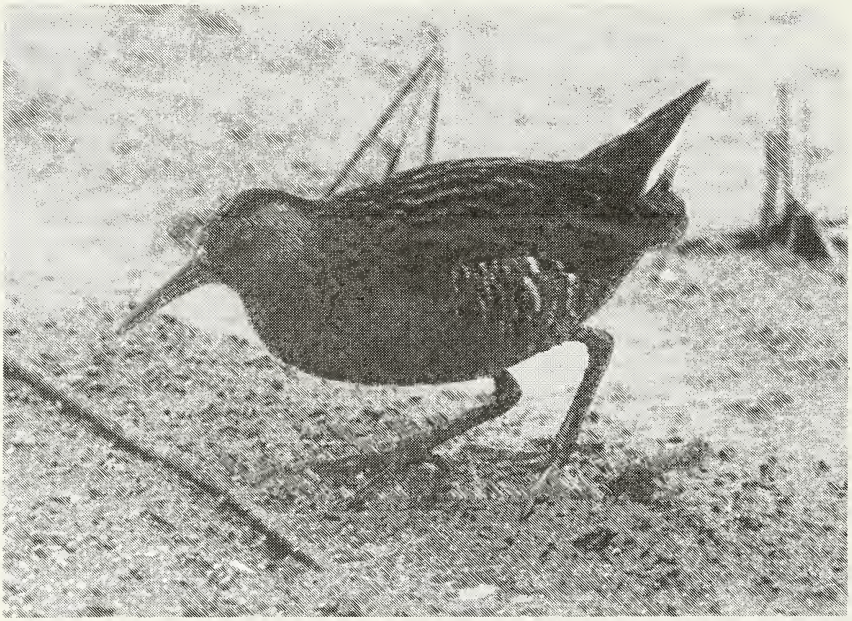

Photo: Richard Vaughan

WATER RAIL

The Water Rail *Rallus aquaticus* is a bird of skulking habit which seldom comes out into the open like the one shown here, photographed at the Humber Wildfowl Refuge in winter. Although Ralph Chislett had never seen a water rail's nest in Yorkshire, the species surely breeds annually at Thorne Moors, Blacktoft Sands, Fairburn Ings, Hornsea Mere and elsewhere. The muddy reed-fringed Humber shores are a favourite resort in winter, a season when water rail numbers are augmented by immigrant continental birds.

ENTOMOLOGICAL REPORTS FOR 1988–1989
COLEOPTERA: STAPHYLINIDAE (ALEOCHARINAE)

M. L. DENTON

Since the last Aleocharinae report (*Naturalist* **113**: 147–151) several new county records and a considerable number of new vice-county records have been forthcoming. The vice-county meetings of the Union can generally be relied upon as a good source of records. Indeed, the VC65 meeting to Semerwater in 1988 produced no fewer than 18 new vice-county records. Additionally, the 1989 VC65 meeting to Gillfield Wood (known locally as Condenser Wood) produced a further ten species which were new to the vice-county. It must be stressed, however, that of the five Yorkshire vice-counties, VC65 has received the least attention and, with few exceptions, the species concerned are widely distributed within the rest of the county.

Work for the Nature Conservancy Council at various sites along the River Derwent has added considerably to the known Yorkshire distribution of the sub-family, as has the survey work carried out by York University at a number of localities on the North York Moors. Several species with a more local distribution have been revealed from these two surveys, and both have added new species to the county list.

It is due to the kindness of Mr W. A. Ely and Dr R. S. Key, both of whom made unnamed specimens available for identification, and Mr E. W. Aubrook, who made his personal collection available for data extraction, that the report contains many records which have hitherto gone unrecorded. Consequently several records have been found which pre-date those already published; records of this nature are indicated in the text. The help afforded by Mr C. Johnson of the Manchester Museum in identifying some of the more problematical specimens must again be acknowledged.

There is still much to be learnt about beetle distribution in Yorkshire, especially the Aleocharinae, but the continued support of the few specialists has added considerably to our knowledge of this interesting sub-family. For reasons described in the first Aleocharinae report (*Naturalist* **111**: 91–96), the sex of the specimen(s) on which identification was based has been indicated; it can be assumed that all specimens were male, unless otherwise stated.

Initials used in the list that follows are those of R. B. Angus, E. W. Aubrook, S. G. Compton, M. L. Denton, W. A. Ely, P. J. Hodge, R. J. Hunt, C. Johnson, R. S. Key, D. A. Lott, R. J. Marsh, D. Maude and E. J. Smith.

This list introduces the names of a species new to Britain, 13 new to the county and 75 new to one or other of the vice-counties.

† New records * New vice-county records.

† *Cypha hanseni* (Palm.) (62) Duncombe Park (SE68), female, 10/6/80, CJ. (64) Studley (SE26), 19/6/89, CJ.

C. pulicarius (Er.) (61) Aughton Ings (SE73), 19/8/88, vegetable refuse, RJM (teste CJ). The only previous records are from Mulgrave Wood (NZ81) in 1934, Dunnington Common (SE65) in 1971 and Morton Wood (SE10) in 1985.

Oligota picipes (Steph.) (63) Gawthorpe (SE22), not sexed, 29/3/48, EWA. This record pre-dates that published in *The Naturalist* **113**: 148 to become the first for VC63.

O. punctulata Heer. (63) Sprotbrough (SE50), 3/11/88, compost heap, RJM (teste CJ). Melton Wood (SE50), both sexes, 12/7/89, compost heap, RJM (teste CJ). Whitley (SE51), both sexes, 14/9/89, straw heap, RJM (teste CJ). The only previous records are from Askham Bog (SE54) in 1969 and Sprotbrough (SE50) in 1987.

O. pusillima (Gr.) (*63) Dalton (SE11), not sexed, 31/10/48, EWA. Whitley (SE51), both sexes, 14/9/89, straw heap, RJM (teste CJ). The ony previous records are from Thirsk (SE58) in 1986 and Spurn (TA41) on an unrecorded date.

Myllaena dubia (Gr.) (*65) Semerwater (SD98), both sexes, 20/8/88, flood refuse, RJM.

M. intermedia Er. (*64) Studley (SE26), 19/6/89, CJ. Skipwith Common (SE63), Sprotbrough Reservoir (SE50) and Burniston (TA09) have yielded the only previous records.

M. kraatzi Sharp. (62) Lealholm (NZ70), both sexes, 8/7/87, pit fall trap, York University det. RJM. The only previous records are from Saltburn (NZ62) in 1894, Grinkle Wood (NZ71) in 1907, Aysgarth (SE08) in 1931 and Scarborough (TA08) on an unrecorded date.

M. minuta (Gr.) (*61) Bubwith (SE63), female, 14/5/88, reed litter, RJM (teste CJ). Knaresborough Ringing Station (SE35), Sprotbrough (SE50) and Askham Bog (SE54) have yielded the only previous records.

Hygronoma dimidiata (Gr.) (*65) Semerwater (SD98), not sexed, 20/8/88, flood refuse, RJM.

Gyrophaena affinis Mann. (*63) Langhold Holt (SK58), 30/6/86, WAE (teste MLD).

G. bihamata Thom. (61) Thorpe Estate, Rudston (TA16), 19/8/89, in *Pleurotus cornucopiae*, RBA (teste MLD). The only previous records are from Skipwith (SE63) in 1915, Torne Bridge (SE60) in 1969 and Thorne Moor (SE71) in 1985.

G. fasciata (Marsh.) (*61) Thorpe Estate, Rudston (TA16), 19/8/89, in *Pleurotus cornucopiae*, RBA and MLD.

† *G. poweri* Crotch. (61) Thorpe Estate, Rudston (TA16), 19/8/89, in *Pleurotus cornucopiae*, MLD.

Homalota plana (Gyll.) (*61) Thornton Ellers (SE74), 28/3/89, under bark, MLD.

Leptusa fumida Kra. (*65) Semerwater (SD98), 20/8/88, flood refuse, MLD.

† *L. norvegica* Strand. (62) Langdale Rigg (SE99), spring 1980, from rotten pine bark taken in 10/79, RSK det. MLD. Troutdale (SE98), 20/2/82, rotten wood, RSK det. MLD. Hagg Wood Marsh (SE89), 10/6/89, under bark, MLD. (63) Elland Park Wood (SE12), 9/9/87, under bark, MLD (teste CJ). The records of this species from Malham (SD86) documented as new for Yorkshire in *The Naturalist* **83**: 13 were given in error. The species concerned was *L. fumida* Kra.

L. pulchella (Mann.) (*64) Studley (SE26), not sexed, 19/6/89, CJ. Bilton Beck (SE35), 1/7/89, MLD (teste CJ).

L. ruficollis (Er.) (*61) East Dale (SE93), 10/2/80, under bark, RSK det. MLD. Burton Constable (TA13), not sexed, 23/7/88, WAE.

Autalia longicornis Sch. (*61) Thornton Ellers (SE74), female, 19/8/87, leaf litter, RJM. (*62) Raincliffe Wood (SE98), 21/10/79, rotting fungi, RSK det. MLD. This last record pre-dates those published in *The Naturalist* **111**: 93 and **113**: 148 to become the first for Yorkshire.

Tachyusa leucopus (Marsh.) (63) Kaye Wood (SE20), not sexed, 15/5/48, EWA. This record pre-dates that published in *The Naturalist* **111**: 93 to become the first for VC63.

Gynpeta rubrior Tott. (61) Thorpe Estate, Rudston (TA16), 19/8/89, RBA det. CJ. The only previous records are from Robin Hood's Bay (NZ90) in 1935, Spurn (TA41) in 1949, Blackmoorfoot (SE11) in 1984 and Langsett (SE20) in 1987.

† *Callicerus rigidicornis* (Er.) (63) Bramley (SK49), 10/5/86, WAE det. CJ. (64) Newton Ings (SE42) 29/4/89, pondside debris, RJH det. MLD. (65) Gillfield Wood (SE09), 7/5/89, rotting turnips, MLD (teste CJ).

Schistoglossa curtipennis (Sharp.) (63) Langsett (SE20), female, 16/3/89, EJS (teste MLD). The only previous records are from Yedingham (SE87) in 1931, Deer Hill (SE01) in 1983, Yateholme (SE10) in 1985, Hades (SE10) in 1985 and Rushy Moor (SE51) in 1986.

S. gemina (Er.) (*61) Bubwith Bridge (SE73), female, 29/5/87, reed litter, RJM. Aughton Ings (SE63), female, 7/7/87, reed litter, RJM. The only previous records are from Askham Bog (SE54) in 1971, Rushy Moor (SE51) in 1985 and Rossington Bridge (SE60) in 1987.

Aloconota gregaria (Er.) (*65) Semerwater (SD98), both sexes, 20/8/88, flood refuse, MLD and RJM.

A. sulcifrons (Steph.) (*65) Semerwater (SD98), both sexes, 20/8/88, flood refuse, RJM.

Amischa forcipata Mul. & Rey. (*63) Sprotbrough (SE50), 6/8/88, old straw bale, RJM (teste CJ). Blacktoft Sands (SE82), female, 21/11/88, reed litter, MLD det. CJ. The only previous record was from Derwent Ings (SE73) in 1987.

A. soror (Kra.) (63) Thorpe-in-Balne (SE51), female, 10/4/87, grass heap, RJM (teste CJ). Sprotbrough (SE50), female, 16/4/87, compost heap, RJM (teste CJ). (*65) Semerwater (SD98), female, 20/8/88, flood refuse, RJM. The only previous records are from North Duffield (SE63) in 1930, Melton Wood (SE50) in 1983, Sprotbrough (SE50) in 1985 and Langhold Holt (SK58) in 1985.

Dinaraea aequata (Er.) (*65) Gillfield Wood (SE09), female, 7/5/89, rotting turnips, MLD.

D. angustula (Gyll.) (*62) Lealholm (NZ70), 8/7/87, pit fall trap, York University det. RJM. (*65) Gillfield Wood (SE09), female, 7/5/89, rotting turnips, MLD.

Dadobia immersa (Er.) (62) Langdale (SE99), sex ?, 31/3/88, under bark, DAL. Roundhay (SE33), Copgrove (SE36), Lindley Wood (SE20), Malham (SD86) and Scarborough (TA08) have yielded the only previous records.

Liogluta granigera (Kies.) (*61) Aughton Ings (SE63), female, 7/7/87, grass cuttings, RJM.

L. nitidula (Kra.) (*65) Gillfield Wood (SE09), female, 7/5/89, rotting turnips, MLD.

Atheta arctica (Thom.) (*62) Egton Moor (NZ70), 7 and 8/87, pit fall trap, York University det. MLD. Spaunton Moor (SE79), 7, 8 and 9/87, pit fall trap, York University det. MLD. Fylingdales Moor (SE89), 3/9/87, pit fall trap, York University det. MLD. The only previous record was from West Nab (SE00) in 1987.

A. debilis (Er.) (63) Edderthorpe Ings (SE40), both sexes, 10/12/72, EWA. This record pre-dates those published in *The Naturalist* **111**: 94 to become the first for Yorkshire. (*65 Semerwater (SD98), 20/8/88, flood refuse, RJM.

A. deformis (Kra.) (*65) Semerwater (SD98), 20/8/88, flood refuse, RJM. The only previous record was from Scarborough (TA08) on an unrecorded date.

† *A. fallaciosa* (Sharp.) (62) Danby High Moor (NZ70), 27/5/87, pit fall trap, York University det. MLD. (61) Skipwith Common (SE63), 27/9/89, RBA det MLD.

A. hygobia (Thom.) (*64) Rudding Park (SE35), 6/6/73, EWA det. CJ. (*63) Blackmoorfoot (SE01), 1/2/89, MLD (teste CJ). The only previous records are from Bubwith (SE73) in 1931 and Ashberry Pastures (SE58) in 1972.

A. hygrotopora (Kra.) (*64) Bilton Beck Wood (SE35), 1/7/89, MLD.

A. malleus Joy. (63) Edderthorpe Ings (SE40), both sexes, 10/12/72, EWA. This record pre-dates those publshed in *The Naturalist* **111**: 94 to become the first for VC63. (*65) Semerwater (SD98), 20/8/88, flood refuse, RJM.

A. melanocera (Thom.) (63) West Bretton (SE21), female, 2/2/49, grass tuft, EWA. This record pre-dates those published in *The Naturalist* **111**: 94 to become the first for VC63.

A. obtusangula Joy. (*65) Semerwater (SD98), 20/8/88, flood refuse, MLD and RJM.

A. palustris (Kies.) (*63) Eggborough (SE52), 3/6/83, vegetable refuse, RJM (teste CJ). Bubwith (SE73), Scarborough (TA08), Hayburn Wyke (TA09) and Scalby Beck (TA09) have yielded the only previous records.

A. difficilis (Bris.) (61) Aughton Ings (SE63), both sexes, 25/4/88, vegetable refuse, RJM (teste CJ). Female, 14/5/88, CJ. Bubwith Bridge (SE73), 24/6/89, *Glyceria* bed, MLD det. CJ. North Duffield Carrs (SE63), Bubwith (SE73), Allerthorpe (SE74) and Yedingham (SE87) have yielded the only previous records.

A. luteipes (Er.) (63) Ravenfield Park (SK49), female 6/7/85, WAE det. CJ. (64) Studley (SE26), female, 19/6/89, CJ. The only previous records are from Bubwith (SE73) in 1919, Cornelian Bay (TA09) in 1926, Bolton Percy (SE54) in 1943, Spurn (TA41) in 1948 and Blaxton Common (SE60) in 1971.

A. hepatica (Er.) (*61) North Cliff (SE83), female, 21/8/88, MLD (teste CJ). (*65) Gillfield Wood (SE09), female, 7/5/89, WAE det. RJM. Studley (SE27), Ripon (SE37), Wheatley Wood (SE50) and Levisham (SE89) have yielded the only previous records.

A. excellens (Kra.) (*61) Newbald Marsh (SE93), 9/8/80, general sweeping, RSK det. MLD.

A. monticola (Thom.) (*64) Austwick Moss (SD77), 16/7/83, WAE det. MLD. The only previous records are from Blackmoorfoot (SE01), Lepton Great Wood (SE11), Netherton (SE11) and Cornelian Bay (TA09).

A. harwoodi Williams. (*62) Castle Howard (SE77), 9/7/88, WAE det. CJ. (*65) Semerwater (SD98), 20/8/88, flood refuse, WAE det. MLD.

A. liturata (Steph.) (63) Roche Abbey (SK58), 23/9/84, WAE det. CJ. This record pre-dates those published in *The Naturalist* **111**: 94 and **113**: 149 to become the first for Yorkshire.

A. corvina (Thom.) (*65) Gale Bank, Wensleydale (SE08), female, 2/10/85, WAE det. CJ.

† *A. puberula* (Sharp.) (63) Rotherham (SK58), female, 12/11/89, WAE det. RJM.

A. amicula (Steph.) (*65) Semerwater (SD98), female, 20/8/88, flood refuse, MLD (teste CJ).

A. indubia (Sharp.) (*62) Kildale Moor (NZ61), female, 20/7/87, pit fall trap, York University det. RJM. Spaunton Moor (SE79), 4/8/87, pit fall trap, York University det. MLD.

† *A. liliputana* (Bris.) (63) Blackmoorfoot (SE01), female, 11/11/87, MLD (teste CJ).

† *A. minuscula* (Bris.) (63) Drop Clough (SE01), female, 10/1/88, DM det. CJ.

A. subtilis (Scriba.) (64) Bishop Wood (SE53), sex ?, 20/4/84, PJH. (*63) Wharncliffe Wood (SK39), female, 20/3/88, EJS. The only previous record was from Askham Bog (SE54) in 1969.

A. cadaverina (Bris.) (63) Bradfield Dale (SK29), female, 2/4/88, old hay, EJS. Crooksmoor (SK38), 9/5/89, compost heap, EJS. The only previous records are from Langsett (SE20) in 1984 and 1985 and Drop Clough (SE01) in 1987.

A. pallidicornis (Thom.) (*63) Broomhead Wood (SK29), 29/5/88, EJS (teste CJ). Mickley (SE27), Copgrove (SE36), Bolton Percy (SE54), Thorganby (SE64) and Scarborough (TA08) have yielded the only previous records.

A. trinotata (Kra.) (*65) White Scar (SE19), female, 25/7/87, WAE det. CJ.

A. amplicollis (Mul. & Rey.) (*61) Thornton Ings (SE74), both sexes, 25/9/87, RBA det. EJS (teste MLD). Aughton Ings (SE63), female, 14/5/88, EJS. Female, 28/3/89, RBA det. MLD. (62) Scar Wood (SE99), sex ?, 1/4/88, small mammal nest, DAL. (63) Rushy Moor (SE51), female, 22/3/86, WAE det. MLD. Denaby Ings (SE50), 26/4/86, WAE det. MLD. Lower Denby (SE20), female, 12/10/86, EJS det. CJ. Rotherham (SK49), 11/8/88, WAE det. MLD. (*64) South Ings (SE54), 1/6/85, WAE det. CJ. (65) Middleton in Teesdale (NY92), 21/6/81, WAE det. MLD. This last record pre-dates those published in *The Naturalist* **111**: 95 and **113**: 149 to become the first for Yorkshire.

A. orbata (Er.) (63) Doncaster Airport (SE50), female, 21/8/82, WAE det. MLD. This record pre-dates those published in *The Naturalist* **113**: 149 to become the first for Yorkshire.

† *A. obfuscata* (Gr.) (63) Hillsborough (SK38), 10/5/89 and 27/6/89, EJS det. CJ.

A. celata (Er.) (*65) Semerwater (SD98), 20/8/88, flood refuse, MLD. Gillfield Wood (SE09), female, 7/5/89, rotting turnips, MLD.

A. dadopora Thom. (63) Anston Stones Wood (SK58), both sexes, 19/5/85, WAE det. CJ. This record pre-dates those published in *The Naturalist* **111**: 95 and **113**: 149 to become the first for Yorkshire. (*61) Thornton Ellers (SE74), 19/8/87, MLD (teste CJ).

† *A. zosterae* (Thom.) (61) Aughton Ings (SE73), female, 25/4/88, flood refuse, RJM (teste CJ).

A. aquatica (Thom.) (*65) Gillfield Wood (SE09), 7/5/89, rotting turnips, MLD.

A. aquatilis (Thom.) (*61) East Cottingwith (SE74), both sexes, 27/7/88, EJS. (*65) Birk's Gill (SE18), female, 4/6/79, WAE det. MLD. Gillfield Wood (SE09), 7/5/89, rotting turnips, MLD.

A. brunneipennis (Thom.) (*62) Chafer Wood (SE88), female, 28/5/88, WAE (teste CJ).

A. castanoptera (Mann.) (*61) Skipwith Common (SE63), both sexes, 23/8/80, decaying fungi, RSK det. MLD. (*65) Gillfield Wood (SE09), 7/5/89, rotting turnips, MLD.

A. pertyi (Heer.) (*65) Semerwater (SD98), 20/8/88, flood refuse, MLD. Gillfield Wood (SE09), female, 7/5/89, RBA det. MLD.

A. triangulum (Kra.) (*65) Gillfield Wood (SE09), female, 7/5/89, rotting turnips, MLD.

† *A. basicornis* (Mul. & Rey.) (63) Thorne Moor (SE71), female, 27/4/85, leaf litter, RJM (teste CJ).

A. coriaria (Kra.) (*62) Langdale Rigg (SE99), female, 20/10/79, under bark, RSK det. MLD.

A. fungicola (Thom.) (*63) Blackmoorfoot (SE01), 4/11/89, grass cuttings, MLD. The only previous records are from Mulgrave Wood (NZ81) in 1934 and Goathland (NZ80) in 1935.

A. intermedia (Thom.) (63) Swinden Plantation (SE10), 19/3/88, wet decaying hay, EJS. The only previous records are from Malham (SD86) in 1954 and Elland Park Wood (SE12) in 1985.

A. laticollis (Steph.) (*62) Beast Cliff (TA09), 17/10/81, moss, RSK det. MLD.

† *A. paracrassicornis* Brun. (64) Malham Tarn (SD86), 13/9/67, decaying grass heap, CJ. This was the first known occurrence of this species within the British Isles. A full account can be found in *The Entomologist* **101**: 64–66.

A. cinnamoptera (Thom.) (*65) Semerwater (SD98), female, 20/8/88, flood refuse, RJM. Burtersett (SD88), both sexes, 10/9/88, rotting vegetation, MLD.

A. laevana (Mul. & Rey.) (*65) Colsterdale (SE18), female, 5/6/82, WAE det. CJ.

A. macrocera (Thom.) (*65 White Scar (SE19), 20/7/87, WAE det. MLD.

A. nigripes (Thom.) (*65) Gillfield Wood (SE09), 7/5/89, rotting turnips, MLD.

A. picipennis (Mann.) (63) Bradfield (SK29), female, 24/9/88, gill fungi, EJS (teste CJ). The only previous record was from Abbey Brook (SK19) in 1987.

A. setigera (Sharp.) (*62) Kildale Moor (NZ61), female, 16/7/87, pit fall trap, York University det. RJM. Ravenscar (NZ90), female, 9/9/89, horse dung, MLD. (63) Thorne Moor (SE71), 19/5/79, RSK det. MLD. This last record pre-dates those published in *The Naturalist* **111**: 95 and **113**: 150 to become the first for VC63.

A. longicornis (Gr.) (*65) Gillfield Wood (SE09), 7/5/89, rotting turnips, MLD.

A. vestita (Gr.) (61) Aughton Ings (SE63), female, 14/5/88, MLD det. CJ. A most unusual find. This species is generally associated with the coast and has not previously been recorded at an inland locality in Yorkshire. It has, however, been noted up the Humber as far as Hessle (TA02).

Alianta incana (Er.) (*61) Saltmarshe Delph (SE72), 20/12/80, RSK det. MLD. Aughton Ings (SE63), sex ?, 7/7/87, reed litter, RJM. Thornton Ellers (SE74), female, 28/3/89, under bark, MLD.

Zyras humeralis (Gr.) (*65) Colsterdale (SE18), not sexed, 20/7/77, WAE (teste MLD).

Phloeopora testacea (Mann.) (*61) Skipwith Common (SE63), female, 27/9/89, MLD.

Calodera aethiops (Gr.) (*65) Semerwater (SD98), female, 20/8/88, flood refuse, RBA det. MLD.

C. riparia Er. (63) Bretton (SE21), both sexes, 2/2/49, EWA. This record pre-dates that published in *The Naturalist* **111**: 96 to become the first for VC63. (61) Aughton Ings (SE63), female, 28/3/89, MLD (teste CJ). Askham Bog (SE54), Bubwith (SE73) and Scarborough (TA08) have yielded the only previous records.

Amarochara umbrosa (Er.) (62) Netherby Dale (SE98), not sexed, 28/5/88, WAE det. CJ. The only previous record was from Saltburn (NZ62) in 1896.

Mniusa incrassata (Mul. & Rey.) (61) Wharram Percy (SE86), female, 9/4/80, RSK det. MLD. This record pre-dates that published in *The Naturalist* **113**: 150 to become the first for VC61.

† *Ocyusa hibernica* (Rye.) (62) Danby Low Moor (NZ71), both sexes, 5, 6, 8 and 9/87, pit fall trap, York University det. MLD (teste CJ). Levisham Moor (SE89), 3/9/87, pit fall trap, York University det. MLD. Danby High Moor (NZ70), 14/9/87, 23/8/88 and 4/10/88, pit fall trap, York University det. MLD. Kildale Moor (NZ61), 14/9/87, pit fall trap, York University det. RJM. Spaunton Moor (SE79), female, 5/10/87, pit fall trap, York University det. MLD.

Oxypoda brachyptera (Steph.) (61) Aughton Ings (SE63), both sexes, 14/5/88, CJ and EJS. Bubwith (SE73), both sexes, 14/5/88, CJ and RJM. (*65) Semerwater (SD98), 20/8/88, flood refuse, MLD (teste CJ). The only previous record was from Aughton Ings (SE63) in 1987.

O. elongatula Aube. (*65) Semerwater (SD98), both sexes, 20/8/88, flood refuse, MLD and RJM.

O. lentula Er. (61) East Cottingwith (SE74), 27/7/88, MLD and EJS. (*63) Edderthorpe Ings (SE4), both sexes, 10/12/72, EWA. The only previous records are from Saltburn (NZ62) in 1898, Bubwith (SE73) in 1921 and North Duffield Carrs (SE63) in 1987. This is a scarce species within the British Isles.

O. lividipennis Mann. (*65) Birk's Gill (SE18), 4/6/78, WAE det. MLD. Colsterdale (SE18), 8/6/78, WAE det. MLD. Low Wood (SE08), 5/10/85, WAE (teste MLD).

O. nigricornis Mot. (63) Cartledge Flat (SK29), female, 12/6/88, EJS. Malham (SD86), Brun Moor (SE00) and Drop Clough (SE01) have yielded the only previous records.

O. procerula Mann. (*61) Aughton Ings (SE63), female, 27/7/88, EJS. Thornton Ellers (SE74), 28/3/89, old straw, MLD. (*62) Egton Moor (NZ70), both sexes, 7/7/87, pit fall trap, York University det. MLD. Levisham Moor (SE89), both sexes, 8 and 9/87, pit fall trap, York University det. MLD. Spaunton Moor (SE79), 3/9/87, pit fall trap, York University det. MLD. Langdale (SE99), 31/3/88, DAL.

Ischnoglossa prolixa (Gr.) (*61) Thornton Ellers (SE74), 28/3/89, under bark, MLD.

Crataraea suturalis (Mann.) (*63) Elland (SE12), not sexed, 24/8/46, haystack refuse, EWA. Swinden Plantation (SE10), both sexes, 19/3/88, wet decaying hay, EJS (teste MLD). (*64) Studley Royal (SE26), 8/5/89, hay bale, RJM (teste CJ). The only previous record was from Beckhole (NZ80) on an unrecorded date.

Haploglossa nidicola (Fair.) (61) Fulford Ings (SE64), 15/8/87, RSK det. MLD. The only previous records are from Rossington (SK69) in 1909, Aldwark Bridge (SE46) in 1960, Wensley (SE08) in 1964, Grass Wood (SD96) in 1986 and Spurn (TA41) on an unrecorded date.

H. pulla (Gyll.) (*65) Mill Beck (NY92), female, 21/6/81, WAE det. MLD.

Aleochara albovillosa Bern. (*61) Gilberdyke (SE82), 5/81, SGC det. MLD. Drop Clough (SE01), Blackmoorfoot (SE01), March Haigh (SE01), Harden Clough (SE10) and Ravensknowle Park (SE11) have yielded the only previous records.

A. bipustulata (L.) (*65) Semerwater (SD98), 20/8/88, cow dung, MLD.

A. cuniculorum Kra. (*63) Blackmoorfoot (SE01), 29/10/87, MLD (teste CJ). The only previous records are from Skipwith Common (SE63) in 1919, Kearby (SE34) in 1937, Askwith (SE14) in 1937 and Spurn (TA41) on an unrecorded date.

AN HISTORIC ORNITHOLOGICAL LETTER

MARTIN LIMBERT
Museum & Art Gallery, Doncaster

Until 1830, the Red-footed Falcon *Falco vespertinus* was unknown as a British bird. In that year, a spring influx brought five specimens to eastern England, all in Norfolk in May except the first, which was shot near Doncaster in April. Details of this latter bird were subsequently communicated to the Linnean Society of London. The original letter is still preserved in the archives of the Society, and in view of its interest to Yorkshire ornithology, it is here transcribed:

Retford – 15 April 1830 –

My Lord

As I am not aware that the *Falco* | *Rufipes* has hitherto ever been noticed as a | British Bird — I take the liberty of communicating | to your Lordship, that a specimen was killed | near Doncaster in April 1830 — which is now | in my possession — The plumage agrees with | the description of the female & young male | given by Temminck — Manuel d'Ornithologie | Vol. 1. page 33 — edit^{n} 1820 — & also agrees with | - Wolf & Meyer's description, as well as their | beautifull representation of the female F. | Rufipes (except some trifling difference in the | markings on the inferior part of the Body | which probably arise from the difference of | age) — Not having had the good fortune to see | the above mentioned Bird, in a fresh state the colour | of the legs, cere, & Irides — can not be, now spoken | to with certainty — but the informatin I have received | as to these points from the person who stuffed the | Bird, and the general Characteristicks of it, leave | I think, no doubt, as to its being what is described | by modern Naturalists, as the female, or young | male, of the Falco rufipes (or Kobez) — Buffon | gives a description & a plate of the male Bird | which he calls "variété singuliere du Hobreau" | Planches enluminées Vol. 1. page 219. plate 431 — |

I have the honor to be
Your Lordship's
most obedient Servant
H.S. Foljambe
F.L.S.

To The Right Honble Lord Stanley
President of the Linnean Society

The Red-footed Falcon, Buffon's 'variété singulière du Hobereau', is still known in French as the 'Faucon kobez'.

The letter was read at the Linnean meeting of 1 May 1832, with the *Transactions* providing the first published notice (Anon. 1837). Clarke (1881) commented that the bird was a male specimen. It was placed in the collection at the Foljambe family seat at Osberton in Nottinghamshire, the taxidermist probably being either [B.] Corbett, 'a London naturalist of some repute' (Jacks 1881), or the Doncaster taxidermist Hugh Reid. Jacks (1881), in outlining the history and scope of this large and important assemblage, observed that it had been started by Francis Ferrand Foljambe (1750–1814). He was an intimate friend of George Montagu, the latter naming the Little Crake *Porzana parva*, *Gallinula foljambei* in his honour, although the name is now sunk in synonymy. Foljambe had seven children. Henry Savile Foljambe (1785–1839) was one of these (Montgomery-Massingberd 1972), and like his father became a Fellow of the Linnean Society. Dobbs (1975) observed that the collection was still preserved as Osberton.

ACKNOWLEDGEMENTS
H. S. Foljambe's letter is published by courtesy of the Linnean Society of London; my helpful contact was the Society's librarian/archivist, Ms Gina Douglas.

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BOOK REVIEWS

The Kestrel by **Gordon Riddle**. Pp. 24, with numerous maps, line diagrams, b/w and coloured photographs. Shire Natural History Publications. 1990. £1.95.

The Kestrel is the commonest and most frequently seen raptor in Britain. At home even in city centres with its habit of hunting along the roadside verges and the central reservations, or hovering over open ground, it ensures that it is constantly in the public eye; it is therefore appropriate that Shire Natural History Publications should produce a booklet on this appealing bird. The booklet has been well thought out and is clearly and concisely written with some excellent photographs and interesting maps. The publication contains more than enough detail to inform the casual observer about the life of this attractive falcon and could whet the appetite sufficiently to encourage a greater interest to be taken, not only in the Kestrel, but in other less conspicuous birds of prey. It will make an inexpensive and welcome present for any young naturalist and a useful booklet for a keen naturalist of any age.

JEK

An Atlas of the Butterflies of Northumberland and Durham by **N. J. Cook**. Pp. 71. Northumberland Biological Records Centre, The Hancock Museum, The University, Newcastle upon Tyne. Special publication No. 5. 1990. £6.00.

The atlas is attractively presented in a parchment coloured stiff paper cover with drawings, large varied type and spiral binding.

The maps referring to vice-counties 66–68 occupy a full page and are bold and clear. 26 species are mapped on a tetrad basis with facing notes under the headings of distribution, description, habitat, flight period and current status. A further 14 species are dealt with briefly under the categories of rare migrants, vagrants and escapees, extinctions since 1945, and historical records from literature.

For those who motor through the counties but have not obtained the OS 1:50,000, the maps are clear enough to be used with the OS Road Atlas.

As the author states, common species could be recorded in many more tetrads in the vast, wild areas of Northumberland and Durham. This atlas will be of use to the serious student, the local recorder or those who just drive through the counties on their way to distant destinations and use the scenic lay-byes and picnic sites. It will be especially useful to Yorkshire naturalists resident on the northern edges of VC62 and 65 who should certainly be able to 'black out' more tetrads.

JP

RECORDER'S THIRD REPORT ON THE ACULEATE HYMENOPTERA IN WATSONIAN YORKSHIRE

MICHAEL E. ARCHER

The Watsonian Yorkshire list of aculeate Hymenoptera (=YLIST) in May 1990 contained 302 species as follows:

Family	No. species	No. records
Dryinidae	20	—
Bethylidae	5	—
Chrysididae	16	309
Tiphiidae	2	9
Mutillidae	2	88
Sapygidae	2	25
Formicidae	17	—
Pompilidae	20	540
Eumenidae	13	529
Vespidae	7	—
Spechidae	72	2320
Colletidae	9	255
Andrenidae	35	—
Halictidae	27	—
Melittidae	1	6
Megachilidae	13	352
Anthophoridae	19	1333
Apidae	22	—

A record is a specimen differing in one of the following three variables: name, sex and day of capture (or observation). At present 5,766 records have been written up and are distributed among the families as indicated in the table.

J. T. Burn has added two species of Dryinidae since Archer (*Naturalist* **112**: 109); *Aphelopus nigriceps* Kieffer and *Anteon tripartitum* Kieffer. Also J. T. Burn has indicated by written communication the following misidentifications published in Burn (*Naturalist* **100**: 143–145): *Chrysis ignita* should be *C. impressa* Schenck, 1856; *Andrena bucephala* be *A. scotica* Perkins, R. C. L., 1916; *A. flavipes* be *A. denticulata* (Kirby, 1802); *Nomada guttulata* be *N. flavoguttata* (Kirby, 1802); *Epeolus cruciger* be *E. variegatus* (Linn., 1758).

For the following 12 species the initials of collectors are as follows: M. E. Archer (MEA), A. Brackenbury (AB), J. D. Coldwell (JDC), W. A. Ely (WEA), J. H. Flint

(JHF), W. D. Hincks (WDH), J. Payne (JP), J. D. Ward (JDW). Some of the specimens were found in the collections of the museums of Keighley and Manchester University. I would like to thank the curators for permission to borrow and examine specimens and to collectors for being allowed access to their material.

Chrysis pseudobrevitarsis Linsenmaier, 1951. This species has possibly been found at Keswick Fitts (VC64, SE34, June 1987, MEA). Unfortunately the specimen is a small male and could be *C. impressa* Schenck, 1856. *C pseudobrevitarsis* is only known from Devon and Northamptonshire although its host, *Ancistrocerus antilope* (Panzer, 1798) has been found in the Harrogate area.

C. rutiliventris Abeille de Perrin, 1879. I have found that my interpretation of *C. ruddii* Shuchard, 1837 has been too broad. Misidentified specimens of *C. ruddii* can now be identified as *C. rutiliventris* so that records of this species given by Archer (*Naturalist* **111**: 32) can be extended: Scarborough (VC62, TA08, July 1930, JDW); Allerthorpe Common (VC61, SE74, June 1976, MEA); Strensall Common (VC62, SE66, August 1983, MEA); Colton (VC64, SE54, July 1985, JP); Duncombe Park (VC62, SE68, July 1985 MEA); Keswick Fitts (VC64, SE34, June 1987, MEA).

Eumenes papilarius (Christ). Tankgasley (VC63, SK39, August 1989, JDC). This species, which is new to the British list, was identified by K. Guichard and confirmed by J. Gusenleitner. K. Guichard has written a note to be published in the *Entomologists' Monthly Magazine*.

Ectemnius sexcinctus (Fabricius, 1775). New species for Watsonian Yorkshire. Sheffield (VC63, SK38, August 1987, AB); Rotherham (VC63, SK49, September 1988, WAE); Cornelian Bay (VC62, TA08, June 1989, MEA).

Spilomena beata Blüthgen, 1953. New species for Watsonian Yorkshire. Hugset Wood (VC63, SE30, June 1987, JDC).

Colletes halophilus Verhoeff, P. M. F., 1943. This new species for Watsonian Yorkshire seems to have been missed in the Spurn report (*Naturalist* **78**: 158). Spurn (VC61, TA41, August 1986, JHF).

Andrena pubescens Olivier, 1789. Previously reported by Butterfield & Fordham (*Naturalist* **57**: 258). A specimen under this name at Keighley Museum, probably arranged by Butterfield, was misidentified and was *A. scotica* Perkins, R. C. L. I suggest this species be withdrawn from the Yorkshire list for the time being.

A. fulvago (Christ, 1791). This species was previously reported by Butterfield & Fordham (*Naturalist* **57**: 280). Several specimens found at Keighley and Manchester University Museums under this name were misidentified and were actually *Halictus rubicundus* (Christ, 1791). *A. fulvago* is usually associated with chalk or limestone grassland while records of this species on the Fordham card index are all from sandy habitats. *A. fulvago* can therefore be withdrawn from the Yorkshire list.

A. ocreata (Christ, 1791). This new species for the Yorkshire list has been confirmed by G. Else. Gundale (VC62, SE88, May 1989, MEA).

A. ovatula (Kirby, 1802). Crow Wood (VC63, SK69, April 1987, MEA). Roebuck (*Trans. Yorkshire Naturalists' Union* 1877: 55 recorded this species as *A. afzehiella*. Perkins, R. C. L., reported by Fordham (*Naturalist* **58**: 120), considered that the record of *A. afzehiella* was worthless without other records. 110 years later another record can be reported.

Sphecodes crassus Thompson, 1870. Until recently females of this species could not be determined with certainty. The folowing three records are of female specimens. Pompocali (VC64, SE34, September 1980, MEA); Woolley Edge Quarry (VC63, SE31, June 1985, MEA); Burton Leonard Lime Quarries (VC64, SE36, June 1987, MEA). This species was previously reported by Butterfield & Fordham (*Naturalist*

57: 236). However, specimens at Keighley Museum, probably arranged by Butterfield, were misidentified and were either *S. fasciatus* von Hagens, 1882, *S. hyalinatus* von Hagens, 1882 or *S. ferruginatus* von Hagens, 1882. Thus all earlier records of *S. crassus* were probably misidentified and cannot be accepted without confirmation.

S. miniatus von Hagens, 1882. Spurn (VC61, TA41, June 1951, WDH). A female of this species was found at Manchester University Museum. This species was previously reported by Butterfield & Fordham (*Naturalist* **57**: 236). Again, however, specimens at Keighley Museum relating to this species were misidentified as *S. hyalinatus* von Hagens, 1882.

A SURVEY OF HIBERNATING BATS IN DREWTON RAILWAY TUNNEL

A. C. LANE (East Yorkshire Bat Group) and
R. H. DEATON (Harrogate Bat Group)

Introduction

A planning proposal for the commercial infilling of the disused Drewton Tunnel near Little Weighton (grid ref. SE 952335 to SE 971337), originally part of the Hull and Barnsley and West Riding Junction Railway, has prompted a winter survey (under the aegis of the Nature Conservancy Council) of the site for the possible presence of hibernating bats. There being no prior history of the usage of the tunnel by over-wintering bats, it was decided to mount as comprehensive a survey as possible so that the whole tunnel could be searched more or less simultaneously. The survey was carried out on 14 January 1990 under the leadership of Ron Deaton.

History of Drewton Tunnel

The Hull and Barnsley Railway opened in 1885 to bring coal to the specially constructed Alexandra Dock in Kingston upon Hull. Taking three years to complete, the tunnel passes through the chalk of the Yorkshire Wolds for a distance of 2,116 yds in an east-west direction. The summit of the line (262 ft above sea level) was adjacent to the eastern portal. The tunnel has five ventilation shafts which provide prominent landmarks in the predominantly agricultural locality. A strange feature of the tunnel's construction was that only the two end sections of the tunnel were fully brick lined; thus between the shafts only the tunnel arch was brick lined. The tunnel became disused when services were withdrawn in 1958 (Hoole, 1972; Hinchcliffe, 1980).

Geology of Drewton Tunnel

The railway line ran east-west, cutting, at right-angles, a series of minor escarpments belonging to the Liassic and Oolithic series until it reached the loftier chalk escarpment at Drewton Tunnel. The tunnel was entirely excavated in the lower beds of white chalk which are full of soft, light-coloured flints. Yorkshire chalk is very hard, a factor which resulted in the described construction characteristics (Cole, 1886).

Survey Method

A preliminary survey noted the internal features of the tunnel such as the shafts and linesmen's step-ins. These major features were then plotted onto graph paper, mapping out the track bed, walls and ceiling. Distance marks were also placed on the walls adjacent to step-ins (at approximately 25 yd intervals) so that location within the tunnel could be ascertained quickly and accurately. Two surveyors were allotted to each length of tunnel which was conveniently defined by either a portal and shaft or two shafts. The task of each surveyor was to seek, note the position and identify any hibernating bats. It was not possible, without any special equipment, to survey the shafts themselves. Although it is well-known that bats may roost on the ground amongst debris, any debris was left undisturbed. Temperature readings were taken in the tunnel and in its immediate

environs on the day. Also, ambient temperatures were recorded for the week preceding the survey at Skidby (grid ref. TA 013335) approximately 3 miles to the east of the tunnel.

Results

During the week preceding the survey, minimum ambient temperatures at Skidby ranged between −3 and +7°C, whereas maximum ambient temperatures ranged between +8 and +12°C. On the day of the survey, a temperature of 7.2°C was recorded at 11.00 hours some 20 yds from the eastern portal. In the central to western sections of the tunnel the temperature had risen to 8.2/8.3°C. Although no humidity readings were taken, it was obvious that the eastern end of the tunnel was relatively dry, but there was ample evidence to suggest that water percolated from the roof during wetter seasons. In contrast, the central to western sections, where bats were found, were more humid with some dripping water causing the brickwork to become 'greasy'. A further factor, probably enhancing the suitability of this area, was the partial infilling of the western railway cutting by adjacent quarrying which had blocked approximately 95% of the western portal.

Weathering of the tunnel had improved the tunnel's potential as a bat hibernaculum, since much of the accumulated soot had fallen. However, the remaining soot was found to provide a suitable, though unlikely, substrate for hibernating bats (Table 1). The brickwork, where it had eroded, showed a clean, bright red surface. In many places the brickwork had completely crumbled, exposing the underlying chalk. There was also evidence for erosion of the chalk, thereby presenting many soot-free surfaces and crevices.

A total of ten bats was discovered which included at least two species, brown long-eared (*Plecotus auritus*) and Daubenton's bat (*Myotis daubentoni*), with one *Myotis* sp. unidentified. The location and position of each bat can be found in Table 1. Bats were found singly in the central to western portion of the tunnel in a variety of near-vertical locations on the side walls, but none were found in the tunnel roof.

Discussion

The distribution of bats located suggested that they preferred either crevices or exposed, near-vertical, surfaces midway to high up on the side-walls of the tunnel. However, these findings would be biased because of the relative difficulty in locating bats in deep crevices and in the tunnel roof. It seemed highly likely that the bats preferred the more humid region of the tunnel which, due to a dry winter and partial occlusion of the western portal, was from the central to western end.

The survey establishes Drewton Tunnel as a hibernaculum for at least two species of bats, but did not confirm the additional sighting of Natterer's bat, (*Myotis nattereri*) by Delap, Freer and Lane (unpublished observations) during December 1989. Furthermore, the survey did not confirm the presence of the pipistrelle (*Pipistrellus pipistrellus*) which had been seen in the vicinity of the eastern portal during the summers of 1988/89, either feeding or behaving socially. There has been no systematic search for summer roosting sites in the tunnel to date (A. C. Lane, East Yorkshire Bat Group Annual Report 1988/89).

The status and distribution of bats on North Humberside is only poorly understood (Howes, 1990). However, all four species mentioned have been identified in the Derwent valley less than 15 miles to the west (Thompson, 1985). The only prior report of any hibernating bats on North Humberside was of a single specimen of *Myotis daubentoni* found in a war-time building (now destroyed) on Spurn Point (Spence, 1973).

North Humberside does not have any natural caves, therefore any man-made structures may assume increased importance if adopted by bats. Apart from the two smaller tunnels to the west of Drewton Tunnel, neither of which have been shown to contain hibernating bats (A. C. Lane, unpublished observations), Drewton Tunnel is the only substantial structure of its kind in this area with all the attributes of an hibernaculum. It is reasonable to claim Drewton Tunnel as the only currently known hibernaculum on North Humberside.

TABLE 1
Location and species of bats found hibernating in Drewton Tunnel.

Distance from eastern portal (yds)	Height (ft)	Location	Species
685	12.0	Exposed on brick	*Plecotus auritus*
872	4.5	Exposed on chalk	*Plecotus auritus*
1035	4.5	Behind wooden board	*Plecotus auritus*
1125	12.0	Exposed on brick	*Plecotus auritus*
1460	15.0	Exposed on brick	*Myotis daubentoni*
1470	20.0	Exposed on brick	*Myotis daubentoni*
1595	4.0	Hanging in brick hole	*Myotis daubentoni*
1860	15.0	Exposed on brick	*Myotis daubentoni*
2025	4.0	Behind soot flake	*Myotis sp.*
2075	3.5	Exposed on soot	*Plecotus auritus*

Conclusion

On the strength of this survey, and taking into consideration the unique status of the tunnel in the region, it was recommended to the Nature Conservancy Council that consideration be given to the conservation of Drewton Tunnel in its entirety, but with restricted access modifications, primarily for the benefit of hibernating bats.

Acknowledgements

The authors wish to record their thanks to the following bat-workers for their participation in the survey: Fiona Black, Brian Darbyshire and Bob Elliott (Harrogate Bat Group); Annie and Pat Delap (Lincolnshire Bat Group); Heather and John Gardner (Wakefield Bat Group); Sue Lane and Kevin Freer (East Yorkshire Bat Group); Colin Howes (Doncaster Museum, Environmental Records); also accompanying the survey team were Jan Davie (who had the distinction of finding one of the bats) and David Cottee of the Humberside County Council Technical Services Department. Finally, the cooperation and kind consent of British Rail and Terry Oliver of Bungalow Farm, Little Weighton for allowing access to the site is acknowledged.

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BOOK REVIEWS

Flora of the East Riding of Yorkshire by **F. E. Crackles**, edited by **R. R. Arnett**. Pp. xii + 271, 41 colour plates, 5 figures, 465 distribution maps and eight overlays. Hull University Press and Humberside County Council. 1990. £30.00 hardback.

A flora of the East Riding of Yorkshire has long been awaited, no such work having been published since that of J. F. Robinson in 1902. Miss Crackles has met that need.

Part one opens with a definition and description of the area covered by the Flora, namely the Watsonian vice-county of S. E. Yorkshire (VC61), which is almost identical with the former East Riding of Yorkshire. A figure showing the botanical areas, and key locations by number, will be useful to those not knowing the area. Despite the odd ordering of a few numbers, it works very well, though of course an Ordnance Survey map is required for many smaller locations. The author has divided the vice-county into four main areas: Upper and Lower Derwentland, the Wolds and Holderness, and uses these divisions as the basis for distribution entries in the flora proper. This affords a satisfactory way of listing locations, though in fact Holderness as here used is neither the historical wapentake nor the geographical plain of Holderness, but all the land east and south of the chalk wolds. The boundary between the two is somewhat arbitrarily drawn, but to have followed a contour line might have been impracticable. The western boundary of the Wolds is made to include the Jurassic rocks, with the consequence that 'woodlands on the western edge of the Wolds' could be over sands or Oxford clay rather than the chalk which would first come to mind. This greater detail is mentioned by Dr Arnett in his chapter on geology and soils, the latter being dealt with in relatively greater detail. The variety of soils described has no corresponding part to play in the Flora. It would be interesting to know, for instance, whether a pelosol east of Stamford Bridge has any influence on the flora? Perhaps this chapter will stimulate future work.

The two chapters entitled 'Habitats' and 'The Distribution of Flowering Plants and Ferns' give a good summary account of the flora of VC61 and display the author's knowledge of it. Inevitably, since there is such a connection between habitat and distribution, there is a degree of repetition: perhaps no bad thing. Those readers accustomed to using Latin names may find reading the lists rather irritating since the plants are given in alphabetical order of their Latin names, but these are printed after the English names, and only on a first mention. Two areas not specifically mentioned in these chapters are the sands at Barmston and the group of woods in Holderness south of a line from Lowthorpe to Burton Agnes, where there is much of interest. Indeed, in view of woods being a major habitat, it is surprising there is no diagram to indicate their distribution, though one can always consult the OS maps. More surprising, however, is the absence of diagrams or tables of climatological data. This prevents easy comparison of East Yorkshire with the rest of Great Britain in this respect. It may not be known to all users of the book, for instance, that the S. E. of the vice-county is one of the three driest areas in the country, and that the rainfall at Spurn (less than 25 in. per annum) can be half that of the high wolds, (20–40 in. per annum).

A short chapter entitled 'The Study of the Flora' gives some details of earlier workers, mainly from the standpoint of their contribution to botanical records, rather than a biographical approach. This chapter also contains a reference to the background to the present work. Miss Crackles mentions that with 848 tetrads in the vice-county, recording on that basis was to some extent over-ambitious. We must be glad that this was the approach. Modern county floras tend to fall into two groups: those that are the life-work of one person very much alone, and those in which the fieldwork is that of a highly organised team over a relatively short period of time, say five years. This flora tends to partake of both methods with many of the advantages of both, and a few disadvantages. The main advantage, as already mentioned, is the writer's detailed knowledge; also there

is time for an historical approach. The main disadvantage of a long recording time — the distribution maps have records spanning almost forty years — is the possible misrepresentation of the number of sites on which a plant can be found. Also, a number of sites have disappeared. To be sure, the author gives fair warning of this, and there is a gain in that a better idea of a possible as distinct from an actual distribution may be obtained. The first part of the book concludes with the obligatory and necessary chapter on conservation.

There is very little to criticise in part two, the annotated list, with its wealth of detail. Only four misprinted names have been noted: *Bromus thominii* is one, and this also shows that nomenclature is not always the same as in other modern works which give this grass as a subspecies of *B. hordeaceus*. Similarly, the three species of *Zannichellia* are usually given as subspecies of *Z. palustris*. On occasion the word 'determined' should have been 'confirmed'; since anyone can make a mistake, confirmations may be needed, but if so they should be recorded as such. In the case of *Symphytum officinale* at Wressle, the determination was by the finder, and it was confirmed by a chromosome count made at the John Innes Institute, not by Dr Perring. *Rumex* × *knafii* at Little Skipwith, 1984, was confirmed by Dr Akeroyd.

Some subspecies receive a mention, e.g. those of *Ranunculus ficaria*, but others do not, e.g. those of *Veronica hederifolia*. Critical and difficult genera get varied treatment. Those which were of special interest to the author, such as Marsh Orchids and the Sedges, are very well dealt with, but with others it varies according to the interest shown by independent botanists; for example, the Brambles, Dandelions and Willows are fairly well covered, but not the Hawkweeds and Eyebrights. Conifers have received little attention, even as aliens, presumably regarded as always planted. Only two incorrect statements have been noted with regard to plant records. Female flowers and fruiting heads of *Petasites hybridus* were obtained at Foston on the Wolds in 1979, and *Ranunculus penicillatus* subsp. *pseudofluitans* var. *vertumnus* was found near Hotham in 1988, but possibly too late for inclusion in this work.

The distribution maps will be much studied. Although the author's aim of encouraging an ecological approach by arranging the distribution maps partly in sets relating to habitat is undoubtedly a laudable one, this may be offset by the necessity for frequent consultation of the index, compared with other floras in which the maps accompany the text. Comparisons often mean looking at the text and two pages of maps at the same time, for example, *Calystegia sepium* and *C. sylvatica*, and *Carex rostrata* and *C. vesicaria*.

The colour plates are interesting, but the colour reproduction is poor for *Campanula latifolia*. There is a good list of reference works, but the index could have been fuller; any plant species not mapped is only indexed by genus and part one is not indexed at all.

The majority of the criticisms made here are concerned with presentation rather than with contents. This book contains an enormous amount of information, meets a great need, and will provide ideas for future work for many years to come. Anyone remotely interested in the plant life of East Yorkshire, whether resident locally or a visitor from further afield, should possess a copy.

EC

Where Have All the Birds Gone? by **John Terborgh**. Pp. 207. Princeton University Press. 1989. £32.95 hardback, £10.95 paperback.

We seem to be inundated by books about birds. This one, however, is genuinely different. It is not for twitchers, nor even specifically for bird watchers or even for bird biologists, though its contents should concern such people. Indeed, it is not only naturalists but, if they can be persuaded to read it, economists and politicians who will benefit from this exercise. It is about birds in the New World, of which many may be

unfamiliar to European readers, but the message is more important than the examples used. It looks at migratory birds, both in their breeding ranges in North America and in their winter quarters in Central and South America, and considers why some of them are declining in numbers. While birds are the key players in the drama, it is also about ecology and about the behaviour of modern man and the way in which he has altered, and continues to alter, his environment. This last is not just a hackneyed rehash of what is now so familiar in these days of many books on 'conservation' but a penetrating analysis of matters that concern the well-being not only of birds but of whole ecosystems.

In presenting the case that, if they continue unchecked, man's excesses will very quickly lead to drastic changes (for the worse) in our avifaunas, the author treats us to much good biology and to many interesting observations on birds and their ecology, as well as bringing home the need to consider problems on a national or supra-national basis. Local tinkering is often not enough. It would require several pages adequately to review the diverse contents of this important book. Parochial naturalists (and there is much to be said for this breed) will find their horizons broadened if they read it. If as a result they begin to work for remedial action in the wider world, their local avifaunas may survive. If they don't they may live to regret it.

GF

Safaris by **K. M. Bennetts**. Pp. 119, with 16 colour plates. Merlin Books, Braunton, Devon. 1990. £6.95.

This is a diarised account of thirteen holidays the author spent between 1964 and 1987 in a variety of often remote locations in eastern Africa (including Madagascar), India, Australia, Falkland Islands, Amazonia, Galapagos, Greenland and Bermuda. The narrative provides interesting first hand information on the natural history of these diverse environments. In addition, the author humanises her accounts with details of the often rigorous conditions under which she travels, the persons she meets and the description of places visited.

MJD

Birds by Character. The Fieldguide to Jizz Identification written by **Bob Hume**, and illustrated by **Ian Wallace, Darren Rees, John Busby** and **Peter Partington**. Pp. 176. Macmillan 1990. £7.99 paperback.

We have seen over the past decade a series of fieldguides to the birds of Britain and Europe but this book is different. It is an imaginative attempt to identify species by their 'jizz'. Most birdwatchers use 'jizz' instinctively when in the field, it being that almost indefinable combination of size, shape, colour and behaviour which a bird can exhibit. This book illustrates all British breeding species with a number of vagrants and rarities — 348 in total. Unlike many guides which show single pictures of breeding adults, this one uses black and white for many of the main illustrations with smaller coloured images in support. For example, Shore Lark is depicted in two black and white and six coloured miniatures. Each species account is accompanied by a distribution map and notes on habitat, calls and behaviour. The standard of illustration is very high and apart from a reversal of Stonechat and Whinchat distribution maps, the text is concise and informative. The authors have produced a book which I believe to be the forerunner of future fieldguides and it will be enjoyed by experienced watchers and novices alike.

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A QUARTERLY JOURNAL OF NATURAL HISTORY FOR THE NORTH OF ENGLAND

A nest-box study in North Yorkshire — *G. W. Follows*

A history of alien freshwater mollusca in north-west England — *Nora McMillan*

Relative abundance and food plants of bumblebees *Bombus* spp. on heather moorland — *R. Hewson*

Published by the Yorkshire Naturalists' Union

Editor **M. R. D. Seaward**, MSc, PhD, DSc, FLS, The University, Bradford BD7 1DP

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Photographic Plates

Readers of *The Naturalist* will have noticed that the number of photographic illustrations has increased in recent years. Good clear photographs, suitably captioned, to accompany articles or as independent features, such as the bird portraits by Arthur Gilpin in recent issues, are always welcome.

To encourage this development, a long-standing member of the YNU, who wishes to remain anonymous, has most generously offered to make a donation, the income from which would finance the publication of a plate or equivalent illustration in future issues whenever possible. The editor, on behalf of the YNU, wishes to record his deep appreciation of this imaginative gesture.

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A NEST-BOX STUDY IN NORTH YORKSHIRE

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Yarm, Cleveland, TS15 0HD

Study Area

The study area is based on Sleightholmedale Lodge, near Kirbymoorside (SE 664 891; 54°17′N 00°59′W) in the valley of the Hodge Beck, one of the southerly flowing streams draining the North Yorkshire Moors National Park.

Most of the indigenous, deciduous woodland along the slopes of the valley has long since been felled and replaced by conifer. However, Mell Bank Wood, together with an ever decreasing part of Skiplam Wood, remains deciduous with English Oak *Quercus robor* the dominant species; Ash *Fraxinus excelsior* and Elm *Ulmus procera* are both common whilst Alder *Alnus glutinosa* is particularly abundant along the banks of the river. (During the course of the study, most Elm trees have died as a result of Dutch Elm Disease and the effect that this has had on the breeding population is discussed later in this paper). As might be expected, such habitat is most suitable for both Pied Flycatchers *Ficedula hypoleuca* and Wood Warblers *Phylloscopus sibilatrix,* and in addition to both Blue Tits *Parus caeruleus* and Great Tits *P. major,* other hole-nesting species to be found in the valley include Coal Tits *P. ater,* Marsh Tits *P. palustris,* Redstarts *Phoenicurus phoenicurus* and Nuthatches *Sitta europea.* However, the principal hole-nesting species which favour nest-boxes and are thus the subject of this study are Blue Tits, Great Tits and Pied Flycatchers.

The first nest-boxes were introduced during the winter of 1973–4, when approximately 60 were located in Mell Bank Wood and in trees along the river bank. These were progressively increased to *ca* 80 by 1977 and then to just under one hundred by 1979, since when numbers have remained relatively constant. The current boxed area is depicted by the hatching in Figure 1; just over one-third are now in Mell Bank Wood at an altitude of 99–107 metres asl (325–350 feet) whilst the remainder are situated along one kilometre of river between 69 and 84 metres asl (225–275 feet). Boxes are of the standard tit type (10×10×20 cm in dimensions) with an overhanging roof and a 3 cm diameter entrance hole, and for ease of inspection are situated 2 metres above ground level. In order to maintain boxes in an acceptable condition, approximately 10% are now renewed annually.

During the course of this study, significant changes in habitat have gradually occurred, with the loss of all mature elms through disease, some commercial felling in The Brow and the loss of a few prime oaks by lightening strike. At the time of writing (February 1990), management plans are well advanced which will result in further significant changes to the habitat. Thus the time is considered appropriate to gather stock, summarise knowledge gained to date and provide a base-line against which future changes can be gauged. Thus the scope of this analysis encompasses the sixteen breeding seasons 1974–1989 inclusive and is based on data collected at weekly intervals between mid-April and late-June/early-July. These data have subsequently been subject to standard statistical analyses to search for inter-relationships between various aspects of breeding biology and a variety of external factors.

Occupation

The number of boxes occupied by the various species each year is detailed in Table 1, and for the commoner species this has been translated into an occupation rate which is displayed graphically in Figure 2. In an attempt to ascertain why populations fluctuate from year to year, various correlations have been explored. With Pied Flycatchers, it has been found that the population is influenced neither by the previous winter weather in Britain (using data kindly provided by Harrogate North Outfall Recording Station) nor by sub-Saharan drought — using both rainfall data published by Lamb (1982) and cereal imports (OECD 1988) as an annual measure of the severity of the drought in the Sahel. The former is perhaps to be

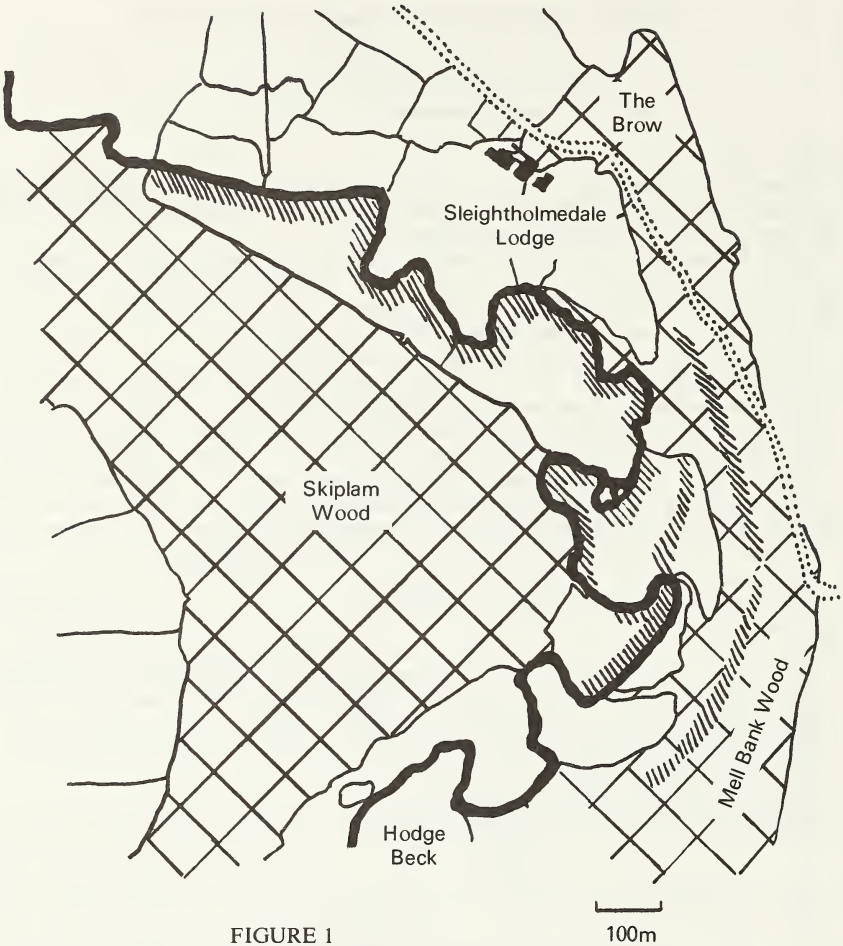

FIGURE 1
Nest-box Study Area

expected, but the latter would suggest that the Pied Flycatcher winters in an area which has not been subject to the devastating droughts experienced in the Sahel region of Africa in recent years which has been responsible for the dramatic decline in the numbers of Whitethroats and Sand Martins returning each year to breed in Britain.

With Blue Tits and Great Tits, both populations tend to move in tandem ($p<0.001$, 14 degrees of freedom) and show a good correlation with the severity of the previous winter, measured for example as the number of days between November and March when the maximum daily temperature did not exceed freezing. This is illustrated graphically in Figure 3.

When considering breeding density, neither Blue Tit nor Great Tit occupation appears to correlate with the Pied Flycatcher population, suggesting that competition for nest sites, ie availability of boxes, is not critical in determining population levels. In fact, the whole of this

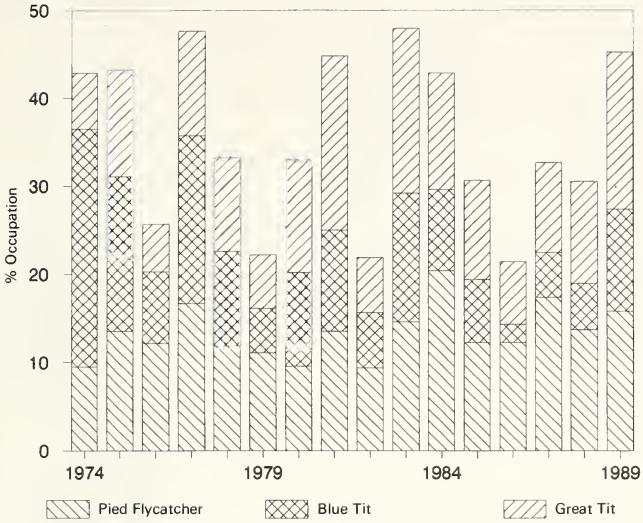

FIGURE 2
Nest Box Occupation, Sleightholmedale 1974–89

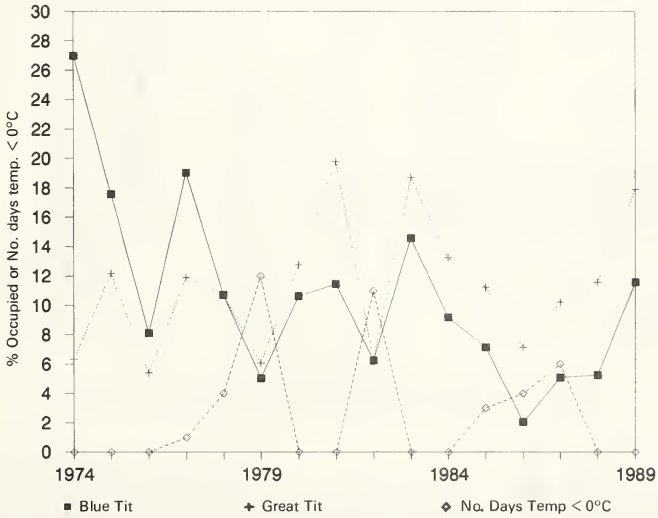

FIGURE 3
Occupation v Severity of Winter, Sleightholmedale 1974–89

TABLE 1
Occupation of Nest-Boxes

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Number of boxes	63	74	74	84	84	99	94	96	96	96	98	98	98	98	95	95
Pied Flycatcher	6	10	9	14	10	11	9	13	9	14	20	12	12	17	13	15
Spotted Flycatcher	2	1	1													
Redstart								1					2	1	1	
Blue Tit	17	13	6	16	9	5	10	11	6	14	9	7	2	5	5	11
Great Tit	4	9	4	10	9	6	12	19	6	18	13	11	7	10	11	17
Marsh Tit	1		1	1								2				2
Coal Tit				1						1		2		1	1	
Robin											1					
Empty	33	41	53	42	56	77	63	52	75	49	55	64	75	64	64	50

TABLE 2
Loyalty of female Pied Flycatchers to Sleightholmedale

Ringed at Sleightholmedale as	Controlled as Breeding Female at Sleightholmedale	Elsewhere
pullus	21	6
adult female	23	1

In addition to the above, 8 females — 7 ringed as pulli and 1 as an adult — have been ringed at Helmsley and controlled at Sleightholmedale in subsequent years.

analysis makes the assumption that the number of birds using the boxes reflects the population as a whole. This is probably a fair assumption to make and for Pied Flycatchers, there is little evidence that birds use anything other than nest-boxes for breeding. In fact the pattern of behaviour for Pied Flycatchers is such that territorial males sing most vociferously when in search of a mate, but once breeding is underway become relatively inconspicuous. However, every year it is possible to identify a number of males which continue singing well after other birds have commenced breeding, and even sometimes make rudimentary attempts at nest construction within a box. Whether these birds fail to attract a mate because of an inbalance in the population or because other males are polygamous has yet to be firmly established.

Rather interestingly, data displayed in Figure 3 suggest that there has been a marked decline in the Blue Tit population during the course of this study. This is statistically highly significant ($p<0.01$,14 dof) and could perhaps be a reflection of habitat changes occuring during the course of this study. Certainly, most of the elms have died in recent years and in certain areas where they were predominant, changes in next-box occupation can be demonstrated (see Figure 4).

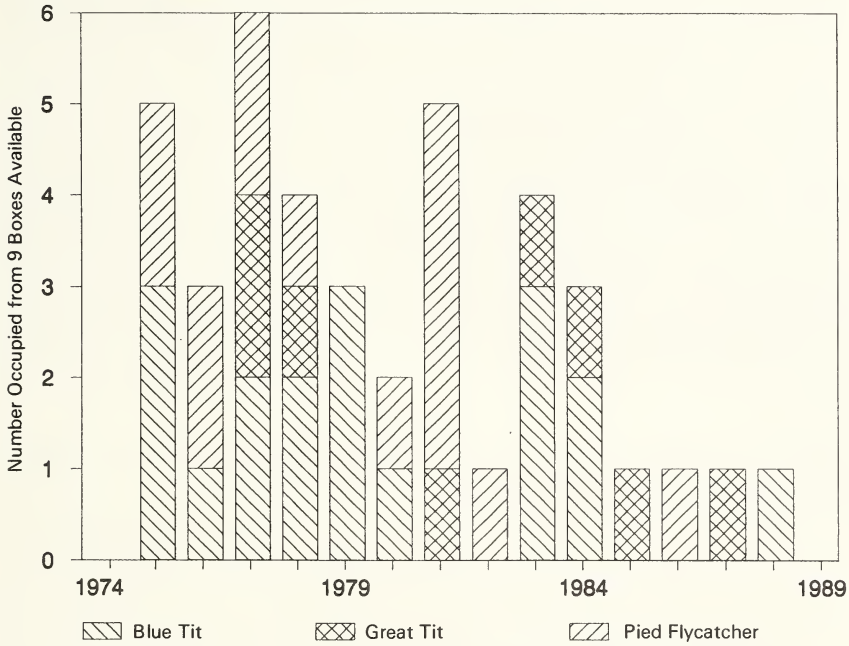

FIGURE 4
Effect of Dutch Elm Disease, Sleightholmedale 1975–89

Timing of the Breeding Season

This is monitored using the date when laying commences and 'mean first egg date' is the average first egg date for each species for each season. Analysis of this information indicates that weather has a major influence on timing of the breeding season with the mean maximum temperature in February correlating well with both Blue and Great Tit 'first egg dates' ($p<0.001$ and $p<0.01$ respectively, 14 dof) and the temperature in April showing good

correlations for all three species, viz $p<0.02$, $p<0.01$ and $p<0.01$ for Blue Tits, Great Tits and Pied Flycatchers respectively; the higher the temperature the earlier laying commences. The influence of November weather, as claimed by O'Conner (1980), was only apparent for Great Tits, and even then was only weak ($p<0.05$).

On average, Blue Tits commence laying two days earlier than Great Tits and some ten days before Pied Flycatchers.

Productivity

It is well known that the number of young produced by any species can vary between individuals, and will also vary from year to year for the same individual. However, analysis of the data reveals that it is the timing of the breeding seasons which has a marked influence on the productivity — in simple terms, the earlier the season the more young are produced. This is well illustrated by the excellent correlations ($p<0.01$) between 'mean first egg date' and both mean clutch size and mean number in brood at fledging for Blue Tits and Great Tits. Such generalised correlations could not be established for Pied Flycatcher but a more detailed analysis of the data revealed that laying date was highly correlated to both clutch size ($p<0.001$) and brood size ($p<0.01$). Correction of first egg date to allow for annual variation in the season, i.e. by expressing laying date relative to the mean for each year, had little or no effect upon the correlation coefficients. The overall pattern, displayed in Figure 5, is

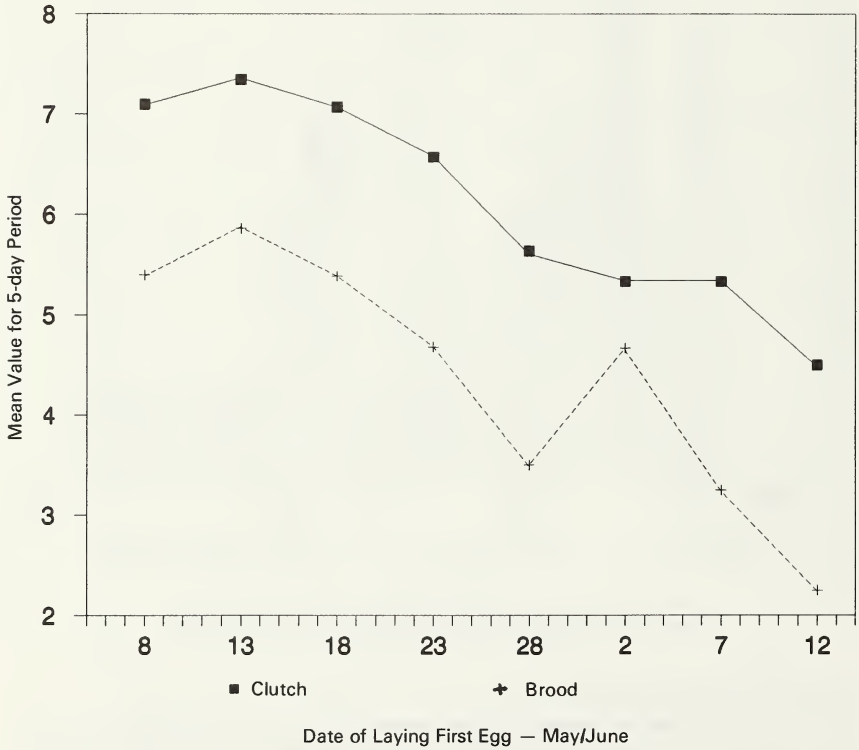

FIGURE 5
Timing of Breeding v Productivity, Sleightholmedale 1974–89

similar to that found during a previous study (Follows 1982).

Although data are limited (n = 29), there are indications that age is also an important criterion, with 2 year old females being more productive than yearlings both in terms of the number of eggs laid and the number of young reared ($p<0.05$).

Albeit there are considerable fluctuations in productivity from year to year due to variation in timing, predation, etc., average productivity over the 16 years has been found to be as follows:

	n	Clutch size	Brood at fledging
Pied Flycatcher	206	6.64	4.92
Blue Tit	146	9.34	7.14
Great Tit	166	8.25	5.80

For the Pied Flycatcher, this equates to 74% of eggs producing fledged young, a figure virtually identical to that found by Haartman in Finland and quoted by Lack (1970).

This productivity, as measured by either clutch size or brood size at fledging, does not appear to be influenced by the density of birds using the boxes. However, the distribution of both clutch and brood, illustrated by the Pied Flycatcher data in Figure 7, does highlight the large number of nests (13%) which fail completely. Of the several contributory factors, predation appears to be random, with some probably being eaten by Wood Mice *Sylvaemus sylvaticus* (certainly the remains of hazel nuts eaten by this species have been found in the boxes during early spring) and both Great Spotted Woodpeckers *Dendrocopos major* and/or Grey Squirrels *Sciurus carolinensis* are responsible for occasionally damaging boxes and taking young. Some years however (1975, 1979, 1989) Woodpeckers or Squirrels were particularly active and tended to favour Blue Tits, raiding all boxes in which the young had reached that stage in their development when they were particularly noisy and hence attracted attention. Presumably this was the behaviour of rogue individuals and/or occurred at a time when normal food was in short supply.

Structure of the Pied Flycatcher Population

The percentage of breeding females caught in any one year which had previously been ringed at Sleightholmedale is shown in Figure 6. This illustrates how the population took several years to establish an equilibrium, after which the figure remained relatively stable at about 50% (1986 being an exception).

Up to an including 1988, the total number of Pied Flycatchers ringed at Sleightholmedale was 922 pulli and 96 adult females. However, at the time of writing, only 44 of these birds, 23 adults and 21 pulli, have subsequently been recaptured at this site. (Perhaps one or two more will be controlled in the next few years.) Data from Table 2 also indicate that for the 23 adult females retrapped at Sleightholmedale, only one was retrapped elsewhere; for pullus females however, this ratio was 21:6. Most of these birds were controlled whilst breeding near Helmsley, Rievaulx and Ampleforth, i.e. within 20 km of where they were first ringed.

As noted above, the average number of young reared per pair over the sixteen years of the study has been 4.92. Assuming a balanced population, the autumn population of one adult female plus 2.46 pullus females will therefore need to reduce to one female by the following spring.

Using these data, it is possible to calculate separate loyalty and survival rates for both adults and nestlings (see Appendix 1 for details). These suggest that whereas adults have an annual survival rate of 64%, that for birds ringed as pulli is only 15%. In addition, of those birds which survive from one year to the next, indications are that two out of three adults will return to Sleightholmedale but only one in two pulli will remain loyal. This adult annual

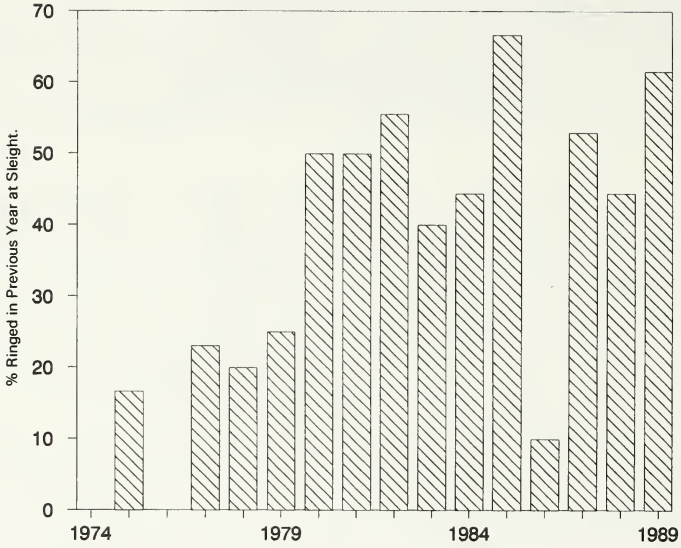

FIGURE 6
Loyalty of Breeding Females, Sleightholmedale 1974–89

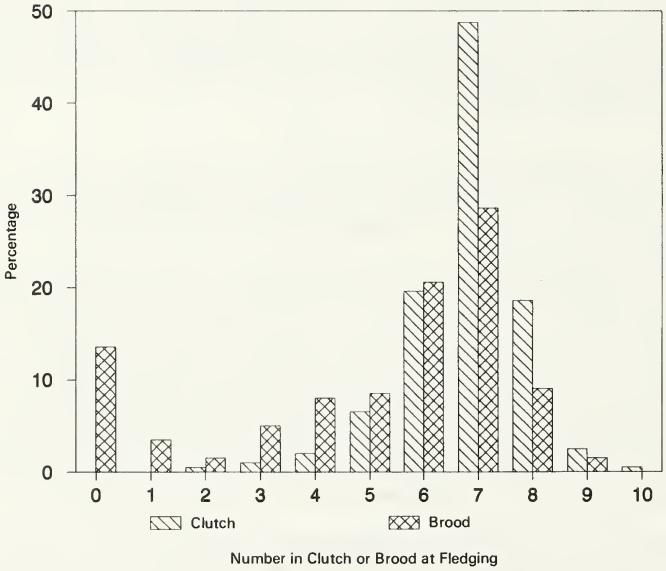

FIGURE 7
Clutch and Brood Size. Pied Flycatcher 1974–89 n = 199

mortality rate of 36% is somewhat lower than the values of 50% and 59% found in Finland and Germany respectively, quoted by Lack in (1970).

SUMMARY

It has been observed that the annual variation in the population of both Blue Tits and Great Tits in a North Yorkshire deciduous woodland tends to reflect the severity of the previous winter weather. Further, the mean maximum temperature in both February and April correlates well with the timing of the breeding season for both tit species as well as for Pied Flycatcher.

Weather also has a major influence on productivity in that it is the timing of the breeding season which influences both clutch size and brood size at fledging; in simple terms, the earlier the season, the more young are produced.

From Pied Flycatcher breeding productivity data and information gleaned from ringing studies, attempts have been made to estimate annual survival and loyalty to site for both adults and juveniles. This suggests that from one breeding season to the next, adult survival is some four times greater that that for recently fledged nestlings; of those birds which return in subsequent years, adults also demonstrate greater loyalty.

ACKNOWLEDGEMENTS

I should like to record my sincere thanks to Mr R. Gash for his company and help with much of the fieldwork; to Mr W. Norman for his comments on an earlier draft of this paper; to Mr W. Hall for kindly providing the weather data; to Mr P. L. Goldsmith for his advice and guidance through the mathematical manipulations and to Mrs G. Foster of Sleightholmedale Lodge for so kindly allowing us free access to her estate.

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APPENDIX 1

CALCULATION OF SURVIVAL AND LOYALTY RATES

Let A = Adult P = Pullus S = Survival L = Loyalty

Since ca 50% of breeding females are ringed, then

$$A_S \times A_L + P_S \times P_L = 0.5 \qquad 1$$

It can be assumed that

$$\frac{A_S \times A_L}{P_S \times P_L} = \frac{\text{Proportion of adults retrapped in colony}}{\text{Proportion of pulli retrapped in colony}}$$

$$= \frac{23/96}{21/461} = 5.26 \qquad 2$$

For the population to remain stable, then the autumn population of one adult female plus 2.46 pulli females must reduce to one adult by the following year, i.e.

$$A_S + 2.46\, P_S = 1 \qquad 3$$

Data from Table 2 indicates that for the 23 adult females retrapped at Sleightholmedale in subsequent years, only 1 was retrapped elsewhere. For pullus, this ratio was 21:6.

Therefore, Loyalty $\frac{A_L}{P_L}$ could be expressed as $\frac{23/24}{21/27}$

$$= 1.23 \qquad 4$$

Solution of equations *1* - *4* results in

$$A_S = 0.64 \qquad P_S = 0.15$$

$$A_L = 0.66 \qquad P_L = 0.54$$

BOOK REVIEW

A Guide to the Birds of Puerto Rico and the Virgin Islands by **Herbert A. Raffaele.** Pp. 254, colour and black and white illustrations throughout, Princeton University Press, Revised Edition 1989, Paperback £10.50.

A Guide to the Birds of Panama with Costa Rica, Nicaragua and Honduras by **Robert S. Ridgely, John A. Gwynne,** Pp. 534, 850 colour illustrations, Princeton University Press, 2nd Edition 1989, £32.00

These two guides to the New World Sub Tropics will be essential luggage for any visiting naturalist. They will also be of interest to a growing number of bird book collectors and the armchair birder, who might be intrigued to know what a Tody Motmot looks like or how to tell a Green-throated Carib from a Puerto Rican Emerald.

The Puerto Rican guide describes and illustrates all of the 284 species known to occur in the Puerto Rico-Virgin Islands archipelago. The plates are good (although it is a pity that not all of them are in colour) and use the familiar Peterson-system of indicating diagnostic field marks by arrows. The islands support 14 endemic species which are not discussed or illustrated in any other recent publication, but many of the birds described are visitors and have a wider distribution on the American mainland. The book, therefore, has uses outside of its nominal geographical range. This reviewer found the illustrations of fall plumage of American Wood Warblers of particular interest and of potential use on the east coast of the USA.

Although small enough to fit into the pocket this book is more than just a field guide. It summarises the biogeography and ecology of the islands' birds and very importantly for the visitor with limited time to spare, it describes in some detail the best bird watching sites. A series of useful locality checklists are also included.

A Guide to the Birds of Panama is really a mini-handbook of the birds of Central America, illustrating in colour 800 species (300 more than in the 1st Edition) and describing over 1000.

The illustrations are good, although the Petersen arrow system is not used, and the descriptions are brief but adequate. The inclusion of a section on 'similar species' under each description is a useful feature and should help to reduce the confusion of the visitor confronted with a bewildering array of species.

Other interesting and useful sections discuss migration and local movements, recent developments in Panama ornithology and conservation and a guide to locations and bird finding.

With a little more political stability in Central America, this book would certainly stimulate more naturalists to visit the region, which can boast one of the richest avi-faunas in the world.

Like the Puerto Rican guide, this book is very well produced and with the wealth of information it contains, the publishers are to be congratulated in providing value for money.

JKS

THE HISTORY OF ALIEN FRESHWATER MOLLUSCA IN NORTH-WEST ENGLAND

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SYNOPSIS
The spread of alien freshwater Mollusca in north-west England is described and dated. The present status of these introduced species (8 alien spp., 2 British but introduced to the north-west) is indicated.

INTRODUCTION

The proliferation of canals in north-west England has encouraged the spread of freshwater organisms, among them some not native. 'Alien', i.e. non-British species, are often unfairly regarded as of inferior status and unworthy of attention. During the nineteenth century north-west England played host to several species of alien Mollusca in the local canals, and it now seems an appropriate time to gather all the dated records of the various alien freshwater molluscs in north-west England, together with my own observations from 1933 onwards.

North-west England is rich in canals (see sketch-maps on pp. 124–125) and rich also in energetic conchologists for the past hundred and seventy years (Thomas Glover began collecting in 1821: M. Glover 1906). Therefore any 'new' species was quickly found and recorded. Oldham (1908), writing of Cheshire Mollusca, noted that between 1898 and 1900 no fewer than four species of alien Mollusca had appeared for the first time in the county, all in canals. These were *Physa heterostropha* Say in 1898, *Potamopyrgus jenkinsi* (Smith) in 1899, and *Planorbis dilatatus* Gould and *Paludestrina taylori* Smith (now *Marstoniopsis scholtzi* (Schmidt)) both in 1900. For the 1966 status of Mollusca in the canals of Lancashire and Cheshire see Edwards, Fogan, McMillan and Millott (1966).

In the following account the species are dealt with in the order of their discovery.

1. *Dreissena polymorpha* (Pallas)

This species was already known in north-west England by the middle of the last century (Standen 1909); the earliest record is that of Captain Thomas Brown (1844) from the Bridgewater Canal and 'in many places in the canal between Manchester and Hull'. *Dreissena,* a native of the USSR where it has a wide range from the Baltic to the Black and Caspian seas (Zhadin 1965), is supposed to have reached England with Baltic timber, and Kew (1893) gives its earlier history. No matter how it arrived here, it evidently found our canals a congenial habitat and proceeded to spread vigorously. Byerley (1854) recorded *Dreissena* from the Ellesmere Canal, but Standen (1909) stated that 'it had long since disappeared from that locality'. Bellars (1858) found it in the Chester Canal and it 'swarmed' there in the 1880s (Tomlin *in litt.* to NMcM 1944); in 1947 Dr Millott and I found it still living there but certainly not abundant.

Oldham (1908) took *Dreissena* in the Shropshire Union Canal at Beeston in 1900 and so did Standen (1909); in 1965 old valves were obtained in fair numbers but no living specimens. Later samplings of various parts of the same canal by I. D. Wallace and NMcM yielded single valves only. The Trent and Mersey Canal held *Dreissena c.* 1908 at Lostock Gralam and Middlewich (Standen 1909), but despite numerous searches by J. O'N. Millott on various dates and by NMcM and G. Whitfield in September 1966 the species was not refound. In fact, between Middlewich and Sandbach the canal in 1966 was innocent of all Mollusca, due to serious pollution by copper in solution from Sandbach Wire Works (M. Finlow pers. comm. 1969).

In Lancashire the species abounded in the Lancaster Canal between Barton and Brock from at least 1887 until *c.* 1908 (Standen 1909), yet in 1914 Jackson (1915) failed to refind it in the same place.


1870
0 10 20
SCALE
LANCASTER
GLASSON DOCK
SKIPTON
Leeds & Liverpool Canal
PRESTON
BLACKBURN
Tram Road
WALTON
Rufford Branch
RUFFORD
Lancaster Canal
Rochdale Canal
ROCHDALE
BURY
BOLTON
Manchester Bolton and Bury Canal
OLDHAM
Huddersfield Narrow Canal
WIGAN
MANCHESTER
Leigh Branch
Ashton Canal
ASHTON
ST. HELENS
Sankey Brook Navigation
LIVERPOOL
Peak Forest Canal
STOCKPORT
WIDNES
Bridgewater Canal
RUNCORN
WHALEY BRIDGE
ELLESMERE PORT
Ellesmere Canal
Weaver Navigation
Trent & Mersey Canal
MACCLESFIELD
Tram Road
Macclesfield Canal
CHESTER
WINSFORD
Middlewich Branch
Chester Canal


PRESENT DAY
0 10 20
SCALE
NAVIGABLE
ABANDONED
LANCASTER
GLASSON DOCK
SKIPTON
Leeds & Liverpool Canal
PRESTON
BLACKBURN
Tram Road
WALTON
Lancaster Canal
Rufford Branch
RUFFORD
Rochdale Canal
ROCHDALE
BURY
BOLTON
Manchester Bolton and Bury Canal
OLDHAM
Huddersfield Narrow Canal
WIGAN
MANCHESTER
Leigh Branch
Ashton Canal
ASHTON
ST. HELENS
Sankey Brook Navigation
LIVERPOOL
Peak Forest Canal
STOCKPORT
Ship Canal
Bridgewater Canal
WIDNES
RUNCORN
Manchester
Weaver Navigation
WHALEY BRIDGE
ELLESMERE PORT
MACCLESFIELD
Trent & Mersey Canal
Macclesfield Canal
CHESTER
WINSFORD
Shropshire Union Canal
Middlewich Branch

In north-west England as a whole *Dreissena* seems to be dying out, and so far as I know now lives only in the Glasson branch of the Lancaster Canal.

Unfortunately for the theory of the species' introduction with Baltic timber during the last century, there is a lake-marl deposit at Plemstall in the Gowy valley, where numerous valves of *Dreissena* together with many other species of freshwater molluscs (32 spp. in all) were found in 1948 and 1969 (McMillan 1958, McMIllan & Millott 1989). Flakes of peat were present, and G. F. Mitchell who examined a sample, was able to state that the deposit was Atlantic or later in age. It is hoped to obtain a radiocarbon dating for these *Dreissena* valves.

2. *Sphaerium transversum* (Say)

This species has a wide range in America, from Canada to Mexico (Herrington 1962). The earliest British records are Exmouth, Devon 1831 and an unlocalised specimen in Turton's collection of British shells (Forbes & Hanley 1849 as *Cyclas lacustris* Draparnaud). J. E. Gray described specimens taken in 1856 from the Grand Junction Canal at Kensal Green London as a new species *Sphaerium pallidum* Gray, 1856, but it was later identified as *S. transversum* of Say. It is now extinct in the London area (Castell 1962).

The species was first taken in north-west England in May 1860 in the Ashton Canal by R. D. Darbishire (*in* Jackson 1907) and in 1920 it was still abundant there (Alkins & Harwood 1921). In 1861 it was found in the Leeds and Liverpool Canal, almost certainly at Accrington (Jackson 1907), and in the same canal in 1862 at Crosby and Litherland (both close to Liverpool) (Gibson 1863, Weld 1863, both as *Cyclas ovalis*). Standen (1887) recorded it from the same canal at Burnley as well as from the Bolton Canal and 'other cotton canals'. By 1901, Long (1901) noted the species as very rare at Burnley, and in the Bolton Canal (Pendleton to Agecroft section) only a few empty shells were taken in 1966 (Edwards *et al.* 1966), where Davies (1922) had found it abundant. In the Bridgewater Canal Jackson (1918) recorded the species from 'between Moston and Worsley', and Davies (1922) interestingly remarked that this canal (at Booth's Hall Bridge) was the only cold-water locality where he had taken it.

There is a recent and unsubstantiated record of *S. transversum* from the Rochdale Canal, and also an erroneous one from the Sankey Valley Country Park, St Helens. The latter was due to a misidentification and should be ignored.

In Cheshire Oldham (1908) found the species abundant in the Trent & Mersey Canal at Sandbach in 1900, and Lucas in the Shropshire Union Canal at Chester in 1903 (Liverpool Museum).

3. *Menetus dilatatus* (Gould), formerly *Planorbis dilatatus*

This little planorbid, also a North American species, was discovered in Britain in the Bolton Canal by Thomas Rogers in 1869 (Jeffreys 1869). It has not spread much and is now much scarcer in the Manchester canals where it occurred towards the end of the last century. Oldham (1908) found a few in the Peak Forest Canal at Dukinfield in 1900–1901, but it has not been refound there subsequently. Kew (1893) expressed surprise that the species had not then spread via canals beyond Lancashire, and Jackson (1930) described it as rare. One shell was taken in the Leeds and Liverpool Canal at Bootle in 1977 (I. D. Wallace). This is the only record of the species immediately around Liverpool, although Heathcote found it in the same canal near Blackburn in 1888 (Liverpool Museum).

Although regarded as a 'canal' species in England, *M. dilatatus* has been found living in the heavily polluted river Tame at Dukinfield in 1919 (Jackson & Kitchen 1919), in a pond at Burnley (Standen 1887), and in a stream between Waterhead and Lees, Oldham, by F. Taylor (1917). Taylor also found a few in a 'lodge' (i.e. reservoir) at Greenacres Hill, Oldham, where it had 'probably been introduced with waterplants brought from the Droylesden and Reddish canals' (i.e. the northern and southern branches of the Ashton Canal) 'many years ago'.

The means by which *M. dilatatus* reached England are unclear. Kew (1893) gives a résumé of the issue.

4. *Physca* cf. *heterostropha* Say

The physid usually so named is another North American species. It was first found in north-west England in the Shropshire Union Canal at Chester in January 1898 and then in the Peak Forest Canal at Dukinfield in November 1900 (Oldham 1908). The earliest records for Lancashire are those of Lucas who took specimens in the Ashton Canal at Gorton and Droylesden between 1898 and 1900 (Lucas 1901). Later, Jackson found it in the Bolton Canal at Pendleton (Jackson 1915). Since then it has spread to other canals (e.g. Bridgewater Canal; Jackson 1918), and now seems to be well established in north-west England. In 1967 I obtained it from the Leeds and Liverpool Canal at Rufford (S. Lancs.) and Whitfield found it in the Sankey–St Helens Canal in 1968. It still flourishes in the Shropshire Union Canal at Backford.

P. heterostropha has also diversified into habitats other than canals. Jackson & Kitchen (1919) found living specimens in the heavily polluted river Tame, and the river Alt at Croxteth (S. Lancs.) yielded the species in 1975. (I. D. Wallace). Whitfield obtained it in the 'flash' at Leigh, Lancs., in 1968, and in Finchetts Gutter which runs into the river Dee near Chester two specimens were taken in 1958.

F. Taylor (1917) found it about Oldham where it had almost certainly been introduced with waterplants from canals at Droylesden and Reddish.

Physids are difficult to identify and it has been suggested that confusion may have arisen between the two species of alien physids which occur in north-west England. These are the North American *Physa* cf. *heterostropha* Say and the European *Physa* cf. *acuta* (Draparnaud). Fortunately Jackson's molluscan collections were acquired by Liverpool Museum and therefore it has been possible to check all his well-localised and dated specimens. In every case the specimens named *P. heterostropha* are what is now known as cf. *heterostropha*.

5. *Potamopyrgus jenkinsi* (Smith)

Undoubtedly the most successful of alien freshwater molluscs. Its native country was long unknown, but recently Winterbourn (1972) and Ponder (1988) have shown that this species is a New Zealand colonist and must now be called *Potamopyrgus antipodarum* (Gray 1843). It was first found in British freshwaters in 1893, in a Midland canal at Dudley (Daniel 1894). It is largely parthenogenetic and therefore sometimes only one specimen is needed to found a colony; since 1893 it has spread widely over much of Britain and Ireland, reaching Cheshire in 1899, when Lucas took it in the Trent and Mersey Canal at Middlewich (Oldham 1908). It is now common throughout the county, not only in canals but in springs, streams of all sizes, even the meanest trickles, and occasionally in ponds. In Bromborough, Cheshire, it lived in one flooded marl-pit from 1947 until 1953, since when it has not been refound although the habitat appears unchanged. It lives in various parts of the Dibbin stream-system but does not usually persist for any length of time. In fact in mid-Wirral the species comes and goes erratically and Boycott (1936) has pointed out that such population explosions and subsequent reduction in numbers are characteristic of alien species in general.

In Lancashire Fred Taylor (1900) added *P. jenkinsi* to the county fauna from the Ashton Canal but it was not refound there in 1966 (Edwards *et al.* 1966). It is now frequent throughout the county.

6. *Paludestrina taylori* Smith, 1901 (now *Marstoniopsis scholtzi* Schmidt))

Described as a new species, *Paludestrina taylori* Smith has since been assigned to the European *Marstoniopsis scholtzi* (Schmidt) and was added to the British fauna by Fred Taylor in 1900 from the Ashton Canal near Fairfield Locks (Jackson & Taylor 1904). It was later (also in 1900) taken in the Peak Forest Canal at Dukinfield, where it was taken alive in 1966 (Edwards *et al.* 1966). In the Ashton Canal a single living specimen was taken in May 1969 at Guidebridge (an unpublished record of the NW Conchological Group). Jackson (1930) described the species as rare in both Lancashire and Cheshire. W. F. Edwards and M.

Fogan found living examples in the Macclesfield Canal at Bollington, Cheshire, in 1973. This species appears to be surviving although rather tenuously.

M. scholtzi seems to hve a very short breeding-season (spring/early summer according to Jackson and Taylor 1904). This is suggested by its abundance in a locality at one time, yet its apparent absence a few weeks later. Presumably the animals die off after breeding.

A recent record from the Agecroft part of the Bolton Canal (Dussart 1976, 1977) is probably a misidentification and has not been confirmed. What appears to be the same record is quoted as from Lymm Dam (SJ6886) in a recent NCC publication.

7. *Physa* cf. *acuta* (Draparnaud)

A European species known in this country for many years (Kew 1893) but only under artificial conditions (tanks in green-houses). It occurred in tanks at the Royal Botanic Gardens, Kew, before 1860, and in heated ponds at Aberdeen in 1887 (Jenkins 1890). Jackson (1930) recorded the species from tanks at Stamford Park, Ashton-under-Lyne, and Bellevue Gardens, Manchester, but not until 1956 was it taken in north-west England in other than highly artificial conditions, when it was found in the Birket (a stream) in Wirral, Cheshire; it is now quite frequent there. In 1976 it was taken in the Dibbin (another stream) at Bromborough where it was certainly not present in 1972. Elsewhere in Cheshire I. D. Wallace found the species in the Trent & Mersey Canal at Dutton in 1980.

In Lancashire it was abundant in the Padgate Brook–Warrington area, where Whitfield took it in 1964, and also in the Bridgewater Canal at Salford in 1968; it occurred in ponds at Stakehill near Royton, Oldham in 1968 (W. F. Edwards, pers. comm.)

The snails I have called cf. *acuta* (Draparnaud) agree well conchologically with French examples from St Jean-de-Losne, Côte d'Or, and so do the Whitfield shells (Liverpool Museum). Duncan (1959) found that British specimens of *P. acuta* bred for a large part of the year and any sample contained specimens of a wide size-range. Whitfield's large sample from the Padgate Brook agrees with this; his largest shells measured 11 mm high.

8. *Ferrissia wautieri* (Mirolli)

The latest invader is this tiny cosmopolitan limpet, now widely distributed in Europe and first noted in Britain by D. S. Brown (1977). C. R. C. Paul found it abundant in a small garden pond at Burton, Wirral, Cheshire, in June 1985 and subsequently, while I. D. Wallace took a single live specimen on waterweed from Wirral Water World (a garden centre) in June 1989. Two further visits to the centre produced no more specimens and the proprietors stated that stock had been bought from many sources, so it may be found in other garden ponds.

9. *Other freshwater species*

Other British freshwater molluscs which now occur in north-west England are known to have been introduced, that is, they are native only in part of their recorded range. An example is *Viviparus contectus* (Millet) which was introduced about Manchester *c.* 1820–1830 by Thomas Glover (Rogers 1887). It was also introduced to Manchester canals *c.* 1844–1846 *fide* Darbishire (Standen 1887) and still lives there.

Another introduction was the large planorbid *Planorbarius corneus* (L.) and its spread in the north-west is fairly well documented. This species is mentioned by none of the earlier workers in north-west England, who included good conchologists such as Isaac Byerley, Donald Cameron, F. P. Marrat and James Wright Whitehead in Liverpool, H. J. Bellars in Chester and an active group in Manchester. R. D. Darbishire (*in* Standen 1887) referring to the years 1841–46 and '1860?' remarked that *P. corneus* did not then occur around Manchester, and added that 'a good deal of colonisation used to be practised from pond to pond and from a distance'.

Apart from a single pre-1858 record 'Lancashire' (no more information) (Dixon & Watson 1858) I know of no Lancashire record of *P. corneus* earlier than 1884 when a small pond at Birch (Manchester) was found by Standen to hold a white-shelled variety (probably a dealer's

stock) (Liverpool Museum), in 1887 in the Reddish branch of the Ashton Canal (Anon 1889), and in the Leeds and Liverpool Canal at Burnley (Standen 1887). By 1890–1900 the species was common around Oldham (Taylor 1898) and Manchester (Liverpool Museum).

West of Manchester, Davies' careful survey (1922) did not find *P. corneus* in the Bolton Canal where it occurred in 1965 (Edwards *et al.* 1966).

Although Heathcote is known to have introduced the species into 'quiet ponds at Farrington', (S.E. of Preston) in the 1880s (Standen 1887) it was not found in the Lancaster Canal until 1965 at Woodplumpton, 4½ miles north of Preston (Kerney 1967).

Oldham (1896, 1908) did not consider *P. corneus* to be native in Cheshire. G. Shrubsole and R. Newstead introduced the species to Chester ponds *c.* 1884 (Tomlin *in litt.* 1944) and it was found in the Peak Forest Canal at Marple in 1896. Since then it has spread widely throughout the county.

In Wirral the species was introduced to a Bidston pond about 1897 (Anon 1927). Observations since 1940 in the Bromborough district have shown that it occurred in 16 out of 130 flooded marl-pits (McMillan 1959), yet Whitehead (see Fisher & Jackson 1936) who collected energetically in Bromborough in 1856 did not see it. In 1976 it was found in the Dibbin where it was certainly not present in 1972.

P. corneus behaves quite normally in its new habitats and exhibits none of the population explosions and subsequent reduction in numbers common to introduced species.

General Comments

It is beyond the scope of this paper to consider physical changes in the canal habitat and their effect on the Mollusca. The two sketch-maps show clearly the changes in the canal-system of north-west England. About the middle of the last century the canals were interconnecting and therefore colonisation of new habitats was relatively easy. Lousley (1970) has pointed out how canal boats took small scraps of plants upstream as well as down and the same must have applied to the transport of small molluscs.

Some canals are now derelict, often reduced to a series of stagnant pools, and such a habitat may not suit the molluscs under discussion. Other canals are much used, sometimes drastically cleared of vegetation, and often contaminated with oil. In 1966 copper in solution polluted a stretch of the Trent & Mersey Canal between Middlewich and Sandbach, effectively killing off all Mollusca, and there must have been similar incidents in the past. All such factors are unfavourable to molluscan life.

Lancashire cotton mills discharged heated water into neighbouring canals and many of the early records of alien molluscs are from such habitats; but there is however no proof that a heated habitat was essential. All the Mollusca discussed in this paper have been taken from normal cold-water habitats as well as those heated.

Conclusion

Considering introduced species, I had wished to show the dated spread of species along the various canals of north-west England, but although plenty of well-localised specimens and published records were available, these tended merely to show the collecting enthusiasm of the older conchologists. In short, they illustrate mainly the distribution of collectors. The following table sets out the data in brief:

Name	First seen NW England	Present status in north-west
Dreissena polymorpha	Bridgewater Canal *c.*1840 (Possibly earlier on Plemstall evidence)	Dying out
Sphaerium transversum	Ashton-under-Lyne Canal. May 1860	Dying out
Menetus dilatatus (formerly *Planorbis*)	Manchester, Bolton & Bury Canal, 1869, at Pendleton	Dying Out
Physa cf. *heterostropha*	Shropshire Union Canal at Chester 1898	Well established
Potamopyrgus antipodarum (formerly *P. jenkinsi*)	Trent & Mersey Canal at Middlewich 1899	Very successful colonist
Marstoniopsis scholtzi (formerly *Paludestrina taylori*)	Ashton Canal nr Fairfield Locks 1900	Surviving
Physa cf. *acuta*	The Birket (a stream), Wirral, Ches. 1956. (Earlier in tanks in public gardens at Ashton & Manchester	Well established and spreading
Ferrissia wautieri	Burton, Wirral, Ches. (in a garden pond) 1985	Apparently just arrived
The above eight species are all aliens (exotic). The following are British but introduced into the north-west of England.		
Viviparus contectus	Manchester *c.* 1820-1830, (to canals *c.* 1844-46)	Successful
Planorbarius corneus	Lancs. pre-1858, Ches. *c.* 1884. (Possibly earlier to Manchester canals)	Successful and spreading

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BOOK REVIEW

The Barnacle Goose by **Myrfyn Owen; The Mandarin Duck** by **Christopher Lever.** Each with pp. 24, with line drawings and diagrams, colour and black and white photographs. Shire Natural History Publications, Princes Risborough. 1990. £1.95 each.

The first of these booklets deals with one of the most attractive of our wintering geese, from its place in legend through to its population dynamics and conservation, and includes sections on its migration, ecology and breeding biology. Dr Owen, Head of Research at the Wildfowl and Wetlands Trust, initiated a long-term study of the Barnacle Goose and his vast knowledge of the bird adds to the authority of the text.

The second, by a leading authority on naturalized animals, features one of our most exotic and beautiful ducks. Although generally familiar in many forms of Chinese Art, the biology of the Mandarin is less well known. Sir Christopher Lever deals with this, as well as giving the history of its introduction to the West and compares its precarious position in its native Far East with its flourishing situation here. On the eve of the centenary of the Union's Protection of Birds Committee, it is a pleasure to read of the part played by its one-time Chairman, W. H. St Quintin in trying to establish the Mandarin in Regent's Park.

Nos. 51 and 53 in the Shire Natural History Series, both are very well illustrated and have easily readable texts, maintaining the high standard we have come to expect.

BSP

RELATIVE ABUNDANCE AND FOOD PLANTS OF BUMBLEBEES *BOMBUS* SPP. ON HEATHER MOORLAND

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Introduction

This paper brings together observations over several years on the relative abundance and preferred food plants of bumblebees on moorland in Scotland and north-east England. Heather (*Calluna vulgaris*) moorland and wet heath, dominated by *Molinia caerulea* and *Trichophorum cespitosum*, covers 0.8 million ha in Scotland and 0.4 million ha in England and Wales (Miller & Watson, 1983). It is an unfavourable habitat for bumblebees. There are few species of food plant, although *Calluna* provides abundant food for a few weeks which is under-exploited by bumblebees. Flowering seasons are generally short and little food is available in early spring. Moorland weather, cool with high rainfall and strong winds, is often unsuitable for foraging by bees.

Apart from the work of Yalden (1982, 1983, 1984) on *B. monticola* in the Peak District of England there are few records of foraging by bumblebees on moorland.

Study Areas

Bumblebees were counted on seven moorland study areas (Fig. 1) at various times between 1977 and 1988. Three study areas were in north-west or west Scotland (Eriboll, Ardnish and Drimnin), three in north-east Scotland (Corgarff, Dinnet and Baudy Meg), and one in north-east England (Strensall). Some of the study areas have been described elsewhere: Ardnish (site 2) (Hewson 1979), Corgarff (site 4) (Hewson 1986) and Strensall (site 7) (Hewson & Walsh 1981).

Of the remainder, Drimnin, (site 3) in west Scotland was, like Ardnish, an area of *Molinia* and *Trichophorum* heathland with *Erica tetralix*, sparse *E. cinerea* and *Calluna*. Devils-bit scabious *Succisa pratensis*, flowering thinly in *Molinia* heath, provided a late summer food supply for bumblebees. Small woods of birch *Betula* spp. contained scattered trees of willow *Salix* spp., holly *Ilex aquifolium* and rowan *Sorbus aucuparia*. These provided food in spring for over-wintered queens. *Iris pseudacorus* flowered in June and bridged the gap until the heaths *Erica* spp. and heather *Calluna vulgaris* flowered.

Eriboll (site 1), in north-west Scotland, had similar vegetation to Drimnin but fewer trees. The vegetation resembled that described by Gimingham (1960, p. 468) for Glendhu Forest, Sutherland.

The Muir of Dinnet (site 5), a National Nature Reserve in north-east Scotland, was a dry heather-dominated moor with much *Arctostaphylos uva-ursi* and *E. cinerea*, and with *E. tetralix* abundant in damp hollows. The reserve has been described in detail by Marren (1979).

Baudy Meg (site 6) was also a heather-dominated moor, rising to 488 m in Glen Tanar, about 8 km from Dinnet, with *E. cinerea* more abundant than *E. tetralix*.

Corgarff (site 4), in north-east Scotland, was a moor well-managed by rotational burning of small patches of heather to provide young shoots as food for red grouse *Lagopus lagopus scoticus*. It differed from the other north-eastern moors in having a zone of arctic-alpine vegetation above 550 m with stunted wind-swept *Calluna, Empetrum nigrum* and *A. uva-ursi*, and smaller amounts of *Vaccinium vitis-idaea* (Hewson, 1986).

Strensall Common, an area of acidic heathland in the Vale of York, has been described in detail by Ratcliffe (1977). Heavy grazing by sheep and periodic heather burning have produced a largely uniform sward of heather, little of which is old or degenerate in form. *E. tetralix* occupied damp hollows 100 m or more across, together with *M. caerulea*. Some moorland plants important to bumblebees were missing from this area: *Vaccinium myrtillus, E. cinerea*, and *Pedicularis sylvatica*.

Study areas at Eriboll, Ardnish and Drimnin were originally chosen for work on foxes

FIGURE 1
Location of study areas: 1 Eriboll, 2 Ardnish, 3 Drimnin, 4 Corgarff, 5 Dinnet, 6 Baudy Meg, 7 Strensall.

Vulpes vulpes, on mountain hares *Lepus timidus* at Corgarff, and on bumblebees at the remaining three.

Altitude and climate of the study areas are shown in Table 1. Western areas were milder, wetter and windier than their eastern counterparts.

Methods

Relative abundance of bumblebees on study areas

Bumblebees were counted along line transects of 100 m–400 m through representative samples of the main food plants. Only bees which settled upon plants or on the ground within 2 m on either side of the transect were counted; at Corgarff bees flying at close range and identifiable were also counted. On Baudy Meg a hill track of 6 km was used as a transect.

TABLE 1

Climate at the study areas: exposure from Birse and Robertson (1970), other data from Meteorological Office (1952). Very exposed situations have very short *Calluna*, extremely exposed have prostrate *Calluna*.

Study area (see Fig. 1)	Height a.s.l. (m)	Nearest weather station a.s.l. (m)	Annual daily mean temperature (°C)	Annual rainfall (mm)	Exposure to wind (see below)
1	0–521	112	7.5	1162	exposed-very exposed
2	0–293	2	8.3	2120	exposed
3	0–369	2	8.3	2120	exposed-extremely exposed
4	400–680				exposed-very exposed
5	180–220	133	7.3		moderately exposed
6	420–480		5.9		exposed
7	0–15		8.7		no data

Average annual wind speed	($m\ s^{-1}$):	
	Moderately exposed	2.6-4.4
	Exposed	4.4-6.2
	Very exposed	6.2-8.0
	Extremely exposed	> 8.0

On Eriboll, Ardnish, Drimnin and Corgarff bumblebees within 2 m were also counted over periods of up to 9 h during other work; those counts were comparable between seasons and between areas. Where data were available on a study area for more than one year they have been lumped to increase sample size.

White-tailed bumblebees were identified as *B. magnus* by the yellow band on the thorax extending below the root of the wing (Alford 1975); where this could not be done in the field they were lumped as *B. magnus/lucorum*: Pekkarinen (1979) considers *B. magnus* to be no more than a race of *B. lucorum*. *B. jonellus* was identified by the two yellow bands on the thorax and by collecting a few specimens; *B. muscorum* and *B. pascuorum* were identified by collecting.

Food availability

To assess food availablity in spring, marked willows *Salix* spp., rowan *Sorbus aucuparia,* and holly *Ilex aquifolium* at Drimnin and Eriboll were visited weekly and the state of flowering assessed on a scale devised by Anderson and Hubricht (1940). This scores one for a tree coming into flower, three for a tree in full flower and two for a tree going out of flower. The scores for trees of each species were summed and a weekly average obtained. At Eriboll the same method was used on willow.

The flowers of *Iris pseudacorus,* which flowered in June, were difficult to count on short transects because the centres of clumps bore more flowers than the periphery, and so all the flowers in each of three largest clumps were counted at Drimnin and Eriboll.

For the main flowering period at Drimnin, two transects of 300 m were used to assess weekly the sequence of flowering of *E. tetralix* and *Calluna* by recording at five-pace intervals whether the nearest shoot was not yet in flower, was flowering, or had finished flowering. In September, the number of *E. tetralix* flower shots/m^2 were counted on 100 quadrats each 50 cm × 50 cm at five-pace intervals on each transect; the proportions of the ground covered by *Calluna* was estimated by eye to the nearest 10% at the same time. At Eriboll, flowering of *E. tetralix* was similarly assessed on a transect of *c.* 400 m. At both places the transects were on the denser vegetation on the lower part of the study area.

At Dinnet, one 200 m transect was set out through moorland dominated by *Calluna,* with *E. cinerea* and *A. uva-ursi* abundant where ground had been burned in the previous few years. A second 200 m transect ran through unburned *Molinia* heath with *E. tetralix, Eriophorum* spp. and sparse old *Calluna.* Flowering shoots of *Calluna, E. cinerea* and *E. tetralix,* and ground cover of these species, were measured in the same way as at Drimnin but with a 0.25 × 0.25 m quadrat at intervals of five paces to count the more abundant flower shoots of *Calluna.*

At Strensall, three transects, each 100 m long, were set up in *E. tetralix* and three of the same length in *Calluna.* Flower shoots were counted and the ground cover estimated as at Drimnin (Hewson & Walsh 1981). Transects were walked about mid-day at weekly intervals from the beginning to the end of the main flowering periods.

Results

Relative abundance of bumblebees on study areas

Except at the high altitude sites at Corgarff and Baudy Meg, *B. magnus/lucorum* was the most numerous bumblebee (Table 2). On the high altitude study areas, *B. monticola* was more abundant, though marginally so at Baudy Meg. Two single counts on high ground also showed a preponderance of *B. monticola.* On 4 July in Glen Clova (800–1000 m), with abundant *V. myrtillus,* 29 *B. monticola* were the only bumblebees seen, and at Pateley Bridge (310 m) in Yorkshire on 12 July 1978, on moorland with *Calluna* and *E. cinerea,* there were 51 *B. monticola,* 35 white-tailed bumblebees, probably *B. lucorum,* and 25 *Psythirus* spp.

B. magnus/lucorum was present on all seven study area; no other species was seen on more than three. *B. jonellus,* common at Dinnet, was rare at Baudy Meg, 8 km away but much higher, and was not found at Ardnish and Drimnin though numerous at Eriboll. *B.*

TABLE 2
Relative abundance of bumblebees within study areas: total bees counted

	Eriboll	Ardnish	Drimnin	Corgarff	Dinnet	Baudy Meg	Strensall
B. magnus/lucorum	157	611	471	90	238	108	424
B. jonellus	87	—	—	—	93	5	—
B. monticola	—	—	—	298	—	117	—
B. muscorum	31	81	few	—	14	—	—
B. pascuorum	—	—	—	—	—	—	40

muscorum was absent from the two highest study areas and the two sites visited once only. *B. pascuorum,* with a southerly distribution compared with *B. muscorum,* occurred only at Strensall.

Food plants

B. magnus/lucorum queens emerging from hibernation fed on *Salix* on the three study areas where it occurred, followed by *I. aquifolium* at Ardnish. Fewer bumblebees were then seen (Hewson 1979). At Eriboll, Corgarff and Dinnet, *A. uva-ursi* was the next source of food, but no large-scale foraging by workers took place until *I. pseudacorus* flowered in the west and *E. cinerea* and *E. tetralix* elsewhere (Table 3). Foraging on *E. cinerea* and *E. tetralix* reflected the relative abundance of *E. cinerea* on eastern study areas and *E. tetralix* in the west.

TABLE 3
Food plants of *B. magnus/lucorum;* number of bees recorded on each study area and proportion (per cent) on each plant species

	Study areas (see Fig. 1)						
	1	2	3	4	5	6	7
Salix spp.	32.5	12.7	20.4	—	—		
Ilex aquifolium	—	6.4	0.9	—	—		
A. uva-ursi	8.3	—	—	6.5	1.3		
V. myrtillus	—	—	—	2.6			
V. vitis-idaea	—	—	—	22.1			
I. pseudacorus	3.1	31.8	31.4	—			
E. cinerea	13.4	10.4	1.5	14.3	86.1	35.2	—
E. tetralix	3.1	26.8	22.7	24.7	8.4	6.5	67.7
C. vulgaris	39.5	12.0	23.1	29.8	4.2	58.3	32.3
Number of bees	157	575	471	77	238	108	424
Other plants or bees nor foraging		36		13			
Total bees	157	611	471	90	238	108	424

On the two highest study areas, *B. monticola* outnumbered *B. magnus/lucorum*, particularly in the arctic/alpine zone at Corgarff where *A. uva-ursi* was abundant and formed the main early food supply (Table 4). *Salix* was not available. Whereas a gap occurred between early and mid-season sources of food in the west, there was no corresponding gap between *A. uva-ursi* and *V. vitis-idaea*, although it was not clear what early food source was available at Baudy Meg. *V. myrtillus* was a possibility. Foraging on *Erica* spp. again reflected their availability. There was more *E. tetralix* than *E. cinerea* on the damp slopes at Corgarff. At Corgarff in September 1984, *B. monticola* foraged on *E. tetralix* and *V. vitis-idaea*, white-tailed bees, probably *B. magnus*, on *Calluna* and *E. cinerea* (Hewson 1986). On Baudy Meg in September 1987, *B. monticola* fed mainly on *E. cinerea*, and *B. magnus/lucorum* on *Calluna*.

Over-wintered queens of *B. jonellus* appeared as early as those of *B. magnus/lucorum*. Individuals of both species occasionally spent several days on *Salix* bushes, torpid and covered with raindrops when the weather became colder. The pattern of foraging was broadly similar to that of *B. magnus/lucorum* except that *B. magnus/lucorum* was relatively more abundant on *Calluna* (Table 5).

There were few *B. muscorum* on the study areas. At Strensall, north-east England, *B. pascuorum*, a similar carder bee, foraged almost exclusively on *E. tetralix* while *B. lucorum* foraged on *Calluna*.

TABLE 4

Food plants of *B. monticola, B. jonellus* and *B. muscorum*: number of bees recorded in each study area and proportion (per cent) on each plant

	B. monticola		*B. jonellus*			*B. muscorum*		
Study area	Corgarff	Baudy Meg	Eriboll	Dinnet	Baudy Meg	Eriboll	Ardnish	Dinnet
Salix spp.	—		12.6					
I. aquifolium	—		—					
A. uva-ursi	28.9		—					
V. myrtillus	3.1		1.2					
V. vitus-idaea	34.5		—					
I. pseudacorus	—		10.3			45.2	17.7	
E. cinerea	3.1	64.1	13.8	50.5	40.0	3.2	9.8	42.9
E. tetralix	24.9	17.1	17.2	16.1	40.0		70.6	57.1
C. vulgaris	5.6	18.8	44.8	33.3	20.0	51.6	1.9	
Number of bees	197	117	87	93	5	31	51	14
Bees not foraging or on other food plants	101						30	
Total bees	298	117	87	93	5		81	

TABLE 5

Variation in numbers of bees on different plants at Baudy Meg and Dinnet on separate sampling occasions

Study area		*E. cinerea*			*E. tetralix*			*Calluna*			
		B. mag.	*B. jon.*	*B. mont.*	*B. mag.*	*B. jon.*	*B. mont.*	*B. mag*	*B. jon.*	*B. mont*	
Baudy Meg (site 6)	1	9	14		4	8					NS
	2	23	2		2	0		6	9		x
	3	32	14					3	18		xxx
	4	37	7								NS
	5	16	7					7	2		NS
Dinnet (site 5)	1	19		18				41		1	xxx
	2	24		24				51		1	xxx
	3	5		6				10		0	NS

x P<0.1 xxx P<0.001

Sequential availability of food plants

Western moors

Western moors generally comprised *Trichophorum* or *Molinia* heath, with sparse *Calluna, E. tetralix* and, less commonly, *E. cinerea*. On Ardnish, for example, 53% of the study area was covered by *Trichophorum* heath, 27% by *Molinia* heath and 11% by *Calluna* (Hewson & Wilson 1979);

The western study areas had *Salix* spp. and *I. aquifolium* for spring foraging and *I. pseudacorus* when worker bumblebees were about. The area of *I. pseudacorus* was very small, 0.25 ha at Ardnish, about the same at Drimnin, less at Eriboll, all with a big concentration of feeding bumblebees.

Salix flowered three weeks later and less abundantly at Eriboll than at Drimnin (Ardnish was very similar to Drimnin). The bushes sampled at Eriboll were generally smaller, older, more spreading, and growing in more exposed situations. Some of them failed to flower, or flowered very sparsely.

I. pseudacorus began to flower as the trees finished (Fig. 2), with the patterns of duration and peak similar at Eriboll and Drimnin.

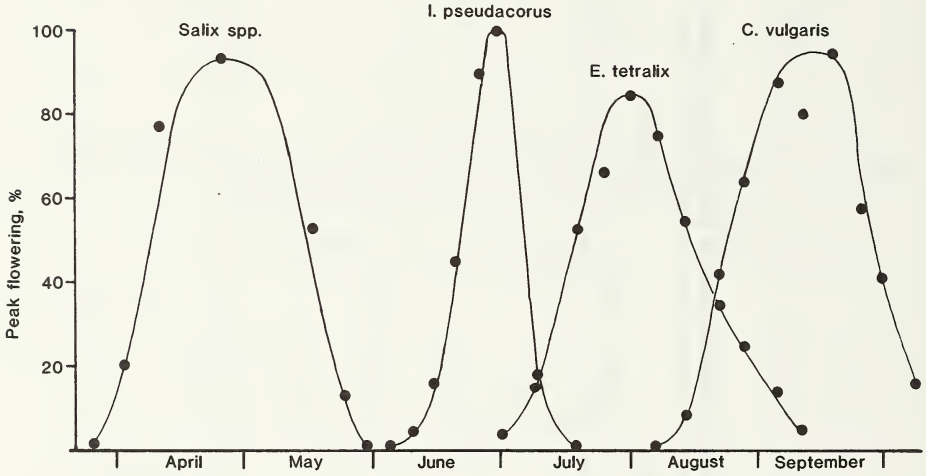

FIGURE 2
Sequential flowering of food plants of bumblebees on a western Scottish moor (Drimnin).

E. tetralix began to flower as *I. pseudacorus* finished. There was little overlap between the two. The flowering periods were similar at Eriboll and Drimnin. However, more flower shoots were available at Drimnin (see below).

Finally, *Calluna* superseded *E. tetralix* as the main source of food in late August, reaching a peak around mid-September and declining rapidly thereafter (Fig. 2). Again the period of overlap was short. The flower shoots of *Calluna* in the west were too widely scattered to provide meaningful estimates of their density.

Succisa pratensis sustained a few carder bees at the end of the foraging season. It was a plant of the moorland fringe and nowhere abundant. *Pedicularis sylvatica,* with a long flowering season, was regularly fed on by bumblebees but its distribution was sparse and

patchy. Of 300 1 m^2 samples of vegetation on 30 km^2 of moorland at Eriboll only seven contained *P. sylvatica*.

Eastern moors

North-eastern Scottish moors were dominated by *Calluna* managed by rotational burning at Corgarff, Baudy Meg, and formerly at Dinnet. At Strensall, north-east England, *Calluna,* though not managed in this way, was more abundant than on western moors.

Over-wintered queen bumblebees had access to *A. uva-ursi* and *V. myrtillus* in spring: (these were present in only small amounts in the west), and *E. cinerea* later. There was *Salix* within 1 km of Dinnet but not within 3–5 km of Corgarff or Baudy Meg. No information on *Salix* was available for Strensall but as this was a moorland enclave within an agricultural area other food plants would have been available.

A. uva-ursi was abundant at Dinnet and Corgarff and flowered earlier than *E. tetralix* and *E. cinerea*. On the high ground (>550 m) at Corgarff, *A. uva-ursi* made up 32% of the food plants available to bumblebees, and along with *V. vitis-idaea,* provided the major source of food for *B. monticola* (Hewson 1986). *V. vitis-idaea,* abundant at Corgarff following rotational burning until it was superseded by *Calluna,* did not figure largely in the diet of bumblebees on moorland elsewhere.

I. pseudacorus was absent from all the north-eastern moors and *E. tetralix, E. cinerea,* and *V. myrtillus* bridged the gap between the flowering of *A. uva-ursi* and the flowering of *Calluna*. On *Molinia* heath at Dinnet, with 308 ± 36 shoots/m^2 ($\bar{x}$ and S.E.M.) and at Strensall (228 ± 35 to 298 ± 44), *E. tetralix* was more abundant than on the western moors. Ardnish had 114 ± 19 and Drimnin 177 (*E. tetralix*) shoots per m^2 on *Molinia* heath. On *Trichophorum* heath, Ardnish had 34 ± 7, Drimnin 79 and Eriboll 51 ± 6 shoots per m^2.

Only at Dinnet was *E. cinerea* sufficiently abundant to measure the number of flowering shoots along a transect. At 894 ± 18 m^2 these were much more common than those of *E. tetralix*. The flower shoots of *Calluna* at Strensall were more numerous still, up to 1187 ± 198/m^2 (Hewson & Walsh 1981). *E. tetralix* had longer corolla tubes (6.75 ± 0.09 mm) than *E. cinerea* (6.17 ± 0.09 mm) ($t = 6.1$, 38 d.f., $P < 0.001$).

Differences in foraging between species

On the few occasions where an adequate number of bumblebees was foraging on more than one plant on the same day, differences between species of bumblebee could be ascertained (Table 5).

B. magnus/lucorum foraged on *E. cinerea* rather than *Calluna* at Dinnet but not at Baudy Meg, where the reverse was true. At Baudy Meg, *B. monticola* foraged on *E. cinerea, B. magnus/lucorum* on *Calluna*. Similarly, at Corgarff, *B. monticola* foraged on *E. tetralix* (*E. cinerea* was uncommon on this study area), with *B. magnus/lucorum* on *Calluna*. Earlier, *B. monticola* was common on *Arctostaphylos,* from which *B. magnus/lucorum* was absent (Hewson 1986).

Discussion

B. magnus/lucorum was the most widely distributed bumblebee, present on all study areas and, except at high altitudes, the most numerous species. *Salix,* an important spring food of over-wintered queens, was missing from the three north-eastern study areas, and here there was a greater proportion of *B. monticola*. In the Peak District, *B. monticola* foraged on *Salix* but white-tailed bumblebees were six times as numerous (Yalden 1984).

The moors where *B. monticola* occurred ranged from 310 m to 1000 m a.s.l., confirming a suggestion that this is a bee of high altitudes (Hewson 1986). Queens emerged late from hibernation, to feed on *A. uva-ursi* and then on *V. vitis-idaea,* neither of which featured prominently in the diet of *B. magnus/lucorum*. In the absence of these food plants, *B. monticola* feeds on *V. myrtillus* (Alford 1975), a favoured food in the Peak District in spring (Yalden 1982, 1984). *B. monticola* was absent from the three study areas in the west and north-west, which had less *E. cinerea, A. uva-ursi* and sparser *Calluna* than north-eastern moors. It is not recorded from high ground in much of west and north-west Scotland

(International Bee Research Association/Biological Records Centre, 1980) where these same conditions occur.

B. jonellus resembled *B. magnus/lucorum* in its food plants and seasonal appearance in north-west Scotland. It was absent or rare in the west Scottish study areas and the higher north-eastern moors. It is, however, one of the two species of bumblebees in Shetland where the climate (windy, high rainfall) is similar to the north-west and where *Calluna* is more abundant than on much of the Scottish mainland.

B. muscorum was everywhere the least numerous bumblebee. It foraged on *E. tetralix* rather than *E. cinerea* or *Calluna*. *E. tetralix* had a longer corolla tube than *E. cinerea* and had fewer flower shoots per m^2: in these respects it appears less advantageous as a source of food than the more numerous flowers of *E. cinerea* or *Calluna*. Brian (1957) describes *B. muscorum* as foraging in sheltered habitats (and thus ill-adapted to moorland), and retiring in its behaviour towards other species. It is also a long-tongued species (Kwak 1977) better able to exploit *Erica* than the shorter-tongued *B. magnus/lucorum*. *B. lucorum* bit through corolla tubes to rob *E. tetralix* at Strensall (Hewson & Walsh 1981).

Flowering periods of the main food plants tended to be discrete except for the overlap between *Calluna* and *E. cinerea*. In the absence of alternative food sources, the virtual absence of overlap may be advantageous to plants seeking pollinators (Heinrich 1979). However, it provides problems for bumblebees. It seems likely that on Scottish moorland, over-wintered queens of *B. magnus/lucorum* and *B. jonellus* feed heavily upon *Salix* before founding a colony from which workers will emerge when the next good source of food is available, *I. pseudacorus* where this occurs, or *V. myrtillus*.

Emerging later from hibernation *B. monticola* has a continuous supply of food, avoids inclement spring weather and is thus better adapted to moorland conditions.

While there are clear and consistent differences in the distribution of bumblebees on moorland, little seems to be known of the mechanisms that bring these about. Why, for example, is *B. muscorum* uncommon in mainland Scotland and *B. muscorum smithianus* the most widespread bumblebee in the harsher environment of Shetland where *B. magnus* is merely a vagrant? Why is *B. monticola* absent from north-west Scotland? It may well be that a detailed study of the life cycle of *B. monticola,* which has the best claim to be a montane species, would be the most rewarding approach to the problem of the distribution of bumblebees on moorland.

Acknowledgements

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MARGARET MEE and RICHARD SPRUCE

From 1 April to 15 July 1990, an exhibition of 60 watercolours of flowers painted by Margaret Mee in the Amazon rainforests was held in the Terrace Gallery at Harewood House, near Leeds.

The Earl of Harewood, accompanied by the Countess, presided at a private reception held on 10 May to celebrate the life and work of the artist. The reception opened with an address of welcome by Lord Harewood in the Gallery. Those present were able to inspect the superb paintings, on loan from the Royal Botanic Gardens, Kew, before the party adjourned to a lecture room to hear an illustrated talk by Professor R. E. Schultes. The text of his address is, with his kind permission, reproduced below.

Margaret Mee MBE (1990–1988) was born in Buckinghamshire and went with her husband to live in Brazil in 1952. She died tragically in 1988 as a result of a car accident. She was a talented artist whose exceptionally skilful paintings combine the highest degree of elegance and beauty with botanical accuracy such that her work ranks with the finest flower paintings of any age. In Brazil, she became captivated by the great beauty of the rain forests and for 30 years she devoted herself to travelling and painting in the Amazonian wilderness, undaunted by the dangers and hardships of travel in the remotest parts of the forest. Indeed, she will be remembered as an intrepid and resourceful traveller as well as a superb botanical artist. She discovered many undescribed species, several of which now bear her name. Her enchantment with these majestic forests inevitably made her a vigorous and outspoken critic of the destructive exploitation and mindless devastation of the unique rainforests.

Richard Spruce (1817–1893), one of the great Victorian traveller-naturalists, needs no introduction to Yorkshire botanists and naturalists. He spent 15 years of continuous botanical work in the Amazon valley and the Andes of Peru and Ecuador. It is unlikely that

his enormous contributions to our knowledge of tropical South American botany will ever be equalled by any other one man. He was born and died in villages on the great Castle Howard estate. Before his departure for South America he had made notable additions to our flora both amongst phanerogams and cryptogams, *Carex appropinquata* (*C. paradoxa*) and *Helicodontium* (*Leskea*) *pulvinata* being two of his discoveries. The Yorkshire Naturalists' Union had come into existence during his absence in Amazonia, but he joined the Union on his return to Yorkshire for his name appears in the list of YNU members printed in Part 3 of the *Transactions* of the YNU issued in 1878. He was elected a life member of the Union at our AGM held at Scarborough in 1891.

Professor Richard E. Schultes

Professor R. E. Schultes, Emeritus Professor of Botany at Harvard University and Director of Harvard University Botanical Museum, has himself spent 14 years of botanical work in the Amazon valley. As a close friend of Margaret Mee and a great admirer of, and authority on, Richard Spruce and his botanical and other scientific activities in the Amazon, no more appropriate choice could have been made to speak about their respective lives and achievements.

Sir William Harding (right) being presented with a cheque for the Margaret Mee Amazon Trust by Dr W. A. Sledge

One of the objects of the gathering was to give publicity to the Margaret Mee Amazon Trust. The Trust has broad objectives, including plans to award travelling scholarships for environmental studies in Amazonia. Its chairman, Sir William Harding, had spoken earlier about the Trust and its aims.

After Professor Schultes' address, a cheque for the Trust was presented to Sir William Harding by Dr W. A. Sledge who recounted how more than 20 years ago, when he and Professor Schultes first became acquainted, they soon discovered that they had in common an unbounded admiration for Richard Spruce; they therefore decided to launch an appeal in an international botanical journal for contributions to a fund wherewith to place a memorial tablet over the door of the cottage in Coneysthorpe where Spruce spent the last 17 years of his life. The response was generous and at a ceremony on 3 September 1971, at which Mr George Howard presided, Professor Schultes, who had come over specially for the

occasion, unveiled the plaque. An account of this gathering will be found in *The Naturalist* 1971, pp. 129–131. Since the sum subscribed considerably exceeded the cost of the tablet, the fund was later used to have the marble headstone of Spruce's grave in Terrington churchyard cleaned and relettered.

There still remained a substantial sum in the fund which continued to accumulate bank interest. It was felt that in due course an opportunity would arise of utilising the money in some way which was wholly appropriate to Spruce's work and interests. The Margaret Mee Amazon Trust fund we felt fulfilled these requirements to perfection. We hope that the fund will be generously supported and that successful beneficiaries will receive inspiration in their work from, and seek to emulate the achievements of, two outstanding personalities whose names will always be associated with Amazonia.

W. A. SLEDGE

Professor Schultes' address:

'It is a great honour for me to have been asked by the organisers of this beautiful exhibit to associate two people, though they lived a century and a half apart, who worked in the Rio Negro region of the north-west Amazon and who loved the extraordinary flora of that forested area. These two intrepid plant explorers were Margaret Mee, the botanical artist whom many of us here knew, and the great Yorkshire explorer, Richard Spruce.

For 30 years, Margaret Mee visited the Amazon, recording its unmatched plant life in exquisitely accurate and artistic water-colours. She loved the Rio Negro above all other parts of the Amazon basin, and in the words of Professor Ghillean Prance, Director of Kew Gardens, 'she went, saw and conquered the region with her water-colours.' Some 60% of her paintings were done on the Rio Negro or its affluents.

Margaret Mee was born near London in 1909 and died in England as the result of a traffic accident in November 1988. She took to art early in life, as her childhood schooling was undertaken by her aunt, herself an artist. Margaret enrolled in an art school in London when she was 15. In 1947, she went as a full-time student to Camberwell School of Art, where she met her husband Greville, a commercial artist.

In 1952, she and Greville went to Brazil where she became familiar with the tropical flora. It was in 1956 that she began her visits to the Amazon, where she painted only from living specimens, usually in the forest. She painted more than the principal species of the picture, for many of her paintings illustrate the intricate interdependence of the plants in this ecologically complex floral environment.

Like Richard Spruce, Margaret — although in a different way — knew these species-rich woodlands. Often travelling in a dugout canoe with an Indian boy, she would see a flowering plant, stop, set up her easel and paint: mud, heat, insects weaned her not a whit from recording the fortunate plant with her brush. She had an uncanny skill in finding some of the rarest species. Actually, a number of species which she painted are now extinct, due to the rampant devastation of the forests in many parts of the tropics, particularly in Brazil. The contribution of Margaret Mee and Richard Spruce has been a powerful impetus to the growing outcry against the systematic destruction of the world's largest rain-forest.

When Margaret came to Boston, she always stayed in our home, and you may perhaps picture our reminiscences of the Rio Negro and mutual friends amongst the native peoples of the area, for I was fortunate to be able to spend seven years in botanical work in this verdant forested region. In fact, Margaret was in our home only a few days before her death here in England. I asked her if she expected to return to the Rio Negro and she answered 'Oh yes! I'll need six lives to finish my work'.

It was fortunate that Margaret was able to experience several great honours, including meeting H.M. Queen Elizabeth, an exhibition of her work at Kew and the Tryon Galleries and the publication of a beautiful biographical book edited by her friend Mr Tony Morrison.

One of the greatest plant explorers of all times but generally still unappreciated was Richard Spruce. His incomparable work helped draw Margaret Mee to the Rio Negro and

I know encouraged her to glorify its unmatched forest flora in pictorial form as he had done in botanical collections.

Spruce was born in Ganthorpe in 1817 and died in Coneysthorpe in 1893, both villages on the estate of Castle Howard. His interest in nature appeared in childhood. At 16, he listed the plants of Ganthorpe, and at 19 he had written the Flora of the Malton District, with 485 species of flowering plants. He began to specialise in the bryophtes. When he read in a French book that mosses did not exist in the Pyrenees, he went to that region and returned with 478 species of bryophytes, 17 of which were new to science. In 1849, believing that his constant bronchial trouble might be tuberculosis and wanting above all else to see and collect in a tropical rain forest, he decided to go to the Amazon. The Director of the Royal Botanic Gardens at Kew agreed to sell his dried plant specimens to herbaria in Europe and the United States to finance his trip.

Spruce's interests in life knew no limits. His diaries and voluminous correspondence included plants and vegetation, geology, anthropology, ethnobotany, linguistics, history, sociology, zoology; he was also an accomplished artist, making pencil drawings of Indians, plants, villages, mountains and panoramas.

Richard Spruce was a man of great contrasts: delicate in health, he betook himself to some of the world's wildest and most difficult areas, the Amazon and the high Andes, where he spent 15 years in hard physical labour; a scholar, he divorced himself from all cultural centres, living amongst unlettered Indians for months or years on end; a poor man, his work on rubber and the quinine tree laid the foundations for huge fortunes; a specialist on tiny mosses and hepatics, he collected and described many gigantic trees new to science; a superb correspondent, he went months without a letter; a mild-mannered man, he more than once had to defend his very life; a man of extremely orderly habits, 'whether in a native hut on the Rio Negro or in his little cottage in Yorkshire, his writing-materials, his books, his microscope, his dried plants, his stores of food and clothing — all had their proper place, where his hand could be laid upon them in a moment'.

Spruce landed in Brazil in 1849 and went slowly up the Amazon collecting. Of all areas, it was the Rio Negro and its affluents that most enthralled him, and where a great number of his species and genera unknown to science were collected. He calculated that between 50,000 and 80,000 species existed in the Amazon forests, and to-day we estimate that the Amazon flora has some 80,000 species. Few botanists since have worked in the Rio Negro region: the Brazilian Dr Adolfo Ducke, Prof. Ghillean Prance and I, and it is still an emporium of undescribed species. I have worked in the Colombian Amazon for 48 years, 12 years living in the Rio Negro area. It is still not an easy region, even for modern botanists with all of our equipment and amenities, and I have often wondered how a frail man like our Yorkshire explorer could have carried on such a long and productive programme without modern medicines, tinned foods and motor transportion.

Following his work on the Rio Negro, he returned to the town of Manáos and then gradually ascended the Amazon River and its western tributaries to the foot of the Ecuadorean Andes, making collections that have not been equalled to this day. He finally arrived in the Andean highlands and spent three years collecting seeds of the best grades of quinine trees, laying the basis for huge plantations in India.

He then proceeded, partly by raft, down the malaria-ridden Pacific forests of Ecuador, returning to England in 1864. After a brief period in London, he retired to his humble cottage in Coneysthorpe, where, despite extremely delicate health, he worked on his bryophytes and South American collections, writing papers and books and corresponding with British and foreign specialists until his death in 1893.

The work of Richard Spruce has influenced many modern botanists — even many who have never been fortunate enough to see the Amazon or Andes. His influence on the spirit and work of Margaret Mee can hardly be exaggerated. Margaret and I often had long conversations about Spruce. In many nebulous ways, this unsung Yorkshire plant explorer became a silent hero to her, and I presume also a source of almost spiritual support during days of disappointment, when everything seemed to be going wrong and when she must have yearned that all would soon be well.

This fragile-appearing self-effacing lady was indeed able to surmount the many difficulties that accompany field work in such remote areas. In closing, may I tell you how I learned about one of her most serious difficulties, and how her quick wit and stamina solved it?

On one of her visits with us, she said that she was to be interviewed in two days on the McNeil-Lehrer national television news programme. So that she could see how it would be conducted, Dorothy, my wife, tuned in on this outstanding programme. Mr McNeil usually interviewed famous people for only 10 minutes, but, when he interviewed Margaret, he gave her 22 minutes. The day following her death in London, he rebroadcast the entire interview *in memoriam*. He later wrote to me that her interview was one of the highlights of his whole journalistic career. That programme reached some 50 million viewers in the United States and Canada.

In this interview, Margaret recounted how she had had to drive off a group of bandits from her hut on the distant, isolated and unpopulated Rio Curicuriarí — a band of desperadoes who were threatening to take all of her meagre possessions. Accompanied only by a young Indian lad, she somehow managed to take out of her baggage a pistol which she brandished at the thieves who took off in great haste at this unexpected turn of events.

Richard Spruce and Margaret Mee shall long live in the spirit of science, art, exploration and conservation of nature; and the work that they both began still cries aloud for workers of their calibre and dedication.'

BOTANICAL REPORT FOR 1989
FLOWERING PLANTS AND FERNS

COMPILED BY J. E. DUNCAN

The Recorders thank the members who have sent in records for the report and the Referees who have kindly helped in identification or confirmation. In each vice-county report these names are given in full the first time they appear, after which initials are used.

10 km grid references are indicated by figures.

EAST YORKSHIRE (VC61) (E. Crackles)

Dryopteris affinis (Lowe) Fraser-Jenkins Hodgson Wood, Great Givendale 44/85; R. Jefferson.

Actaea spicata L. Hodgson Wood, Great Givendale 44/85; R.J.

Ranunculas parviflorus L. Thorpe Hall estate 54/16; E. H. Wear.

R. pencillatus (Dumort.) Bab. subsp. *pseudofluitans* (Syme) S. Webster var. *vertumnus* C. D. K. Cook Hotham 44/83; E. Chicken conf. S. Webster. *Myosurus minimus* L. North Duffield Carrs 44/63, 'a massive population ... approaching one million plants'; T. E. Dixon. North Duffield Ings 44/73, an estimated 10,000 plants; T.E.D. Six plants on rutted track, Sutton Ings 44/74; T.E.D.

Diplotaxis tenuifolius (L.) DC. South of Bridlington 54/16; E.C.

Stellaria palustris Retz. Water-meadow, near Withernwick 54/23; R.J.

Chenopodium polyspermum L. Near Wheldrake 44/47; T.E.D.

Rubus drejeri G. Jenson Burton Constable 54/13; E.C. det. A. Newton.

R. echinatoides (Rogers) Rogers Burton Constable 54/13; E.C. det. A.N.

R. lindleianus F. J. Muell Burton Constabale 54/13; E.C. det. A.N.

R. polyanthemus Lindeb. Little Kelk 54/13; E.C. det. A.N.

Rosa sherardii Davies Roadside, Butterwick 44/97; det. E.C. conf. Rev. A. L. Primavesi.

Chrysoplenium alternifolium L. Roadside copse, near Howsham Bridge 44/76, 1984; C. S. V. Yeates; the second vice-county record.

Hippophae rhamnoides L. One plant, roadside, Escrick Grange Farm 44/64; D. R. Grant.
Viscum album L. Orchard, Old Rectory, Sproatley 54/13; F.E.C. confirming an old record in Robinson's *Flora* (1902).
Sium latifolium L. Dykes in water-meadows near North Duffield 44/63, 1987; C. Birkenshaw.
Oenanthe aquatica (L.) Poiret Dykes in water-meadows near Thorganby 44/64 and near East Cottinwith 44/74, 1987; C.B.
Polygonum arenastrum Boreau Wheldrake Ings, Thornton Ellers and Melbourne 44/74; T.E.D.
Rumex maritimus L. Thorpe Hall 54/16; YNU Excursion, the only extant VC 61 locality.
Lithospermum officianale L. By Holderness drain just south of Leven Canal 56/04; D. Webb.
Orbanche minor Sm. Three plants, south of the A63 near South Cave 44/93; M. Binnion.
Mentha × *smithiana* R. A. Graham Thorpe Hall estate 54/16; YNU Excursion.
Bidens cernua L. Dyke in water-meadow, near Storwood 44/17, 1987; C.B.
Potamogeton friesii Rupr. Dyke in water-meadow, near Ellerton 44/63, 1987; C.B.
Allium vineale L. Waste place, east Hull 54/13; R. Middleton.
Orchis morio L. Field, Priory Road, Hull 54/03; E.H.W. and R.M.
Carex paniculata L. Thornton Ings 44/74; R.J.
Festuca arundinacea Schreb. × *Lolium perenne* L. = × *Festulolium holmbergii* (Dorfl.) P. Fourn. Sands above high water, south end of Bridlington 54/16; E.C. conf. P. J. O. Trist.
Calamagrostis canescens (Weber) Roth Thornton Ings 44/74; R.J.

North-East Yorkshire (VC 62) (T. F. Medd)

Equisetum hyemale L. Liverton 45/71; R. and M. Gulliver.
Osmunda regalis L. Harwood Dale 44/99; Mrs N. Sykes and C. Wilson.
Phegopteris connectilis (Michx) Watt Hartoft Beck 44/79; Miss J. Lambert.
Juniperus communis L. Danby Head 45/70; N.S.
Ranunculus sardous Crantz Colcroft Farm 45/90; N.S.
Rorippa palustris (L.) Bess. West Ayton 44/98; N.S.
Geranium pyrenaicum Burm. f. Ruston 44/98; N.S.
Saxifraga granulata L. Liverton 45/71; R. and M.G.
Lythrum salicaria L. Scalby 44/99; C.W.
Apium inundatum (L.) Reichb. f. West Ayton 44/98; N.S.
Vaccinium oxycoccos L. Stape 44/79; L. Magee.
Stachys palustris L. Howldale 45/90; N.S.
Valerianella carinata Lois. Ruswarp station 45/80; R. and M.G. New vice-county record.
Dipsacus fullonum L. Keldholme 44/78; L.M.
Antennaria dioica (L.) Gaertner Thornton Dale 44/88; D. R. Grant.
Triglochin palustris L. Buttercrambe 44/75; J.L.
Narthecium ossifragum (L.) Huds. Kirk Moor 45/90; R. and M.G.
Orchis ustulata L. Thornton Dale 44/88; I. C. Lawrence.
Dactylorhiza fuchsii (Druce) Soó × *D. incarnata* (L.) Soó ssp. *pulchella* (Druce) Soó × *D. traunsteineri* (Sauter) Soó Dalby Forest 44/88; F. Horsman.
D. traunsteineri (Sauter) Soó Near Rievaulx 44/58; N. Thompson.
Scirpus sylvaticus L. Buttercrambe 44/75; J. L. Keldholme 44/78; L.M.
Eleocharis quinqueflora (F. X. Hartmann) Schwarz Thornton Dale 44/88; D.R.G.
Rhinchospora alba (L.) Vahl Hawnby Moor 44/59; C.W.
Carex acuta L. Waupley Moor 45/71; I.C.L.
Hordelymus europaeus (L.) Harz Liverton 45/71; R. and M.G.

SOUTH-WEST YORKSHIRE (VC 63) (D. R. Grant)

Ceratophyllum demersum L. Campsall 44/51; E. Thompson.
Erophila verna (L.) Chevall. Pugneys, Wakefield 44/31; C. Hartley.
Arabis hirsuta (L.) Scop. Old colliery site, Cadeby 43/59; D. R. Grant.
Hypericum montanum L. Fryston Wood, Castleford 44/42; YNU Excursion.
Malva moschata L. Horbury 44/31; C.H.
Coronilla varia L. Ravenscliffe, Bradford 44/13; B. Hartley.
Crataegus oxyacanthoides Thuill. Campsall 44/51; T. Schofield.
Lythrum salicaria L. Low Levels, near Hatfield 44/70; T.S.
Hippuris vulgaris L. Near Swillington 44/33; D.R.G. and Old Hills, Bingley 44/13; T.S.
Berula erecta (Huds.) Coville Auckley 44/60; E.T.
Bryonia dioica Jacq. North Featherstone 44/42; D.R.G. and Methley near Church 44/32; E.T.
Parietaria diffusa Mert. & Koch Campsall 44/15; E.T.
Salix pentandra L. Gisburn Forest 34/75; T.S.
S. repens L. Crosland Moor, Huddersfield 44/11; J. Lucas.
Samolus valerandi L. Campsall 44/51; D.R.G.
Scrophularia aquatica L. Pother Country Park 43/48; E.T.
S. umbrosa Dumort. Centre of Leeds 44/23; L. Magee; Carleton, near Skipton 34/94; T.S. and Thornton-in-Craven 34/94; D.R.G.
Veronica scutellata L. Old Hills, Bingley 44/13; D.R.G.
Acinos arvensis (Lam.) Dandy Criddling Stubbs Quarry 44/52; YNU Excursion.
Dipsacus fullonum L. Near by-pass, Elland 44/12; D.R.G.
Sonchus palustris L. RSPB Reserve, Blacktoft Sands 44/82; D. Proctor.
Crepis biennis L. Near Maltby 43/59; YNU Excursion.
Zannichellia palustris L. Eastburn, near Keighley 44/04; D.R.G. and feeder stream to Langold Lake 34/58; T.S.
Juncus subnodulosus Schrank Campsall 44/51; T.S.
Allium oleraceum L. Fryston Wood, Castleford 44/42; YNU Excursion.
Dactylorchis purpurella (T & T. A. Stephenson) Vermeul. Holywell Quarry, Castleford 44/42; F. Horsman.
Scripus sylvaticus L. Gisburn Forest 34/75; T.S.
S. Lacustris L. Stockbridge, Keighley 44/04; T.S.
Carex pseudocyperus L. Campsall 44/51; D.R.G.
C. caryophyllea La Tourr. Cowling Head 34/94; D.R.G.
Hordelymus europaeus (L.) Harz Bramham Park 44/44; E.T. confirmation of an old record.
Aira caryophyllea L. Dunsville 44/60; D.R.G.

MID-WEST YORKSHIRE (VC 64) (L. Magee)

A large number of records were received from eight sources. Many interesting records or confirmations were from remote and underrecorded grid squares. Space limitations allow for only a smaller number to be selected. The low water levels and exposed mud on rivers, lakes and reservoirs enabled many plants to flourish and become accessible during the late summer months. Thanks are again due to all who took so much trouble to send in records.

Ranunculus circinatus Sibth. Pond near Sherburn 44/53, 1988; P. Abbott.
R. penicillatus (Dumort.) Bab. var. *penicillatus* R. Wharfe, Thorp Arch 44/44: L. Magee.
Hypericum × *desetangssii* Lamotte Disused railway, Linton 34/96; P.A.
Euonymus europaeus L. Roadside, Bramham Park 44/44; D. R. Grant.
Chrysosplenium alternifolium L. Gisburn Forest 34/75; D.R.G.
Epilobium nerteroides Cunn. Grimwith Reservoir 44/06; L.M.
Silaum silaus (L.) Schinz & Thell. Below Grassington Bridge 34/96; H. Lefevre.

Salix viminalis L. Upper Threshfield Beck 34/96; H.L.
Salix × *smithiana* Willd. Upper Threshfield Beck 34/96; H.L.
S. cinerea ssp. *oleifolia* Macreight Upper Threshfield Beck 34/96; H.L.
Myosotis stolonifera (DC.) Gay ex Leresche & Levier Ditch on Coniston Moor 44/06; P.A.
Limosella aquatica L. Fewston Reservoir 44/14; YNU Botanical Section Excursion. Confirmation of 1959 record.
Veronica scutellata L. Sniddles Moss 34/76; D.R.G.
Orobanche minor Sm. Sherburn 44/13; D.R.G.
Littorella uniflora (L.) Ascherson Embsay Reservoir 34/95; L.M.
Inula helenium L. Near R. Wharfe, Boston Spa 44/44; L.M.
Gnaphalim uliginosum L. Embsay Reservoir 34/95; L.M.
Baldellia ranunculoides (L.) Parl. Sniddles Moss 34/76; D.R.G.
Potamogeton × *nitens* Weber. Malham 34/86; P.A. conf. C. D. Preston. Confirmation of 1935 record.
Potamogeton × *suecicus* K. Richt. R. Wharfe, Linton Bridge 44/34; P.A. conf. C.D.P.
Juncus filiformis L. Winterburn Reservoir 34/96; B.S.B.I.
Dactylorhiza incarnata (L.) Soó subsp. *pulchella* (Druce) Soó × *Dactylorhiza fuchsii* (Druce) Soó 'Near Grassington'; F. Horsman.
D. incarnata (L.) Soó subsp. *incarnata* × *D. fuchsii* (Druce) Soó 'Near Grassington'; F.H.
Eleocharis multicaulis (Sm.) Sm Swinsty Reservoir 44/15; YNU Excursion.
Carex acuta L. Haggarth Ings, Tadcaster 44/44; D.R.G.
C. spicata Huds. Roadside at Red House 44/55; D.R.G.
Scirpus sylvaticus L. Gisburn Forest 34/75; D.R.G. and Nun Monkton 44/45; C. Hartley per D.R.G.
Hordelymus europaeus (L.) Harz Bramham Park 44/44; D.R.G.
Calamagrostis canescens (Weber) Roth Nun Monkton 44/55; D.R.G.

North-West Yorkshire (VC 65) (T. F. Medd)

Rorippa sylvestris (L.) Bess. Sedbergh 34/69; D. R. Grant.
Trientalis europaea L. Gunnerside Pasture 34/99; D. Burnham.
Dactylorhiza maculata (L.) Soó ssp. *ericetorum* (E. F. Linton) Hunt & Summerhayes Gunnerside Pasture 34/99; D.B.
D. × *latirella (P. M. Hall) Soó* = *D. incarnata* × *purpurella* Semerwater 34/98; F. Horsman. Confirmation of 50 year old record.
D. × *venusta* (T. & T. A. Stephenson) Soó = *D. fuchsii* × *purpurella* Semerwater 34/98; F.H.

Casuals and Adventives (E. Chicken)

During 1989, there were 143 records received of 116 taxa from 33 individuals and two groups, the Swarthmore Botany Group and the members of the YNU Field Meetings. It is perhaps not surprising that there were so many records for aliens in view of the hot, dry summer. Particularly notable were the number of *Amaranthus* species and records for *Datura stramonium*. Of necessity there is an element of subjectivity in deciding what to include in the report. Bird-seed aliens are a problem and are excluded if thought to have been deliberatly sown. I have hesitated for some years now about including *Chenopodium foliosum* which was introduced from Cyprus in 1970, and unintentionally got into a garden border where it has come up annually from seed, but apparently only spreads as far as its seeds fall. It may get no further, but one has the classic example of *Senecio squalidus* in mind. Not far from York, *Chenopodium quinoa* Willd. has been grown as a crop and it will be interesting to see if it turns up as a weed in a year or two.

Unfortunately the report for 1987 gives the Merrion Centre, Leeds as being in VC 63 when it is in VC 64. This should probably have been realised, but it would help if more information were given about place names, especially in built-up areas.

The contributor is the determiner unless otherwise stated. The fields treated with wool shoddy between Leeds and Wakefield are given as E. Ardsley.

Pteris cretica L. (61) Disused organery, Thorpe Hall Estate, Rudston 54/16; YNU Excn.
Azolla filiculoides Lam. (63) Mickletown Nos. 1 and 2 Flashes 44/32; D. R. Grant. Stanley Ferry, Wakefield 44/32; C. Hartley per D.R.G.
Rapistrum rugosum (L.) All. (62) Neglected garden, York 44/64; Mrs E. Bray conf. E. Chicken.
Erysimum cheiranthoides L. (62) Arable at Hay Brow, Scalby 44/99; Mrs N. Sykes.
Agrostemma githago L. (64) Grassland near Burton Leonard 44/36; D. Tennant, 1986, conf. Dr W. A. Sledge.
Cerastium tomentosum L. (64) Kettlewell 34/97; T. Schofield per D.R.G.
Amaranthus hybridus L. (63) E. Ardsley 44/22; Swarthmore Botany Group per Mrs P. P. Abbott, conf. E. J. Clement.
Amaranthus retroflexus L. (62) Arable at Hay Brow, Scalby 44/99; C. Wilson per N.S. (63) Garden at Bessacarr, Doncaster 44/60; Mrs. D. Bramley. E. Ardsley 44/22; S.B.G. conf. E.J.C.
Amaranthus blitoides S. Watson (63) E. Ardsley 44/22; S.B.G. conf. E.J.C.
Amaranthus albus L. (63) E. Ardsley 44/22; S.B.G. det. E.J.C.
Amaranthus thunbergii Moq. (63) E. Ardsley 44/22; S.B.G. det. E.J.C.
Amaranthus viridis L. (63) E. Ardsley 44/22; J. Martin det. E.C.
Chenopodium botrys L. E. Ardsley 44/22; J.M. conf. E.C.
Chenopodium foliosum (Moench) Aschers. (61) Garden at Driffield 54/05; E.C. conf. Dr R. D. Meikle.
Atriplex tatarica L. (63) E. Ardsley 44/22; J.M. det. E.C. conf. J.M. Mullin.
Linum usitatissimum L. (64) Pavement, Wellington Bridge, Leeds 44/23; Mrs B. Walker and P.P.A., 1988, per D.R.G.
Parthenocissus quinquefolia (L.) Planch. (62) Waste ground at York 44/65; Miss J. Lambert.
Medicago polymorpha L. (63) E. Ardsley 44/22; J.M. conf. E.C. (64) Selby 44/53; P.P.A., 1988, per L. Magee.
Medicago laciniata (L.) Miller (63) E. Ardsley 44/22; J.M., also S.B.G. conf. E.J.C.
Coronilla varia L. (63) Ravenscliffe, Bradford 44/13; Miss B. Hartley per D.R.G.
Scorpiurus muricatus L. (63) E. Ardsley 44/22; J.M. det. E.C.
Spirea salicifolia L. (63) Dene near Hebden Bridge 34/92; T.S. per D.R.G.
Rosa multiflora Thunb. (62) Hedgerow at Westerdale 45/60; Dr F. Garforth det. E.C.
Rosa rugosa Thunb. (64) Old railway, Bishopthorpe 44/54; T.S. per D.R.G.
Cotoneaster horizontalis Decne. (64) Thorp Arch 44/44; E. Thompson per D.R.G.
Tellima grandilfora (Pursh) Dougl. ex Lindl. (63) Woodland near Slaithwaite 44/01; Mrs J. Lucas.
Astilbe × *arendsii* hort. (64) Bank of R. Wharfe, Addingham 44/04 Dr C. D. Preston and P.P.A. det. Dr A. C. Leslie.
Hedera hibernica hort. (61) Plantation at Middleton-on-the-Wolds 44/94; E.C. det. Dr H. A. McAllister.
Ammi majus L. (62) Neglected garden at York 44/64; E.B.
Angelica archangelica L. (64) N. bank of R. Aire at Brotherton 44/42; D.R.G.
Heracleum mantegazzianum Somm. & Lev. (64) by R. Ouse at Cawood 44/53; D.R.G.
Mercurialis annua L. (63) E. Ardsley 44/22; J.M. det. J.M.M.
Soleirolia soleirolii (Req.) Dandy (61) Disused orangery at Thorpe Hall Estate, Rudston 54/16; YNU Excn.
Lysimachia punctata L. (63) Waste ground at Slaithwaite 55/01; J.L.
Physalis pubescens L. (63) E. Ardsley 44/22; J.M. det. E.C.
Solanum sarrachoides Sendt. (64) Arable at Thorpe Willoughby 44/53; Mrs M. Bradbrook and P.P.A. per D.R.G.

Solanum rostratum Dunal (61) Garden at Duggleby 44/36; Mrs A. Heward det. Mrs M. Robinson conf. E.C. per M.R.

Datura stramonium L. (61) Garden at Hornsea 54/24; Mrs J. Peasgood per M.R. (63) Garden at Kirk Sandall 44/60; D.B. (64) Stainburn near Otley 44/24; Mrs J. Liddle per Mrs J. E. Duncan. Starbotton 34/97; Mrs Sinton per Miss H. Lefevre and J.E.D.

Orobanche minor Sm. (64) Leeds University precinct 44/23; L.M.

Inula helenium L. (64) Roadside east of High Bentham 34/66; Mrs M. Lindep, P.P.A. and D. Horne, 1988, per D.R.G.

Aster × *salignus* Willd. (64) Ben Rhydding gravel pits 44/14; M.B. and P.P.A. det. A.C.L., per D.R.G.

Conyza canadensis (L.) Cronq. (62) Waste land at York 44/65; J.L.

Centaurea hyalolepis Boiss. (63) E. Ardsley 44/22; S.B.G. det. E.J.C. In the past came into Britain with grain from the Middle East where it is native, but has not been known before as wool alien: E.J.C.

C. solstitialis L. (63) E. Ardsley 44/22; J.M. conf. E.C.

Carthamus tinctorius L. (61) Spurn Point 54/41; finder not known, per B. S. Pashby, then per Miss F. E. Crackles.

Crepis setosa Haller f. (64) Verge at Bridge Inn, Walshford, Wetherby 44/45; E.C.

Allium carinatum L. (64) Ben Rhydding gravel pits 44/14; P.P.A. and M.B. det. A.C.L., per D.R.G.

Tritonia × *crocosmiflora* (Lemoine) Nicholson (63) Quarry near Huddersfield 44/01; J.L.

Phalaris canariensis L. (63) Birdseed alien in garden at Bessacarr, Doncaster 44/60; D.B.

Echinochloa crus-galli (L.) Beauv. (63) Birdseed alien in garden at Bessacarr, Doncaster 44/60; D.B.

Digitaria velutina (Forssk.). P. Beauv. (62) Garden at York 44/65; T. Medd det. Dr T. A. Cope.

BOOK REVIEWS

Harvestmen by **P. D. Hillyard** and **J. H. P. Sankey.** Pp. viii + 120, numerous figures, line drawings and distribution maps. Synopses of the British Fauna (New Series) No. 4 Second Edition. E. J. Brill, Leiden, for The Linnean Society of London & The Esturine and Brackish-water Sciences Association. 1989. Available in Great Britain from Natural History Book Service, Totnes, Devon TQ9 5XN. US $37.50

This is without doubt the publication for which anyone with an interest in Harvestmen has been waiting. All the faults and omissions of earlier editions have been eliminated, the illustrations are magnificent and leave nothing to the imagination and inclusion of details of male genitalia bring the publication into line with international literature on the subject. About a third of the book is given over to the general structure, biology, distribution and ecology, all dealt with in such a manner as to render it eminently suitable as a text-book without destroying its attraction for the amateur enthusiast. The glossary is detailed and concise and the chapter on the derivation of scientific names a very welcome innovation. The 10km square species distribution maps, albeit small, give the distribution known at the date of publication and provide much valuable food for thought. Errors are almost non-existent, the only one of any significance being on p.37 where *Mitopus morio* var *ericaeus* Jennings 1962 should read Jennings 1982.

This will surely remain the standard reference book for British Harvestmen well into the next century — the authors are to be congratulated on their achievement.

Regrettably, having roused expectations, it is necessary to end by dashing those of many; although according to the publishers '*The Synopses of the British Fauna* are illustrated field and laboratory pocket books designed to meet the needs of amateur and professional naturalists from sixth-form level upwards', only the first statement is true, as the price is quite

outrageous for a paperback, even of this quality. How can taxonomy, enthusiasm and student participation be encouraged at this price? The Linnean Society of London should realize that there are a number of contemporary publications of equivalent size and quality on the market which are being offered at a fraction of the cost. It is an insult to the authors to price this book out of the market it is allegedly aimed at.

DTR

Under the Microscope by **J. Burgess, M. Marten** and **R. Taylor.** Pp. 208, with numerous micrographs both in colour and in black and white. Cambridge University Press. £12.95 soft back.

This is a book to delight the eye and stimulate the mind. It appears at first sight to be just a coffee table book, with photos produced from light microscopes, transmission electron microscopes, scanning electron microscopes, and even more sophisticated equipment. The pictures reveal unimaginable intricacy in the anatomy of plants and animals. Of particular note are pictures of minute invertebrates, algae, bacteria and viruses. The text is a mine of information, from which an assiduous reader may obtain an insight into the various fields in which microscopes are useful — biology, bacteriology, crystallography, geology, medicine and industry. There is an interesting account of the construction and working of several kinds of modern microscopes.

MA

Cooperative Breeding in Birds edited by **P. B. Stacey** and **W. D. Koenig.** Pp. xviii + 615, including numerous line drawings and b/w figures. Cambridge University Press. 1990. £22.50 paperback, £55.00 hardback.

In this new volume, ornithological research workers, from all six continents present an up-to-date account of current theories on cooperative breeding in birds, and show how these have been tested by experiment and observation. This altruistic behavioural phenomenon, which poses an evolutionary dilemma in apparently contradicting the fundamental theorem of natural selection, has been the focus of many long-term research studies in the last two decades in several parts of the world.

Each of the volume's 18 chapters is a complete study in itself; there are long-term studies of the demography and social relation of 20 species of birds, starting with a brief introduction establishing the rationale behind the study of cooperative breeding and providing a complete historical account. A well written conclusion summarizes studies and discusses all the answered and the unanswered questions.

I strongly recommend this very useful publication to research workers concerned with ornithology, behaviour ecology and population biology. It should be in every major library.

AHE-S

Secrets of Bird Life. A Guide to Bird Biology by **Ron Freethy.** Pp. xii + 220, with 12 colour and 40 b/w photographs, 80 line drawings and tables. [First published in 1982 as **How Birds Work.**] Revised edition. Blandford 1990. Paperback £8.95.

Among a plethora of books on bird identification, it should have been a pleasure to welcome the revised edition of a very readable book for those wishing to know more about birds other than identification, and to a great extent this is so. The lay-out of the text is good, beginning with chapters on anatomy, physiology, migration and ending with others on bird distribution and the relationship of birds and man. The author, a biology teacher and lecturer on natural history should be applauded for dealing with a scientific subject in such a straightforward manner and along such a smooth path. However, there are a few hiccups: there is some confusion as to which of those two great Irish naturalists, Babbington or Barrington, is meant (both being mentioned within a few lines, though I'm fairly certain it

should be the latter); the mammalian lung is described as being like a hollow sac, whereas surely it is like a sponge; respiratory rates are given when ventilation rates are what is meant. These are minor blemishes; much more serious is the inaccurate labelling of the bird's eye structure (Fig. 83) in which, for example both iris and cornea are wrongly labelled. A further error (Fig. 51) shows the nictitating membrane wrongly placed in the outer 'corner' of the eye. Readers will not find the bibliography of much help as there are no annotations relating information in the text to the books listed. Nevertheless the book is good value and may well prompt some readers to delve further into the fascinating subject of bird biology. Finally, am I alone in my ignorance of what the publishing world means or can mean, by a revised edition? A new, somewhat voyeuristic title, a more eye-catching cover, plus a list of further reading (post 1982) are surely insufficient grounds for describing as a revised edition something which, after all merely reprints the original.

BSP

The Secret Life of Flowers by **Bob Gibbons.** Pp. 160, including 12 full page colour photographs. Blandford. 1990. £8.95.

This publication has an appealing title, but the sub-title 'A Guide to Plant Biology' gives a better idea of its contents.

The author covers plant evolution and classification, cell structure, physiology and reproduction to particular life cycles; a section on ecology is followed by an important chapter on Plants and Man.

The line drawings are useful, clear and accurate, while the text is enhanced by the author's spectacular photographs (the double page hay meadow is one of the best) and the enlarged studies of flowers depict well the beauty of their structure. The frontispiece, Cross-leaved heath, was unfortunately missing from the review copy.

Many of the 'secrets' in the life of flowers revealed in this book have been known for a long time, but there is always more to discover and for a start a basic knowledge of the subject is essential.

JED

Trees of the Countryside by **Alan Fairhurst** and **Eric Soothill,** line drawings by **Doreen Edmond.** Pp. 159 with numerous colour photographs. Paperback edition 1989. Blandford Press. £6.95.

The reader will be pleasantly surprised with this imaginative book, as indicated by Dr David Bellamy in the Foreword.

The introduction gives a concise description of the basic structure and physiology of a tree and refers to insects and fungi which may be harmful or useful to trees. 65 species, both Angiosperms and Gymnosperms, are treated in full and with each there is reference to related species and varieties.

A double page spread is allotted to each species with a standard arrangement giving description, timber, general information, associated fungi and insects and detailed structure. The accompanying excellent photographs by Eric Soothill show the trunk and other parts of the tree, confirming the epithet on the cover — a recognition guide. Correct botanical terms are used throughout and there is a helpful glossary. It is just unfortunate that while the fleshy fruits are given their proper name in the text, berry, drupe or pome, photographs of such fruits are simply titled as berries.

The plan of the book makes it easy to use, with the reader being led in many directions of discovery, and finding guidance in the Bibliography. There are four indexes: English and Latin names of trees, Fungi and Insects. The large number of species included in the last two indicate the extensive research which must have gone into the preparation of the book and the authors are generous in their acknowledgement of help, naming botanists, mycologists, entomologists and others.

Alan Fairhurst and Eric Soothill are to be congratulated on producing a guide which provides an original and enjoyable way of learning about the trees of the countryside.

JED

The Trees of Britain and Northern Europe by **Alan Mitchell,** illustrated by **John Wilkinson.** Pp. 288 with copious illustrations. Collins. 1988. £6.95.

This edition has a change of cover from the first of 1982, but no change in the text has been detected up to page 264. Therefore it has retained all the excellence of the first edition, giving a wealth of information about all the trees, wild and cultivated, which might be seen in Britain and Northern Europe. After the comprehensive introduction and keys, the concise text for each species is next to the very clear and attractive coloured illustrations to aid identification.

For want of a correct simple term the author has had to use the word 'fruit' loosely to label the diagrams for some of the Gymnosperms. As explained in the introduction, they possess naked seeds, so there is no structure which is botanically a fruit, but some have a fleshy layer surrounding the seeds. However the origin of this is stated for Juniper 'berries' and the aril of the Yew 'fruit' around the naked seed is labelled. For the Angiosperms a drawing of several *fruits* shown together should be so-named (not fruit). The label 'seeds' of the Tree of Heaven should surely be *fruits.*

These comments in no way detract from the value of the book, described on the back cover as 'The Complete Pocket Guide' with over 600 trees illustrated in colour.

Sadly, a new paragraph had to be written shortly before this edition went to press, following the gale of 16 October 1987 when so many trees suffered destruction especially in Kent and Sussex. This comes in the section at the end of the book on Notable Trees in the British Isles. The author has revised the long list of trees and where they may be found with regard to the major collections, but he states that it will take years to collate the full extent of the losses. Comparison with the earlier list shows the loss of important trees in such places as Sheffield Park and Wakehurst Place. In addition a number of tree measurements — height and girth — have been updated for 1988.

This list is an invaluable reference for anyone wishing to visit special places and see magnificent trees; the new edition, at a modest price, will be an essential pocket companion for such expeditions.

JED

Perennials. Enduring Classics for the Contemporary Garden by **Rob Proctor,** with photographs by **Rob Gray.** Pp. 160, full colour illustrations throughout. Cassell. 1990. £16.95 hardback.

This attractive book provides a guide to over 75 of the best old-fashioned perennials, with their histories and cultivation requirements. The very readable general historical introduction conveys a wealth of information admirably succinctly, and is followed by beautifully illustrated accounts of the individual plants. This British edition provides a useful list of UK suppliers at the end of the book. It is a pity that the opportunity was not also taken to append a list of popular English plant names; those given by the two American authors include many that are decidedly unfamiliar to most of us, and the average nurserymen might well be puzzled if asked to supply, for example, Pigsqueak, Nosebleed, Jupiter's Beard, Loving Andrews and Old Gooseneck (viz. *Bergenia cordifolia, Achillea millefolium, Cetranthus ruber, Geranium pratense* and *Lysimachia clethroides* respectively).

VAH

Water Gardens by **Ken Aslet, John Warwick** and **Jan Bolders.** Pp. 64, with full colour illustrations throughout. Cassell, for The Royal Horticultural Society (A Wisley Handbook). 1990. £3.95 paperback.

This is the third edition of a most useful title in the long-established series of Wisley Handbooks. Any work appearing under the aegis of the RHS might be expected to be a model of accurate and helpful information, and the work under review is no exception, providing, not withstanding its brevity, a wealth of practical advice on the physical construction of various kinds of water garden and on the plants most suitable for growing in or beside them. Highly recommended.

VAH

Unusual Houseplants by **William Davidson, Clive Innes** and **Ray Bilton.** Pp. 158, fully illustrated. Ward Lock. 1989. £8.95 paperback.

If only the title of this very well produced book reflected its contents more accurately! Now that conservatories are becoming so popular again, the range of possible 'house' plants has expanded enormously of recent years, and a good and affordable book on these exotica is badly needed. Unfortunately, the authors waste valuable space by including well-known houseplants on which more than enough information is readily available elsewhere, such as the African violet, begonia and shrimp plant and a range of widely sold foliage plants. How much more useful would have been the provision of information on, for example, *Brunfelsia,* the Calamondin orange and other 'pottable' citrus species, *Datura, Dipladenia, Gardenia, Gerbera, Lapageria* and oleander, to name but a few of the lesser-known plants (mostly imported from Holland) which my local market has had on sale this year, few of them named or accompanied by any information on their cultivation requirements and therefore no doubt doomed to a very short life indeed in most homes.

However, whilst regretting these lost opportunities, this book is nevertheless very well worth purchasing. Its information is attractively presented and excellently illustrated, with instructions on care set out with admirable clarity in diagrammatic form. Introductory chapters on Origins, General Care, Pests and Disease, Propagation, Problems, etc. are followed by three A - Z sections on Flowering and Foliage Plants, Cacti and Succulents, and Orchids.

In spite of the plethora of horticultural titles presently available, this attractive book is most welcome, filling a real need at a very reasonable price. I only hope that it will soon run to a second edition, dropping its present quota of run-of-the-mill plants and replacing them with a wider selection of unusual but increasingly widely available plants on sale now.

VAH

New Flowers. How to create a new-look garden with the latest varieties by **Tess Paul,** with consultant editor **Daphne Ledward.** Pp. 168, full colour illustrations throughout. Cassell. 1990 £12.95 hardback.

Appropriately coinciding with the appearance of the new season's seed catalogues, with their tempting pictures and even more tempting descriptions of new plant varieties on offer, this timely publication should help the gardener to make an informed choice. With the advent of micropropagation and other aids to rapid plant raising, the speed with which commercial stocks of new introductions can be built up has accelerated enormously over the past decade, and this attractive book highlights many of the best of these newcomers, which are excellently photographed.

However, in a work embracing such a wide range of annual and perennial garden plants, bulbs, roses and shrubs, coverage of any one species is inevitably confined to a very brief selection of new introductions, and perhaps interested readers might be better advised to borrow this book from the library rather than buy it for their own shelves: attractive though it is, its usefulness is somewhat limited and subject to inbuilt obsolescence.

VAH

The Correspondence of Charles Darwin. Edited by **Frederick Burkhardt** and **Sydney Smith. Volume 5. 1851–1855.** Pp. xxxii + 705, plus 9 b/w photographic plates; **Volume 6. 1856–1857.** Pp. xxxii + 673, plus 9 b/w photographic plates. Cambridge University Press. 1989 & 1990. £32.50 & £35.00 respectively.

These latest volumes in this monumental work (Darwin was a prolific correspondent) contain more than 970 letters written over a seven-year period. Editing this work is a phenomenal undertaking when one considers that six bulky volumes have already been published and another two years must still elapse before the publication of the *Origin of Species*! As mentioned in previous notices (*Naturalist* **111**: 36, **113**: 24 & **114**: 98) this authoritative work is a model of scholarship in both its comprehensiveness and supporting documentation which provides a rich source of background, biographical and bibliographical detail.

MRDS

RECENT FLORAS

The publication of Eva Crackles' excellent *Flora of the East Riding of Yorkshire* (see *Naturalist* **115**:110–111) prompted me to mention several other Floras which have been published in recent years but not reviewed in this journal.

Flora of Leicestershire edited by **A. L. Primavesi** and **P. A. Evans.** Pp. 486, including maps & other line drawings, plus 9 pages of full colour plates. Leicestershire Museums, Art Galleries & Records Service, Leicester. 1988. £30.00, plus £2.25 postage & packing from: Leicestershire Museums Service, 96 New Walk, Leicester LE1 6TD.

This scholarly and handsomely-produced work is a fitting tribute to F. A. Sowter (1899-1972) who did so much to research all aspects of his county's flora. The present work describes the status of 1279 flowering plants and ferns, and provides distribution maps of 1080 of these, as well as 107 habitat studies of particularly interesting sites. It is the culmination of about 20 years of intense activity by many enthusiasts who have accumulated some 160,000 records during that time. It also forms a companion volume to K. G. Messenger's *Flora of Rutland* published in 1971. Introductory chapters are provided on such aspects as Topography, Geology and soils, Climate, Impact of man on the flora, Leicestershire botany and botanists, and Changes in the county's flora since 1933 (ie. since the publication of A. R. Horwood & C. F. W. Noel's *The Flora of Leicestershire and Rutland*) which have had both extensive and dramatic effects on the local landscape. The text is supported by an excellent gazetteer, bibliography and index.

The Flora & Vegetation of County Durham by **G. G. Graham.** Pp. vi + 526 including maps & other line drawings, coloured illustrations, and end-paper maps. Durham Flora Committee & Durham County Conservation Trust. 1988. £30.00, plus £3.00 postage & packing from: the author, 3 The Willows, Bishop Auckland, Co. Durham DL14 7HH.

This is a great achievement and a remarkable labour of love by Gordon Graham, who has devoted much of his life to the understanding of all aspects of his county's flora, since the *Flora* covers not only the flowering plants and ferns (over 1800 taxa), but also the liverworts, mosses and lichens (nearly 1000 taxa); furthermore, the 'Vegetation' component of the work includes meticulous ecological analyses of all the county's major habitats, based on 960 individual site descriptions. The majority of species entries within the 'Flora' component are complemented by over 800 detailed maps based on tetrad recording. Introductory chapters include 'The history of botanical recording', Topography, Geomorphology, Geology, Soils and Climate. This work is not only a monument to scholarship and dedication, but is also a delight to the eye.

The Flowering Plants and Ferns of North Lancashire by **L. A. Livermore** and **P. D. Livermore.** Pp. iv + 154, including maps; A4 format and paperback. Published by the authors. 1987, *NB.* Now out of print.

Although produced in a less elaborate format than the two previous *Floras* reviewed, this work is nevertheless an important contribution to our knowledge of the British flora, and since the eastern boundary of the area considered borders Yorkshire, and therefore contains similar habitats, it will be of particular interest to Yorkshire botanists. The area, covering about 220 ml^2 (about 45% of that surveyed by J. A. Wheldon & A. Wilson's *The Flora of West Lancashire* published in 1907), has been recorded for the present survey on a tetrad basis, maps being provided for most of the taxa listed. The introductory matter includes sections on 'Habitats' and 'Changes in the flora', and there are indexes to popular and Latin names.

Census Catalogue of the Flora of Ireland by **Mary J. P. Scannell** and **Donal M. Synnott.** Pp. xxvii + 171, including 4 line drawings, plus coloured map. 2nd edition. 1987. The Stationery Office, Dublin. £4.80 from: National Botanic Gardens, Glasnevin, Dublin 9.

This much revised edition of a work which first appeared in 1972 is most welcome. In the intervening period, 305 taxa have been added to the *Catalogue,* of which 174 (mainly microspecies of *Rubus fruticosus* and *Taraxacum officinale*) are considered to be native, and 30 taxa have been deleted; furthermore, an estimated 1600 vice-county records have been added. Introductory matter is limited, but there are useful references and indexes to Irish, English and Latin (family and genus only) names. The most useful vice-county map of the previous edition (a direct reprint of that first appearing in R.L1. Praeger's (1901) *Irish Topographical Botany*) once again accompanies this *Catalogue.* All botanists working in or visiting Ireland should certainly acquire this invaluable work.

MRDS

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