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ARE SOME BIRD VOCALIZATIONS MALADAPTIVE? REFLECTIONS ON SOME PUTATIVE EXAMPLES

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Introduction

The adaptive nature of the innumerable traits of living organisms is often self-evident. Natural selection ensures that this is so. It is therefore puzzling that certain vocalizations of birds appear to be disadvantageous to their producers, or at least include disadvantageous elements. A major difficulty in assessing the significance of such vocalizations is of course that of appreciating the true context in which they are uttered, and how they are interpreted by their hearers. What to the human ear and mind may appear intuitively disadvantageous need not necessarily be so to a bird whose environment and lifestyle must always remain alien to, and only partly comprehended by, the human observer. Nevertheless some examples appear to include an element of maladaptation which is difficult to deny.

Even very small selective advantages can have important evolutionary effects. Conversely one might expect the deleterious consequences of any maladaptation to lead to their weeding out. However, some vocalizations appear to embrace both adaptive and maladaptive elements, the result being that the latter survive because the adaptive element is the more important. This may be true, for example, when a song that has obvious adaptive functions, such as advertising ownership of a territory, or attracting a mate, also draws to its singer the unwelcome attention of a predator. It may also apply if a particular call is used in a variety of contexts, of which examples are given below, or is disadvantageous only at certain times of the life cycle. Moreover some putative examples of maladaptations are difficult to separate from adaptations that have costs as well as benefits. Animal behaviour presents many examples of the latter. The larger the antlers of a Red Deer, *Cervus elaphus*, which send a reliable signal of its fitness to a female, the more effectively do they serve as weapons and the greater status they confer, but they also demand more energy to produce, maintain and employ. The long tail feathers of males of the African Long-tailed Widow Bird, *Euplectes progne*, are in this context an avian equivalent of cervid antlers, as are the spectacular tail feathers of the Indian Peacock, *Pavo cristatus*.

Some Possible Cases of Maladaptive Vocalizations

Putative examples of maladaptive vocalizations include the vociferousness of nestlings of the Great Spotted Woodpecker *Dendrocopus major*, which often emit loud, virtually continuous 'whirring' calls for long periods. I have been led to an unsuspected nest in a wood from a considerable distance by such calling, and the inference is that predators could be similarly guided to a nest-hole. Thus, calling by the nestlings is potentially maladaptive. While it can be argued that the disadvantage may be more than offset by some adaptive element of this behaviour – such as, perhaps, stimulation of the parents to provide food – I do not find this convincing. Indeed, while potentially deleterious consequences are self-evident, I am unable to suggest any useful function for this persistent calling, nor have I seen any such suggestion. Although calling by the young is restricted to a period of a few days only, if it is maladaptive, and if there is selection against noisy nestlings, it could be important. Breeding takes place only once a year, and the loss of a brood can have serious demographic consequences.

It is particularly intriguing that the calls of nestlings of the Syrian Woodpecker, *D. syriacus*, which is closely related to the Great Spotted Woodpecker, are subdued, barely audible from a distance, and given only when parents arrive with food. This poses intriguing questions and perhaps offers the possibility of comparative experiments. The Great Spotted and Syrian Woodpeckers are so similar that, where their ranges overlap, they occasionally hybridize, yet the former has 'noisy', the latter 'silent' nestlings. This difference in very closely related species, that use similar nests, is remarkable. If, as innumerable examples confirm, natural selection is a very effective force, the difference is difficult to explain. On the face of it the silent (vocally cryptic) nestlings of the Syrian Woodpecker display clearly adaptive behaviour: those of the Great Spotted Woodpecker, maladaptive. Persistence of the latter may be made possible by its transitory nature and the relative security of the nest, but this does not explain why this divergence happened, or why selection operated so differently in the two species – or failed to operate? It is difficult to believe that the trait is selectively neutral. This is embarrassing for those like myself who believe in the power of natural selection. It is also of interest that young of the Great Spotted Woodpecker call more loudly and more frequently than those of the Middle Spotted Woodpecker, *D. medius*.

Several other woodpeckers have noisy nestlings. Those of the Green Woodpecker, *Picus viridis*, were described by B. W. Tucker in the *Handbook of British Birds* as keeping up "an extraordinary babel of loud squeaks and raucous noises". Winkler and Christie (2002) note that the noise produced by nestlings of various species can often be heard emanating from the nest site when no parent is present and "can be audible at great distances". They also say that it is not unusual to see a single begging nestling peering out of the nest-hole and calling when the parents are away. All this hints strongly that such vocalizations may be maladaptive. The question then arises – how did the 'noisy nestling' trait become established? If it is indeed maladaptive, why has it not been eliminated? Its distribution among woodpeckers, whose apparently well founded phylogeny is, however, in some respects in conflict with molecular findings, suggests that it has been acquired (or lost) more than once.

The Great Spotted Woodpecker is itself a serious predator of small hole-nesting birds such as titmice. Perrins (1979) gives references and provides what appears to be a definite example of its attraction to its prey by sounds. When preying on tits breeding in nestboxes, "it appears to be attracted by the sound of the calling young since it makes a completely new hole at the level of the young" through which it pulls them. Cramp (1985) cites similar observations by others which suggest that nestlings are located by sound. Young titmice in nestboxes are also preyed upon by Weasels, *Mustela nivalis* and according to Perrins there seems little doubt that they are located by sound. Late and large broods are most often found by Weasels, perhaps, it has been suggested, because they are less well fed than those of early and small broods, and therefore call more loudly for food. Calling here thus seems to have at least a maladaptive element.

There is indeed experimental evidence that begging calls attract predators. In North America, Haskell (1994) set up numerous artificial nests, well spaced out, both on the ground and in trees. Each was baited with the egg of a Common Quail, *Coturnix coturnix,* whose fate revealed whether or not predation occurred. In each he secreted a miniature two-way radio which broadcast recorded begging calls of the Western Bluebird, *Sialia mexicana*, which have an acoustic structure that makes them easy to locate. In one experiment half of 40 ground nests and 60 tree nests played begging calls at a rate of 25 per minute from dawn to dusk for five days, and half were silent. In another, 50 ground nests played begging calls, half at 25 per minute and half at 13 per minute, the treatment being reversed from day to day so that all nests were subjected to three days of each treatment. Ground nests (but not tree nests) which broadcast calls were predated at a higher rate than silent nests, and nests with higher begging rates suffered greater predation than those with lower rates. The experiments showed that begging calls can attract predators and that the cost of begging seems to be an increasing function of begging rate. This, and the 'silent' nestlings of the Syrian Woodpecker, do nothing to make the noisy behaviour of the Great Spotted Woodpecker less problematic. To claim that it reflects the nature of the nest – a seemingly relatively secure excavated chamber – does not sit comfortably with the fact that young of the Syrian Woodpecker are reared in a similar nest, but produce only subdued calls!

One caveat needs to be made. If parents can warn nestlings of the proximity of a predator, and impose silence, Haskell's observations may not be a valid reflection of what happens in nature. Nevertheless they clearly show that the incessant calling of young Great Spotted Woodpeckers is likely to attract predators, as common sense suggests.

Nestlings are preyed upon by many birds, of which corvids and several woodpeckers are well known examples, but how much is contributed to the success of such predation by the calls of the victims is largely unknown. Among raptors the African Gymnogene, *Polyboroides typus,* methodically searches trees, cliffs, and colonies of weavers, swifts and other birds, and pulls out nestlings from holes and crevices, aided by its 'double jointed' legs. Convergently similar habits, aided by similar morphological specialisations, are displayed by the South American Crane Hawk. *Geranospiza caerulescens.* While their success is presumably sometimes aided by give-away calls of their prey, the role of such calls in this respect is moot. Likewise, the Black Eagle, *Ictinaetus malayensis,* of S.E. Asia is a specialised predator on nestlings, but again it is not clear how much it utilises their calls in its searches. Ferguson-Lees and Christie (2000) say that the African Gabar Goshawk, *Micronisus gabar,* regularly takes nestlings, especially of social and colonial species "whose noise and activities draw attention", but the role of sound is difficult to specify. Similarly, several species of *Accipiter* regularly take nestlings and may be guided in part by their calls. Calls that render such assistance are clearly maladaptive.

The Wood Nuthatch, *Sitta europaea,* is a noisy bird whose loud and frequent calls unmistakably draw attention to its presence. It is difficult to imagine that its vociferousness goes unnoticed by a predator such as the Eurasian Sparrow Hawk, *Accipiter nisus,* and might be thought to place it at greater risk than less noisy, and less vocal species with which it co-exists. I have not, however, found any reference to this in the literature. Frequent common associates in Britain include up to five species of titmice, *Parus* spp., all of which are vocal throughout the year, but are much less noisy, even when, in due season, they establish territories. Although the Nuthatch is territorial throughout the year it is not immediately obvious what advantage accrues from its vociferousness, though there is presumably some or it would not have been selected. Nevertheless it is difficult not to view this behaviour as potentially maladaptive.

Male birds often render themselves conspicuous during the breeding season by singing and by visual display. A familiar example is the Song Thrush, *Turdus philomelos,* whose loud and varied song, often uttered from a visually conspicuous perch, serves various purposes of an adaptive nature, but inevitably must draw to the performer what may be the unwelcome attention of a predator. Moreover, a Song Thrush may sing vigorously towards the end of the breeding season when advertisement of territorial ownership is probably of diminishing significance. Might it not then simply be indulging in, and enjoying, its vocal abilities with no audience in mind? Bird mimics, of which there are many, surely often do just that? Why else should a Jay, *Garrulus glandarius*, imitate so faithfully the call of a buzzard? Singing cage birds are surely not always seeking to attract a mate or advertising ownership of a territory, and the songs produced at a very early age by several species, that are presumably related to learning, can convey no message. Some singing may perhaps be equated with such comfort behaviour as bathing or sunbathing, or even with play. While singing often clearly brings advantages to a Song Thrush, it at least incurs costs, and at times may be maladaptive. It is a salutory fact that while sonograms and the like have led to deeper understanding of what might be called the physics of vocalizations, they cannot necessarily tell us what they mean to the bird producing them, or to a conspecific hearer, if any.

The human observer is pointedly informed by the agitated behaviour, especially the calls, of the Whinchat, *Saxicola rubetra,* Stonechat, *S. torquata,* and Northern Wheatear, *Oenanthae oenanthae* when he is in the vicinity of a nest. Potential predators are similarly greeted. My attention was once attracted by the agitated calls of a Northern Wheatear, caused by a Stoat, *Mustela erminea*, questing around, presumably not far from a nest, which clearly alarmed a pair of these birds until it moved on. This, my only observation of such a situation, is, however, apparently typical. Cramp (1988) cites several cases of Northern Wheatears following, harassing or mobbing Stoats as soon as they enter their territory. Whether this behaviour is adaptive or maladaptive is problematic. If it deters such a predator it is adaptive: if it cannot do so it may inform it of the proximity of helpless prey and encourage searching.

That adult birds can draw attention to themselves by calling, and that selection has led to ways of "camouflaging" such calls, can be inferred from the fact that alarm calls of small passerines often have acoustic characteristics that make them difficult to locate. This is due in part to the frequency of the sounds employed, and because the calls begin and end gradually, which makes it hard for a predator to compare the times at which they reach its two ears, whose binaural reception of sounds is the aural equivalent of binocular vision. Moreover, the alarm calls of many small birds are sufficiently similar to warn not only conspecifics but individuals of other species. The convergent characteristics of such calls throw into strong relief the way in which, for example, a singing Song Thrush must be rendered audibly conspicuous, suggesting that the advantages of vocalizations are attended by costs, which must grade inevitably into maladaptations.

The effectiveness of alarm and distress calls is well shown by the use of recordings of such calls to frighten birds from crops and airfields. Such calls, however, may become ineffective if used too frequently, and their hearers become habituated to them. One can cry 'wolf' too often. As we shall see, however, in some birds there may be various circumstances in which these calls fail to evince the expected response.

Problematic Aspects of the Calls of Some Birds of Prey

The vocalizations of certain birds of prey are such as to suggest that they may include an element of maladaptiveness. Many observations on nesting Common Buzzards, *Buteo buteo*, have provided examples that I am tempted to regard as disadvantageous, at least in the context in which they are uttered, and certainly appear to be so if man is regarded as an enemy. Near the head of a remote Lake District valley where Buzzards have been found nesting on crags in several different years, an observer moving towards the nesting area from lower ground is often spotted by the off duty bird (presumably usually the male), which evidently calls its mate from the nest. Both birds may then leave the nesting area and soar high above the intruder, calling as they do so, even before he comes within a kilometre of the nest. Such behaviour usually confirms the existence of a nest before it has been located. Crag-nesting Common Buzzards at other sites often display similar behaviour, but the very early reaction to a possible intruder in this locality, in which the birds have a good look-out, is particularly striking and has probably involved several different individuals in different years. The nearer one approaches the nest the more vociferous and more agitated do the birds usually become. Such clamorous behaviour usually continues as the nest is inspected and for a short time after one has left it. Such behaviour, especially if accompanied by diving at the intruder, may serve to deter certain predators. Although unusual, one bird regularly and persistently so 'attacked' me (Fryer 1974); others, there cited, report similar behaviour. Diving may be invoked more readily by such predators as a Fox, *Vulpes vulpes*, or Stoat which can certainly reach some nests. I once disturbed a Fox that had probably been sleeping on a ledge on which Common Buzzards had successfully nested in a previous year, and even more accessible sites have been seen. Although this suggestion is made with no supporting evidence, from only one of many nests seen in the Lake District have young disappeared from an easily accessible nest, probably not as a result of human interference. A clutch of three eggs disappeared from an even easier site. Such attacks and calls may well deter such potential takers of eggs and small young as Carrion Crows, *Corvus corone*. It may be, therefore, that such behaviour is maladaptive only if practiced against *Homo sapiens* or a large predator such as a Fox.

The problem of understanding the meaning of calls, which may differ in different situations, is very relevant. The Common Buzzard has a limited vocabulary, and although Cramp and Simmons (1980) cite work which suggests that some calls have been overlooked by most observers, most are variants of the mewing 'peei-oo' call. Weir and Piccozi (1975) list the few main variants and Cramp and Simmons (1980) note that aggressive calls are sharper, more ringing, and more prolonged and wavering than the contact call, and provides a sonogram. Wenzel (1959) noted that the common call varies in pitch and tempo and was able to recognise one variant used by individuals as they flew to a nest with prey.

It seems self-evident that a call which undoubtedly often brings its mate from a nest is specifically intended as a warning, and is interpreted as such by the receiver. But is this the case? It is sometimes possible to approach an occupied nest from above and, if undetected, to look down on the sitting bird which is, however, usually extremely alert and quickly detects even a slow leaning forward to obtain a view. At one such site I was detected by the off-duty bird which called vigorously well before I was near the nest, and I assumed that this was a warning to its mate, which I expected to have left the nest. On peering over the edge of the crag, however, I was surprised to find it sitting, and it flushed only when, as usual, it quickly detected my presence, and revealed two eggs. One therefore asks – what did the calls of its mate mean to the brooding bird? Other experiences strongly suggest that they were warning calls, to which the hearer often responds by vacating the nest. Then why were they ignored? Was my interpretation of the calls incorrect? Or was the urge to brood at a stage sufficiently strong to over-ride a vocal warning? If so would this not be disadvantageous? Such experiences show how difficult it is to understand a bird's world, and to interpret what may appear to be simple situations.

Similar behaviour is exhibited by tree-nesters. As I approached an area regularly occupied by a pair of tree-nesting Common Buzzards, a presumed male appeared when I was about 350 metres from what proved to be the nest tree, and flew back and forth calling loudly and alighting in trees from time to time. Having located the nest, a hand-clap flushed the presumed female. Again persistent calling by its mate had not induced such vacation. So what purpose is served by these calls? If the stimulus they provide has to exceed a certain threshold before it induces vacation of the nest, and the level of this threshold differs according to circumstances, what are these circumstances, and what advantages accrue respectively to vacation and tight sitting? Such challenges can perhaps be tested by the play-back of recordings of calls that may be subtly different among themselves, or provide different stimuli at various stages of incubation and brooding. At present all that can be said is that what seem to be warning calls are sometimes ignored – which causes one to wonder about their effectiveness, information content, and significance.

A Common Buzzard with a vocal impediment provides food for thought. In 1986 I encountered a female that evidently had some malfunction of its syrinx. Instead of the usual 'peei-oo' it emitted what can best be described as a croak. This had not prevented pairing as it was attending one well grown young at a crag nest. The area was not visited in the two following years, but in 1989 a bird was flushed from the same, visible but inaccessible, and empty, nest, and revealed itself as the croaking female of 1986. In 1990 the same female used the same nest and produced one young from two eggs, and in 1991 again had two eggs in the same nest. No visit was made in 1992. In 1993 the nest had been taken over by Carrion Crows and the croaking buzzard was not located. In spite of its disability, which meant that it could communicate vocally with conspecifics only by what, to the human ear, was a very un-buzzard-like call, it nevertheless paired successfully with at least one presumably normal male and bred at least three times. This suggests that, in the Common Buzzard, the configuration of the calls is perhaps less important than the human interpreter might wish to believe. Its vocalisations are of course less varied and much simpler than those of many passerines and are presumably less important in communication and survival. Also, if the female chose its mate (rather than vice versa) the role of its voice may be small in this respect, but vocal communication between the two for other purposes must have been impaired. Nevertheless, like someone with a speech impediment, its disability did not prevent participation in important activities. Certainly its mate would have no difficulty in recognising it as an individual! The role of voice in individual recognition seems likely to be less important in these essentially solitary and sparsely distributed birds of restricted vocal abilities but acute vision, than it is in song birds that can recognise their immediate neighbours, or in colony-nesting species such as gannets, auks and terns whose mates and offspring are recognised by subtle individual vocal attributes. This is not to say that a Common Buzzard cannot recognise other individuals by their calls, but this ability seems likely to be less well developed than in more social species.

Towards the end of their sojourn in the nest, and for some weeks after fledging, young Common Buzzards often call, stridently and persistently, and can be heard by the human ear from a distance of several hundred metres. This again may attract predators to the nest, at which, when the young are well grown, adults are not always present, or to where vulnerable newly fledged young have alighted. Such calling is therefore potentially maladaptive, and it is difficult to see in it any adaptive value. Location of newly fledged young does not demand such persistent calling, and none is needed at the nest. Tubbs (1974) has already observed that it is not always associated with the soliciting of food and that even if the parents bring food this does not always quell such calling. Like the calling of young woodpeckers it appears to be maladaptive.

Other raptors, all with limited vocal abilities, give what, in view of the uncertainty of their significance, are best referred to as alarm/aggressive calls when one approaches their nest. I have observed this in the Common Kestrel, *Falco tinnunculus*, Merlin, *F. columbarius*, Peregrine Falcon, *F. peregrinus*, and Hen Harrier, *Circus cyaneus*, which belong to two different families (or even orders according to some authorities). Indeed, a very recent publication (Fain & Houde, 2004) suggests, on molecular grounds, that the Falconidae is more closely related to the Coliidae (Mousebirds) than to other raptors. Vocal 'abuse' certainly appears to be an element of aggressive/defensive behaviour in the Peregrine Falcon. Like the Common Buzzard, a nesting Peregrine Falcon sometimes becomes very vociferous when one is a considerable distance from what to most predators is an essentially impregnable nest. Its raucous calls, much harsher than those of the other raptors mentioned here, are audible far from the eyrie, whose whereabouts they reveal. If man is to be regarded as a predator, these calls may be considered maladaptive. Apart from the fact that, in some areas, he eats nestlings, and has probably long done so, this is perhaps justified by the long history of falconry and his more recent savage persecution. Similar vocal abuse is, however, directed at other intruders, most commonly the Common Raven, *Corvus corax*, not infrequently a close nesting companion. Here it reinforces the aggressive stooping that is such a spectacular feature of these well known encounters. One has therefore to consider whether, or how, any distinction can be made between calls signifying alarm or emphasising aggression. When used between stoops at a Common Raven, the call of the Peregrine Falcon is surely emphasising aggressive intent in an adaptive manner, but when it calls as it patrols the surroundings of its eyrie what appear to be the same calls are perhaps maladaptive.

The calls of the Peregrine Falcon are itemized in Cramp and Simmons (1980), and Ratcliffe (1993) provides a summary of what, in spite of variants, is a scanty repertoire, of which only the harsh, 'hek-ek-ek' – the cacking call – is relevant here. Both draw attention to the highly significant findings of Wrege and Cade that most calls are used in numerous contexts. Rather than being associated with any particular behaviour, calls communicate intensity of motivation. Use of what appears to be the same call when harrying a Raven and expressing 'concern' about a distant man is an excellent example.

It is easy to assume that a call which induces a particular response in another individual is given specifically for that purpose, but this need not necessarily be so. In several raptors, calling by the adult female (and perhaps the male) causes nestlings older than the downy stage to squat low in the nest (and apparently to remain silent, but more observations are needed). They are then less conspicuous to an approaching predator than if they were standing and moving, or calling. However, this need not mean that the parent has given a deliberate warning to the young. The supposed warning may be no more than a general alarm call, or simply a reaction to a state of unease, to which the young happen to react in an adaptive manner. The parent may neither be directing the call to its offspring, nor even be aware of their reaction to it. What appear to be similar (identical?) calls are given when eggs are in the nest – and an egg cannot respond – and at other times, but these need to be recorded, and the reaction of the young to their playback tested. There may be subtle differences between them, but whether such subtleties are within the capabilities of raptor vocalizations, and if so whether they can be recognized and interpreted by recipients, need to be explored. Although the calls of the Common Buzzard and Peregrine Falcon are very different, both induce this response in their young (but appear also to be used in other circumstances), and the same appears to be true of the Common Kestrel and Merlin whose calls are again different. However, Common Buzzards near to fledging sometimes stand in the nest and seem not to respond to parental calls, but more observations are needed. All these birds have a very limited repertoire of vocalizations, and their ability to use sounds as signals may be less precise than appears superficially to be the case.

Surprisingly little seems to be known about whether adult birds can send vocal signals that can suppress calling by their young. I was nevertheless surprised by the claim of Platzen and Magrath (2004) that there is no strong evidence of this "despite the plausibility that they do so", and that their observations on the Australian White-browed Scrubwren, *Sericornis frontalis*, have provided "the first robust evidence that alarm calls can transfer information about the presence of danger to nestlings". They dismiss as incomplete earlier observations, such as those of Greig-Smith (1980), that Stonechat nestlings ceased their begging calls in response to recordings of the alarm call, and even those of Knight and Temple (1986) which clearly showed that a specific call of the American Goldfinch, *Carduelis tristis*, "causes nestlings to crouch low in the nest and freeze" and also "silences the young". Their own demonstration was that playback of parental alarm calls almost completely suppressed the non-begging calls of nestlings. However, when, after hearing an alarm call, they heard a simulated parental visit (a short 'chip' call, followed by a longer 'provisioning' call), they reduced their begging calls by only a modest 30% or so. Could this simply reflect the absence of an actual adult? Sound alone may be inadequate to quell a call from nestlings primed by the provisioning call to expect an immediate offering of food.

Some raptors, whether or not with deliberate intent, certainly send vocal signals to which their young react. It may be that these birds, with their simple calls, and whose nests can sometimes be observed from a safe distance, are particularly suitable for throwing light on such interactions, about which more may already be known by naturalists than academic investigators imagine. For example, the comment by Davies *et al.* (2004) that it is not known whether nestling responses are specific to their own species' alarms seems unrealistic to those familiar with the alarm/aggressive calls of the Common Buzzard and Peregrine Falcon. It is hard to imagine the young of either of these responding to calls of an adult of the other which, whatever the explanation, is what they undoubtedly do in response to those of their own species. This applies with equal force to congeneric species. The Peregrine Falcon, Common Kestrel and Merlin all belong to the genus *Falco*, but one would hardly expect a Peregrine Falcon to respond to the calls of either a Common Kestrel or Merlin, or vice versa. Unusual situations, such as those in which, in the pesticide era, Common Kestrels were reared from clutches of eggs taken over by Peregrine Falcons whose own eggs were broken, could provide information on this. A perfect opportunity for so doing would be when, for conservation purposes, young Red Kites, *Milvus milvus*, are fostered by Common Buzzards. Such information may well exist.

Predators of Raptors: A Relevant Diversion

Peregrine Falcons will stoop aggressively against dogs, and Ratcliffe (1980) inferred, as we shall see, correctly, that this suggests that they would not hesitate to attack a Fox, but was able to cite only one report from Alaska. In 1993 he was able to add an account of a tiercel and three fledged eyasses stooping repeatedly at a Fox in Devon. Treleaven (1977) describes how, in Cornwall, a female calling "angrily" stooped repeatedly at a full grown Fox beneath an eyrie. Each time the bird shot past, the Fox turned its head and bared its teeth before slinking into the undergrowth. As so few incidents are reported in Britain I place on record that the late Mr S. Cumbus, a farmer who grew up in a Lakeland valley with a long history of breeding Peregrine Falcons, told me that he had twice witnessed such attacks.

Important information on this topic given by Fischer (1968) seems to have escaped notice in publications in English. He reports a striking case from near Celle in Northern Germany, an area in which Peregrine Falcons are tree nesters, utilizing old nests of other birds, particularly raptors and corvids. Here a female Peregrine Falcon, killed by a Fox, and found below a nest, had Fox hair in its talons. It had evidently attacked a Fox in defence of a nestling squatting on the ground and had been seized and killed.

Fischer also makes it clear that although predation by mammals is little known in Britain it is common in areas where Peregrine Falcons are ground nesters, as in Fenno-Scandia and Estonia, and in tundra regions. He refers to Fox (three species), Wild Cat, Wolf, Wolverine, Raccoon, and Martens as predators, but says that, as a robber of eggs and young, the Stoat tops the list. He also mentions other mammalian predators – Coyote, Bears and Lynx – and notes that in tundra regions Elk and Musk-Ox can be enemies by keeping birds off nests containing eggs or young. He says that while Peregrine Falcons vigorously attack, and often drive away, the commonest mammalian nest robbers, such as Martens and Foxes (and in tundra regions the Wolf), it is probable that in most such incidents the nest is robbed. One assumes that during its attempts to drive away these predators the Peregrine always calls. Vocal reinforcement of the message conveyed by stooping is clearly adaptive: the same cannot be said with confidence of loud and persistent calling when a potential enemy is hundreds of metres from an eyrie, as is not infrequently the case in crag nesters. Such behaviour in ground nesters would be a recipe for disaster.

That ground-nesting Peregrine Falcons should be subject to predation from mammals is not surprising. Ground nests of Merlins are exposed to such predation in Britain where the range of mammalian predators is much less. Of 12 ground nests personally observed, four broods (three of four young and one of five) disappeared – more cases than among far more numerous crag nests of Common Buzzards. (As buzzard nests were not always followed to fledging it is not possible to make a strict comparison.) Although the culprit was in no case known, and human interference, while unlikely, could not certainly be ruled out, Foxes were strong suspects. Of six tree nests in the same area, all in old nests of Carrion Crows, only one suffered predation. Its three young were possibly taken by a Common Buzzard nesting nearby. Another in a different area was also successful. In Britain the Adder, *Viperus berus*, has been known to take young Merlins. Ironically, in a recent very rare case of a Peregrine Falcon nesting on the ground in Northumberland, the well-grown young were killed by a Fox!

I witnessed a scaled down version of a Peregrine Falcon – Fox interaction when, in the Lake District, I saw a Common Kestrel stoop several times at a Stoat, which moved at a brisk but not unduly hasty pace across open ground, and once stopped and reared up (and possibly jumped but this was not seen clearly) as the kestrel swept by in a shallow swoop. Although fortunate to watch this through binoculars I was at some distance and have no note as to whether the kestrel also called.

Anomalous Individuals: Precursors of New Habits?

Characteristic as are the raucous calls of the Peregrine Falcon, they are not always employed when they might be expected to be. Although calling may begin when one is far from an eyrie, females on eggs (perhaps confident of their impregnable site?) may continue to sit as one moves slowly towards them, bird and observer both being fully aware of each other. Near one eyrie, in several years, I sat in full view of a sitting female, ate my lunch and pottered about, looking at the bird through binoculars from time to time without apparently causing alarm, and have had a similar experience at other eyries.

Even more remarkably, a bird will sometimes slip silently from the nest and, instead of flying back and forth nearby calling loudly as is usually the case – which betrays the presence of a breeding pair – will maintain silence after doing so. In present-day circumstances such behaviour is entirely adaptive. One female, surprised when my head appeared in view, departed silently from three eggs and made no calls thereafter. More remarkable was a female whose eyrie could be looked into from a nearby accessible vantage point. When I gingerly brought my head into view, the brooding bird saw me and moved somewhat, exposing one egg, then settled down. Having retreated I thought it justifiable to disturb the sitter in order to ascertain the size of the clutch and repeated my visit. The bird slipped off four eggs in complete silence and never called thereafter as it flew back and forth nearby. Two young were reared. Geoff Horne, who has vast experience of nesting peregrines, tells me that he has, but rarely, encountered such silent individuals, and Ratcliffe (1993) reports similar behaviour. If a few bearers of this trait are present in the population, and if the trait is heritable, might this reaction be selected and eventually lead to a change in behaviour? Various birds, including birds of prey, have become more wary of man in relatively short periods. Newton (1979) refers to changes in habits related to persecution that have taken place in various raptors in less than 200 years, and Ratcliffe (1993) cites reports from Spain which suggest that maintaining silence in the face of intrusions at eyries may be happening among peregrines there. A dramatic example of former naïve tameness is provided by the Galapagos Hawk, *Buteo galapagoensis*, which in 1835 Darwin pushed off a branch of a tree with the muzzle of his gun.

A Word in Conclusion

According to Armstrong (1963) there is no record of a predatory bird being frightened away by an imitation of its threat call or attracted by an imitation of its own call. This is perhaps an indication that these calls are less important in communication than one might imagine, or that their meanings have been misinterpreted. It may also have a bearing on the way that, while Common Buzzards often appear to respond to what seem to be warning calls, they sometimes ignore them. However, in both Common Buzzard and Peregrine Falcon a male may appear when a female begins to call – though one may not know whence it came – apparently in response to that call. Much remains to be clarified here. Raptors have primitive vocal apparatus: the range of sounds produced is small, and even vocal species have small vocabularies. However, the relationship need not necessarily be direct: complexity of the syrinx is not always correlated with the complexity of the sounds produced, a puzzle for both the functional morphologist and the behaviourist. Nevertheless, as their 'language' is rudimentary, the meaning of any vocalization seems likely to be less precise than in forms with a more elaborate repertoire. That the meaning of even these 'simple' sounds is still open to question shows how little we understand either them or the minds of these animals.

A curious fact is that, although capable of producing far more complex sounds, a mimic such as the Eurasian Jay (by no means the greatest exponent of this ability) appears to use only a small vocabulary of relatively simple calls in its day-to-day activities. This raises interesting questions, causing one to wonder whether its 'simple' calls are actually so subtly varied that they can convey a wider range of information than is apparent – which has a bearing on the interpretation of the calls of raptors.

A vast amount is now known about bird vocalizations but, not surprisingly, interest has been concentrated on the remarkable abilities of songbirds. These include the performances of such virtuosos as the North American Brown Thrasher, *Toxostoma rufum*, which can sing well over 1000, and perhaps as many as 2000, different songs, and, like many other songbirds and certain others, can sing two different songs simultaneously. These abilities also include individual recognition and amazing memory. Jellis (1977) reports an example provided by a male Great Tit, *Parus major*, which had owned a back garden territory for nearly ten years. This bird spent much of its time within earshot of unpredictable Great Tit sounds emanating from the tape-recorders of investigators in the house, which delivered songs and calls in improbable sequences, often at the wrong time of the year. It learned to ignore them all. However, on one occasion, outside the song season, a recording of a long-dead neighbour was played. The bird in the garden heard it and responded by flying to the boundary where, five years earlier, it had been accustomed to have trouble with this particular rival.

In spite of enormous advances in our understanding of the sounds produced by birds, the exact meaning of even some simple calls is still uncertain. The question with which we began – are some vocalizations maladaptive? – also still awaits a satisfactory answer, though some possible examples are at present difficult, perhaps impossible, to deny. However, if this is so, why has natural selection not eliminated them?

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THE MYXOMYCETES OF THE SHEFFIELD AREA

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INTRODUCTION

Stimulated by the publication of a comprehensive, well-illustrated identification guide to British and Irish Myxomycetes (Ing 1999) and aware that this group had been little studied in the Sheffield area, we started systematically surveying them early in 2000. This paper reports the first three years of survey work and a few additional records made up to September 2004. The study area (Fig. 1) is a rectangle composed of twenty 10 km x 10 km grid squares; west to east it stretches from the Pennine summits to the agricultural lowlands, traversing in turn the Carboniferous Limestone, Edale Shales, Millstone Grit, Coal Measures, Magnesian Limestone and the Triassic Plain. Particular attention was paid to ecology, the location of fieldwork being determined more by the presence of habitats thought to have a high potential than by attempting to obtain an even coverage across the area. The richest sites were visited several times so that strongly seasonal species would not be missed.

PREVIOUS WORK

The first local Myxomycete record appears to be *Diderma floriforme* from near Worksop, made in 1897 during a British Mycological Society Foray. From then on BMS forays in 1909, 1911, 1914, 1919, 1924, 1956, 1965, 1980 and 2000 provide a steady trickle of records; the 1980 excursion based at Loosehill Hall, Castleton was particularly productive, resulting in 32 species from 14 localities (Bevan 1981). A number of records have also been gleaned from field meeting reports of the Yorkshire Naturalists' Union published in *The Naturalist*. A. J. E. Lyon of Sheffield University gave us access to his database of 50 species from the area, mostly composed of literature records but including his own records (spanning 1982 to 1997) of nine common species (including 40 sites for *Lycogala epidendrum*). Six individuals have been identified who contributed mostly single records over the last 50 years. More active has been a local mycologist, Carol Hobart (CH), who has been responsible for some significant finds since 1995. Bruce Ing (*pers. comm.*) carried out casual recording in the study area that resulted in records of 17 species made between 1978 and 1989. A rich source of unlocalised grid square records is *A Provisional Atlas of British Myxomycetes* (Ing 1982), which contains 10 km square dot maps of 99 species divided into pre-1960 and post-1960.

Our survey commenced in Spring 2000, mainly with an examination of dead wood. Later this was extended to leaf litter, tall herb communities, brambles, moss, ferns, moorland, marsh, fen, and last of all, following a workshop meeting at Chester in Autumn 2002, we started on bark culture. January 2000 was taken as separating old from modern records. When we started, the 20 grid squares studied contained records of 70 species; by July 2003 the number of taxa had risen to 160, approximately a third of the British list. The additional taxa are identified in the systematic list by an asterisk (*).

MYXOMYCETE HABITATS

Reference to the systematic list shows the great range of environments that are occupied by myxomycetes: indeed, they can be found in almost any niche where bacteria, their main food, occur. However, rotten wood is the easiest place to find them, though deep plant litter can also be a rich habitat. Many species are very inconspicuous and not easily found in the field. "Moist-chamber-cultivation" within petri dishes, using bark fragments taken from living trees, has identified a further group of generally very small species adapted to that

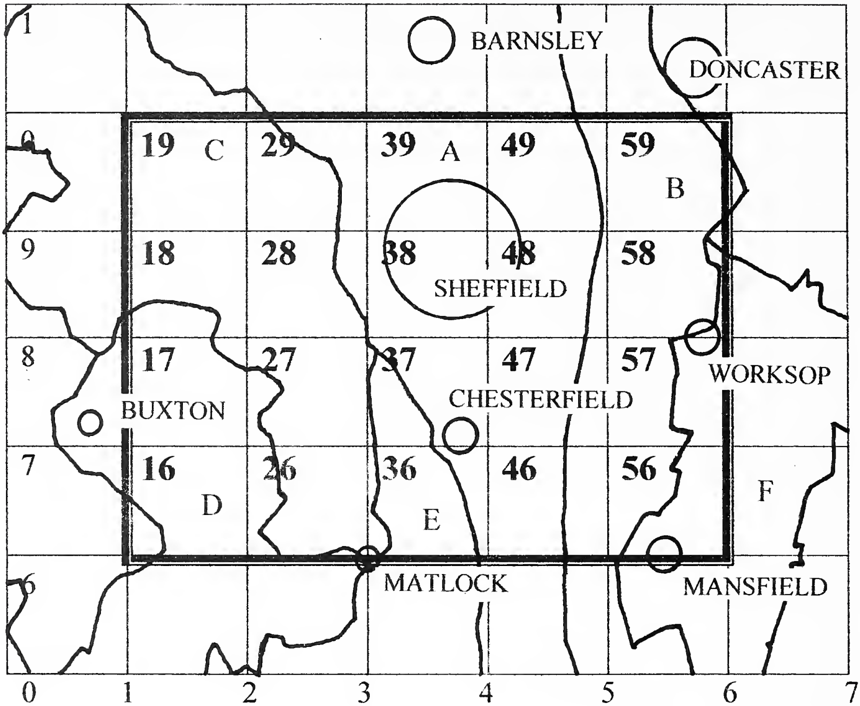

FIGURE 1.
Map showing the survey area of twenty 10 km x 10 km grid squares, the major towns and the boundaries of natural areas

particular environment. Continuing work on living-bark and other under-studied niches should, with time, greatly extend our knowledge of the local myxomycete flora.

Extensive forays around Sheffield, carried out by the authors over the last three years, have identified a number of important local myxomycete habitats, some of national significance.

1) Heather (*Calluna*)

Close examination of the damp under-branches of leggy heather in Ladybower Wood, after late snowfalls early in 2000, revealed the presence of the tiny yellow sporangia of an unknown *Trichia*. This was determined by the national myxomycete expert Bruce Ing to be *T. sordida*, a nivicolous species associated with retreating snow. It was previously unrecorded in Britain and is only the second "snowline" species to be found in England (Ing 2003). Subsequent late winter surveys of heather after snow showed that this myxomycete is widespread in the Sheffield area, being found almost anywhere where moist leggy heather occurs, but particularly on north facing slopes and in ravines. It has been found over the entire local altitude range, from the edge of the Kinder plateaux in the west, to Holbrook Marsh in the eastern lowlands.

Searches for *Trichia sordida* also led to the discovery of a previously unrecognised late winter myxomycete community that is associated with heather and characterised by

T.sordida and *Hemitrichia leiotricha*. It was previously thought that upland heath had no characteristic myxomycete species (Ing 1999). Other species recorded on local heather include minute forms of *Trichia contorta*, *Hemitrichia pardina*, a modified form of *Craterium minutum*, *Diderma radiatum*, and *Physarum galbeum*.

2) Wooded ravines

Wooded gorges in western Britain are notable for their "ravine association" myxomycetes, which are reliant on constantly moist conditions (Ing 1983, 1999). There are old local records for two of the characteristic species, *Lepidoderma tigrinum* and *Fuligo muscorum*, so the authors searched suitable sites in the Peak District, notably in the Upper Derwent Valley, where the higher plant flora shows significant 'Atlantic' tendencies, to see if elements of the ravine mxyomycete community occurred there. One site, Ladybower Wood, was found to be especially significant for these myxomycetes, and four out of the seven characteristic species listed by Ing (1999) were found there: *Lepidoderma tigrinum, Lamproderma columbinum, Diderma ochraceum,* and *Fuligo muscorum*. Of greater significance was the discovery of *Lepidoderma crassipes*, a species new to Britain. This little known taxon should probably be added to the "ravine association" (Ing *pers.comm.*).

3) Other Atlantic communities

Atlantic myxomycetes are not just restricted to deep gorge-like sites in the Peak District. Calver Marsh proved to be a particularly significant site when samples of crack willow bark were put into "moist-chamber-cultivation". These samples produced three distinctly Atlantic, rarely recorded species: *Licea scyphoides, Diderma chondrioderma* and *Diacheopsis incessa*. This site is especially humid and 'western' in character because it is marshy and lies in the flood plain of the river Derwent.

4) Sessile oak woods

The acid wood and bark of broad-leaved trees such as oak, birch, and alder may support myxomycete elements common to conifers. However, an extensive survey of South Pennine oak woods has established that they support a distinctive myxomycete community, with some coniferous elements, but including other species characteristic of oak. The ubiquitous *Cribraria rufa* is always to be found, often with *Calomyxa metallica*, and occasionally *Enteridium lobatum* and *Lamproderma columbinum*. *Cribraria splendens* and *Dianema harveyi* are much less common but appear to be characteristic. The rare *Physarum bethelii, Cribraria minutissima,* and *C. microcarpa* have appeared in bark cultures. *Cribraria rufa* and *Enteridium lobatum* are listed as conifer species by Ing (1999); it may be that they are in fact native to sessile oak woods and perhaps Scottish pine woods, from whence they have spread into conifer plantations.

5) Conifer plantations

The conifer plantations of the Peak District can be a rich source of myxomycetes, particularly during the summer and autumn, but when dense are worth checking throughout the year when conditions are humid. *Cribraria rufa* and *Trichia verrucosa* are nearly always present under mossy log piles, but there are a number of other apparently common species, including *Didymium melanospermum, Fuligo septica* (sometimes in a purple form), *Physarum viride, Cribraria macrocarpa, Lycogala epidendrum, Faminitzinia fruticulosa*, and *Comatricha nigra*. In sheltered, humid plantations, the bottom two metres or so of standing, decorticated dead conifer trunks may be colonized by a distinct myxomycete community comprising *Dianema corticatum*, which was thought to be rare away from the native pine forests of Scotland, *Arcyria ferruginea*, *Comatricha nigra,* and occasionally *Enerthenema papillatum*. The *Dianema* seems to be restricted to this niche in the plantations where it often occurs in a plasmodiocarpous form; British material is typically sporangiate (Ing 1999). The *Arcyria* is only common in this niche, characteristically emerging from old insect and woodpecker holes. Mossy conifer stumps were found to be particularly attractive to myxomycetes. Seven species were found fruiting around a single mossy larch stump in a flush in Westend Clough in the Upper Derwent Valley. Notable associates include *Lepidoderma tigrinum*, *Diachea subsessilis* and *Physarum confertum*. The rare *Stemonitis splendens var. webberi* and *Stemonitopsis reticulata* occur on the trunks of fallen conifers.

SYSTEMATIC LIST

The Latin name is followed by a statement on the local ecology of the species; if it has been found by bark culturing this is noted. The months during which it was collected are then given. A first record (FR) is provided, followed for the rarer species by up to four individual records. A list of the 10 km grid squares in the survey area from which it is currently known (pre-2000 in brackets) is supplied. Nomenclature follows Ing (2000) with up-dates.

***Arcyria cinerea* (Bull.) Pers.**
The top and sides of mossy logs; a small, dispersed form is frequent in bark culture. May-Sept, frequent. FR: Padley Gorge 27 (BMS 1980). 17, 18, 19, (26), 27, 28, (56), (58), 59.
***A. denudata* (L.) Wettst.**
Sides of rotten logs; often present as extensive developments on soggy wood. July-Oct, abundant. FR: Chatsworth 27 (Lyon 1982). 16, 17, 18, 26, 27, 28, 36, (37), 38, (46), (48), 56), 57, (58), (59).
***A. ferruginea* Saut.**
Logs and lower trunk of dead standing trees, mainly conifers. Dec-Jan, locally frequent. FR: Treversall 46 (J. W. Carr 1911). 18, 27, 28, 36, 38, (46), (56), 58.
***A. incarnata* (Pers.) Pers.**
Oak logs. May-Aug, rare. FR: Loosehill Hall 18 (BMS 1980); Abney Clough 27 (PAA 2001), Bretton Clough 27 (OLG 2002). (18), (26), 27, (58), (59).
***A. *minuta* Buchet**
Dead wood, Aug, rare. FR: Abney Clough 27 (OLG 2001). 27.
***A. nutans* (Bull.) Grev.**
Sides of logs and dead standing trees of various species. July-Sept, occasional. FR: Silverwood 49 (YNU 1985). 17, 18, 26, 27, (49).
***A. oerstedtii* Rostaf.**
Conifer logs. Nov, rare. FR: pre-1960 17 & 26 (Ing 1982). Lockerbrook 18 (PAA/OLG 2001); (17), 18, (26). Nationally uncommon.
***A. pomiformis* (Leers) Rostaf.**
Stumps, logs, a small dispersed form is present in bark culture. May-Sept, frequent. FR: 58 pre-1960 (Ing 1982). 16, 18, (26), 27, 28, 38, 57, 58, 59.
***A. *stipata* (Schw.) Lister**
Well rotten wood. All seasons, occasional. FR: Lockerbrook 18 (PAA 2001). 17, 18, 19, 38, 56. Nationally a rare southern species.
***_Badhamia foliicola_ Lister**
Leaf litter. Sept, rare. FR: Lady Cannings Plantation on dead leaves and wood chippings 28 (PAA 2003, 2004). 28.
B. *lilacina* (Fr.) Rostaf. var. *lilacina
Wet moorland. Sept, rare. FR: Rivelin Valley on bilberry stems in *Sphagnum* bog 28 (PAA 2002, 2003). 28.
***B. *macrocarpa* (Ces.) Rostaf.**
Side of logs, living bark, bark culture. Aug, rare. FR: Wardlow on sycamore log and elder tree 17 (PAA 2002). Walton Wood on rowan 36 (PAA 2002); Calver Marsh on crack willow (bark culture) 27 (PAA 2002); Holmesfield Park Wood on felled beech 37 (PAA 2003). 17, 27, 36, 37. Nationally uncommon.
***B. panicea* (Fr.) Rostaf.**
On logs, bark culture. May-Oct, rare. FR: Loosehill Hall 18 (BMS 1980). Cressbrook Dale

17 (BMS 1980); Grainfoot Clough on larch 18 (PAA 2000). (17), 18, 27.

***B. utricularis* (Bull.) Berk.**

On bracket fungi on dead wood. Jan-May, occasional. FR: Loosehill Hall 18 (BMS 1980). Cressbrook Dale 17 (BMS 1980); Grainfoot Clough on rowan 18 (PAA 2000); Ladybower Wood on oak 28 (PAA 2000); Blackbrook on oak 28 (PAA 2002). (17), 18, (26), (27), 28, 36.

***Brefeldia maxima* (Fr.) Rostaf.**

Rotting stumps. Nov. rare. FR: Anston Stones Wood 58 (Ing 1987). Norfolk Park, Sheffield 38 (CH 2000). 38, (58).

***Calomyxa metallica* (Berk.) Niewland**

On the bark of standing and fallen trees, stumps, bark culture. All seasons, occasional. FR: Chatsworth 27 (Ing 1978). Ladybower Wood 28 (PAA 2000); Calver Marsh on crack willow 27 (PAA 2002); Cressbrook Dale on aspen 17 (PAA 2002); Scarcliffe Park on hawthorn (bark culture 57 (OLG 2003). 17, 18, 27, 28, 57. Characteristic of Southern Pennine sessile oak woods.

***Collaria elegans* (Racib.) Dhillon & Nann.-Bremek.**

Small fallen branch. May, rare. FR: Ashopton 18 (BMS 1980). (18).

****C. rubens* (Lister) Nann.-Bremek.**

Deep leaf litter. Dec, rare. FR: Holmesfield Park Wood on deep holly litter 37 (OLG 2000). 37. Nationally rare.

****Colloderma oculatum* (Lipp.) G. Lister**

Mosses on wet rocks and trees, and bark culture, generally associated with cyanobacteria and most commonly seen in bark culture. Nov-Feb, common. FR: Calver Marsh on crack willow (bark culture) 27 (PAA 2002). 18, 19, 26, 27, 28, 29, 37, 38, 58. A species of southern Pennine sessile oak woods.

****Comatricha alta* Preuss**

Rotten elm log. Feb, rare. FR: Woolley Wood 39 (PAA 2002). 39.

***C. laxa* Rostaf.**

Old deciduous tree stump. Aug, rare. FR: Bull Wood, Tankersley 39 (Lyon 1986). (39).

***C. nigra* (Pers.) Schröt**

On all types of dead wood including decorticated conifers, fallen boughs and twigs, once on *Armillaria* rhizomorphs. All seasons, abundant. FR: Loosehill Hall 18 (BMS 1980). 16, 17, 18, 19, (26), 27, 28, 29, 36, 37, 38, 39, 47, 56, 57, 58, 59.

C. pulchella* (C. Bab.) Rostaf. var. *pulchella

On mosses including *Sphagnum* and *Eurhynchium praelongum*, leggy heather, fern litter. Feb-April, occasional. FR: pre-1960 26 (Ing 1982). 18, 19, (26), 28, 29.

***C. tenerrima* (M. A. Curtis) G. Lister**

Dead stems including those of marsh plants such as *Juncus* and *Epilobium hirsutum*. June-Nov, occasional. FR: Bradford Dale 16 (BMS 1980). (16), 17, 19, 28, 57.

****Craterium aureum* (Schum.) Rostaf.**

Leaf litter of bracken, *Deschampsia cespitosa*. Sept-Oct, rare. FR: Deep Dale 17 (PAA 2000). Sessile form on bracken in Clough Wood 26 (PAA/OLG 2001), Kirk Dale 16 (PAA 2002). 16, 17, 26.

****C. leucocephalum* (Pers.) Ditm.**

Mossy logs. Feb, Sept, rare. FR: Lathkill Dale 16 (PAA 2001, 2002). 16.

***C. minutum* (Leers) Fr.**

Living leaves, litter, twigs, bramble stems, birch trees, bark culture. Aug-Dec, frequent. FR: Wortley Hall 26 (C. H. 1996). 16, 17, 18, 26, 27, 28, (39), 57.

***Cribaria argillacea* (Pers.) Pers.**

Rotting conifer wood. Aug-Oct, occasional. FR: pre-1960 27 (Ing 1982). Sitka spruce West End Clough 19 (PAA 2000); Ewden Valley 29 (PAA 2001), Sitka spruce Win Hill 18 (PAA 2001). 18, 19, (27), 29.

***C. aurantiaca* Schrad.**

Rotting conifer, elm and willow logs etc. Aug-Sept, frequent. FR: pre-1960 32 (Ing 1982).

17, 18, (26), 27, (32), (57), 58, (59).

***C. cancellata* (Batsch) Nann.-Bremek.**

Mossy fallen trunks and branches of a variety of trees. Aug-Sept, frequent. FR: post-1960 27 (Ing 1982). 16, 17, 18, 27, 36, 38.

****C. macrocarpa* Schrad.**

On dead conifer wood. Sept-Dec, occasional. FR: Birchen Clough 19 (OLG 2001). West End Clough 19 (PAA 2001); Lockerbrook 18 (PAA 2001); Win Hill 18 (PAA 2002). 18, 19. Uncommon nationally and worldwide.

****C. microcarpa* (Schrad.) Pers.**

Rotting logs and tree bark, usually coniferous. March & July, rare. FR: on rotten alder log Clough Wood 26 (PAA 2000). 26, 38. Nationally rare.

****C. minutissima* Schw.**

Oak bark culture. June, rare. FR: Agden Wood 29 (PAA 2003 conf. Ing). 29. The second British and first English record.

***C. persooni* Nann.-Bremek.**

Rotting conifer wood. Jan, rare. FR: Anston Stones Wood 58 (J. Webb 2000 det. Ing). 58.

***C. rufa* (Roth) Rostaf.**

Rotting wood of acid barked trees, conifers, alder, birch, oak. All seasons, abundant. FR: Chatsworth 27 (BMS 1980). 16, 18, 19, 26, 27, 28, 29, 36, 37, 38, 39, 46, 47. Typical of southern Pennine sessile oakwoods, alder carrs, and coniferous plantations.

****C. splendens* (Schrad.) Pers.**

Rotting wood of conifers and oak. Oct, rare. FR: Ladybower Wood 28 (PAA 2002 conf. Ing). 28 – seen several times at this site. Nationally rare.

****Diachea leucopodia* (Bull.) Rostaf.**

Plant stems. March, rare. FR: Wingerworth on *Fuschia* stem in greenhouse 36 (J. Rose 2001 det. PAA). West Wood on bramble 47 (PAA 2001). 36, 47.

****D. subsessilis* Peck**

Litter. Dec, rare. FR: on moss and litter by Sitka spruce stump West End Clough 19 (PAA 2000). 19. Nationally uncommon.

****Diacheopsis insessa* (G. Lister) Ing**

Associated with epiphytic lichens; characteristic of Atlantic woodlands. Nov, rare. FR: Calver Marsh on crack willow (bark culture) 27 (PAA 2002). 27.

****Dianema corticatum* Rex**

Base of standing and fallen decorticate conifers. Dec-Jan, rare. FR: Win Hill on Sitka spruce 18 (PAA 2002). Hollow Meadows on base of larch 28 (PAA 2003). 18, 28. Nationally rare.

****D. depressum* (G. Lister) G. Lister**

Rotten wood; on the Magnesian Limestone. March, rare. FR: on fallen ash bough Roseland Wood 46 (OLG 2002). 46.

****D. harveyi* Rex**

Fallen wood, bark culture. Nov-March, rare. FR: Ladybower Wood on oak stump 28 (PAA 2001). Padley Gorge on mossy alder log 27 (PAA 2001), Crosspool on *Fuschia* trunk (bark culture) 38 (PAA 2002). 27, 28, 38 (all conf. Ing).

***Dictydiaethalium plumbeum* (Schum.) Rostaf.**

Logs and litter. Sept-March, occasional. FR: Anston Stones Wood 58 (Ing 1987; CH 1994). 18, (27), 28, 46, (58).

****Diderma chondrioderma* (de Bary & Rostaf.) G. Lister**

Bark culture. Nov-Dec, rare. FR: Calver Marsh on crack willow 27 (PAA 2002). 27. Nationally uncommon.

****D. cinereum* Morg.**

Mosses and leaf litter. Oct, rare. FR: mossy limestone rocks Monk's Dale 17 (OLG 2001, det. Ing). 17. Third British record.

****D. deplanatum* Fr.**

On moss and litter. Sept-Nov, rare. FR: Abney Clough on moss and oak litter 27

(PAA/OLG 2001). Reddicar Clough on *Sphagnum*, bracken, pleurocarpous moss 28 (PAA/OLG 2002); 27, 28.

***D. donkii* Nann.-Bremek.**

Leaf litter. Aug, rare. First record: on beech litter Grimbocar Wood 18 (PAA 2002). 18. Nationally rare.

***D. effusum* (Schw.) Morg.**

Leaf litter and moss. May-Nov, occasional. FR: Whitwell Wood 57 (PAA 2001). Priddock Wood 28 (PAA 2001), Grimbocar Wood 18 (CH 2002); 18, 28, 57.

***D. floriforme* (Bull.) Pers.**

Dead wood. Season unknown, rare. FR: near Worksop 57 (BMS 1897). Chatsworth 27 (BMS1909). (27), (57). A species of ancient broad-leaved woodland.

***D. globosum* Pers.**

Leaf litter and living plant stems. Season unknown, rare. FR: Miller's Dale 17 (P. Smith 1990). (17).

***D. hemisphaericum* (Bull.) Hornem.**

Damp leaf litter. March, rare. First record: Cressbrook Dale on hazel litter 17 (PAA 2000). West Wood on ash litter 47 (PAA 2002). 17, 47.

D. montanum* (Meyl.) Meyl. var. *montanum

Moss and litter. Oct, rare. FR: Monk's Dale on mossy limestone 17 (OLG 2001). Clough Wood on bracken litter 26 (PAA 2001). 17, 26.

***D. montanum* (Meyl.) Meyl. var. *album* Ing**

On moss and litter. Dec, rare. FR: *Thamnobryum* on limestone rock face, Cressbrook Dale 17 (PAA 2000 det. Ing). 17. First British record of this variety.

***D. ochraceum* Hoffm.**

Mossy rocks. Nov-Jan, rare. FR: limeless form Ladybower wood 28 (PAA 2002). Typical form on pine log West End 19 (PAA 2001), typical form Ladybower Wood 28 (PAA 2002). 19,28. Nationally uncommon, mainly in western and northern areas of Britain.

***D. radiatum* (L.) Morg.**

Various woody substrata. Feb & Aug, rare. FR: Ewden Valley on rotten log 29 (OLG 2001). Near Cutthroat Bridge on heather litter 28 (PAA 2002). 28, 29. Nationally rare.

***D. spumarioides* (Fr.) Fr.**

Moss and litter. Sept, rare. FR: Miller's Dale 17 (P. Smith 1990). Arrock Plantation, Kirk Dale on limestone16 (PAA 2002). 16, (17).

***D. umbilicatum* (Pers.). var. *umbilicatum*.**

Dead twigs and branches. Dec, rare. FR: on *Mnium hornum* on rotting log Lockerbrook 18 (PAA 2000). 18.

***Didymium anellus* Morg.**

Litter and living leaves. May & Oct, rare. FR: on moribund *Equisetum telmateia* Clough Wood 26 (PAA 2001). Beech litter, Scarcliffe Park 57 (PAA 2003). 26, 57. A mainly southern species.

***D. clavus* (Alb. & Schw.) Rabenh.**

Leaf litter. Feb-March, rare. FR: on sycamore and other broad-leaf litter, Wardlow 17 (PAA 2003, 2004). 17.

***D. comatum* (Lister) Nann.-Bremek.**

Herbaceous material. Aug, rare. FR: Crosspool on pitchers of *Sarracina psittacina* grown as house plant 38 (PAA 2003 det. Ing). 38. A nationally rare species.

***D. difforme* (Pers.) S. F. Gray**

On many types of herbaceous litter including dead stems of *Heracleum*, *Holcus* and especially *Urtica*. All seasons, common. FR: Bradford Dale 16 (BMS 1980). (16), (26), 27, 28, 36, 46, 47, 57, 58, 59.

***D. dubium* Rostaf.**

Leaf litter. Sept-Nov, rare. FR: beech litter Abney Clough 27 (OLG 2001). Litter over wood chips, Lady Cannings Plantation 28 (OLG & PAA); living bilberry and grass, Upper Rivelin 28 (PAA). 27, 28. Nationally rare.

***D. ilicinum* Ing**
Fallen holly leaves, living bramble stems, pine needles, bracken litter, etc. June, occasional. FR: Howden 19 (CH 1996). (19), 28, 36, 38, 57, 58. A recently described species but probably common.
***D. melanospermum* (Pers.) T. Macbr.**
Conifer litter and wood, occasional on mossy rocks in oak woodland. All seasons, frequent. FR: Ladybower Wood 28 (R. Cook 1990). 18, 19, 28, 29, 39.
****D. minus* (Lister) Morg.**
Dead herbaceous stems and leaf litter. Aug, rare. FR: on bracken stem Chee Dale 17 (OLG 2002). 17.
***D. nigripes* (Link) Fr.**
Leaf litter and dead herbaceous stems. Season unknown, occasional. FR: Grindleford 27 (BMS 1909). Chatsworth 26 (BMS 1909, 1919), Baslow 27 (BMS 1919). (26), (27).
***D. squamulosum* (Alb. & Schw.) Fr.**
Deep leaf litter especially of holly and beech, general herbaceous debris, under hay bales. All seasons, abundant. FR: pre-1960, 29 (Ing 1982). 16, 17, 18, (26), 27, 28, 29, 36, 37, 38, 39, 46, 47, 49, 57, 58, (59).
****Echinostelium apitectum* K. D. Whitney**
Bark culture. Jan, rare. FR: West End Clough on oak bark 19 (PAA 2003 det. Ing). 19.
***E. fragile* Nann.-Bremek.**
Bark culture. May, rare. FR: Loosehill Hall 18 (BMS 1980). Miller's Dale 17 (Ing 1986). (17), (18).
***E. minutum* de Bary**
Bark culture. May, occasional. FR: Haddon Hall 26 (BMS 1965). Miller's Dale 17 (BMS 1980), Cressbrook Dale 17 (BMS 1980); Agden on sycamore 29 (OLG 2003), Scarcliffe Park on alder (OLG 2003), Stubbing Court on willow bark 36 (PAA 2003). (17), (26), 29, 36, 57.
***Enerthenema papillatum* (Pers.) Rostaf.**
Dead wood including conifer, bark culture (crab apple, poplar). May, Dec, common. FR: Ladybower Wood 28 (BMS 1980). 16, 17, 18, (27), 28, 38, 49.
***Faminitzinia fruticulosa* (O. F. Müll.) Lado**
Dead wood, often coniferous. May-Oct, frequent. FR pre 1960 (Ing 1982). 16, 17, 18, 19, (26), 27, 28, 38, (57), (58), (59).
***Fuligo muscorum* Alb. & Schw.**
Moss and litter in humid woodlands, a member of the ravine community. Nov-Dec, rare. FR: Grindleford 27 (BMS 1909). Cressbrook Dale 17 (PAA 2000), Priddock Wood 27 (PAA 2001), Abney Clough 28 (PAA 2001). 17, 27, 28.
***F. septica* (L.) F. H. Wigg. 'Flowers of Tan'**
Rotting wood, moss and litter. May-Oct, common. FR: 17 & 59, pre-1960 (Ing 1982). (17), 18, 19, 26, 27, 28, 37, 38, (39), (48), (49), (58), (59). A striking and widespread species frequently recorded by general mycologists.
****Hyporhamma calyculata* (Speg.) Farr**
Rotting logs, particularly of elm. Dec-Feb, uncommon. FR: Anston Stones Wood 58 (BMS 2000). Cressbrook 17 (PAA/OLG 2000, 2003), Lathkilldale 16 (PAA 2001). 16, 17, 58.
****H. clavata* (Pers.) Rostaf.**
Rotting logs, particularly of elm, rarely on conifer wood. Feb-May & Aug-Dec, frequent. FR: Ecclesall Woods 38 (PAA 2000). 16, 17, 18, 27, 28, 38, 39, 46, 56, 58.
****H. intorta* (Lister) Lister**
Rotten wood and bark. Dec-March, occasional. FR: on flaking mossy ash bark Lathkilldale 16 (PAA 2001). Cheedale on bark of cherry log 17 (OLG 2001), Norwood on rotten fallen elm 46 (OLG 2002), Wooley Wood on dead bramble stem (sessile form) 39 (PAA 2002), Porter Valley on elm bark 28 (OLG 2003). 16, 17, 28, 39, 46. Nationally rare.
****H. leiotricha* (Lister) G. Lister**
Litter, especially *Calluna* litter. Mainly Nov-Feb, local. FR: Cutthroat Bridge 28 (PAA

2000). 28, 29. Recorded 15 times from these two grid squares on the Millstone Grit.

***H. pardina* (Minkata) Ing**

Living bark and litter. Jan-Feb, uncommon. FR: Wardlow on elder 17 (PAA 2002). Ladybower Wood on heather litter and Hollow Meadows on elder bark (PAA 2003). 17, 28.

***Lamproderma arcyrioides* (Sommerf.) Rostaf.**

Leaf litter. March, rare. FR: Coombes Dale 27 (OLG 2003). 27.

***L. columbinum* (Pers.) Rostaf.**

Mossy rocks, logs, tree bases; a member of the ravine community. July-Mar (mainly Oct-Nov), local. FR: Reddicar Clough 28 (PAA 2000, 2004). 18, 28, 38, 57.

***L. echinulatum* (Berk.) Rostaf.**

Logs and stumps. Aug-Dec, rare. FR: on mossy oak log Lockerbrook Clough 18 (PAA 2001). Win Hill under Scots pine log 18 (PAA 2002), Ladybower Wood under oak stump 28 (PAA 2002), Grimbocar Wood on Scots pine stump 18 (PAA 2002), Lady Clough under Sitka spruce log 19 (PAA 2003). 18, 19, 28. All local records are from the Upper Derwent Valley. A nationally rare species.

***L. scintillans* (Berk. & Broome) Morg.**

Leaf litter, once found on living *Lysimachia nummularia*. Sept-Jan, uncommon. FR: post-1960 (Ing 1982). Cressbrook Dale 17 (PAA 2000). 17, (18), 26, 27, 37, 58. Probably more widespread than the records indicate.

***Leocarpus fragilis* (Dicks.) Rostaf.**

Wood and leaf litter, once on the side of a sandstone boulder in an oak wood. Nov-Feb, uncommon. FR: post-1960 (Ing 1982). Ladybower Wood 28 (PAA 2000). 18, (26), (27), 28, (29), (57). Surprisingly few modern records of this distinctive species.

***Lepidoderma crassipes* Flatau, Massner & Schirmer**

Mossy wood and rocks. Oct, very rare. FR: on the side of a mossy gritstone boulder Ladybower Wood 28 (PAA 2002 conf. Ing). 28. The first British record of what is probably another ravine species.

***L. tigrinum* (Schrad.) Rostaf.**

Mossy rocks, stumps and logs, a member of the ravine community. Oct-Dec, local. FR: Grindleford 27 (BMS 1909). 18, 19, 27, 28. Common at several sites in the Upper Derwent Valley.

***Licea belmontiana* Nann.-Bremek.**

Bark culture. Season unknown, rare. FR: Cressbrook Dale 17 (BMS 1980). (17).

***L. castanea* G. Lister**

Bark. Dec-Feb, rare. FR: on fallen aspens, Cressbrook Dale 17 (PAA 2003). 17.

***L. longa* Flatau**

Bark. Dec-Jan, rare. FR: on the bark of a dead standing aspen, Cressbrook Dale 17 (PAA 2003). Wardlow on elder 17 (PAA 2003). 17. Initially found in the field and subsequently in bark culture. A recently described species.

***L. minima* Fr.**

Bark, living and dead, in the field and in culture. Season unknown, uncommon. FR: Lathkilldale 16 (BMS 1980). *Rhododendron* wood from Reddicar Clough 28 (PAA 2000), rowan branch Upper Misden Clough 19 (PAA 2000). (16), 19, (26), 28.

***L. parasitica* (Zukal) Martin**

Bark of living trees, also bark culture. Season unknown, frequent. FR: Cressbrook Dale 17 (BMS 1980). (17), (18), (27), 28, 29, 36, 38. An inconspicuous but probably widespread species.

***L. pusilla* Schrad.**

Logs and bark of living trees. Nov, occasional. FR: Wyming Brook on conifer log 28 (PAA 2002). Crab apple bark from near Hathersage (culture) 27 (OLG 2003), Lady Clough on oak 19 (PAA 2003). 19, 27, 28.

***L. scyphoides* T. E. Brooks & Keller**

Bark culture. Nov, rare. FR: Calver Marsh on crack willow 27 (PAA 2002). 27. Nationally widespread in W. Britain.

L. testundinacea **Nann.-Bremek.**
Bark culture. Season unknown, rare. FR: Millersdale 17 (Ing 1986). (17).
L. variabilis **Schrad.**
Dead wood. Jan, rare. FR: Longshaw 27 (BMS 1965). Ewden Valley 29 (OLG 2001). (27), 29.
******Lycogala conicum*** **Pers.**
Dead wood. June, rare. FR: Little Matlock Wood on mossy elm log 38 (PAA & CH 2004). 38. Characteristic of ancient woodland sites.
******L. epidendrum*** **(L.) Fr.**
Dead wood, especially pine logs, characteristic of conifer plantations. May-June & Aug-Sept, local. FR: Blackamor 28 (PAA 2001). 16, 18, 19, 27, 28, 57, 58.
L. exiguum **Morg.**
Dead wood. Season unknown, rare. FR: Monks Dale 17 (D.S. Fieldhouse 1965). (17).
******L. terrestre*** **Fr.**
Dead wood, especially well-rotten logs of beech and elm, characteristic of broad-leaved woodland. May-Dec, common. FR: Whitwell Wood 57 (PAA 2000). 17, 18, 19, 27, 28, 37, 38, 49, 57.
Macbrideola cornea **(G. Lister & Cran) Alexop.**
Bark culture. Season unknown, rare. FR: Wyedale 17 (Ing 1986). Meersbrook Park on sycamore 38 (OLG 2002). (17), 38.
Metatrichia floriformis **(Schw.) Nann.-Bremek.**
Rotten logs, especially elm, abundant under large soggy logs. Feb-May & Aug-Oct, very common. FR: Padley Gorge 27 (BMS 1980). 16, 17, 18, 19, (26), 27, 28, 29, 36, 37, 38, 39, 46, 47, 48, 49, 56, 57, 59.
M. vesparium **(Batsch) Nann.-Bremek.**
Fallen wood, especially of elm and beech. Season unknown, rare. First record: Matlock 26 (BMS 1924). (26).
Mucilago crustacea **F. H. Wigg.**
Grassland and tall herb vegetation, typical of limestone grassland. May & Sept-Dec, locally common. FR: pre-1960 (Ing 1982). 16, 17, 26, (27), 38, 47, (58), (59).
Paradiacheopsis fimbriata **(G. Lister & Cran) Hertel**
Bark culture. May, scattered. FR: Lathkilldale 26 (BMS 1980). 18, 26, 28, 38.
P. solitaria **(Nann.-Bremek.) Nann.-Bremek.**
Bark culture. May & Nov-Dec, rare. FR: Cressbrook Dale 17 (BMS 1980). Calver Marsh (PAA 2002), North Lees (OLG 2002). 17, 27, 28.
Perichaena chrysosperma **(Currey) Lister**
Bark of living trees. Oct-Nov, rare. FR: Eckhampton Wood 59 (BMS 1914). Calver Bridge 27 (OLG 2002), Wardlow 17 (PAA 2002). 17, 27,(59).
P. corticalis **(Batsch) Rostaf.**
Bark of fallen trees, especially ash. Feb & May, local. FR: Teversall 46 (BMS 1911). Stubbin Court on fallen ash bough 36 (OLG 2003). (17), (18), (26), (27), 36, (46), (56), (58).
P. depressa **Lib.**
Bark of fallen trees, especially ash. May, local. FR: Losehill Hall 18 (BMS 1980). (18), (26), (27), (46), (57), (59).
******P. liceoides*** **Rostaf.**
Leaf litter. Nov, rare. FR: Westend Clough on dead *Blechnum* fronds – an imperfect development 19 (PAA 2001 det. Ing). 19. A nationally rare taxon.
******P. vermicularis*** **(Schwein.) Rostaf.**
Bark culture, dead plant material. Nov-Feb, occasional. FR: Nether Green bark of apple 38 (OLG 2002). Broomhill on plane 38 (OLG 2003), Porter Valley on nettle stem 28 (PAA 2003), Coombs Dale dead willow leaf 27 (OLG 2003). 27, 28, 36, 38.
Physarum album **(Bull.) Chevall.**
Dead wood. Aug-Sept, frequent. FR: Cressbrook Dale 17 (BMS 1980). 16, 17, 19, (16), 17,

18, 28, 36, 38, (48), 58, (59). Common and widespread.
***P. bethelii* T. Macbr.**
Oak bark culture. June, rare. FR: Broomhead Reservoir 29 (PAA 2003 det. Ing). 29. A nationally rare species.
***P. bitectum* G. Lister**
Leaf litter and the living stems of grasses and herbs. Nov, rare. FR: Wyming Brook 28 (CH 1995). Abney Clough 27 (PAA/OLG 2001). 27, (28). A mainly southern and eastern species in Britain.
***P. bivalve* Pers.**
Leaf litter. Feb-Mar & Sept-Nov, occasional. FR: pre-1960 (Ing 1982). 16, (26), 27, 28, 39, 47, 57, (59). Typically occurs where the soil is rich in phosphates; occasionally in unusual niches such as on the living stems of giant horsetail and under logs.
***P. cinereum* (Batsch) Pers.**
Moss and litter. Feb, rare. FR: Chatsworth 27 (Ing 1978). Crook Hill 18 (PAA 2000). 18, (27).
***P. compressum* Alb. & Schw.**
On underside of straw bales. March, rare. FR: Norwood 46 (PAA 2002). 46.
***P. confertum* T. Macbr.**
Coniferous woodland. Aug, rare. FR: Win Hill on root-plate of Sitka spruce 18 (PAA 2002, conf. Ing). 18. A nationally rare species.
***P. galbeum* Wingate**
Plant stems. Nov, rare. FR: Cutthroat Bridge on heather and soft rush 28 (PAA 2001 det. Ing). 28. Nationally southern and uncommon.
***P. leucophaeum* Fr.**
Mainly on the wood and bark of broad-leaved trees. Sept-March, frequent. FR: Haddon Hall 26 (BMS 1965). (17), 18, (26), 27, 28, 36, 38, 47, 48, 56.
***P. licheniforme* (Schw.) Lado**
Grass litter. Season unknown, rare. FR: Cheedale 17 (BMS 1919). (17).
***P. psittacinum* Ditm.**
Rotten wood, characteristic of ancient broad-leaved woodland. Dec, rare. FR: Chatsworth 27 (BMS 1919). Grimbocar Wood 18 (OLG 2000). 18, (27).
***P. pusillum* (Berk. & M. A. Curtis) G. Lister**
Litter. June & Oct, rare. FR: Clough Wood 26 (PAA/OLG 2001). Calver Marsh 27 (OLG 2001), Whitwell Wood 57 (OLG 2002). 26, 27, 57.
***P. robustum* (Lister) Nann.-Bremek.**
Dead wood. Dec, rare. FR: Grimbocar Wood on decorticate elm wood 18 (PAA/OLG 2000). 18.
***P. vernum* Sommerf.**
Leaf litter, dead stems and bryophytes. Nov & Feb, rare. FR: Cutthroat Bridge on leafy liverworts under heather 28 (PAA 2001). Abney Clough on mossy alder log 27 (PAA/OLG 2001), Stubbing Court on dead bramble stem 36 (PAA 2003). 27, 28, 36 Nationally uncommon.
***P. virescens* Ditm.**
Heathland mosses. Oct, rare. FR: Wharncliffe Heath 39 (PAA 2000). 39. Mainly in W and N Britain.
***P. viride* (Bull.) Pers.**
Conifer and oak logs. July-Nov, occasional. First record: Chatsworth 27 (BMS 1980). 18, 19, (26), 27, (58), (59).
***P. viride* var *incana* Lister**
Dead wood. July, rare. FR: Lady Cannings Plantation on coniferous wood chip pile 28 (OLG 2004, conf. B. Ing). 28. Nationally uncommon.
***Pocheina rosea* (Cienk.) A. R. Loeblich. & Tappan**
Bark of living trees, especially those with acid bark. Season unknown, rare. FR: Maltby 59 (Ing 1988). (59).

***Prototrichia metallica* (Berk.) Massee**
Woody litter and herbaceous litter. Nov-Dec, uncommon. FR: Beeley Wood on bark flake of poplar 39 (PAA 2001). Ladybower Wood on bracken litter 28 (PAA 2001), Wyming Brook on dead bracken stem 28 (PAA 2001), Harehill Plantation on grass litter under beech log 36 (PAA 2003), Cressbrook Dale on rotten elm log 17 (OLG 2003). 17, 28, 36, 39.

***Reticularia intermedia* Nann.-Bremek.**
Rotting deciduous logs. April & Aug, rare. FR: Grimbocar Wood 18 (PAA 2002). On log Anston Stones Wood 58 (CH 2002). 18, 58.

***R. lobatum* (Lister) Farr**
Under decaying oak and conifer stumps and logs. Nov-April, frequent. FR: Lockerbrook 18 (PAA 2001). 18, 28, 39, 38, 46. Found by upending decaying oak stumps, often in coniferous plantations on former site of oak woodland; once under Sitka spruce stump.

***R. lycoperdon* Bull.**
Trunks of dead standing trees such as alder, beech, hawthorn, oak, pine, Sitka spruce. April-May, Sept, common. FR: pre-1960 58 (Ing 1982). (16), (17), (18), 19, (26), (27), 28, (29), (37), 38, (39), (47), 49, (56), 57, 58, 59. Many of these records made by general mycologists.

***Stemonitis axifera* (Bull.) T. Macbr.**
Rotten wood, in Sheffield area only on elm. Aug-Dec, rare. FR: 27 pre-1960 (Ing 1982). Grimbocarr Wood 18 (PAA 2002) an unusually small-spored form; Lathkilldale 16 (PAA 2002). 16, 18, (27).

***S. flavogenita* E. Jahn**
Rotten wood. July-Oct, rare. FR: Bakewell 26 & Grindleford 27 (BMS 1909). Chatsworth 26 (BMS 1956), Linacre Wood decorticated log 37 (CH 2000), Stubbins Court on willow 36 (PAA 2003), Lady Cannings Plantation on wood chip pile 28 (OLG 2004). (26), (27), 28, 36, 37.

***S. fusca* Roth.**
Dead wood. May-Oct, occasional. FR: Lathkilldale 16 (BMS 1980); 16, 17, (26), (27), 28, (37), (38), (39), 57, (58), (59).

***S. splendens* (Rex) Lister var. *webberi* (Rex) Lister**
Dead wood. July-Aug, rare. FR: Grimbocarr Wood beech log 18 (CH 1997, det. B.Ing). Win Hill Sitka spruce log 18 (PAA 2002). 18. Nationally rare.

***S. virginiensis* Rex**
Rotting logs, once found on bilberry stems. Aug-Dec, uncommon. FR: Linacre Wood 37 (CH 1997). 18, 26, 27, 28, (37).

***Stemonitopsis reticulata* (H. C. Gilbert) Nann.-Bremek. & Y. Yamam.**
Decorticated conifer trunks. Oct, very rare. FR: Lockerbrook Clough fallen larch 18 (PAA 2001, det. Ing). 18. Third British record.

***S. typhina* (F. H. Wigg.) Nann.-Bremek.**
Soggy logs of broad-leaved trees. Aug-Sept, frequent. FR: pre-1960 (Ing 1982). 16, 17, 18, (26), (27), 28, 38, 48, (49), (58), (59).

***Symphytocarpus flaccidus* (Lister) Ing & Nann.-Bremek.**
Stumps and trunks, mainly of broad-leaved trees. April, rare. FR: Anston Stones Wood 58 (YNU 1964). (58).

***Trichia affinis* de Bary**
Rotting, mossy logs of broad-leaved trees. Throughout year, mainly Feb-March, abundant. FR: pre-1960 (Ing 1982). 16, (17), 18, 19, 26, 27, 28, 29, 36, 39, 46, 47, 56, 57, 58, 59.

T. botrytis* (J. F. Gmel.) Pers. var. *botrytis
Dead wood especially of conifers. Recorded in every month, but most frequently Nov-May, abundant. FR: pre-1960 (Ing 1982). (16), (17), 18, 19, 20, 21, 22, 23, 36, 38, (39), 46, 47, (56), 57, (58), (59).

***T. botrytis* var. *cerifera* G. Lister**
Oak and conifer wood. Feb-Apr, rare. FR: Reddicar Clough 28 (PAA 2000). Teversal Trail

46 (PAA 2002, 2004), Birchin Clough 19 (PAA 2002), Reddicar Clough 28 (PAA 2003, 2004). 19, 28, 46. Nationally rare.

T. contorta* (Ditmar) Rostaf. var. *contorta

Fallen branches, leaf litter, once on grouse droppings. Jan-Feb & May, uncommon. FR: 58 pre-1960 (Ing 1982). (16), (17), (27), 28, 37, 57, (58).

***T. contorta var. *attenuata* Meyl.**

Dead bark and leaf litter. Nov-Dec & May, rare. FR: Bowden Howsteads Wood blackthorn litter 48 (PAA 2000, det. Ing). Westend Clough beech litter 19 (OLG 2001), Cressbrook Dale aspen log 17 (PAA 2003) Lady Cannings Plantation dead willow leaf on wood chip pile 28 (PAA 2004). 17, 19, 28, 48. Nationally rare.

***T. contorta var. *inconspicua* (Rostaf.) Lister**

Twigs and leaf litter. March, rare. FR: Lady Clough blackthorn litter 19 (PAA 2000). 19.

***T. contorta var. *iowensis* (T. Macbr.) Torr.**

Dead wood. Dec, rare. FR: Cressbrook Dale on the bark of a standing dead aspen 17 (PAA 2002). 17. Nationally rare.

T. decipiens* (Pers.) T. Macbr. var. *decipiens

Dead, unrotten wood. Oct-May, mainly Feb-March, abundant. FR: Parkin Clough 18 (PAA/OLG 2000). 16, 17, 18, 19, 27, 28, 29, 36, 38, 39, 46, 47, 56, 57, 58, 59. Early records are of the aggregate species from which *T. meylanii* has been separated.

***T. decipiens var. *hemitrichoides* Brandza**

Associated with moss on the logs of broad-leaved trees. Feb-Apr, local. FR: Deep Dale 17 (PAA 2000, conf. Ing). 16, 17, 19, 26, 38. Third British record. Inconspicuous and probably under-recorded.

***T. flavicoma (Lister) Ing**

Leaf litter. Jan, rare. FR: Holmesfield Park Wood 37 (OLG 2001). 37. Nationally rare.

***T. meylanii Ing**

Soft rotting logs particularly of elm. Aug-March, frequent. FR: Grimbocarr Wood 18 (PAA 2001). 16, 17, 18, 26, 27, 29, 36, 38, 39, 46, 57, 58. Previously included within *T. decipiens*.

***T. munda* (Lister) Meyl.**

Mossy debris and bark culture. Season unknown, rare. FR: Chatsworth 27 (BMS 1909). Organic debris Rivelin Valley 28 (CH 2002), Stanton Moor on oak bark 26 (PAA 2003). 26, (27), 28.

***T. persimilis* P. Karsten**

Recently fallen logs, grass litter, once on living *Mercurialis*. Jan-May, uncommon. FR: pre-1960 (Ing 1982). (16), (17), 18, 19, (26), (27), 28, 39, (46), 56, (57), 58.

***T. scabra* Rostaf.**

Rotting logs especially of elm, characteristic of ancient broad-leaved woodland. No particular season, occasional. FR: 46 pre-1960 (Ing 1982). (16), 17, (26), 27, 28, (38), 39, 46, 58.

***T. sordida Johanessen**

Leggy heather, locally abundant in deep under-litter after snow. Jan-Apr, local. FR: Ladybower Wood (PAA 2000, det. Ing). 18, 19, 28, 29, 38. The Ladybower Wood record was the first for Britain; at present the species has only been recorded from the Sheffield area and a single site in Mid-Wales. *T. sordida* is a member of the nivicolous snowline *Myxomycete* community and is only the second of this group of species recorded from England.

***T. varia* (Pers.) Pers.**

Dead wood, typically well-rotted, logs. Aug-May, very common. FR: pre-1960 (Ing 1982). 16, 17, 18, 19, 26, 27, 28, 29, 36, 37, 38, 39, 46, 47, 49, 56, 57, 58, 59. Possibly the commonest species in the Sheffield area, its habitat range includes ruderal sites.

***T. verrucosa* Berk.**

Mossy logs in humid woodland. Feb-May & Sept-Nov, uncommon. FR: 27, pre-1960 (Ing 1982). 18, 19, 27, 28, 29, 38. Tends to be a ravine species in the Peak District.

***Tubulifera arachnoidea* Jacq.**
Rotting logs and stumps especially of conifers. Sept-Nov, occasional. FR: pre-1960 (Ing 1982). (17), 26, 27, 28, (57). Under-recorded in the Sheffield area.

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BOOK REVIEW

Global Warming: a Yorkshire Perspective edited by **Margaret Atherden**. Pp. 113. PLACE Research Centre, York St John College, York YO31 7EX. 2003. £5.50 paperback.

These accounts are based on a PLACE symposium. John Lawton as the first speaker related climate change to nature conservation, pointing out that nine of the ten warmest years on record occurred during the last decade of the 20th century and that global warming could be linked to increased carbon dioxide in the atmosphere. Predictions were for warmer but wetter winters for Great Britain but for wetter summers in Scotland and warmer summers in England and Wales; and if the Gulf Stream was diverted, then our country would become much colder. Such climate change would affect the distribution of wildlife. The next speaker, Richard Chiverrell, has studied climate change by looking at peat profiles from the North York Moors, in particular looking for plant macrofossils, testate amoebae and signs of plant decomposition. Apart from the recent change in climate he found major climate changes at *c*. AD1400, *c*. AD500 and *c*. BC500. Prof. Stuart Lane then presented data on the changing hydrology in Yorkshire with particular reference to the River Ouse at York. He found that floods were becoming more frequent as well as increasing in magnitude. He considered these changes to be a consequence of a general increase in winter rainfall and improved land drainage. Next A. J. Long gave an account of past and future sea-level changes along the Yorkshire coast based on a study of the Humber estuary. Even without climate change he predicted that the rate of sea-level rise will become more rapid in the next 50 years. Prof. P. Grimes then considered the effect of climate change on the British flora. In particular, he gave details of his most interesting results from field experiments of the effects of changes in winter temperature and summer rainfall on vegetation plots over a 5-year period. Dr Pamela Berry provided details of modelling changes in habitat and species distribution as a result of global warming. She showed that the conservation movement has a dynamic future to consider. As an epilogue, Lance Saxby from the City of York Council explored the challenge of a warmer York. This book is very informative and well worth a read.

MEA

POLLEN IN THE FAECES OF BATS (CHIROPTERA) AS INDICATORS OF FORAGING HABITATS

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INTRODUCTION

Analysis of pollen in animal faeces, both fossilised (coprolites) and contemporary, has been the subject of a range of investigations for a number of reasons such as palaeo-environmental and dietary studies (Martin *et al.* 1961, Spaulding 1974, King 1997, Rasmussen 1993), prehistoric human faeces with regard to diet (Martin & Sharrock 1964), and analysis of contemporary animal faeces in relation to pollen rain, diet and habitat (Moe 1983, Caulton & Gibson 1988).

The nutritional value of pollen in tropical bat pollinators has been the subject of several studies using faecal pollens as indicators of preferred food, source flowers from which fresh pollen could be gathered *en masse* for biochemical analysis (Turner 1984, Studier *et al.* 1994, Korine 1999, Roulston & Cane 2000). Pollen loads collected from large insects have been studied in Australian subtropical rainforests (Williams & Adam 1998). Faecal analysis for allergenic pollens were undertaken for horse (Dixon *et al.* 1992, Kreckek *et al.* 1993) and dog (Fraser *et al.* 2001) enabling the indication of the cause of atopic symptons in these animals. There have been no studies reported in the literature relating to temperate zone bat species and foraging habitats using indicator pollens in faeces.

MATERIALS AND METHODS

Faecal sample from five species of bat were received from roosts, churches and barns in East Yorkshore and West Lothian: Pipistrelle (*Pipistrellus pipistrellus*), Natterer's (*Myotis natteri*), Long-eared (*Plecotus auritus*), Nocule (*Nyctalus noctule*) and Daubenton's (*M. daubentonii*). All samples were kept in the laboratory freezer until treatment, which followed that used for pollen studies on herbivore faeces (Caulton 1988). A total of 46 samples were treated: Pipistrelle 25; Natterer's 6; Long-eared 8; Noctule 1; Daubenton's 2 and mixed species 4. Upon receipt, each sample was allocated an accession number with identity of bat, locality of collection, date of collection and collector's name.

In view of the possible health hazard posed by spores of the pathogenic fungus, *Histoplasma*, treatment was undertaken in a nearly-closed fume cupboard, with protective clothing and accessories worn. Histoplasmosis is an extremely rare condition in temperate regions inhabited by bats, never-the-less all precautions were taken.

A small quantity of treated faecal samples was pipetted on a slide and mounted in phenolysed glycerine – glycerol stained with basic fuchsin. The slide was covered with the cover slip and the margin sealed with colourless (commercial) nail varnish. Each slide preparation was labelled with the sample's accession number. Examination was undertaken using a Leitz "Biomed" binocular microscope at x 400 magnification. (x 1000 magnification was used only where detailed examination of the grain was required to confirm identification). Reference was made to illustrated keys (Hyde & Adams 1958, Grant-Smith 1984, Moore *et al.* 1991). Slides exhibited numerous arthropod fragments (bat prey), which, whilst not the primary concern of the investigation, never-the-less had their own intrinsic interest (Shiel *et al.* 1997). Backround information on Chiroptera in general, was by reference to several works Vesey-Fitzgerald 1949, Harrison Matthews 1952, Proctor & Yeo 1973, Lane 2000, Altringham 2002).

RESULTS

The number and taxonomic range of pollens recorded for the faecal samples treated varied considerably not only between the five bat species, but also within species. Thirty pollen types were recorded from 46 samples belonging to 23 families, five of which were identified as being significant: Poaceae, Umbelliferae, Pinaceae, Tiliaceae and Asteraceae; the remaining families were categorised as "other taxa". Table 1 enumerates the pollen count and percentage of the total pollen count for each of the five families and other taxa for each bat species, and Table 2 enumerates the pollens recorded and the percentage for each species of bat. Determining foraging areas from the mixed samples was not possible for any meaningful interpretation. In one sample of Pipistrelle faeces (acc. 00448 from East Yorks collected in October, 2001), an interesting observation of *c*.70 pollen grains of *Chenopodium album* was observed, the grains clustered *en masse* among the bristles of an arthropod leg segment.

Achillea millefolium and *Senecio jacobea* pollen were the dominant types of the Asteraceae and were found abundantly in the faecal samples of Pipistrelle, Natterer's and "mixed" spp. Both pollen types were absent from the faeces of Long-eared and Daubenton's bats. Small quantities of *Hieracium* and *Taraxacum officinalis* comprised the remaining composite pollens.

TABLE 1

Numbers and percentages of each type of pollen for each plant category

Category	Pipistrelle		Natterer's		Long eared		Noctule		Daubenton's		Mixed Species	
	Pollen grains	%	Pollen grains	%	Pollen grains	%	Pollen grains	%	Pollen grains	%	Pollen grains	%
Umbelliferae	39	5	36	3	0	0	4	13	0	0	224	30
Poaceae	376	46	650	60	219	57	16	53	18	38	220	30
Asteraceae	41	5	181	17	8	2	0	0	0	0	205	28
Tiliaceae	119	15	3	0	18	5	0	0	1	2	18	2
Pinaceae	86	10	8	1	63	17	6	20	2	4	3	1
Other taxa	158	19	211	19	72	19	4	14	14	56	69	9

DISCUSSION

The number of pollen grains recorded from samples for each bat varied greatly (Table 2); in the case of Pipistrelle, counts ranged from 6 to 81 (mean 36). It has been suggested (Lane *pers. comm.*) that the lowest number of pollen grains recorded were most likely to have been from immature individuals, possibly still at the suckling stage. Many Pipistrelles forage for small insects over water (gnats, midges, flies, etc.) which may also explain low counts.

Pipistrelle faeces accounted for the highest number of Umbelliferous pollens (excluding the counts from mixed species faeces). Collecting dates of Pipistrelle samples extended over six months (29 April-23 October). Three taxa recorded, *Anthriscus sylvestris, Heracleum sphondylium* and *Conium maculatum*, respectively characterise spring, summer and autumn flowering times. Because of overlap of flowering times between these seasons, it was decided to group them together under Umbellifereae.

Ecologically, *Anthriscus* is a component of the hedgerow community, a habitat exposed to a greater amount of sunlight than woodland, the habitat of *Heracleum* and *Conium*. The umbelliferous inflorescence comprises a domed platform of a cluster of flowers that attracts a range of insect and small arthropod pollinators (Corbett 1970).

The highest pollen counts for Pipistrelle were for grasses, which are anemophilous and pollen trap records in northern Britain indicate a dehiscence period beginning in May and ending in July (Caulton 1988-2003). Data from these records show the diurnal periodicity during June, frequently display evening and overnight dehiscence, when the local climatic conditions are warm, and dry with a light breeze. Bats skimming the surface of dehiscing

TABLE 2
Total number and percentage of pollens for each bat species

Category	Total number of pollen grains	%
Pipistrelle	819	27
Natterer's	1089	35
Long-eared	380	12
Noctule	30	1
Daubenton's	35	1
Mixed spp	739	24

grasses may well accumulate considerable quantities of pollen during foraging (Table 2).

Tilia vulgaris pollen also figured prominently in Pipistrelle faecal counts, but less so in Long-eared and mixed spp. *Tilia* flowers are pollinated by small bumble-bees, but as flowers are pendulous and tend to occur at the distal ends of branches, much pollen is dispersed by wind. Bats may pick up such released pollen grains on their fur whilst foraging in the vicinity of *Tilia* trees, which are commonly planted on estates and suburban areas, parks etc. as amenity trees; many attain considerable size when mature and frequently, the lower branches of the canopy dip down forming a "tent", into which foraging bats may penetrate and find rich supplies of prey (Lane *pers. comm.*). Pipistrelle was the only bat species to record a significant number of *Tilia* pollen (Table 1).

As with Poaceae, conifers such as *Pinus*, *Abies* and *Picea* are anemophilous, shedding vast amounts of pollen under dry warm and breezy conditions during May and June. Both Pipistrelle and Long-eared bats trapped quantities of pollen of these conifers during foraging flights in the vicinity of coniferous woodland. Natterer's, Noctule and Daubenton's bats gathered on their coats significantly less conifer pollen. Upon returning to their roosts after foraging, bats groom their fur, removing pollen derived from wind and present on the integuments of arthropod prey. The pollen grains enter the digestive tract, their exines passing undamaged with the faeces. The pollen contents are digested and may (incidentally) contribute nourishment to the bat's diet.

Achillea millefolium and *Senecio jacobea* occupy distinct habitats, the former growing in the hedgerow, verge and gravelly soils, whilst the latter is characteristic of grazed meadowland, and being toxic to cattle when eaten. Pollen counts of *A. millefolium* were high in Natterer's and mixed spp., but much lower in Pipistrelle, indicating the verge habitat as a fruitful source of prey. The shallow dome of the inflorescences of *A. millefolium* with its distinctive scent attracts many small pollinators. The inflorescence of *S. jacobea*, comprises a cluster of daisy-like florets forming, like *A. millefolium*, a dome but more open. Again, as with *A.* millefolium, the inflorescences of *S. jacobea* provide a rich and varied source of prey.

Table 1, Pipistrelle and Natterer's respectively, indicate hedgerow, verge and meadow pasture foraging habitats. Grassland and open woodland habitats for foraging appear to be preferred by Long-eared bats. Both these habitats, either as meadow or wooodland fringe, where large quantities of airborne pollen of grass and conifer are trapped during flight, are indicated by such pollen.

In both Noctule and Daubenton's, grass pollen was dominant. Both umbelliferous and pine pollen were present but in relatively low number and percentage, indicating grassland adjacent to woodland. The majority of pollen species grouped under the category "other taxa" (Table 1) were herbaceous, characteristic of open habitats in the majority, a few occurring in open woodland, e.g. *Silene dioica*, thistle *Cirsium* or *Carduus*, and perennial shrubs *Erica* or *Calluna*.

The application of the concept of "indicator species" to habitat recognition by means of pollen ingested and voided in the faeces of animals such as bats, enables studies to be made with some degree of confidence in determining the principal foraging habitats of nonpollinating Chiroptera in the temperate regions. The application of this technique also has implications for bat conservation and habitat preservation.

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BOOK REVIEW

Trading the Genome: Investigating the Commodification of Bio-Information by **Bronwyn Parry.** Pp. xv + 319, with diagrams & graphs. 2004. Columbia University Press, New York. £25.50 hardback.

Bronwyn Parry has revealed, partly through interviews, much of the modern commercial world of pharmaceutics, and has invoked information technology as a paradigm: cells, and DNA sequences may be traded. Even *information* about the molecular structure of pharmacologically active compounds contained within natural materials 'may become a key commodity *in its own right*'. She reveals the complexities of matters such as invention, co-invention, patenting and ownership of 'the genome' (and its fragments), and what she describes as the larding up of layers of contractual and legislative requirements which, in fact, have not resulted in any *substantial* economic returns to source countries from the exploitation of their collected materials.

Until well after the beginning of the last century large collections of dead and living organisms were being built up, first in institutions in Europe and later also in the USA. Some tropical plant species were found to be of pharmaceutical value. These could be imported either raw or partially processed from what was by then 'the third world'. Climate-dependent production of the raw materials *sometimes* remained *in situ* with at least part of the commercial benefit remaining in 'local' hands. Useful materials might originate from crops, or from the wild. Institutions such as The Royal Botanic Gardens, Kew produced regional Floras without obvious commercial objectives. According to Hutchinson and Dalziel (*Flora of West Tropical Africa* (2nd edition) revised by R. W. Keay, 1954, Crown Agents, London) "The chief purpose of [one such] Flora is to render easy the determination in the field of the Vascular Plants of West Tropical Africa". However an Appendix to the same *Flora* records the uses to which plants were put by local people and healers: this was described in its Preface thus: "Such a supplement is a new departure in connection with the publication of a Flora and its compilation was undertaken in the belief that it will furnish a valuable link between botanical knowledge and research and the work of those who are concerned with the administration, welfare and economic development of the region . . .". Floras, based on the non-commercial work of many collectors and taxonomists, are an important primary foundation of modern bioprospecting: yet, surprisingly, they receive no specific mention in Bronwyn Parry's book, and a volume such as the Appendix described above (with some 800 genera, most with multiple species, included) must be a goldmine for 'bioprospectors'. Only a reference to a 1995 paper prepared for the 'South Pacific Consultation on Indigenous People's Knowledge and Intellectual Property Rights, United Nations Development Program . . .' suggests what has been largely lost sight of in the world of invention, patenting, licencing, royalties etc.: as Parry quotes from an interviewee "This whole idea of including healers as co-inventors is tremendously difficult . . .".

Bioprospecting – combing biomes for organisms of possible (often pharmaceutical) use – would once have involved the organization of expeditions and the transporting of large amounts of material from a geographical source to extraction and testing facilities in the northern hemisphere. Much of the necessary preliminary work, however, came 'for free' to the pharmaceutical industry from the original discovery and naming of species to the publication of unattributable local knowledge. Until comparatively recently the great systematic repositories of named living and dead specimens freely exchanged materials and specimens with each other, and with academic institutions, with no commercial strings. This freedom, as Parry shows, is now compromised.

Where very large quantities of the living source material are required to produce a tiny amount of a pharmacologically active substance, it is likely to be neither commercially nor ecologically sustainable for countries in the developed world to grow it or to import it. Effort is now devoted to produce small replicable proxies for the 'messy thick organism': this applies even when the plant source is a temperate species in cultivation such as the Yew *Taxus brevifolia* – the original source of the trademarked drug Taxol used in the treatment of ovarian and breast cancer.

Parry explains that synthesis of analogues of complex pharmacologically active compounds found initially in living organisms was always unlikely to prove commercially viable, whilst commercial-scale fermentation (the PCF process) developed in the mid-1990s allows viable quantities of some active compounds to be generated from very small amounts of collected material. Cultured cells, genes, plasmids, biochemical compounds etc, and even DNA strands, are then proxies for the original organisms. DNA extraction techniques are now so advanced that it is possible to use long-dead herbarium specimens as sources: a few milligrams of material may be all that is required to initiate production of potential pharmaceuticals for use in extremely rapid high-throughput predictive assays against, for example, a range of cancer cells in culture. Bioprospecting for DNA appears to have already occurred in some academic and scientific collections.

The possibilities for translocating 'valuable' genetic material into a culturable cellular vehicle for its commercial exploitation are endless. The repositories of scientific collections of whole organisms could possibly get some benefit, as will, more certainly, commercial repositories of cryogenically preserved whole specimens and extracts ('libraries of plant animal, fungal, microbial and even human genetic materials'); such repositories in the USA are described and listed. The underdeveloped countries from which much of the genetic material originated may get little or no benefit; the difficulty of assigning a geographical provenance to, for example, genes that have been combined with others in cultured cells of a host organism are insurmountable.

I have always been glad that some commercial justification for conservation of threatened ecosystems, such as rainforests, could be advanced as a deterrent to their complete destruction (I appreciate 'messy thick organisms' that have not been decontextualised or disassembled!). It is dismaying that bioprospecting has led to legalistic hindrances to collection of plants for taxonomic purposes, and has impeded botanical fieldwork, in developing countries. Parry has suggested how 'all parties' could benefit from what she describes a 'moderated free access regime', and suggests a voluntary (*voluntary*?) global agreement from the pharmaceutical industry to ameliorate some of the (financial) inequities that have characterised collection processes in the past.

Trading the Genome is strongly recommended as an eye-opener to the practices of the modern pharmaceutical industry, both in terms of the technology now available, and the routes to corporate profitability. The sources of information for each of the seven chapters are provided in a Notes section; there is also a Bibliography, and an Index which may not be quite as comprehensive as one would like: for example, vincristine and vinblastine 'derived from materials collected without recompense' do not appear there. A useful addendum could have been a glossary of all those bodies represented by initials – a rapid reminder rather than a tax on the reader's memory each time a GATT, TRIP, UNCED, GRAIN or other conglomeration of capitals appears in the text. DJH

THE HINCKELHAUGH INSECT IN JOHN RAY'S POSTHUMOUS WORK, *HISTORIA INSECTORUM*, 1710

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Introduction

Modern-day naturalists are familiar with the name Linnaeus (Carl von Linné) (1707-1778), and know of his system and method for plant and animal classification, part of which advocated the use of binominal nomenclature. Linnaeus eventually became consistent in his use of binominal nomenclature, but only over a period of many years, and several publications. In his earlier scientific works, he embraced the polynomial, or phrase-name, system used by his immediate predecessors and contemporaries, and used up to twelve words for the species element, following one word for the genus (Pont, 1996).

One of the predecessors of Linnaeus was John Ray (1628-1705), the foremost English naturalist of his age, who is credited with being the first zoologist to recognise the concept of the genus and species as systematic units (Pont, 1996). The life and works of Ray, whilst hardly touched upon in this current paper, are worthy of consideration by Yorkshire naturalists, for, during the 17th century, he travelled to some of the more remote parts of the county, and included occasional references to places in Yorkshire amongst his works and correspondence.

At the time of John Ray's death in 1705, his great work on insects, *Historia Insectorum*, was an incomplete manuscript; however, it was published posthumously by the Royal Society in 1710. On page 273 of this work, John Ray gives a polynomial scientific description of an insect he found at 'Hinckelhaugh' near Settle. This is probably the earliest published Yorkshire record of a scientifically described insect.

Ray's Scientific Description of The Hinckelhaugh Insect

Ray's scientific name, description and notes on his specimen are as follows: "*Musca Apiformis montana, corpore breviore, thorace nigro, abdomine annulis nigris et rubris alternis vario*. Ape vulgari mellifica paulò brevior est, thorace nigro, abdomine annulis nigris et rubris alternis composito. Alae cinereae transversa linea nigra prope imam partem notatae. In monte praealto *Hinckelhaugh* dicto prope *Settle* Comitatûs Eboracensis oppidulum, inveni. Valdè importuna erat et molesta circa montis cacumen. Aculeum non habet, verum forcipes ad caudam iis quae in erucarum ore similes". [Translation: *Bee-shaped mountain fly, shortish body, black thorax, abdomen marked with alternating black and red rings*. It is a little shorter than the common honey-bee, with black thorax, and abdomen marked with alternating black and red rings. The wings are ash-coloured and marked near the end part with a black line across. I found one on a very high hill called *Hinckelhaugh* near the small town of *Settle* in the county of Yorkshire. It was a very aggressive nuisance near the top of the hill. It has no sting, but has pincers in the tail similar to those in the mouths of caterpillars.]

Discussion on the possible identity of Ray's Hinckelhaugh Insect

In the absence of Ray's Hinckelhaugh specimen, which was presumably accurately described by him, it is unlikely that we will ever be absolutely certain of the identity of the species concerned, but calculated conjecture can be offered.

Dale (1852) presumed that it was the same species as one encountered in numbers on Dartmoor by Mr. Paris, and about which Dale desired to know the identity of the species concerned. After some discussion and correspondence, Bloomfield (1883) understandably stated "I think we are now in a position to say that Mr. Paris' piping fly was probably *Sericomyia borealis*" [= *S. silentis* (Harris, [1776]) (Diptera: Syrphidae)]. This does not mean that Ray's insect was also likely to be *S. silentis*; indeed there are several parts of Ray's description which distinctly disagree with this species. Bloomfield (1883a) was perplexed by Ray's Hinckelhaugh insect, and posed the question "Is any British insect known which will in all respects answer this description?".

Dale (1852) had quoted Ray's description and notes *verbatim*, with the comment that "The first part seems to agree with a *Tabanus*, but the latter part with the *Asilus* of the moderns, and yet the account agrees better with the former, and still less with *Oestrus* [presumably also of the moderns] or *Sericomyia*". Dale naturally assumed that the species was a dipteran, but this may not have been the case, because in *Historia Insectorum* not every '*Musca*' is a dipteran, nor is every dipteran a '*Musca*', nor are all the dipterans and '*Musca*' species to be found in the same part of the book.

The Hinckelhaugh insect is apparently listed under '*Muscae bipennes*' (flies with two wings), a section which occupies pages 266-276, and comprises an unbroken list of 52 of Ray's miscellaneous '*Musca*' species; however, the last 13 of these 52 are certainly not dipterans, for their names begin with '*Musca quadripennis*' (a fly with four wings), or contain the word '*quadripennis*'. This section of *Historia Insectorum* appears to be incomplete, and inconsistent with Ray's method as outlined in the introduction entitled *Prolegomena de Insectis*. In his introduction, Ray gives a table apparently referring all the '*Bipennia*', to the name '*Culex*' [the Latin word for a gnat, midge, or similar insect] not '*Musca*' [a general Latin word for a 'fly'], and separates these from the '*Quadripennia*', which are sub-divided into several groups, apparently including '*Muscae Vespiformes*', '*Apiformia*' and '*Vespiformia*'.

Some of the species described on pages 266-276 contain words such as '*bipennis*' (two-winged) or '*carnaria*' (connected with meat), and should presumably be dipterans. The Hinckelhaugh insect, described on page 273, is one of four species, placed together, whose description begins '*Musca Apiformis*'. There may be a significance attached to the higher-case letter in '*Apiformis*', which could indicate the species is in Ray's concept of a group he termed '*Apiformia*', these apparently being hymenopterans. If there is such significance in the use of an upper-case letter at the beginning of the word following '*Musca*', then it would follow that '*Musca Vespiformis maxima*', etc., which is placed in the list between the '*Musca Apiformis*' species and the '*Musca quadripennis*' species, would presumably be a hymenopteran; whereas '*Musca vespiformis minor*', etc., which is placed amongst some '*Musca bipennis*' species, would presumably be a dipteran. A species containing the word '*apiformis*' with a lower-case 'a', *viz*. '*Musca bipennis apiformis*', etc. is obviously a dipteran. It may be that the first section of Ray's '*Muscae bipennes*' are all Diptera, and the second section are all Hymenoptera, but the heading '*Muscae quadripennes*' was simply omitted in error. Further and prolonged study is needed before a definitive opinion can be formed on all the aforementioned.

I know of no British dipterans that would adequately match the description of Ray's Hinckelhaugh insect. My best instinctive guess would be that it could have been a very small reddish male of the Birch Sawfly *Cimbex femoratus* (Linnaeus, 1758) (Hymenoptera: Symphyta: Cimbicidae); the larvae of these are frequently found, but the adults are elusive. This species is possibly fairly common in Yorkshire (J. D. Coldwell, *pers. comm*.). The occurrence of large dipterans or large hymenopterans swarming above high hills is a known, but rarely witnessed, phenomenon; for example, I was somewhat surprised to find a male of another large sawfly, *Urocerus gigas* (Linnaeus, 1758), on the viewpoint pinnacle of a treeless high hill on Cringle Moor (NZ535033) on 13.8.1995. More intriguing still is the observation regarding this species in Anon. (1876) which stated "Mr. Edward Taylor exhibited a living specimen of *Sirex gigas*, captured in the town [Huddersfield] on a horse's back. As the horse was apparently excessively annoyed by it, some surprise was expressed as to the reason why a purely vegetable feeder should be found in such a situation".

THE LOCALITY 'HINCKELHAUGH'

Raven (1942) endeavoured to locate the 'high hill' near Settle, which Ray called Hinckelhaugh, or, as he once spelt it, Hinckle-hoe, but failed to find such a locality on maps of the Settle area, nor was he able to find any local knowledge of the name. He dismissed the obvious suggestion that Hinckelhaugh was simply a variant form of Ingleborough (as assumed by Bloomfield, 1883), because he found both localities mentioned by Ray in one place; moreover, he noted that elsewhere Ray had described Hinckelhaugh as 'overhanging the town of Settle', and 'about three miles east of it'. This suggested to Raven that Hinckelhaugh was the gritstone eminence, on one of the lines of the Craven fault, which is named on modern maps as Rye Loaf Hill. His further enquiries established that this hill was formerly called Inglehow; it is therefore very likely to be synonymous with Ray's Hinckelhaugh.

Today the mountainous area to the east of Settle is rather devoid of adult insects; moreover it is impoverished in flowering plants and virtually devoid of shrubs or trees. Likewise birds are not much in evidence aside from the conspicuous Peregrine Falcons, Jackdaws and occasional Common Buzzard. The entire area is currently grassland, enclosed by dry-stone walls, and grazed by roughly equal numbers of cattle and sheep. Most of the adult insects present occur in the vicinity of the springs and wet meadow lying to the south of Attermire Scar, and along Stockdale Beck westwards of Rye Loaf Hill.

Further Notes on *Historia insectorum*

That Ray's *Historia Insectorum* was published at all is remarkable as work on insects etc. was necessarily neglected by him, until his treatises on groups within certain higher orders had been completed. By the time he concentrated his attention on entomology, he was working under difficult conditions (Salmon *et al.*, 2000). At this time he was living with his wife and daughters in rural Essex ('Dewlands', Black Notley, near Braintree), ageing, generally in poor health and without ready access to either zoological collections or a library. Salmon *et al.* (2000) stated that shortly before his death, Ray recognised that 'The work which I have now entered upon is indeed too much for me. I rely chiefly on Mr. Willughby's [Francis Willughby (1635-1672)] discoveries and the contributions of my friends'.

The classification of insects was always likely to prove problematic to John Ray, for these had mainly been the deceased Willughby's department; indeed it was Willughby who had been responsible for most of the zoological collecting carried out during their wide-ranging travels together in the 1660s. Ray's entomological studies were further hampered due to Willughby's invaluable notebooks being withheld from him until almost the end of his life. A few entomological specimens collected and mounted by Ray are believed to exist in the collection of his associate Hans Sloane, which is held at The Natural History Museum, London (Salmon *et al.*, 2000).

Historia Insectorum is really three books in one. With the exception of a letter in English, and the odd personal or vernacular name, the text is entirely in Latin, including the Latinisation of the author's name to *Joanne Raio*. The first part, on pages iii-xv, is entitled *Prolegomena de Insectis*; this was a reprint of his *Methodus Insectorum* published in 1705, shortly before his death. In *Prolegomena de Insectis*, Ray includes several tables, and divulges the principles by which he was attempting to conquer the classification of insects and related groups adequately.

The main part of *Historia Insectorum* is titled as such and occupies pages 1-375. As previously stated, this is Ray's incomplete manuscript, which was edited prior to its publication. One assumes that if Ray had lived to see the completion of his work on *Historia Insectorum*, then the species described therein would have been ordered and classified according to his method outlined in *Prolegomena de Insectis*; however, this was not to be the case, and so the main text occurs in various stages of incompletion, with some groups of species numbered and ordered, and others not. Likewise, some species are fully described with detailed and fascinating annotations, whereas others exist only as a polynomial name. Ray was particularly interested in butterflies and moths, and their caterpillars, and these are relatively well dealt with in *Historia Insectorum*, but even these are not treated together, with, for example, many moths described and listed under the heading of the year in which they were found. At the outset of his work on insects, Ray decided to concentrate on those which occur in Britain, but foreign insects are, nevertheless, occasionally included.

The third part of *Historia Insectorum* (pages 377-398) consists of a comparatively well-ordered appendix on British beetles by Martin Lister (1638-1712). This bears the title *Appendix de Scarabaeis Britannicis*, and is followed by an *Index Generalis* (pages 399-400).

In compiling *Historia Insectorum*, Ray drew heavily on the original unpublished work of Willughby, and also gleaned from the publications of other naturalists, including Johann Jacob Swammerdam (1637-1680). Some of the species for which Ray gave scientific descriptions had been described by his predecessors, or were the unpublished work of Willughby, but Ray fully acknowledged the work of others, including the addition of the author's name or initials following the names of species for which he gave a description.

Ray's attention to detail in *Historia Insectorum* is truly commendable, as is the additional information he provides. For some species, at least some of the following are given: the months of the year in which adults, or sometimes larvae, occur; localities of capture; dates of capture; and notes on basic distribution and abundance. The detail is most apparent with the butterflies and moths, where comments like 'captured on 17.7.1692 in my bedroom' are not unusual. An observation sometimes made is that a species 'occurs frequently in southern England', or is 'rare in northern England, but frequent in southern England'; one species, a rare inclusion of a non-British insect, 'occurs frequently in Spain'.

John Ray fully deserves the credit he has been given for the advancements in classification and knowledge he made in *Historia Insectorum*. It was unparalled in its time, and was not truly superseded in terms of classification until the works of Linnaeus. It remains a fascinating example of the fruits of the scientific labours of a widely travelled and knowledgeable 17th century naturalist, who paid attention to detail, and desired to understand, classify, and make order of the natural world around him.

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YORKSHIRE SEABIRDS: A REVIEW OF BREEDING SPECIES

W. F. CURTIS

Presidential address presented to the Yorkshire Naturalists' Union at Cross Hills, 4 December 2004

Introduction

It is my intention, in the course of this review to look at, in particular, the breeding seabirds of Yorkshire from the earliest records to the present day. The information has been gleaned from the various avi-fauna of the County of York from the list prepared by Thomas Allis, in 1844, which he delivered at a meeting of the British Association in York, to that of John Mather in 1986. The journal of the Yorkshire Naturalists' Union, *The Naturalist*, from 1875 to the present day as well as all relevant Ornithological Reports have been consulted. In line with the policy of the YNU, I have used the historical boundaries of the county although this has, at times, caused some minor problems with the areas now in Cleveland, Lancashire and Cumbria, whilst, at a more local scale, all references to Flamborough or Flamborough Head refer to the whole area of the cliffs from Speeton to Sewerby.

The first hurdle which must be addressed is exactly what we consider to be a seabird. The obvious answer to this is "a bird which goes to sea" and, although this will encompass all seabirds it also takes in many other species; and is, in effect, similar to including a ship's cat in a list of marine mammals. In truth there is no one definition so I have taken the one laid out by Schreiber and Burger (2002) who state "marine birds [seabirds] are those living in, and making their living from, the marine environment which includes coastal areas, estuaries, islands and the open sea"; these birds all feed (or are capable of feeding) in saltwater though this is not necessarily the case particularly with inland breeders, *i.e.* some gulls, terns and, in Britain recently, cormorants. There are also many birds which feed in estuarine areas, *i.e.* waders, which I am not including even though two species, the Grey and Red-necked Phalarope both spend their non-breeding periods in the open ocean. Other species that are found in coastal areas during the non-breeding season, eiders; scoters, divers and, to a lesser degree, grebes, are also excluded. We have thus whittled down this list, being left with albatrosses, petrels, shearwaters and storm-petrels, cormorants, gulls, terns, skuas and auks.

Seabirds share the following characteristics:

(a) they have high adult survival rates of generally between 80 and 95%, although it should be stressed that gulls, terns and cormorants usually have a lower survival rate than petrels, gannets and auks; an age of 60 years for Manx Shearwaters and Northern Fulmars is not unheard of.

(b) the age of first breeding is quite high with cormorants and Black Guillemot when two to three years old; terns and small gulls at three years; the larger gulls; gannets and the remaining auks at four to five; Great Skuas at seven and Northern Fulmars at nine. The age of first breeding though will tend to decrease if the total breeding population falls.

(c) productivity is low owing to small clutch size; petrels, gannets, Common Guillemots, Puffins and Razorbills lay only one egg; skuas, Black Guillemot, Roseate and Sandwich Terns lay two; gulls and other terns, three; Great Cormorant and Shag up to five, although three is more usual.

(d) long chick rearing period, often up to six months. Egg/chick losses may be high some years, particularly so with terns, gulls, skuas and cormorants, and although this loss may be compensated by replacement clutches, the rearing of more than one brood per year is rare with seabirds.

(e) growth of colonies is slow due to the long period of immaturity; thus there is a low recruitment rate. However, since 85 to 95% of breeding birds are experienced as opposed to first time breeders, success is generally high.

(f) they tend to have less colourful plumage than land birds – mainly white, grey, brown or black.

Concerning the small clutch size – the hypothesis has been put forward that this is considered to be a result of the high rate of chick survival (up to 40%) and that large colonies may deplete food sources within the feeding range, thus two or three chicks per pair could not be supported. This hypothesis is not supported by all authorities, although since owls and skuas raise large clutches during years of plentiful food, this would make sense.

It has also been suggested that the size of the colony is related to the feeding range; for instance, shearwaters and gannets which have feeding ranges of up to 450 km, breed in far larger colonies than gulls and terns (Sooty Tern being an exception) where the average feeding ranges are 60 and 15 km respectively. Discounting the species that spend portions of their time inland, i.e. Black-headed Gull, the diet generally consists of fish, squid, krill and plankton, all of which they obtain as sea, a habitat that can vary greatly and where, also, weather can have a significant affect on:

(a) the cost of catching the food (the effort taken to acquire food in both distance to the feeding grounds and of actually catching of the food)
(b) ability to find food (fish behave differently according to weather conditions)
(c) timing of the breeding season
(d) numbers of birds which nest
(e) clutch size
(f) breeding success
(g) survival of adults (winter areas).

Weather may also have effects, in the long-term (i.e over a period of 50 years warming or cooling trends can change the availability of food), seasonal (where poor summers etc may result in less food) and short-term (where gales or adverse weather may curtail the ability of the birds to feed). Surface feeding fish are known to swim at a lower depth during periods of strong winds thereby surface feeders and, in particular, plunge divers find their ability to catch food decreased. Where man and birds target the same species, then food supplies available to birds may be decreased thus also affecting breeding success.

It is here that we must examine the subject of sandeels, one of the staple diets of many seabirds. This issue is rather more complex than formerly thought. Initially, over-fishing was considered to be the prime cause for the decline of this species and the corresponding low breeding levels of seabirds reliant on these fish. It is accepted that low breeding success was recorded during some years when the sandeel fishery was at its height with up to one million tonnes per annum taken and that after a ban on taking this species was introduced between the north of Scotland and Northumberland, breeding success was reported as being much improved. This does not, however, account for the very poor year of 2004, as the ban was still extant. Global warming has also been offered as a cause. However, the International Council for the Exploration of the Sea (ICES) stated that, in 2002, the spring in the North Sea gave exceptionally high water temperatures, whilst 2003 was only an "average" year. Thus the lower recruitment of sandeels in 2003 is not backed up by the hydrographical statistics. A further factor, reported by ICES, is the huge increase in abundance of herring stocks in the North Sea to levels, it has been suggested, approaching those seen before over-fishing caused the crash of the early 1960s. That herrings, which congregate in the north-western North Sea, in winter and spring, feed on sandeel larvae, as well as other large zooplankton, must have a significant effect on the sandeel population. The southern North Sea does not appear to have been affected in the same manner owing to fewer herring being present during this period. We may see, therefore, with a return to the former abundance of the herring and thus a lesser number of sandeels a decrease in seabird numbers.

I will now say a little concerning the exploitation and persecution of seabirds. This was only a significant problem at some breeding locations in Yorkshire owing to the harvesting of eggs for food or for collectors, for specimens, especially in Victorian times, again for collectors, and the use of feathers or plumage for the millinery trade. As a result of this, many tern populations were reduced to a critically low level in parts of Europe. These activities have long since ceased however pressures on seabirds still exist and can have quite a significant effect on their populations. Large gulls are culled, or calls for culling are heard, to minimise their adverse impact on other nearby breeding birds including at moorland colonies where they are reputed to prey on game-bird chicks. The rapid increase of urban nesting gulls has given rise to demands for culling owing to damage to property, noise and alleged health hazards, although as yet practical problems with this control have so far prevented any widespread action to date. Great Cormorants are shot under license (and illegally) to protect angling and commercial fishery interests whilst, sadly, the collection of eggs of some of the rarer breeding birds, particularly Little, Roseate Terns and Mediterranean Gulls is slowing the increase of these species. The trapping, for food or sport, abroad, particularly of immature terns wintering off West Africa results in far fewer individuals returning to breed in future years.

Seabirds face problems from commercial fisheries, especially those using monofilament nets, where, in the open ocean, nets of many kilometres in length killed millions of birds, turtles and cetaceans, until being banned in 1993. It must be stated, however, that in the northeast Atlantic this type of fishing was of a small nature with little by-catch of birds. On the other hand, inshore, fixed gill nets near breeding colonies caused a high mortality of pursuit diving seabirds, and although large numbers of auks were caught, this was insufficient to cause a decline of local populations. Over the past decade the gill net fishery around the British Isles has declined as fish stocks have dwindled, and thus this threat has been greatly reduced. Furthermore, although fixed nets are used off-shore along the coasts of mainland Europe, the numbers of birds trapped therein has been insufficient to cause a decline in our breeding colonies. Long-line fishing has resulted in great mortality amongst petrels and albatrosses in the southern oceans, and has been proven to affect the levels of the breeding colonies in that part of the world. In the north-eastern Atlantic, this type of fishing around the coasts of Scandinavia, Iceland, the Faeroes and Scotland has resulted in mortality of Northern Fulmars and, to a lesser extent, of the larger gulls and Northern Gannets. The decrease in the numbers of breeding Northern Fulmars, in the northern isles may be as a result of this by-catch, although changes in food availability may also be a factor. A more recent problem may be caused by off-shore wind farms. It has long been acknowledged that a substantial number of land birds die as a result of collisions with turbines at terrestrial sites. No research has, as yet, been carried out at sites off-shore where corpses cannot be collected; however, it is known that seabirds fly at a height within the span of the blades and, although radar studies have shown birds tend to avoid the blades, this is not the case in bad visibility or when flying down wind.

Predation of nesting seabirds by mammals on off-shore islands has long been a significant problem. Rats, introduced, generally accidentally, to these islands cause severe predation of eggs and chicks especially in the case of burrow nesting birds. This can actually exterminate populations of some species which is seen by the fact that both British Storm-petrels and Leach's Storm-petrels nest only on islands that are free or rats. A similar situation exists with American Mink which escaped from fur farms and are now found on some of the western isles and parts of western mainland Scotland. Mink can, and do, cause complete breeding failure, with terns, Black-headed Gulls and Black Guillemots being most affected. The same charges can be applied to the domestic cat, whilst, on sandy beaches, the Red Fox can decimate colonies of terns.

Of avian predators in Yorkshire, only falcons and corvids are of any significant problem as will be seen later with regard to the Easington Little Tern colony. Further north in the British Isles, Great Skuas which are capable of killing any breeding seabird occurring in Britain, including adult Northern Gannet, causes great havoc. In the St Kilda group of islands it has been estimated that this species kills some 41,000 birds a year whilst, at Hermaness, the total is thought to be about 11,000.

Northern Fulmar

The remarkable spread of this species was minutely documented by James Fisher (1952).

Fulmars have bred, since historical records have been available, in the Arctic regions, at Spitzbergen, Bear Island and Jan Mayen. It was considered that by 1750 breeding was occurring at two, possibly three, sites in Iceland and, lastly, and most importantly to us, at St Kilda. By 1850, birds from Iceland had not only colonised other parts of that island but spread southwards to the Faeroe Islands. In 1878, breeding was confirmed at a second site in the British Isles, at Foula and, although it is generally stated that the spread occurred from St. Kilda, it must be considered possible that Foula was colonised by birds from Iceland/Faeroes. Following the breeding at Foula, the species spread to other locations in the Shetland Islands, thence the Orkneys and mainland Britain. In 1918, the first prospecting birds were reported from Yorkshire, on the cliffs of the Flamborough headland in the vicinity of Bempton/Speeton, a fact that was reported by E. A. Wallis, father of the late Athol Wallis, a past President of this Union. This was incidentally the first known prospecting of a site in England, with the nearest station being at St. Abbs Head in Berwickshire. Numbers patrolling/prospecting the Flamborough cliffs increased annually so that by 1921 about 15 birds were "in residence". In 1922, the cliff-climbers (known locally as climmers), reported finding Northern Fulmars with eggs, nine by their reckoning, of which four were taken, although they stated that 15 to 20 sites were occupied. Two eggs were brought up on the 26 May, being seen by H. B. Booth, thus affording him the privilege of being the first ornithologist to set eyes upon an English Northern Fulmar's egg. During this period, Northern Fulmars were reported prospecting other locations in the county; in 1921 they were seen off Castle Cliff, Scarborough, and in 1922, they were recorded prospecting in the Whitby area. Breeding at Scarborough was proven in 1929, whilst in 1941 they were seen by W. J. Clarke flying in and out, and landing on the top terraces of the Grand Hotel, at this resort. Today this species has colonised every suitable stretch of coastal cliff and, since 1956, have been reported breeding at several inland sites, notably quarries or similar locations, particularly Stoupe Brow near Ravenscar which is *c.* 2 km from the sea, Hasty Bank, *c.* 12 km inland whilst prospecting has been reported on several occasions from Sutton Bank and Roseberry Topping.

Various counts for the cliffs of Flamborough gave the following: 767 Apparently Occupied Sites (AOS) between Speeton and the Fog Station in 1964; 832 at Bempton in 1983; 500+ chicks along the whole headland in 1974. Further north, at Scarborough Castle Hill, 52 sites were occupied in 1974. More accurate and comparable counts have been undertaken on three occasions during the last 30 years though the use of the regions of Cleveland, Humberside and North Yorkshire do cause some problems, as previously mentioned. During the period 1969-1970 a nationwide survey known as "Operation Seafarer" produced a total of 1172 pairs along our coast, whilst the "Seabird Colony Register" of 1985-1988 gave 2040 and the recent "Seabird 2000" some 2197 as follows:

	Op. Seafarer	Seabird Col. Reg.	Seabird 2000
Cleveland	266	160	219
North Yorkshire	360	920	733
Humberside	546	960	1245

It is obvious from the above figures that discrepancies in counting occurred, particularly in the areas to the north of Filey. The area now in Cleveland consisting of the Boulby and Hunt Cliff has actually remained remarkably steady with the 2003 Cleveland Bird Report giving a total of 260 for that area. In the 30 years between "Operation Seafarer" and "Seabird 2000", the numbers in North Yorkshire increased by 100% whilst those in Humberside (which is the Flamborough headland) saw an increase of 130%. The population of the British Isles has remained constant during the last 15 years where the continued increase of breeding birds in England and Ireland has been off-set by a corresponding decline of numbers in Scotland. The reason for the initial increase and spread of this species was attributed by Fisher (1952) to be as a result of the increase in availability of food in the guise of offal as a by-product from firstly the whaling industry and latterly fishing. However, the depletion in recent years of the white fish take and decrease in fish waste has not seen a corresponding decrease in Northern Fulmar numbers. A future affect on numbers overall may arise from long-line fishing. Some 20,000 birds per year are taken by the Norwegian fleet and, if this is extrapolated to take account of the Icelandic and Faeroese fleets, this could well be at least 50,000, perhaps 100,000.

In line with the spread in breeding colonies, it is obvious that numbers seen off our coast have also increased significantly. It should also be noted that the recent (relatively) increase in observers and the time spent in the field has also been a factor in the increase in records. Allis (1844) considered this species to be "rare on the east coast"; however, by 1868, it was said by local fishermen "to be particularly numerous" and in 1872 "numerous off Flamborough with many being captured on the fishing grounds". With this increase in breeding numbers it is not surprising that large counts, frequently exceeding 4000 in a day, are recorded, especially at Flamborough whilst a maximum of 19,300 were reported passing that headland on 8 February 1983.

Following a period of prolonged storms and severe westerly gales in February 1962, large numbers of Fulmars were displaced into the North Sea with many dead birds being washed up along the beaches of Yorkshire. Some 342 corpses were found, mainly south of Bridlington, where obviously the broad beaches were suitable for retaining the bodies, and, of those critically examined, six were considered to be of the small-billed form *Fulmarus glacialis minor* which breeds in the northeast Canadian Arctic and northwest Greenland. For many years Fulmars had been considered to have two races, nominate *glacialis* which breed throughout the Atlantic and *rogersii*, which is limited to the Pacific. Fifty years ago the Danish zoologist Finn Salomonsen examined a large series of skins collected at Baffin Island in 1924, coming to the conclusion that all these birds belonged to a "short-billed " form with the result that he revived the name *minor* at a subspecific level. Studies by other zoologists over the next 15 years supported his findings. It is only the bill length which distinguishes males of this form from nominate birds, although in the case of females the bird is markedly smaller. In recent years, the form *minor* has fallen from grace with the resurrection of another former race *auduboni*, which covers birds of the lower latitudes on both sides of the North Atlantic, as well as Jan Mayen and Novaya Zemlya, whilst the nominate race *glacialis* occupies the higher latitudes, namely Spitzbergen, Bear Island, Franz Joseph Land, northeast Canada and northern Greenland. The form *minor* is now part of this nominate race with the differences between birds from Franz Joseph Land and Baffin Island being clinal, east to west. Whichever taxonomic theory we subscribe to, it is without doubt that individuals from northeastern arctic Canada occurred in our waters in 1962, the occurrence of such being only the second for the British Isles, the first being at Blakeney (Norfolk) in 1928; a full account of this is provided by Boylan (1967) and a photograph of one of the short-billed birds appears in Mather (1986).

NORTHERN GANNET

This species has increased in the eastern North Atlantic from *c.* 54,000 pairs at 14 breeding locations in 1940 to 132,000 pairs at 17 locations by 1970, and to 259,000 at 21 sites in 2001. The general diet of the Northern Gannet has enabled it to switch prey as fishing reduced stock levels of Herring and Mackerel, its former diet. The rate of growth, *c.* 2% per annum, although sustained over a long period, is low compared with other species of the family, i.e. Australian Gannet with a 6% increase in recent years. It is also low when compared with, for instance, Common Guillemot and Atlantic Puffin which have similar numbers of eggs laid, chicks reared and adult survival and age when first breeding. These two species have increased at *c.* 5% in recent decades, whilst the Northern Fulmar, with similar parameters, has shown an increase of 4% over the part 100 years. No definite reason has been put forward to account for this discrepancy, but it is considered that the relatively low rate of survival between fledging and breeding is the most likely reason; however, there is, at present, little to substantiate this theory.

Northern Gannets generally breed on remote islands mainly in the north and west of the

British Isles. In Yorkshire, we had until recently a unique breeding situation in that the colony at Bempton was the only one to be found on the mainland. In 1988, Northern Gannets were proven as breeding at Troup Head in Scotland, although Bempton is still the only breeding colony in England. Northern Gannets were seen patrolling the cliffs of the Flamborough headland during the early 1920s, with a pair frequenting the area known as "Black Shelf". A nest was reported in 1925, but due to lack of observations and details it was not until 1937 that the first egg was seen at "Jubilee Corner" (so called owing to it being first climbed in the year of Queen Victoria's Jubilee). It is not unreasonable to suggest that eggs may have been laid in earlier years as large portions of the cliffs here are not visible from above. Few reports were forthcoming during the war years, and not until 1944 were details received of birds flying into the same spot, although for reasons given above, neither nest nor eggs were seen. Birds were present during the next few years, but in 1947, a climmer, J. Petty, stated that he considered that breeding had not occurred. In 1948, A. J. Wallis was informed by another climmer that there were three nests, one of which held an egg. Apparently, one of these nests was visible from the cliff top, whilst a report was received from J. R. Artley that two young had been reared. Thus it would seem that some 24 years had elapsed between the first egg being confirmed and the first chick sighted. Little change occurred during the following 12 years with the fortunes of this colony, but, in 1960, six young were raised, after which a slow increase in numbers was noted, with 24 occupied sites in 1970 producing 18 young. In 1971, an adult of an unsuccessful breeding pair was seen to be carrying a colour ring, indicating that it had been reared on the Bass Rock in either 1961 or 1966. This was the first proof, although it had long been suspected, that immigration to Bempton was taking place from Bass Rock where the number of AOSs was increasing faster than at any other large colony. Additional coloured-ringed birds have since been noted at Bempton, thus adding further proof of this trend. (The numbers at Bass Rock increased from 8000 AOSs in 1969 to 44,100 in 2000 and, at that rate, this locality, permitting suitable sites, could be the largest colony in the world by 2012 with an estimated 68,000.) Immigration has resulted in a rapid increase of the colony, the increase being too great to be accountable to returning offspring. By 1974 there were *c.* 100 nests, increasing to 542 in 1983, 1077 in 1989, 1360 in 1992, and to 2552 in 1999. It would appear that once a colony reaches 20 to 30 pairs, a rapid increase occurs, mainly from immigration; thus, had our colony relied on locally born birds returning, there would have been *c.* 60 pairs in 1999, against some 2500.

As with the previous species, the proximity of a breeding colony ensures that large numbers are frequently recorded from our coastline, particularly Flamborough Head, with three figure counts being common and four figure counts not uncommon.

GREAT CORMORANT

This species breeds on suitable coastal cliffs, all of which occur to the north of the Flamborough headland, as far north as Hunt Cliff near Saltburn. The remainder of our coastal areas, consisting of the boulder clays of Holderness and the dunes of Spurn and South Gare, are totally unsuitable for any cliff-nesting seabirds. Recently this species has utilised inland locations, breeding in trees or large bushes, as occurs in mainland Europe. All but three of these inland sites in England have been established since 1988, with the first successful nesting occurring in Yorkshire, at Wheldrake, in 1998, although there were strong indications that a pair may have bred near that location in 1997. Inland breeding is widespread and well established in mainland Europe where all birds are of the race *sinensis* which it was assumed, from plumage characteristics, was the situation in England. This is only partly the story, it now being considered that this continental race does in fact colonise inland areas in Britain, to be followed, when the colony is well established, by birds of the nominate race *carbo*, with old established colonies having quite a large proportion of nominate individuals.

To return to coastal birds, in the mid-19th century it is known that several locations between Saltburn and Scarborough held up to 40 or even 50 pairs; however, due to persecution (a Scarborough man is reported, by Nelson (1907) to have shot 10 out of 20 breeding birds at a colony in the vicinity of Ravenscar) and disturbance, several colonies were either deserted or greatly reduced in numbers, mainly due to the construction of the Scarborough-Whitby-Saltburn railway line which, in places, passed very close to the cliffs. The colony at Hunt Cliff was re-colonised, according to P. J. Stead, about the period of the First World War. Small numbers have always bred between Scarborough and Filey, whilst the cliffs of the Flamborough headland held a variable population until about 1860, when persecution eradicated the colony, although it was re-established by 1873 with one or two pairs; however, the Bempton climmers stated that although birds were present, there was no proof of breeding. Although it has been stated earlier that breeding does not occur to the south of Flamborough owing to the unsuitability of the terrain, it has in fact occurred in this area, albeit in rather unusual circumstances. In 1887, during adverse weather, the vessel *Earl of Beaconsfield* floundered off Ringborough, just to the south of Aldbrough; as a warning to navigators, one of the masts was left standing with a result that the structure became a resting/roosting place for this species and, in 1893, it was reported that a pair had nested on the crosstrees and reared young. It is considered that young were reared here, on a fairly regular basis, until at least 1900.

In recent years, the breeding numbers along the coast have fluctuated with totals over the period of the three surveys of 38 pairs during Operation Seafarer (1969), 126 for the Seabird Colony Register in 1987, and 140 during Seabird 2000. These figures are incomplete as the records show no totals for Humberside, i.e. Flamborough, for the last two surveys, although Seabird 2000 indicates 47 pairs breeding inland. The results of these surveys show, locally, numbers in north-eastern England have remained constant since 1987, with an increase in the Tyne and Wear area balanced by a decrease in Yorkshire, which is disputable for the reasons given above.

Persecution, it has been stated earlier, has been one of the main causes for the change in numbers; this continues today to an unknown extent even though the passing of the 1981 Wildlife and Countryside Act prohibits the taking of this species except under license. Food, obviously, is an important factor in determining population trends, although correlation of cause and effect are not easily established. A clear indication does come from Norway where a marked decrease in the numbers of breeding cormorants in 1986-1987 followed winters of low sea temperatures and associated low numbers of capelin and other prey fish. With respect to inland breeding populations, readily available food at fish-farms, which have proliferated recently, has been a major influence on the increase of inland colonies. In fact DEFRA instituted a cull of this species in 2004 in response to calls from fishing interests.

European Shag

This species was reported in 1766 "in small flocks at Flamborough Head" by Pennant who was journeying to Sutherland, but Allis (1844) quoted A. Strickland as saying that Shags used to breed at Flamborough in considerable numbers, but apparently no longer do so. From this period until Nelson (1907), there was no definite record of breeding although Nelson considered that given protection from persecution, it may well breed. The situation at Flamborough is a little clouded during the following 40 or so years, not least by Chislett (1952), who stated that there had been little change in those intervening years, but did confirm that "in recent years one or two birds had been seen entering the caves at the base of the cliffs at Flamborough". He went on to say that these birds had not been specifically identified as either Shags or Cormorants. However, in 1949, on 19 May, a Shag was seen here, and five weeks later an adult and immature were seen to be joined by further birds until eight adults and 20 immatures were present. It can thus be safely assumed that this species had returned to Flamborough as a breeding bird. Birds were observed during the following years and, in 1953, a climmer claimed to have found eggs, and in 1955, juveniles were seen being fed by adults, so breeding was unequivocally taking place, whilst in 1957, a nest was finally seen from the cliff top. By 1965, breeding was occurring between

Flamborough headland and Speeton, being estimated at *c.* 50 pairs which ties in with the 58 Apparently Occupied Nests AONs quoted by Operation Seafarer for the period 1969-1970; however, the YNU estimated that in 1979 only 27 pairs were breeding at Flamborough, consisting of 12 at the headland and 15 at Bempton. There have been few counts carried out in recent years, excepting those undertaken for the two national surveys, the Seabird Colony Register of 1985-1988 and Seabird 2000 covering 1998-2002 which revealed 31 and 32 AON respectively. As stated earlier, there may be confusion over these three surveys, since former boundaries were quoted; thus, in 1969, there were 13 AONs in Humberside and 45 AONs in North Yorkshire, but the two following surveys state that there was no breeding in North Yorkshire, with all records coming from Humberside (i.e. Flamborough).

Numbers continued to increase during the following years with, in 1971, a colour-ringed individual observed, which, on investigation, was found to have been marked on the Farne Islands in 1967, the first indication of the immigration to Flamborough. By 1972, numbers were increasing quite rapidly, particularly at Bempton, and counts of roosting birds increased likewise with 138 on the sea there in 1977, whilst off the headland large counts were reported, with a maximum of 345 on the 22 October. Maxima increased during the following years, with 537 on 27 September 1982 and 634 on 30 October 1983. This trend continued, culminating in a peak count of 1379 on 1 January 1985; thereafter numbers for that area slowly decreased to those of the pre-1982 level. No explanation for either the increase or decrease has been advanced other than variations in food and the removal of the bounty paid for beaks of Great Cormorant.

Shags are occasionally found inland, with, for example, at least 50 observed on one of the lakes in Roundhay Park, Leeds on 29 January 1996, although only five were remaining on 2 February. This lake iced over during inclement weather, and when, on 13 February, a thaw set in, two dead birds were found. During the next week, 64 bodies were recovered, eight of which carried rings indicating that most had originated on the Isle of May (Fife).

MEDITERRANEAN GULL

This species was, at one time, restricted to the Crimean area of the Black Sea coast, where numbers were subject to large cyclic fluctuations, i.e. 40,000 breeding pairs reported in 1953 which had increased to 155,000 pairs by 1983, declined to 20,000 in 1993, before increasing to 75,000 in 1998. During the 1950s and 1960s, this species underwent a westward expansion which, although the reason for such an expansion in range is not fully clear, must obviously have had some association with high breeding numbers around the northern Black Sea areas. The results of this expansion were first noted from Hungary where breeding was stated as being regular by 1953, and by Germany, Great Britain, Belgium and the Netherlands in 1963, 1968, 1969 and 1970 respectively. There are now several thousand pairs in the Low Countries, from where the main immigration into Britain has occurred. This has been substantiated by colour-ringed individuals reported in the UK, with 290+ originating in Holland/Belgium, 30 in Hungary, and five in Germany.

The first to be reported in Yorkshire (Nelson 1907) was an adult shot on the coast in November 1895, this being the third record for the British Isles. A photograph of this bird appears in Mather (1986) noting that this bird is in fact a second-year individual. The owner of this specimen refused Nelson permission to publish full details, thus no more is known of its history. The second county record did not occur until 12 October 1958, when another second-year individual was observed, from a fishing boat, several miles off Scarborough. This record was given a rough ride by the national rarities committee, at first being rejected, but, on review, was duly accepted in 1978. In recent years, this species has occurred annually and, in line with the increase in breeding records in Britain, the numbers in Yorkshire have increased with four or more individuals frequently being reported from the Scarborough area.

Moving on now to the breeding status of this species in Yorkshire, we find that the Lancashire Bird Report for 1997 states that at Stocks Reservoir (VC64, though since 1974, part of Lancashire), "nine individuals including at least six adults were present amongst the Black-headed Gull colony during the summer". For 1998, the same publication stated "Stocks Reservoir became the county's [Lancashire] second successful breeding site when a pair and one paired with a Black-headed Gull nested amongst the Black-headeds", although it continues to state that only the hybrid pair reared young. In 1999, two adults were present in mid-March, being joined by another pair at the end of the month, with two birds incubating by 9 May, but by 10 June there was only one remaining. The outcome of this breeding attempt is not known. In 2000, an adult female and a second-summer male paired with Black-headed Gulls, and, although subsequent events are not clear, one pair did actually nest. At least four adults were present in 2001; however, no further details were received owing to visiting restrictions imposed as a result of the Foot and Mouth outbreak. Thus it was not until 2002 that the successful breeding of a pure pair was recorded at this location, when two pairs reared one and two young respectively. The following year, two pairs again bred, one of which was successful. Elsewhere in Yorkshire a pair attempted to breed in 1999, and in 2000 a pair were seen displaying, but any attempt to nest was curtailed by flood-water. Birds have been reported at several locations during recent years throughout part or all of the breeding season.

LITTLE GULL

The breeding range of this species extends from Finland, thence south and east through parts of the Former Soviet Union and Belarus to the Ukraine, wintering southwards along coastal areas of western Europe, the Mediterranean and the Black Sea. It is thought that most of the breeding population of the Baltic areas move south along the western coast of Europe and through the English Channel, but there is a distinct passage along the Rhine and other, large mainland rivers; the Baltic population has been estimated at 10 to 14 thousand pairs. There have been several breeding attempts in the British Isles since 1975, with the second, in 1978, at Fairburn Ings which was almost successful, with the birds incubating (or at least considered to have done so, although dense vegetation obscured them latterly) to full term. This attempt was considered to have failed due to disturbance which resulted in the nest being predated (Madge 1979). There have been further instances in recent years of this species taking up residence in Black-headed Gull colonies, particularly along the Lower Derwent National Nature Reserve.

One hundred years ago, this species was stated to be a visitor, in varying numbers, according to weather conditions, along our coasts, in autumn and winter; for instance, 30 birds were obtained in Bridlington Bay on three February days of 1870 during an easterly gale. From the early 1900s to the time of Chislett's *Yorkshire Birds* (1952), this species was reported only very infrequently, and then never more than one or two individuals at a time. Thus it may safely be deduced that the species was overlooked, probably as the few observers during that period were not active along the coast and/or were not in the right place at the right time (birds occurring mid-week). An increase in the number of observers during the last 30 or so years, coupled with a great increase in car ownership and changing work profiles, and a far better understanding of weather conditions, has resulted in a far more comprehensive coverage of suitable locations. A near blanket coverage at Flamborough in recent years has produced some startling totals passing the headland, generally associated with strong on-shore winds. By 1976, it was not unusual to record up to 85 birds in a day at that location, with three figure counts in 1978, and in 1980, some 170 were recorded roosting at Hornsea Mere. 1982 saw what was then considered as exceptional numbers at Flamborough, when optimum weather conditions during the period of heavy passage of Baltic breeding birds along the Dutch coast, resulted in excess of 5000 birds passing off-shore during the period 24 September to 7 October, with 1300 being recorded during at nearby Filey Brigg. Since then, numbers have increased, with peaks of 4002 at Flamborough on 17 October 1987, 4110 on 21 October 1995 and 3619 on 25 October 1997, whilst at Filey, 247 were reported on 19 October 1985 and the Hornsea Mere roost having 1900 on 7 September 1994, up to 3000 during late August and early

September 1997, and some 7000 on 18 September 2004. Spurn reported immense numbers in 2003, culminating with an estimated 10,000 on 12 September, these large numbers apparently feeding several miles off-shore out of view from the land according to local fishermen, thus eliciting the thought that these large gatherings may not be as rare as it would seem (i.e if we do not have the right weather, we do not have the birds).

BLACK-HEADED GULL

Allis (1844) stated that this species was "formerly abundant at Thorne Moors but now much decreased" and quoted A. Strickland as saying "breeds in great abundance on one of the islands in the middle of Hornsea Mere". No further comments were forthcoming as regards the distribution of this species, with Clarke and Roebuck (1881) adding little except that the only breeding colony in West Yorkshire was at Thorne Waste, and was, in fact, probably the only one in Yorkshire, as birds at Riccal had ceased to breed. Nelson (1907) reiterates Allis, going on to mention that the vast breeding colony at Thorton Bridge, near Bedale had ceased to exist, but mentions Strensall, Riccal and Skipwith Commons as further sites. Nelson also states that there is no doubt that breeding occurred in the carr-lands of East Yorkshire until that area was drained. Small colonies were also mentioned as existing at Summer Lodge Tarn, Locker Tarn [Wensleydale] and on the moors between Whitby and Scarborough, the latter site being plundered annually and thought to be doomed to failure if such persecution continued. In 1920, H. B. Booth undertook a breeding survey of this species throughout Yorkshire, details of which (Booth 1921) show that some 14 colonies were located with an estimated total of 2000+ breeding pairs and that there may be other small, isolated colonies, particularly in moorland areas where breeding may occasionally occur. In 1938, a survey undertaken by Chislett and others determined a total of 25 colonies with 2100 pairs (Chislett 1939). Attempted breeding occurred at several other locations; however, the birds were either driven away by keepers or the eggs collected for food, as was the case at Skipwith. In more recent years, several large colonies were reported at various times with 500 pairs at Whitaside Tarn, 1200 pairs on Bowes Moor, 500 on Haworth Moor, 500 on both Dallowgill and Arnagill Moors, and, in 1978, Stocks Reservoir being reported as supporting 6000 pairs. The first seabird census carried out in the British Isles "Operation Seafarer" did not include inland breeding locations, thus Yorkshire, with no coastal breeding Black-headed Gulls, did not feature. The "Seabird Colony Register" of 1985-88 gave a total of 2015 pairs for Yorkshire, but this does not include Stocks Reservoir from where I have no figures for this period, although in 1990 the Lancashire Bird Report estimates some 4000 pairs there. "Seabird 2000" gives 6880 pairs, which includes 1680 at Stocks. The most significant change during the period between the last two surveys occurred at Upper Barden Reservoir where the colony increased from 500 to 4000 pairs. More recently, the distribution and abundance of breeding Black-headed Gulls has varied over the British Isles, although the total breeding pairs for England of *c*. 82,750 has remained relatively constant with only a 1% decrease over 15 years. However, owing to only limited research having been carried out, no definite reason has been forthcoming, although, for inland breeding birds, with which we are concerned, changes in agriculture, particularly intensification and thereby reduction in availability of food [invertebrates], may be a major factor.

Large gatherings are quite frequently reported during the winter months, with several locations exceeding the threshold of international importance, currently 20,000 individuals. Of these, Tophill Low Reservoirs regularly exceeds this total, and was, for several years, the only location in Britain to so do, with several counts of more than 32,000, with a maximum of 43,800 on 25 November 1997. The only other inland location to exceed this threshold was the Lower Derwent Ings, with up to 50,000 recorded, although Bolton-on-Swale with 19,500 on 7 December 1997 came close. Large roosts have been reported from the Estuary, with up to 50,000 at Whitton Sands, whilst Barmston, on the coast, has at times recorded as many as 25,000.

COMMON (MEW) GULL

This species breeds across the Palearctic and parts of North America, both coastally and inland; in the British Isles, the breeding distribution is almost solely confined to Scotland and the northwestern part of Ireland, with *c.* 57% of the total population breeding inland. The Common Gull was not reported as breeding in Yorkshire until 1955, when a pair hatched young at Malham Tarn, but regrettably none fledged. A pair nested on Ilton Moor in 1957, but again fledging did not occur although the eggs hatched with the chicks being found dead near the nest, a nearby Lesser Black-backed Gull being cited as the culprit. Breeding did occur near Scaling Dam in both 1966 and 1967, but in both instances the outcome is unknown. Since this time, breeding has taken place during several years in Upper Wharfedale, being considered to have been successful in 1971. Other locations to have recorded breeding attempts are near Settle, Fountains Fell Tarn, the Stainmore area, Upper Barden Reservoir, Binks Moor, Angram Reservoir, Bishop's Moor and Dallowgill.

The international threshold for this species has been set at 16,000, with only Tophill Low Reservoirs attaining this level, with an average over five years (1996-7 to 2000-1) of 28,100, whilst even higher peaks of 38,000 in November 1998, 42,000 in February 2000 and 55,000 on 9 November 1997 have been recorded. Elsewhere, 34,000 were recorded on Coatham Sands on 27 January 1978, whilst totals reported under the "Birds of the Estuary Enquiry" (BoEE), now replaced by the "Wetland Bird Survey" (WeBS), gave of 55,857 in 1980 for the north shore of the Humber Estuary, as well as the Ouse as far as Goole, and, in 1978, under "gulls", some 50,000, most of which were this species. These totals cover the whole area from Spurn to Goole. There have been occasional reports of birds having all the characteristics of the Russian race *Larus canus heinei* from coastal areas, particularly Flamborough, the estuary and Tophill Low Reservoirs.

LESSER BLACK-BACKED GULL

Lesser Black-backed Gulls are found breeding in northwestern Europe, eastwards through northern Russia into Siberia, occurring in the British Isles around the coasts, although few breed between the Tees and Norfolk. About 22% found during the survey of "Seabird 2000" were reported inland, but none more than *c.* 24 km from either the sea or an estuary; inland nesting sites were not counted during the previous two surveys.

There were claims that this species bred in Yorkshire, between Scarborough and Filey, in 1876, although Nelson (1907) considered this unreliable, as he did with a second record concerning eggs taken by a climmer in 1885 when neither the birds not the nest were seen by the person reporting the occurrence. Nelson, however, goes on to state that he had proof of nesting Lesser Black-backed Gulls on inaccessible areas of cliffs near Whitby, amongst colonies of Herring Gulls, with birds present on all visits. This was in 1878, but it was not until 1892 that a nest was seen, and consequently photographed. Nelson considered that one to three pairs were breeding regularly in the Boulby and Kettleness areas up to 1907. Chislett (1952) confirmed that the breeding of one or two pairs continued at these locations, and P. J. Stead found nests in 1954. A pair was present at Bempton in 1973; however, breeding, although probable, was not actually confirmed. Since then the only coastal breeding has occurred on roof-tops at Bridlington, Scarborough and Whitby, in all instances, the numbers involved being between one and three pairs.

Inland, a small colony of 20 pairs was established near Tan Hill in 1960; however, by 1963 the birds had deserted this site and were breeding some miles distant in Westmoreland although, in subsequent years, breeding occurred occasionally in the vicinity of the original site. Forty pairs were noted in 1968 and 1969, whilst 300 birds were in the colony in 1976. Breeding has also been noted occasionally at Grimwith Reservoir, Nosterfield Gravel Pits and on Grassington Moor, and at Stocks Reservoir (now in Lancashire) breeding was attempted during the war years and, again, more recently, although success has been thwarted by human persecution. Persistent disturbance and clutch destruction at a colony on a Wharfedale grouse moor, which was estimated to have some 3000 pairs in 1990-91, reduced it to 12 pairs by 2000, most of which were unsuccessful. Small numbers tried to breed in North Yorkshire during the period of "Seabird 2000", but with limited success. In the Bowland area, a few miles over the border into Lancashire, exists one of the largest colonies of this species in Britain; in fact, in 2000 it was the largest inland colony and the second largest overall. This colony is centred on Tarnbrook Fell (referred to as Roeburndale in Mather 1986), but the boundaries vary from year to year, particularly in association with size fluctuations with, at times, a small proportion extending into Yorkshire. In 1981, it was estimated that 25,000 pairs were at the site; however, numbers were reduced to 5,000 by culling and controlled disturbance, although numbers have been allowed to increase once more, with a total of 18,515 AONs being counted during the "Seabird 2000" census. It should be noted that about 29,000 gulls, mostly of this species, were culled in the Bowland area, including Tarnbrook, during the period 1999-2002. As mentioned above, the boundaries of this colony are not easily determined; therefore, the numbers actually breeding in Yorkshire cannot be definitely determined. According to Pyefinch and Golborn (2001), this colony extends into two Yorkshire tetrads, but no numbers are obviously available (i.e there may only be one pair in each tetrad, but there could just as easily be several hundred).

HERRING GULL

This species breeds throughout most of the Holarctic region, excepting parts of Siberia where other taxa are present; however, taxonomists are still at odds as to whether birds in this area are races of Herring or Lesser Black-backed Gull or even full species in their own right. The race breeding in the British Isles is *Larus argentatus argenteus*, with the nominate birds breeding throughout the remainder of north-western Europe. Breeding in the British Isles occurs along all coastlines with few gaps; the largest being between Flamborough and the Wash.

The first mention of this species in Yorkshire was by Pennant, who, in 1769, noted it amongst the multitudes of birds at Flamborough. It was considered to be abundant along the cliffs at Gristhorpe where 180 eggs were collected on 13 May 1899, and in 1903, Whitby fishermen took over 1000 eggs at Kettleness. As well as being a cliff-nester, it has spread to roof-tops in many coastal towns, possibly due to a lack of cliff sites, but this may be disputed considering the decline of breeding numbers in that habitat; a second reason proffered being the safety from predators which is backed up by the far greater increase shown by birds nesting on buildings whilst those on cliffs have, in general, declined. The first reported instances of Herring Gulls nesting on buildings in Yorkshire were at Whitby in 1942, Robin Hoods' Bay, Staithes and Cowbar in 1947, Scarborough in 1967, Runswick Bay in 1969, Filey in 1976, Withernsea in 1995 and Hornsea in 1998. [I have been unable to find details for Bridlington.] In recent years, three national surveys have been carried out which gave a total of 343,000 AONs in 1969-70, decreasing to 177,000 in 1985-88, with a further decrease to 147,000 in 1998-2000. The first two counts only gave numbers for natural coastal sites, with roof-nesting birds being surveyed in 1976 and 1993-95 (Mitchell *et al.* 2004), whilst in 1978-79 a complete survey of the Yorkshire coast was undertaken, with full details provided by Leach *et al.* (1980). The results of the national surveys show a slight increase in coastal nesting, which is confirmed by the local survey, although the large increase is in roof-nesting birds with 109 in 1969-70, 666 in 1978-79, and up to 1766 by 2000. About 4800 AONs were recorded on the coast in 2000, which is a decrease of some 800 on 1979, showing a decrease of 2000 cliff-nesting birds against an increase of 1100 urban [roof-nesters] birds. As stated earlier, the use of the older county/administrative areas has caused difficulties at times in comparing years. Returning to roof-nesting birds, the majority were at Scarborough with 870 and Whitby with 528, these two sites being the second and fourth largest such colonies in the British Isles. According to the Cleveland Bird Reports, there are no roof-nesting birds north of Staithes.

Inland, small numbers have frequently bred in association with the Lesser Black-backed Gull colonies at Tarnbrook Fell; how many were on our side of the county boundary is unclear, but 100 were reported in 1958, whilst ten pairs were present in the gullery at Tan

Hill in 1969. During World War II, the north pier of Bridlington Harbour was closed with the result that small numbers of this species took advantage of the lack of disturbance to nest there.

Great Black-backed Gull

This species breeds from eastern North America, parts of western Greenland, Iceland and north-western Europe to the White Sea. In the British Isles it is confined to the west and the north, being absent from the coastline between the Firth of Forth and Hampshire/Dorset excepting for one to four pairs breeding in Northumberland and Suffolk. It has been reported as being present amongst the large numbers of Lesser Black-backed Gulls breeding on the Lancashire/Yorkshire border, c.19 km from the Lancashire coast, which although not specified, would no doubt be the Tarnbrook Fell colony. It was not conclusively proven that birds were breeding on our side of the county boundary however the probability exists. Adults were reported at that site in 1949, and may have been present in earlier years, with at least three pairs in 1951 increasing to some 20 to 25 in 1958; young being observed during several of those years. An account of this occurrence by Iles *et al.* (1959) also claims this as the first inland breeding of this species in Britain, a claim which was corrected shortly after by both Chislett and Blezard (1959), the latter, on behalf of the Carlisle Natural History Society. In 1997, a pair bred, but failed to rear young, at Stocks Reservoir.

Over the period of the three national surveys numbers have decreased by about ten percent throughout the British Isles though the small numbers breeding in England have increased by one percent. These changes in populations have been attributed to several reasons; the cessation of persecution, particularly the harvesting of eggs having contributed to the increase whilst botulism, although not that significant, and American Mink, at the breeding grounds, being responsible for some decrease. Changes in food, particularly as a bi-product of the fishing industry, would appear to have had little effect on the numbers of this gull it being the dominant species attending trawlers. Furthermore, it exploits a large spectrum of more natural food sources, especially mammals and birds, with accounts of this species killing and swallowing Moorhens whole.

Indications that this species was not as numerous some 100 years ago are given by Nelson (1907) who describes a movement off Redcar on 23 October 1881 and during previous days as "a great passage . . . as many as 100 going by to the NW in one day". Numbers appearing on the coast apparently increased however between the time of Nelson (1907) and Chislett (1952), but few totals are available. In 6 October 1955, 1500 were present at Spurn, the first four figure total for the county; 3000 there on 24 September 1958 was later surpassed by 3300 at Tophill Low Reservoirs in November 1992, 3440 at Flamborough on 19 September 1993, and 5472 at the same location on 1 December 1995. Inland, Chislett ceased to include records in the annual Ornithological Report unless large numbers were involved (e.g. 40 near Wakefield in 1947). By the 1960s, an increase in inland numbers was noted with 110 at Eccup Reservoir in 1960 and 500 in 1967, with similar increases at Gouthwaite Reservoir and Fairburn Ings. This last location became one of the main inland roosts with 1000+ on several occasions in the early 1970s, including 1800 on 12 December 1971 and 2000 in February 1979. More recently, roosts of 1000+ have been reported at several other inland locations.

Black-legged Kittiwake

The common breeding gull of our coasts which is also found from north-western North America, Greenland and north-western Europe eastwards along the arctic coasts into Russia and intermittently into eastern Siberia; it winters at sea. This species has always bred on the cliffs at Flamborough with Waterton (1835) stating it to be "so numerous as totally to defy any attempt to count them", whilst Allis (1844), in his address to the British Association, quotes A. Strickland as saying "they breed in very great abundance on the rocks at Flamborough". However, by the time of the passing of the Sea Birds Protection

Act, it was thought that they were in danger of extermination though, as a result of the ensuing protection, Chislett (1952) considered they were probably back to their former numbers. If we return to the 1830s, it was owing to the huge gathering of breeding birds in an area that was relatively accessible, particularly by boats, which led to the decrease in numbers. During this time boats from Bridlington regularly conveyed large parties of shooters to the breeding cliffs where, upon the sounding of their sirens causing great panic amongst the birds, many were killed in the ensuing barrage of shot. It should be noted that during this same period many Kittiwakes and terns were shot in Bridlington Bay to fulfil the demand of the millinery trade for the feathers of these birds. This situation continued unabated until, in 1868, Professor Alfred Newton, an eminent ornithologist and a founder member of the British Ornithologists' Union, alerted a wider audience at a meeting of the British Association to the carnage. This was the start of a movement also taken up by the Rev. F. O. Morris, vicar of Nunburnholme, which resulted in the formation of the Yorkshire-based "Association for the Protection of Sea-Birds". Many influential people became involved, with the result that the following year Christopher Sykes of Sledmere, MP for the East Riding, introduced a Bill into Parliament which became law in June 1869 as the previously mentioned "Sea Birds Protection Act". This called for a close season between 1 April and 1 August for 35 species, although, at the specific request of the climmers, the taking of eggs was excluded. A detailed account of this is chronicled by Clive Varty (1991) in his history to mark the centenary of the YNU Protection of Birds Committee, a perusal of which I recommend. It was this forethought by local people that was the catalyst for the bird protection movement in Britain, the benefit of which we still have today.

Returning to the breeding of this species in Yorkshire, the colony on the Flamborough headland has always been immense, being for many years, numerically, the largest colony in the British Isles. To the north of Flamborough, Kittiwakes colonised Scarborough Castle Hill with a pair being reported there in 1940, Boulby and Staithes prior to 1950 when some 80 nests were recorded from those locations, and Hunt Cliff in 1961. To the south, Kittiwakes moved onto buildings along the periphery of Bridlington Bay when, in 1978, several nests were noted on the window sills of a warehouse over-looking the Gypsey Race, with 48 nests being reported from that area in 2000. The three national surveys gave totals for the Yorkshire coast of 36,882 in 1970, 103,870 in 1986, and 57,688 in 2000. Individual counts for the Flamborough headland were carried out on several occasions in the late 1970s giving totals between 100,000 and 80,000, and considering the difficulties in counting in this area, I feel we should not give too much credence to these fluctuations; the 1986 totals of the "Seabird Colony Register" have been disputed. 12,725 were reported for Cleveland, although the Cleveland Bird Report for that year records only 6900, with 7500 the following year. Conversely the 83,694 at Flamborough is now considered to be high, by quite an appreciable degree. Much of the "Seabird 2000" counts were done with the aid of digital images, thus these totals are bound to be far more accurate. It will be seen from these counts that there has been a small change in breeding numbers since 1970, although since 1986 a great decrease has occurred, but not uniformly over the whole country. Shetland, for instance, has seen a decrease of *c.* 70%, whist north-eastern England has decreased by 40%, but North Yorkshire has increased by 16%. Thirty years ago, there appeared to be no sign of a slow down to the increase of this species, other than a limit of suitable nesting sites. The main food of this species, Sandeel or small Herring and Sprats, have all undergone distinct fluctuations in recent years; this removal of food supply will contribute significantly to low breeding success. In addition, local weather conditions may affect breeding, especially when strong northerly winds coupled with heavy rain, as has happened twice in recent years, during the height of the breeding period causes great loss of eggs or young, or both, with the result that fledging rates are very low, as actually happened this year at Flamborough.

Roseate Tern

The distribution of this species covers all continents, excepting Antarctica, between 56° N, in the North Sea, and 34° S in southern Africa. It has undergone the most dramatic change of status of any seabird in the British Isles during the period of the national surveys with a 67% decrease overall, and a 90% decrease in England. It has a very restricted breeding range in the British Isles, with a very large proportion being found at three locations. In 1968, 3812 pairs were located; thereafter a rapid decline resulted in just 521 pairs in 1985, although there has been a slow recovery to about 790 pairs in 2000, of which 618 were at Rockabill near Dublin. Of the 36 pairs nesting in England in 2000, 34 were on Coquet Island, Northumberland, a decrease from 230 in 1969, although this colony has increased in the last three years to about 60 pairs due to the provision of nest-boxes. The main reason for the decline between 1969 and 1988 was thought to be due to poor survival rates of immatures, as a result of deliberate trapping at the wintering grounds in Ghana. Predation and loss of nesting habitat, the latter due to erosion, competition with gulls, etc., may also be factors related to its decline. In Yorkshire, a pair nested unsuccessfully amongst the Common Tern colony at the British Steel ore terminal at Redcar in 1997. The pair laid two eggs, but they were washed out. In 2002, a pair again bred at the same location, this time being successful, rearing two young to the flying stage. Small numbers are reported each year along our coast, most birds considered to originate from the colony at Coquet Island, the maximum recorded being 17 at Spurn on 19 September 2003

Common Tern

Nelson (1907) alludes to the fact that terns probably bred at Teesmouth until, perhaps, the 1850s. He states that there were people still living when he was writing his book who could remember terns nesting, in great quantities; the Common Tern being, no doubt, one of the commonest in that area during the summer. Nelson also refers to the Cottonian MS (1604) which states "Neere until Dobhoome (the portion in the mouth of the Tease, so named), an infinite number of sea-fowle laye their egges here and scatteringlie in such sorte that in tyme of breedinge one can hardly sett his foote soe warelye that he spoyle not many of their nestes". This location is at Dabholm Gut, a little inland of the present British Steel ore terminal at Redcar. Another colony is reputed to have existed on an island in Hornsea Mere, according to a letter to Abraham de la Pryme, dated 21 December 1693, but since the Black-headed Gull is known to have nested there, confusion between the two species may have existed.

The first recorded nesting of this species in Yorkshire occurred on the south bank of the Tees in 1950, when two pairs laid eggs though neither were successful, both clutches being stolen. The following year, 10 pairs attempted to breed on slag in the same vicinity, although few details are available, whilst a nest was found in the same area in 1952, with breeding thought to have occurred also in 1955. It was not until 1961, however, that successful breeding was proven in the county, when single pairs were reported in both South and North Yorkshire, and, assuming the breeding referred to above at Hornsea Mere concerned Black-headed Gulls, this was the first occurrence of inland breeding in the county. In recent years, breeding inland has occurred on an increasing scale in the county, mainly in the south and west, so that by 2000, 21 pairs were reported from at least seven locations. At the British Steel ore terminal at Redcar breeding has occurred since at least 1991, when 23 pairs were reported, no mention being made of this colony prior to this date. Totals here have increased to 100+ in 1993, to 227 in 1997, and to 400+ in 2001. However, in 2001-2, part of the site was stated to have been destroyed, thus affecting breeding in more recent years, although 205 young were reared in 2002, and 95 pairs were present in 2003.

The species is quite common along the coast in late summer and particularly autumn with daily totals of up to 2000 at Spurn, Hornsea, Flamborough and Filey, usually during the latter hours of the day. Counts of up to 5000 unidentified terns, either Common or Arctic (colloquially known as "Commic" Terns), have been reported, and, as this species is more widespread along our coast than Arctic, most would have been of this species. Small numbers are seen annually, on passage, inland, more generally in spring. As a summer visitor, arrives mainly during the latter part of April and into May, leaving in late August and September. Early dates of arrival reported being 28 March 1993 when seven were at Old Denaby, 1 April at Southfield Reservoir, whilst a record of one off Hornsea on 31 March 1961 was reported as "Commic". Stragglers are occasionally recorded well into November, the latest recorded being at Spurn on 16 and 23 November 1969, and at Flamborough on 6 December 1959.

Arctic Tern

Has a circumpolar breeding distribution as far south as Brittany in France, New England, British Columbia and Kamchatka, generally along the coasts though it occurs inland along some of the larger rivers of Siberia; it winters in the southern oceans. In the British Isles, breeding is mainly in the north and west, the bulk of the population being centred on the northern isles with no breeding occurring between the Farne Islands and Anglesey, excepting three colonies, of less than four pairs each, in East Anglia. It has bred on one occasion in Yorkshire, when, on 29 June 1939, J. Lord and G. H. Ainsworth watched, at close quarters, an adult feeding a young bird at Spurn. Breeding had been suspected in 1910 according to E. W. Wade. The comments made under the previous species concerning confusion between the two apply here. Numbers of specifically identified Arctic Terns are smaller than those of Common Terns, although there are more inland records with pronounced cross country passage occurring during the spring of some years. On 25 April 1981, between 15 and 53 individuals were reported at several locations, whilst on 2 May 1982, 10 to 70 were recorded at several inland sites, with 369 at Fairburn Ings, and 378 at Pugney's Gravel Pits [now Country Park]. Fairburn Ings, the site reporting the most occurrences, also had 123 on 6 May 1978 and 232 on 27 April 1989. This species is very occasionally reported during the month of March, with the earliest being recorded in 1978 on the 24th at Filey, whilst, as far as late birds go, the same location reported one on 21 November 1994, and Scarborough one on 12 December 1996.

Little Tern

This species breeds exclusively on sand and shingle beaches around the coasts of the British Isles, with concentrations towards the south and the east. The only areas of the Yorkshire coastline that meet these criteria are in the extreme south, from Easington to Spurn Point and the extreme north in the vicinity of Coatham Sands and South Gare. It would appear that this species has always bred in the Spurn area as indicated by Chislett (1952) who stated that it had bred on the coast south of Kilnsea since "times ornithologically immemorial". In 1861, a colony of 40 to 50 pairs was found on the seaward side of the Spurn peninsula, near the lighthouse; Dobree writing in *The Zoologist* at this time stated that they never bred along the Humber shore of the peninsula. In subsequent years, this colony extended northwards along the seashore to a point opposite the Warren, although no numbers are available for this period. Whatever the numbers of breeding pairs, the success was bound to be low as the nests were plundered by both egg collectors and day-trippers. In 1895, approaches were made to the East Riding County Council to apply a protection order on Spurn under the 1894 Wild Birds Protection Act. As a result of this action, a watcher was appointed by the County Council, but this appears to have been of very limited success since in 1897 the nests were washed out by an abnormally high tide. In 1898 and 1899, no watcher was employed resulting in the wanton collection of eggs by local children and trippers from Grimsby; one of the latter being seen to take 34 eggs. A watcher was employed in 1900, but again circumstances conspired against the colony in the guise of a timber ship which was wrecked at Kilnsea, the consequent gathering of timber along the beach resulted in wholesale trampling of the area and all nests. This is in variance with Nelson (1907) who states that with this protection, some 100 pairs of young were hatched in 1900. In 1912, 80 nests were located to the north of Kilnsea, with two to the south, eight on the Humber shore and four at the point; however, in subsequent years, the numbers north of Kilnsea decreased until breeding only occurred sporadically in this area, although in 1935 a few pairs bred on pastureland a little way inland. The following year, C.F.Proctor recorded 94 nests containing 259 eggs, a level which was maintained to 1939, but decreased during the war years with the resulting disturbance and greater access afforded by the building of the road along the peninsula. During the late 1940s, the YNU Protection of Birds Committee supplied a watcher with the result that by 1950 about 60 pairs were nesting, although only about half of these actually reared young. The colony in this area suffered thereafter with, in 1953, 53 pairs laying 101 eggs, but only one juvenile was seen, after which numbers declined so that during the 1960s few pairs were present. In 1977, a small colony was established near Easington Lagoons with varying numbers and success. Less than 10 pairs were present here until 1989, excepting for the two years 1985-86, whilst from 1992 more than 30 pairs have been present, with a maximum of 71 in 1995. Success, however, has been poor, with 1995 being the worst, when only four young fledging, and 42 young from 41 pairs in 1998 being the best. Although this site has been wardened, predation from Fox; crows, Kestrels and Merlins (but not all in the same year) has limited the success, whilst, in recent years, human interference has been a major problem. The erection of an electric fence around the colony has provided some increased protection.

In the north of the county, breeding has occurred in the Coatham Sands/South Gare areas. J. Hogg, writing in *The Zoologist* (1845 p 1187) states that the Lesser Tern "inhabited, in summer, the sandy beach near the Teesmouth", but he makes no comment as to whether breeding actually occurred. The first documented breeding was recorded at this location in 1910 according to Stead (1964), but Mather (1986) says that Nelson had annotated his personal copy of his own book saying breeding had taken place at this site in both 1908 and 1909. I have, as yet, not found collaboration in any journal of this fact. According to Stead (1964), three pairs nested on Coatham Sands in 1910, increasing to 20 pairs in 1912, and to 30 pairs in 1931. The number of pairs dwindled thereafter, with only small numbers occasionally breeding to the1950s when one to four pairs were present at the usual site each year, to about 1986 when the Cleveland Bird Report records "25 pairs with *c.* 40 young", assumed to be at the South Gare/Coatham Sands location. In 1994, the regular breeding colony at Coatham Sands held 97 nests with 191 eggs, of which 48 hatched and 15 young were fledged. In recent years, only a few pairs have bred at this location, with most of the breeding numbers in Cleveland having moved to the north of the River Tees at Crimdon Dene. The reasons again for failure/fluctuations were due to human disturbance (the birds favouring similar beaches to the tourists), flooding out by high tides, and Foxes and avian predators.

Black Tern

A. Strickland, quoted by Allis (1844), stated that this species bred near Driffield prior to the drainage of the River Hull valley. Although there are no details, it must be noted that this species probably also bred in the marshlands of the Vale of York and the Humberhead Levels, both areas being similar to the River Hull carr-lands prior to drainage. Chislett (1952) alluded to this fact, and I am not one to disagree. In 1999, this species laid eggs and was incubating at Wheldrake Ings when the area was drained down very rapidly causing desertion and the destruction of this nest and nests of several other species. Nowadays, the Black Tern is regarded as a passage migrant with, generally, larger numbers in spring, these coinciding with optimum weather conditions in early May, namely southerly winds over the near continent and the English Channel. During these periods of passage, it would appear that Yorkshire is usually about the northerly limit in the British Isles to report this species in any quantity. Fairburn Ings and the Humber areas have, over the years recorded the largest numbers with 67 at the former on 25 May 1966. On 2 May 1990, a massive influx occurred, with 152 recorded at Blacktoft Sand, 127 at Hornsea Mere and 20 at Spurn, and on the following day, 101 were seen at Fairburn Ings, 96 at Blacktoft, 89 at

Saltend, and 163 at Spurn. This passage was noted further south in England, with more than 1000 birds being reported passing eastwards along the North Norfolk coast on the same day. As with Little Gull, large numbers may be displaced northwards to the British Isles given optimum weather conditions, whilst birds are moving westwards along the channel coasts of the continent, large counts recorded under these circumstances being 149 at Spurn on 26 September 1965 and 126 on 17 August 1979, whilst 143 passed Filey on 11 September 1992. The largest count to be reported in Yorkshire, however, occurred at Spurn on 3 May 1997, when 223 flew east from the Humber out into the North Sea. There is in Nelson (1907) an ambiguous statement of a remarkable spring migration at the end of April or early May when Leonard Gill of the Newcastle Museum stated "I first saw them in 1893 when nearly a thousand passed from west to east". It is not made clear that they were all seen on the same day, even though it must rank as one of the most intense spring movements reported in Yorkshire. A footnote in Nelson (1907) says that J. H. Gurney observed them in Norfolk a day later.

Common Guillemot

This is one of the most abundant seabirds to be found in the temperate and colder areas of the northern hemisphere, having large populations in the Atlantic, Pacific and areas of the Arctic Ocean. The population of the British Isles is, by habitat, restricted to northern and western areas with, in the eastern areas, excepting the Flamborough headland and adjacent areas, no breeding between the Farne Islands and the Isle of Wight. According to Allis (1844), quoting A. Strickland, "they breed in countless numbers on the Flamborough cliffs", whilst Nelson (1907) states "the most remarkable feature [of the Flamborough cliffs] is the great loomery or breeding station of the Guillemot . . . found there in such vast quantities as to be practically innumerable". The history of the cliff-climbers or "climmers" is outside the remit of this address, but I will touch on it; more detailed accounts are to be found in Nelson (1907) and Mather (1986). It is from this history that we are able to gather some idea of the numbers of this species to be found at Flamborough. The climbing season, and thus the egg-collecting season, originally extended from about 12 May to 13 July, but in later years it commenced a week to ten days later, and by 1904 an agreement to cease collecting by 1 July was reached. With respect to the number of eggs collected in a season, Cordeaux (1885) stated that in 1884 one party of climmers admitted that in seven weeks and three days they took 30,000 eggs of various sorts. As the local fishermen also took large numbers of eggs, by climbing up from below, it is probable that the total annual take was probably more like 130,000, the bulk of these being Guillemot. This total was repeated by Nelson (1907), although it was obviously a gross exaggeration as suggested by A. J. Wallis, who argued that with four gangs working that, equates to some 570 eggs per day per gang. This average daily take is well in excess of the total of a good day as stated by both Wade (1903) or Seebohm (1885), assuming also that collecting took place on every day of the seven plus weeks, which obviously did not happen due to adverse weather etc. It would seem therefore that the combined total was nearer 30,000, so could Cordeaux have misinterpreted the information given to him – namely 30,000 in total and not 30,000 per gang? Whatever the actual numbers breeding on the Flamborough cliffs during the collecting period, it became obvious before the Second World War that the numbers were decreasing, a situation agreed by both conservationists (the YNU Wild Birds and Eggs Protection Committee) and the climbing gangs. As a result of this downturn in numbers, a meeting was held with the two sides agreeing that selective gathering would be undertaken; that is that some of the areas of cliff would not be worked every year, although the suggestion that harvesting should cease by early June could not be met by the climmers. A further decrease in the breeding population, however, led to the cessation of the harvest in 1953. The eggs were taken either for human consumption or sent to the larger towns in the West Riding to be used in the patent leather industry, whilst well marked or unusually marked ones were sold to collectors commanding prices, in about 1900, of 7s 6d to 10s (37.5p to 50p), a grand sum for those days. An unusually marked egg occasionally gave an indication of age/longevity of birds. One climmer, George Londesborough, who gave the details of the annual harvest to Cordeaux, brought up a fine red egg from the same ledge for 15 consecutive years. After 1953, when collecting ceased, the numbers of breeding birds increased, although there were fluctuations of the totals counted. In 1964, between Flamborough Fog Station and Speeton, 12,950 AONs were recorded, whilst along the same stretch of cliffs in 1974 the total arrived at was 13,801. Two years later, 12,200 AONs were recorded on the cliffs of the Bempton RSPB Reserve, but the following year the number reported was 9224, increasing again by 1978 to 13,250. The three national surveys gave 17,963 AONs in 1970, 32,288 in 1987, and 46,625 in 2000, although the first of these three counts would appear to be at some variance with the local counts, and it is conceivable that a large decrease had taken place by 1977. The increase in Yorkshire equates to 2.8% annually between 1987 and 2000, against 2.2% over the whole of the British Isles.

The current threats to Guillemots, and other seabirds, are firstly the industrial fishing for sandeels, a food source for many marine predators. The annual take of sandeels increased during the 1970s and 1980s to a level approaching one million tonnes. However, Guillemots are generally not as sensitive to changes in availability of sandeels as some surface-feeding species such as Kittiwakes and terns, but where intense fishing and birds compete for the same fish, numbers crash as in the case of the depletion of Capelin in the Barents Sea when numbers of Guillemots on Bear Island dramatically declined from 245,000 pairs in 1986 to 36,000 the following year. The second cause for concern is global warming, which is expected to increase the frequency of summer storms, thus eggs/young may be washed and/or blown off the nesting ledges (as happened with Kittiwakes in 2004); an increase in summer storms will also have an effect on feeding caused by a greater difficulty in catching food.

Razorbill

This is a bird of the temperate North Atlantic and adjacent parts of the Arctic Ocean. Breeding occurs around the coasts of the British Isles, but, as with many cliff-nesting seabirds, this species is absent between Flamborough and Purbeck (Dorset). Undertaking a census of this species is difficult as frequently their nests are hidden, often in fissures in the cliffs, whilst small numbers of breeding birds are frequently scattered amongst large numbers of Kittiwakes and Guillemots. The change in the population of Razorbills over the period of the three national seabird surveys would appear to be similar to some other species, i.e Guillemots and Fulmars. In our area, Flamborough has always been the stronghold of this species with Nelson (1907) stating that Razorbill was outnumbered there by Guillemot by a ratio of 100:1, a situation that does not occur today, probably being more in the region of 5:1. Small numbers according to Mather (1986) established a breeding colony on the cliffs to the north of Filey Brigg some years prior to the publication of his book, whilst the Filey Bird Report stated in 1981 "breeds on the cliffs to the north of the brigg". The latter publication states that 104 pairs were assessed to breed by the seabird census team in 1986. Further north, in the area covered by the Cleveland Bird Club, up to 12 birds were reported to be on the cliffs at Cowbar during June-July of 1994, with up to ten there the following year, whilst by 2003, at least 22 pairs were breeding between Boulby and Cowbar. Estimates of the numbers to be found on the Flamborough headland gave 2492 between Speeton and the Fog Station in 1964, and 3767 ten years later along the same section. The three national surveys of 1970, 1987 and 2000 gave counts of 11, 182 and 176 respectively in North Yorkshire, and 2573, 7662 and 8438 respectively for Humberside, which is, in effect, Flamborough. The 2000 total for Flamborough makes that location the fourth largest in the British Isles. No birds were reported in Cleveland during the first two counts, but seven were recorded in 2000.

Again, as with other seabirds, they are liable to wrecks, of non-oiled birds, after long periods of stormy weather, one such occurring in February 1983, when more than 1000 individuals were found in Yorkshire, most on the large expanses of beaches of Holderness which are only washed by high tides. These birds were mainly immatures with depleted fat reserves indicating that, even though they can feed at depths of up to 120 m, they still suffered from such prolonged bad weather. Many of the corpses were either measured *in situ* or collected by J.R.Mather, P.A.Lassey and B.R.Spence, with the conclusion being reached that almost all were from the British populations of the northern isles and only 1% were thought to be of the nominate race *Alca torda torda* from Scandinavia or Russia.

On 29 April 1999, two Razorbills were observed at Pugney's Country Park, thought at the time to be the first inland record of a live bird of this species for the county. A trawl of the literature, however, proved this to be incorrect, with three other occurrences brought to light; however, it is still a very rare bird away from the coast.

BLACK GUILLEMOT

This species is circumpolar, being found in the northern areas of both the Pacific and Atlantic Oceans. In the British Isles it breeds in northern and western Scotland from Galloway to Caithness, with a few small breeding colonies in Cumbria, the Isle of Man, Anglesey and Ireland. There is only one definite breeding occurrence for Yorkshire, when a pair was observed by V. C. F. Zimmerman feeding young at Bempton Cliffs on 24 July 1938, following sightings of an adult at the same location on several occasions in previous weeks. This breeding event was mentioned in the YNU Annual Report for 1938 (see *The Naturalist* **64**: 15). It must be stated, however, that the climmers had neither seen nor known of this species at the headland. Breeding had been claimed at the Flamborough headland on previous occasions; Pennant, who visited the headland on 3 July 1769. states that he observed a few Black Guillemots amongst the multitude of birds there, whilst A. Strickland is quoted by Allis (1844) as saying "about 30 years ago I killed a specimen, in full plumage, from a flock at the height of the breeding season, near the rocks at Flamborough". In addition, Prof. Alfred Newton showed Nelson "the unmistakable egg of this species" which came from the collection of Charles Waterton and was labelled "1834 Flamborough", a photograph of which egg is to be found in Nelson (1907). It has always been quite a scarce bird off the Yorkshire coast, only occurring annually in recent years, possibly due to far greater observer coverage, rather than an actual change in status. There have been three inland records: near Todmorden in 1948, Peasholm Park Lake, Scarborough in 1959, and Glasshouse Dam in 1987.

PUFFIN

This species occurs in the North Atlantic and adjacent Arctic Ocean, and is, like the other auks, a colonial nester, although in this case, utilising underground burrows rather than cliff ledges. Puffins have bred in Yorkshire as long as records have been available, and certainly since the time of Willughby who stated "they breed yearly in great numbers . . . etc", whilst Allis (1844) merely states "common at Flamborough". According to Nelson (1907), it bred in very large numbers on the Flamborough range of cliffs between the headland and Raincliff, one of only two nesting locations on the east coast of England (the other at that time being the Farne Islands). Throughout all those years no exact numbers were recorded, doubtless in part due to the difficulties caused by the birds occupying burrows or crevices in the cliffs. Counts for the cliffs vary greatly with 2564 individuals recorded in 1974 between Speeton and the Fog Station, whilst 4876 were present in 1977 on the cliffs of the Bempton RSPB Reserve, with 2000 pairs thought to be breeding there in 1978. The difficulty in arriving at an accurate figure of the breeding birds can be illustrated by the fact that on 12 June 1978 between 6000 and 7000 were present in the Bempton area, whilst very few had been recorded the previous day. In 1976, an estimated 25 pairs were seen on Newbiggin Cliff, just to the north of Filey, since when few counts have been forthcoming, although 36 birds were counted on the cliffs in 1986. The three national surveys reported 997 birds for Humberside in 1970; by 1987 this had increased to 6946, but decreased to 2612 in 2000. None were found in North Yorkshire during the 1970 survey, but 139 were recorded in 1987, and 38 in 2000. It has been admitted that the counts of "Operation Seafarer" for this species were of low accuracy, thus comparisons between that census and the two subsequent ones should be viewed with caution. However, even with a degree of scepticism, the breeding numbers between the Moray Firth and the Flamborough headland have increased 12-fold since 1970. Flamborough has had an overall increase since 1970, although the 2000 total is dramatically down on that of 1987. Again it must be stressed that reliance on these counts should be cautious. No reasons have been forthcoming for the level of the Flamborough breeding numbers, but obviously the restricted availability of breeding sites may be a large factor. The colony on the Isle of May, in the Firth of Forth, being on a flat-topped island with large areas of grass and thus suitable breeding areas, has increased from 2000 occupied sites in 1970 to more than 69,000 in 2003. It has been estimated that if the remainder of the island, so far with few breeding birds, is utilised to the full, this site could hold 250,000 pairs, assuming that there is a sufficient, readily available food supply. Likewise, other east coast colonies have increased in a similar manner; the Farne Islands now hold 55,700 pairs (cf. 26,000 in 1985), whilst Coquet Island has 17,000 (cf. 3000 in 1968). In common with other seabirds breeding in large numbers on Flamborough, it is not unusual to record exceptionally large counts from the seaward end of the head, although with over 30,000 being reported on several occasions, a large proportion of these birds must be on feeding forays from colonies further north.

Conclusions

It has been shown that seabirds breeding within Yorkshire, in general with those in the remainder of the British Isles, have increased in recent decades, although there have been occasional setbacks to certain species in some years when the population of sandeels has been low. There is much dispute as to the reasons for decreases in sandeels ranging from global warming, over-fishing, and a return of herring stocks to a previous high level. Seabirds, owing to their longevity, are able to withstand occasional years of low productivity or even a complete lack of young being reared, as long as lean years do not become common-place. Future and more varied research will, hopefully, lead to a greater understanding of the sandeel situation so that measures may be implemented to safeguard levels of that species around our coasts.

Acknowledgements

I wish to express my gratitude to all who commented or advised on the preliminary drafts of this paper, to Prof. M. R. D. Seaward, Editor of *The Naturalist*, for his patience and forbearance, and to the members of the Yorkshire Naturalists' Union who bestowed upon me the honour of Presidency during 2004.

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BOOK REVIEW

Freshwater Bivalves of Britain and Ireland by **Ian Killeen**, **David Aldridge** and **Graham Oliver**. AIDGAP Publication. 2004. £23.00 (including postage) from: Field Studies Council, Preston Montford, Shropshire SY4 1HW.

This A4 sized, 114-page ring-bound publication contains 35 full colour plates, full colour identification charts and figures as well as national distribution maps. It illustrates 32 species, including one predicted to arrive but, as yet, not found in Britain or Ireland.

Freshwater bivalves are notoriously difficult to identify, especially the pea shells belonging to the genus *Pisidium*. The high quality illustrations, combined with the charts and biological information, are a great help in determining the special characteristics which separate these very small bivalves. The identifications within this guide are based on external comparisons with bulk samples, something I personally was very doubtful about, but since the publication of this book, I have followed the methods suggested and find that many species have proved to be very easy to separate.

The book is perhaps one of the best of the AIDGAP series and should become a classic for all interested in our native freshwater fauna.

AN

RECORDS OF THE SLENDER GROUND-HOPPER *TETRIX SUBULATA* (LINN. 1758) (ORTHOPTERA: TETRIGIDAE) IN YORKSHIRE

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INTRODUCTION

The Slender Ground-hopper *Tetrix subulata* has a wide distribution in southern and central England and is a species characteristic of bare mud and damp habitats with short vegetation (Marshall & Haes 1990; Haes & Harding 1997). It is considered to be associated mainly with calcareous soils such as floodplains and fens. *T. subulata* is one of three species of Tetrigidae occurring in the UK, the others being the Common Ground-hopper *T. undulata* which is widespread in Yorkshire and Cepero's Ground-hopper *T. ceperoi* which is only found in the extreme south of the country. *T. subulata* was found in Yorkshire at several locations in the Thorne-Hatfield Moors area, but was last recorded in 1837 (Skidmore *et al.* 1987) and had since been considered extinct. More recently, its status has been described as "rare and localized resident" (Limbert 2004).

A detailed description of the biology of this species is given in Marshall and Haes (1990) and will not be reproduced here. *T. subulata* can be differentiated from *T. undulata* by the elongated pronotum which extends beyond the end of the abdomen, with the wings extending beyond the end of the pronotum (Fig. 1). *T. undulata* has a much shortened pronotum with a more pronounced keel. *T. ceperoi* also has an extended pronotum with which *T. subulata* could be confused in the south of England and southern Wales, but this is not a concern in Yorkshire.

FIGURE 1.
Photograph of adult *T. subulata* captured at Drax Power Station (SE653282) on 25/04/2004.

RECENT RECORDS NORTH OF THE RIVER HUMBER

The first sighting of this species north of the River Humber was by the author at Barlow Ash Mound, adjacent to Drax Power Station near Selby, on 8 May 1998 during a moth trapping session when a single specimen wandered onto the sheet. The moth light (160W blended mercury vapour) was placed at the edge of a relatively mature woodland. The specimen was subsequently verified by John Widgery (Orthoptera Recording Scheme). Despite extensive searches at Drax for more specimens in 1998, 1999 and 2000, it was not until April 2001 that a second individual was found purely by accident when it was disturbed and jumped into Fenton's Pond. The pond is *c.* 1 km south of the first record on the same site, and the insect has subsequently been found on bare ground to the north of the pond in 2002 and at the original woodland edge site in 2004 in large numbers.

Since 1998, the insect has been found at 9 additional sites as detailed in Table 1, partly as a result of bioacoustic research on automated species identification (Chesmore & Ohya 2004). These sites are as much as 20 km north and 50 km east of Drax in a variety of habitats, but all north of the River Humber. Figures 2 and 3 show distribution maps at 2 km and 10 km scales respectively. Several of the sites are described in detail in the following section.

TABLE 1
T. subulata Records in Yorkshire since 1998

Site	VC	Grid Reference	Recorder	Date(s)
Allerthorpe Wood	61	SE760480	D. Chesmore	13/05/2001 19/05/2001
Bishop Wood	64	SE555335	D. Chesmore	30/03/2004 8/06/2004
Broomfleet Ponds	61	SE865283	P. Kendall	2/05/2001
Drax Power Station	62	SE653282	D. Chesmore	8/05/1998 20/04/2001 27/03/2002 25/04/2004
Eastrington Ponds	61	SE785299	P. Kendall	14/06/2001
Disused railway line in Holme on Spalding Moor	61	SE770379	D. Chesmore	4/08/2004
Kiplingcotes Station	61	SE903426	D. Chesmore	16/05/2004
Leconfield Carrs	61	TA030435	D. Chesmore	13/09/2003
North Duffield Ings	61	SE696358	P. Kendall	11/08/2001
Saltmarshe Delph	61	SE774248	P. Kendall	20/05/2001

HABITAT CHARACTERISTICS

Barlow Nature Reserve, Drax Power Station (Drax Power Ltd)

The nature reserve at Drax power station is situated to the west of the station and is accessed via Barlow village. The reserve is over 100 ha in area, most of which is Barlow Ash Mound, created by pulverised fuel ash from the power station, and is being actively managed for agriculture and wildlife. The reserve extends off the mound to the west and includes areas of woodland (mixed oak, beech, mature hawthorn and some Scots pine), run-off ditches and man-made ponds. The site is rich in biodiversity, particularly flora, birds and insects; nearly 400 species of Lepidoptera have been recorded, as well as the Oak Bush-cricket *Meconema thalassinum* (Chesmore 1999, 2001). *T. subulata* has been found at Drax along the edges of Fenton's Pond, a man-made shallow pond, on bare ground at the edge of woodland dominated by Scots pine and close to the main path, and on mud-clinker mix to the north of the nature study centre.

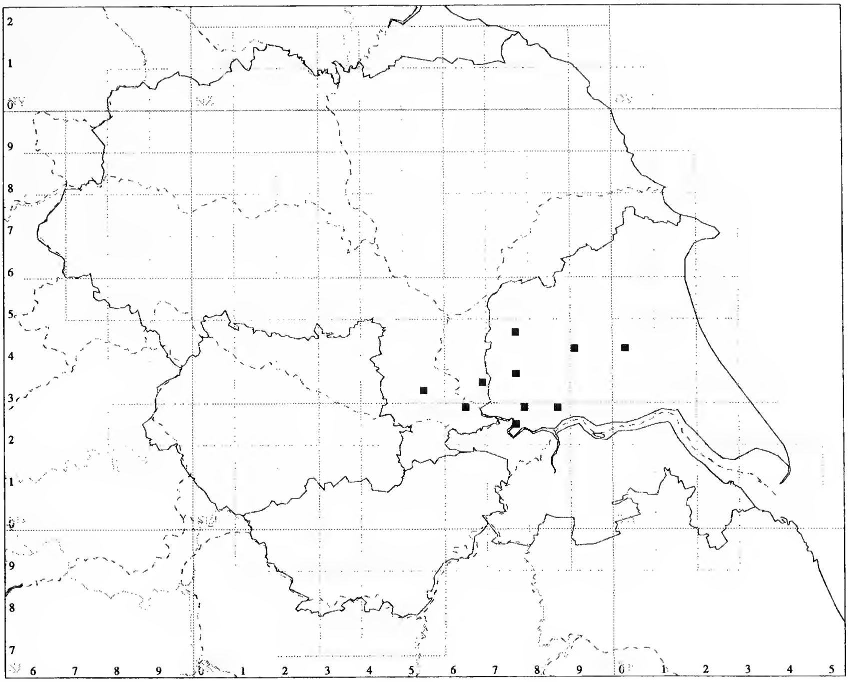

FIGURE 2.
Distribution of *T. subulata* in Yorkshire on a 2 km grid.

Eastrington Ponds Local Nature Reserve (East Riding of Yorkshire Council)
Eastrington ponds lie west of Eastrington village and consist of one large and several smaller ponds and several borrow pits along the disused railway line. The ponds were dug for clay and are now used for fishing. The habitat is varied and rich in flora and fauna including Purple Hairstreak butterfly *Quercusia quercus*, Speckled Wood butterfly *Pararge aegeria* and the Cream-bordered Green Pea moth *Earis clorana* (a notable B species). The site has neutral to slightly acid soil, with areas of bare ground around the ponds and along the railway line.

Allerthorpe Wood (Forestry Commission)
Allerthorpe Wood is a pine plantation on a lowland heath (Allerthorpe Common). The heathland that still exists is managed by the Yorkshire Wildlife Trust. Allerthorpe Wood is unusually rich in insect species, especially Lepidoptera such as Pine Hawk-moth *Hyloicus pinastri* and the recently discovered *Scythris inspersella* that only occurs elsewhere in the UK in North Norfolk (Chesmore 2003). *T. subulata* was found together with *T. undulata* in 2001 on wet bare ground along one of the sandy rides in the woodland. The ground along the rides is acidic and often dries out in the summer. *T. subulata* has not yet been found on the heathland.

North Duffield Ings (part of Lower Derwent National Nature Reserve)
The site is on the north side of the A163 between Bubwith and North Duffield and to the west of the River Derwent. One specimen was found during National Moth Night on 11

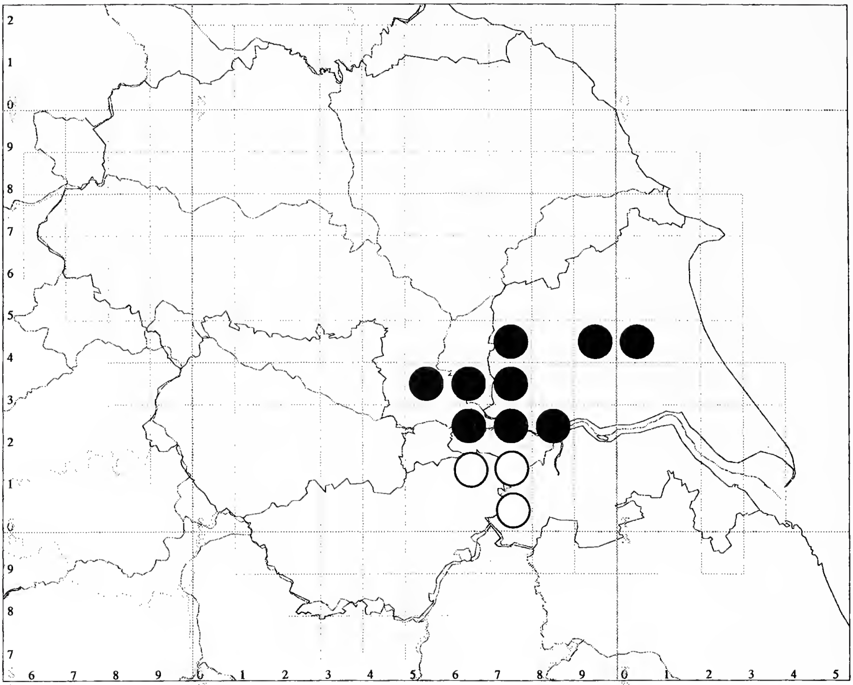

FIGURE 3.
Distribution of *T. subulata* distribution in Yorkshire on a 10 km grid. Black dots are for records since 1992 and white dots for 1837 (from Haes & Harding 1997).

August 2001 by Peter Kendall. The insect had been attracted to one of the MV lights placed on the southern edge of the pond. The site is close to the River Derwent and is flooded at least once per year, sometimes for several weeks.

Leconfield Carrs (Ministry of Defence)
The Carrs are part of the MoD School of Transport at Normandy Barracks in Leconfield. The author has recently been carrying out Lepidoptera surveys using light traps and it was at one of the trapping sessions that *T. subulata* appeared, attracted to the light. The habitat where the insect was found is Combat Wood 1 under oak trees on a path where army vehicles are regularly driven. The whole site is 233 ha in size and the ground is alkaline. There are many suitable habitats within the site and the insect is likely to be present at other locations.

Holme on Spalding Moor Disused Railway Line
The disused railway line between Howden and Market Weighton passes through Holme on Spalding Moor to the north-west and is a public right of way for most of its length. The line crosses the A163 *c.* 2.5 km west of the village where there is a rough car park. One *T. subulata* was found swimming in a temporary puddle at the edge of the car park, on bare ground. The car park area is often used for temporary storage of hard core for road repairs and puddles are often polluted by petrol and diesel.

Bishop Wood (Forestry Commission)

Bishop Wood is a planted ancient woodland *c*. 5 km west of Selby. It is the largest wooded area in the Humberland levels and is entomologically rich; it is one of the few sites where the Argent and Sable moth *Rheumaptera hastata* is found. The Oak Bush-cricket *Meconema thalassinum* is also common. *T. subulata* was first found in the wetter southern side of the wood during a moth trapping session. It has subsequently been found on the north side of the wood during the day.

Discussion

A gap of 161 years between sitings of *T. subulata* and its subsequent discovery over a wide geographic area naturally leads to several questions: Is this a recent expansion? Has the species been expanding slowly for many years and overlooked? Has it simply been overlooked? What are the mechanisms of dispersal?

Apparently "rapid" expansions of species are commonly attributed to climate change, notably "global warming", but the signature for this, if any, is currently too small to isolate. Many other factors complicate the simplistic notion that some species will extend their range as a consequence of increased temperature. This is particularly true for the UK since the landscape has been, and continues to be, modified by man. Habitat loss, land use changes, etc all have greater impacts on species distribution than climate change, and often on a shorter time scale. This is of course a generalization and different species will show different sensitivity to habitat and climate changes. The author has suggested that many species are more suited to the monitoring of habitat change than climate change (Chesmore 2004).

It is the author's opinion that the insect has simply been overlooked for several reasons. Firstly, Marshall and Haes (1998) state that the species "has a marked preference for acid-free soils". However, its discovery on acid soils in Yorkshire may indicate that it has a wider tolerance of soil pH and that it should be looked for in more diverse habitats. Secondly, there are very few active recorders of Orthoptera in Yorkshire and no systematic surveys have been undertaken. Indeed, the majority of recent sitings have been serendipitous. Dispersal mechanisms are not known although *T. subulata* is a strong flyer and can swim well. Its survival in water may be a contributing factor in riverine transport and via flooding

T. subulata is generally considered to be diurnal (Marshall & Haes 1990); however, it has been found in four sites, having been attracted to high intensity mercury vapour (MV) and blended MV lamps during moth trapping sessions. Whether the species exhibits nocturnal traits or has simply been disturbed remains to be determined. This may provide the basis for a more comprehensive survey

Acknowledgements

The author would like to acknowledge John Widgery (Orthoptera Recording Scheme) for identification and information, Peter Kendall for providing records, and the Forestry Commission, English Nature, Drax Power Ltd, Yorkshire Wildlife Trust, East Riding of Yorkshire Council and the MOD Conservation Leconfield Carrs conservation group for permission to visit sites.

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BOOK REVIEW

The Dragonflies of Europe by **R. R. Askew**. Revised edition. Pp. 308, with 513 text figures, 114 maps and 30 colour plates. Harley Books, Great Horkesley, Colchester. 2004. £30.00 softback.

This is a re-issue in a smaller format, but with updated information, of the 1988 hardback edition. It has a new cover, foreword, preface, a 10-page supplement, five extra pages of references and recent literature, and one new colour plate. The book is divided into sections covering the evolution of odonates, their life-history, a description of the adult insects, and their distribution and morphology. These are virtually unchanged from the first edition.

A checklist of the European species of Odonata is followed by keys to families, genera and species, and includes black and white figures showing critical features. A description of the adult of each species is given along with brief notes of its biology and behaviour, flight period and distribution. Keys and very clear black and white diagrams are provided to identify the final instar larvae.

The Supplement comprises, under headings, information on Nomenclature; Orthography; Thermoregulation; American species observed in Europe; Accidental introductions in Europe; Other species newly recognised in Europe; Expansion of recorded ranges within Europe; Other new distribution records, and contraction of recorded ranges. A short history and description is given of each of the additional species mentioned in the Supplement and, where appropriate, black and white text figures are provided.

The front cover portrays the newly discovered Bulgarian odonate *Somatochlora borisi*.

Range changes of some species and the availability of many more distribution records than were available in 1988 are noted in the text, and it is a pity that the maps have not been updated to reflect this information. The male abdomen and the pronotal margins of both the male and female of the eleven species of *Coenagrion* are illustrated, but the pterostigma of only seven of the species are depicted. Furthermore, with the addition of eleven new breeding species, the total is now 125 and not 124 as stated on the back cover. However, these are minor niggles in an otherwise excellent publication.

If you bought the original, is it worth paying £30.00 for an extra 16 pages of text and one colour plate? However, if you did not buy the original, buy this. It is the most comprehensive, informative and beautifully illustrated guide and reference book to European Odonata available and well worth the asking price.

MJL

YORKSHIRE NATURALISTS' UNION EXCURSIONS IN 2003

Compiled by
A. HENDERSON and JANETTA LAMBERT

HAW PARK (VC63), 17 May 2003

INTRODUCTION (J. Lambert)

The weather, cloudy after rain, soon brightened. 22 members and guests gathered in the car park at The Heronry Country Park on Haw Park Lane. The afternoon meeting, held at the Waterton Countryside Discovery Centre was well attended and the refreshments were much appreciated by members after a day in the field. Adrian Norris took the Chair; 14 Affiliated Societies were represented. After the main reports, it was noted that the boundary wall of Waterton Park was in a bad state of repair in several places and conservation work was desirable. Where the Barnsley canal runs south of Haw Park Wood, some sections have been filled in and the steep sandy banks were becoming very overgrown and shading valuable habitat.

A vote of thanks was given to John Baxter, the Countryside Ranger, for hosting the meeting, and to all who had helped with the day's organisation.

VERTEBRATES

Common Frog, Toad, Smooth Newt, Stickleback, Rabbit, Bank Vole, Grey Squirrel and Stoat were seen on the day. An American Mink was seen on a pre-meeting visit a few weeks previously at Cold Hiendley Bridge.

ORNITHOLOGY (P. Smith)

The highlight of the day was without doubt the juvenile Swallow that was seen sitting on wires in the car park at the start of the meeting. It was in full juvenile plumage with a pale buff throat and forehead, dull and indistinct breast band, duller blue upper parts and short tail streamers. It is far too early for it to be a British bred bird as they fledge in mid to late June at the earliest; it was more likely to be a bird from the Spanish or North African breeding population as they arrive and breed earlier than ours. Presumably it joined some British Swallows migrating through this region and followed them northwards to our shores.

The rest of the day was spent in pleasant mixed woodland where the usual range of species was seen and heard, the highlights being Cuckoo, Tawny Owl, Goldcrest, Garden Warbler and Great Spotted Woodpecker.

CONCHOLOGY (A. Norris)

The mollusca of Haw Park and Wintersett Reservoir are fairly well known, visits having taken place in April 1967, April 1976, and May 1988. A total of 51 species is recorded from SE/3614, and 18 from SE/3514, altogether totalling 53 species. On this visit the recording was confined to SE/3615 (18 species), SE/3715 (24 species) and SE/3815 (10 species). Eight species were new to the area, bringing the total for the estate to 59.

Acroloxus lacustris, *Stagnicola palustris* and *Anisus spirorbis* all came from the old canal which has deteriorated over the years and no longer contains a canal fauna. The alien *Physella acuta* came from the ponds by the café and was probably introduced with pondweeds. The next three species, *Punctum pygmaeum*, *Zonitoides nitidus* and *Aegopinella pura*, all came from the banks of Wintersett Reservoir close to Anglers Country Park. *Monacha cantiana* was found by the side of the road near the main car park. It should be noted that the specimens of *Acroloxus lacustris* from the old canal proved to be exceptionally large, so they at least like the new habitat.

ENTOMOLOGY (G. Boyd & A. Coleman)

The weather was rather cool and grey after overnight rain though occasionally warm when the sun showed for a few minutes. Insects noted included 5 species of lepidoptera, 9 species of diptera and 10 species of coleoptera, all of which are widespread in the area. The one species of hymenoptera, a Cuckoo Bee *Nomada lathburiana* is listed in the Red Data Book, but Dr Michael Archer has found it to be fairly widespread in Yorkshire, especially in the south.

COLEOPTERA (F. E. Kenington & M. L. Denton)
The occasional shower, coupled with more persistent rain the previous day, made employment of the sweep-net and beating-sheet a futile operation. Inspection of dead wood and general searching, however, revealed the presence of a number of interesting species. Yet, despite the number of coleopterists, the total for the day was only 83 species.

The black, red and white Ant Beetle *Thanasimus formicarius* was found on a pile of stacked pine logs. The adult is 7-10 mm in length, and both it and the larvae are effective predators of bark beetles, generally in pine forests, but occasionally in deciduous woods. Common in southern Britain and Speyside, the species is rarer away from these areas. In Yorkshire it is recorded from 18 localities, but only six of these are post-1970.

The weevil *Curculio venosus* was found on its food plant, oak. Locally distributed in southern Britain, but rarer north of there, the species is known from only 15 Yorkshire localities, all in the southern half of the county, the first record being in 1979. The females have an extremely long rostrum which they use to bore holes in acorns where they lay their eggs.

The ground beetle *Leistus spinibarbis* was found in a small copse adjacent to Haw Park (from where it was also reported earlier in the year). The species has no particular habit specificity; it is locally common in some parts of southern Britain, but occurs less frequently in the north, with very few Yorkshire records.

A number of common Staphylinids and ground beetles were found in the Barnsley Canal near Blue Bridge, but, rather interestingly, no water beetles were observed. The saproxylic click beetle *Denticollis linearis* (a common species) was found in this area, as was the closely related *Trixagus dermestoides* (they can also spring, but less ably); the larvae live in the soil and show little activity, feeding on ectotrophic mycorrhizas of various trees.

In the insect world runts are extremely unusual. Certain species, due to their food when in the larval stage, can vary tremendously in length; for example, the click beetle *Melanotus villosus* can vary in size between 15.0 and 20.0 mm. On the other hand, runt ground beetles are a rarity, so the finding of a *Notiophilus biguttatus* at only 4.5 mm (the normal size ranges between 5.0 and 6.0 mm) was most unexpected.

FLOWERING PLANTS (J. Lambert)
In Haw Park Lane amongst Oak, Hazel and Willow it was pleasant to see several *Ulmus glabra*. *Rosa arvensis*, more abundant here in the south of the county, was in hedgerows. In the main part of the wood *Hyacinthoides non-scripta*, *Mercurialis perennis*, *Melica uniflora* and *Oxalis acetosella* occurred. To the north, the boundary wall of Walton Park was covered in places with huge trusses of *Hedera helix*, perhaps surviving from Charles Waterton's time.

In places under the mainly coniferous tree canopy *Luzula pilosa* was seen. The tall elegant *Milium effusum* was also in the wood and with *Deschampsia flexuosa* on the steep banks of the Barnsley Canal further north. In this area the lane sides had some magnificent clumps of *Teucrium scorodonia*. One clump of *Hypericum pulchrum* was also seen. In the south-west part of the wood, *Lamiastrum galeobdolon* subsp. *montanum* was in full flower.

MYCOLOGY (J. O. K. Webb)
The dryness of recent weeks was not alleviated to any degree by the morning rain, which made little difference to the sparseness of agarics in a predominantly coniferous habitat (*Pinus sylvestris*), with occasional small stands of *Quercus* and *Fagus*, and some scattered *Betula*. Near the canal were species of Alder and Salix.

The common *Orbilla xanthostigma* was one of eight Ascomycetes found. Willis Bramley commented in his *Flora* that it was "once used as a repository for similar discomycetes". A small white disc on the base of an *Urtica* stem, which could be readily mistaken for a discomycete, was collected but determination as *Calyptella capula* put it firmly in the Basidiomycota, of which 9 were collected. Ten Myxomycetes were recorded, *Lycogala terrestre* being particularly profuse; *L. epidendrum* in contrast was not found. Of three *Cribraria* collected, *C. macrocarpa, C. rufa* and *C. microcarpa*, the last was new to VC63.

In total, 34 species were collected and successfully determined.

LICHENOLOGY (A. Henderson)

As the meeting assembled in the car park, extensive littering of the low kerb edges by numerous thalli of *Nostoc commune* was noted. The ovoid nameplate by the car park entrance illustrated how propagules of *Xanthorion-Physcietum* species, carried by birds perching above, are washed down the glossy surface until they lodge in niches of the rough wooden stand below and successfully develop.

Willow carr proved to be the most productive habitat with at least 19 corticolous species, 12 of them fruticose or foliose. Occasional *Parmeliopsis ambigua* signalled a degree of atmospheric acidity. *Ramalina farinacea* and *Evernia prunastri* were up to *c*. 7 cm long. *Parmotrema chinense* and *Punctelia subrudecta* were recent invaders on underlying *Amandinea punctata, Lecania erysibe, L. cyrtella, Lecanora conizaeoides* and *L. dispersa* with an occasional *Xanthorion* element.

Considerable time was spent out of sentimentality, historical interest and conservationist concern, examining what remains of the dilapidated boundary wall of Charles Waterton's Walton Hall estate. It supports a flora comparable with that of older less polluted, cemented/mortared, brick/stone walls in industrialised areas with *Lecanora albescens, Lecidella stigmatea, Lepraria lobificans, Scoliciosporum umbrinum* and *Trapelia coarctata* among the defining species of the assemblages noted.

A total of 42 species was recorded during the day.

INGLEBOROUGH (VC64) 21 June 2003

INTRODUCTION (A. Norris)

The excursion to Southerscales, Scar Close and Brae Pasture was a great success even if the turnout was less than expected. Eleven members representing twelve societies met in the car park of the Hill Inn. The main party spent most of the day on Southerscales with a smaller party visiting Scar Close. Brae Pasture was visited in the late afternoon, after the tea and main meeting, which was held in the Hill Inn. It was very disappointing not to have any members recording the main entomological groups, particularly since the weather was so fine and dry. The weather forecast for the day indicated that a weather front was very close to the area. This front however stayed away until the early evening so most of the day was spent in hot sunny weather. Light rain occurred at Brae Pasture in the early evening bringing out the midges in force.

Few mammals were recorded other than mole and rabbit, although a dead hare was noted on the road close to the Hill Inn.

CONCHOLOGY (A. Norris & D. Lindley)

On a visit to Southerscales in August 1974 Prof. R. A. D. Cameron recorded 19 species. The conchologists, visiting in September 2001, recorded 25 species, so that the total number of mollusca now recorded for Southerscales is 34. In 1974 Cameron also visited Scar Close recording 25 species. As we had never visited Scar Close previously, we looked at several specific sites and recorded 40 species, bringing the total for the area to 42. Two species, *Vitrea crystallina* and *Trichia hispida*, recorded by Cameron, we failed to re-find.

Visiting Brae Pasture in January 2003, we recorded 18 species. On this occasion we recorded a further 13 species bringing the total to 31.

Several important and interesting records were noted from the three sites. *Acicula fusca* was found under overlapping mats of vegetation on the limestone clints at Scar Close. This species is rarely recorded in the Yorkshire Dales. *Abida secale* was recorded from both Southerscales and Scar Close. This is a high altitude species, in Yorkshire found only on the mountain limestone. Five Vertiginidae were recorded, including *Vertigo substriata*, *V. pygmaea* and *V. alpestris*. The latter was found under and amongst the mosses *Hypnum cupressiforme, Neckera complanata, N. crispa, Homalothecium sericeum* and *Tortella tortuosa* on an old dry stone wall bordering Brae Pasture. *Vitrea subrimata* proved to be very common under stones in the Scar Close Reserve, and *Acanthinula aculeata* was also found amongst leaf litter in the reserve.

PLANT GALLS (K. Payne)

Leaf galls on *Crataegus monogyna* growing as single trees on the limestone pavement at Southerscales were later identified as caused by one of a group of *Dysaphis* species which all have *Crataegus* as their primary host but whose summer generation lives on the roots of various other flowering plants. At Brae Pasture YWT reserve, galls caused by the mite *Eriophyes goniothorax typicus* were seen on the leaves of *Crataegus*.

OTHER ARTHROPODS (D. T. Richardson)

Records for the day were four species of woodlouse from Scar Close, including *Armadillidium pulchellum* in large numbers beneath moss mats on the clints, two centipedes, four millipedes, including large numbers of the striking orange-striped *Ommatoiulus sabulosus*, and the harvestman *Mitopus morio*.

BOTANY (P. P. Abbott & J. G. Lambert)

As expected, the grykes contained many ferns, including *Dryopteris submontana,* and *Gymnocarpium robertianum* was on the ledges. *Actaea spicata* was frequent. A delightful vignette was a group of *Sedum villosum* in a hollow in a clint – the subject of many photographs. The limestone pavement was interspersed with areas of glacial drift where build-up of peat had produced a calcifuge flora including *Calluna vulgaris, Carex pilulifera* and *Vaccinium myrtillus*.

Plants seen at Brae Pasture included *Asplenium trichomanes-ramosum, Primula farinosa, Polygonum viviparum* and *Carlina vulgaris*. In stony places, mainly under the west boundary wall, there were several patches of flowering *Saxifraga hypnoides*.

BRYOLOGY (J. M. Blackburn)

Most of the day was spent recording Southerscales Reserve, with an hour each at Park Close and Brae Pasture.

At Southerscales, the first hour was spent looking at the grassland areas away from the limestone pavement. Species recorded included *Calliergonella cuspidata, Dicranum scoparium, Hypnum lacunosum* var. *lacunosum*, some good-sized pads of *Leucobryum glaucum, Thuidium tamariscinum* and *Scapania aspera*. Species found on or around the rocks were *Ctenidium molluscum, Didymodon sinuosus, Ditrichum crispatissimum, Fissidens cristatus, Gymnostomum aeruginosum, Neckera complanata, N. crispa* and *Tortella tortuosa*. The pavement grykes were well vegetated with *Encalypta streptocarpa, Isothecium myurum, Plagiomnium undulatum, Thamnobryum alopecurum, Conocephalum conicum* and *Plagiochila porelloides*. Soil pockets on the pavement surface had *Bryum pallens* and *B. pseudotriquetrum*. The rather stunted trees on the pavement had a limited cover of common species. Some of the higher ground was acidic and unrewarding, but a low-lying wet area supported four common *Sphagnum* species, along with *Aulacomnium palustre, Campylopus paradoxus, Calypogeia muelleriana, Diplophyllum albicans* and *Lophozia ventricosa*.

More extensive cover of the reserve would surely reveal more, but a satisfying 50 species were recorded.

A quick visit to the nearby reserve of Scar Close was made late in the afternoon in order to compare the two areas. Here the grykes were much deeper and any vegetation was inaccessible. However, in the grassland several species not recorded on Southerscales were seen, including *Hylocomium splendens, Pleurozium schreberi* and *Rhytidiadelphus triquetrus*. A total of 18 species was recorded.

An hour at Brae Pasture was spent entirely in the lower part. The long wall forming the reserve boundary was covered in mosses, with *Ctenidium molluscum, Neckera complanata, N. crispa* and *Tortella tortuosa*. The grassed and bare areas had *Cratoneuron filicinum, Fissidens cristatus, Palustriella commutata* var. *commutata, Philonotis fontana, Plagiomnium affine, Thuidium tamariscinum, Scapania aspera* and *Jungermannia gracillima*. Two surprising finds were *Cinclidotus fontinaloides* and *Hygrohypnum ochraceum*, seen here, no doubt, because of flooding in wet weather. Rocks on the slopes were quite rich, with *Didymodon luridus, Isothecium myurum, Thamnobryum alopecurum, Trichostomum brachydontium, Diplophyllum albicans* and *Pellia epiphylla*. A cave-like area with tufa-forming dripping water had the expected moss *Eucladium verticillatum*. Several trees had a few common species.

A total of 39 species was recorded on this short visit. The higher parts of the reserve were not inspected as, apart from time, the midges were becoming troublesome.

MYCOLOGY (C. S. V. Yeates)

Sites such as those visited on this occasion, comprising short grazed grassland, exposed limestone pavement, etc., are not ideal for the mycologist in midsummer. Wet weather can produce a flush of fascinating and attractive grassland agarics and other fungi, but these were not the conditions prevailing here. However, careful searching by the writer and John Webb did produce a modest list and a few species of note. The sites explored included Southerscales Scar and Scar Close above Chapel-le-Dale, and Brae Pasture above Selside.

By far the most interesting species found was the ascomycete *Gloniella moliniae*; ironically, in such a predominantly calcareous area, it occurred on *Molinia caerulea* in damp acid grassland above the limestone pavement at Southerscales. This species has not been recorded in Yorkshire before; indeed on the British Mycological Society's Fungal Records Database (which is now approaching one million records) there is no localised occurrence for the whole of Great Britain and Ireland.

The hyphomycete *Phacellium alborosellum* was recorded on dying spots on living *Cerastium fontanum* leaves; this was the fourth Yorkshire record, and the second for VC64. Among the relatively few species of rust fungi found, *Hyalopsora polypodii* on *Cystopteris fragilis* in the limestone pavement at Southerscales was the most significant. This species is rather unusual among the rusts on ferns in that its spores are pigmented. Apart from a late 19th century record from New Farnley near Leeds, the few Yorkshire records of this species are, as here, from the western portion of VC64.

In all, 45 species, almost all microfungi, were recorded during the day.

FRESHWATER ECOLOGY (D. T. Richardson)

Scar Close provided extensive sheets of the semi-terrestrial alga *Nostoc commune* and the salmon-pink rotifer *Philodina roseola* in water-filled solution hollows on the clints. A *Sphagnum* pool hosted a number of desmids, filamentous algae and diatoms, six of the latter being identified to species level. A small stream (SE 7511.7674) yielded the water-cricket *Vella caprai*, the amphipod *Gammarus pulex* and the larva of the mayfly *Baëtis muiticus*; water analyses revealed the following: composition (in mg $CaCO_3$ l^{-1}) Ca + Mg 134, Ca 98 and alkalinity 132, water temperature 15°C and pH 8.15.

HEBBLETHWAITE HALL GILL, SEDBURGH (VC65) 5 July 2003

INTRODUCTION (D. Millward)

21 members from 12 societies attended the meeting on a dull but dry, warm day. Members gathered at Greenwood Hall where the owners had kindly permitted some overspill parking. Throughout the day members had the benefit of the landowner's very sound

knowledge of the local history and land use of the area, and we are very grateful to Mr Lancaster for devoting the time to accompany the group and answer the many questions on mining, mills and population trends, that arose during the day.

After crossing several indifferent fields the route passed through a deserted farmyard where we were shown the intricacies of the fine timberwork in a barn roof. Beyond this point the quality of habitat improved with some good wet areas and diverse grassland before dropping into the gill itself, now owned by the Woodland Trust. Here the secondary woodland which had developed since the abandonment of the mill, was dark and sombre with several epiphytes established on the now mature trees. The habitat altered with the changing geology as we walked over first conglomerate, then Silurian slates, followed by the sandstones and calcareous beds of the Wensleydale (Yoredale) series of rocks. At the heart of the Dent fault these latter beds were contorted and in places vertical, making fascinating topography.

After lunching beside the stream on a calcareous knoll, where several new species were recorded for the local change project run by the Botanical Society of the British Isles, we clambered up a rocky gorge to emerge onto the open moorland. Here flushes running into the stream added interest and we gathered on a rocky outcrop festooned with honeysuckle and bell heather in full bloom to see how the water had eroded a shale bed, forming a strange channel between harder rocks. Most members crossed a short stretch of moor to see Breaksay Mire but few ventured far onto the notorious quaking bog. Returning to the cars down a high banked narrow lane was more reminiscent of Devon than "Yorkshire as was" and now Cumbria.

Unusually for a VC65 meeting, the report session was held in the very civilised setting of Farfield Mill where the superior catering was appreciated and made a pleasant change from the normal alfresco event that this excursion secretary tends to organise.

MAMMALS AND AMPHIBIANS (C. Simms)

Common Frog, Common Toad (bones under stone), Mole, Common Shrew, Brown Hare, Rabbit, Weasel, Fox, Brown Rat, Bank Vole (skull) and Field Vole were recorded.

ORNITHOLOGY (B. Shorrock)

Bird song had virtually ceased, so a few species were missed, but nevertheless a good many were noted. Rather surprisingly no buzzards were seen until after the walk had been completed and yet this bird is well established in the Sedburgh area. A Kestrel and a Short-eared Owl, viewed long distance, were the only birds of prey observed. A family party of Whinchat, along with Tree Pipit, Ring Ouzel, Spotted Flycatcher and Redstart were the main birds of interest. Most of the common species were noted, Corvids, Chaffinch, House Sparrow, Blackbird, Blue and Great Tit, Mallard, Robin, Willow Warbler, etc. The waders, Redshank, Woodcock and Oystercatcher were recorded by C. Simms. One Curlew was heard and one Snipe seen. A visit in May would be more productive from an ornithological viewpoint in what is a very interesting area.

CONCHOLOGY (A. Norris)

Five 1 km squares were visited and a total of 37 species was found. The occurrence of *Boettgerilla pallens* in the Woodland Trust area was of particular note as this slug is regarded as a species which was introduced with, and spread by, garden plants. The Woodland Trust area is quite away from any garden. One of the more interesting locations was a limestone block on the top of a gritstone gatepost, part of a now derelict boundary wall. This was the only location in which we found *Balea perversa*. The calcareous springs at the head of the valley produced two vertiginids, *Vertigo antivertigo* and *V. substriata*. A fuller survey of this area could well produce one or more even rarer species of mollusc.

ENTOMOLOGY (C. Simms & J. G. Lambert)

The moths, Chimney Sweeper *Odezia atrata*, Red Underwing *Catacola nupta* and Large

Yellow Underwing *Noctua pronuba*, and the Red Damselfly *Pyrrhosoma nymphula* were recorded.

Plant Galls (T. Higginbottom)
The late Fred Stubbs often commented that finding plant galls in VC65 was no easy task. Twenty-two galls were discovered during the day, which, on reflection, was quite a good list for the habitats visited. Meadowsweet was quite common in marshy areas and the leaves were often covered in the white pimples of the midge gall *Dasineura ulmaria* or the circular blisters of another midge *D. pustulans*. A line of Alders were galled by three mite galls: *Acalitus brevitarsus* which produces an erineum on the under surface of the leaf, *Aceria laevis* which covers the leaf all over in whitish pimples, and the more pronounced pimples down the mid-rib caused by *Eriophyes inangulis*. There was an abundance of another mite gall *E. padi*, which is like a fine nail gall, on the leaves of Bird Cherry. It was also interesting to see the flowers of Ash galled by the mite *Aceria fraxinivorus*, a gall which often seems abundant on one tree but does not affect neighbouring trees.

Botany (J. G. Lambert)
Over 200 species were recorded by Margaret Hartley and Deborah Millward, including 14 species of *Carex*, the small *C. dioica* and *C. caryophyllea* being easily overlooked. *Gentianella amarella* was in short grass on a calcareous knoll where the botanists stopped for lunch, and on an outcrop of limestone rock several ferns were seen, including *Cystopteris fragilis*. *Menyanthes trifoliata* and *Vaccinium oxycoccos* in Breaksay Moss were typical of the habitat.

Bryology (J.M. Blackburn)
The fields and bank sides on the way to the gill were examined. Whilst nothing too significant was observed, 37 species were recorded. Soil pockets on the bank sides provided most interest with *Pohlia annotina, P. wahlenbergii* and *Marsupella emarginata* var. *emarginata*. *Hylocomium splendens* was plentiful in the grassland. The gill provided continuing interest. Most of the common woodland species were noted on the way up the gill, including the attractive *Rhytidiadelphus loreus*. The most noteworthy species, seen on and around the base-rich rocks on the trackside, included *Eurhynchium crassinervium, Ditrichum crispatissimum, Leucobryum glaucum, Trichostomum brachydontium, T. crispulum, Lejeunea lamacerina* and *Scapania nemorea*. Two small tufts of the bud-like moss *Diphyscium foliosum* were seen, with capsules. The beck was examined only towards the top of the gill, where dripping rocks produced dense pads of *Amphidium mougeotii*, along with *Bryum pseudotriquetrum* and *Dicranella palustris*. Base-rich flushes in the open area at the top of the gill had *Climacium dendroides, Philonotis calcarea* and *Palustriella commutata* var. *falcata*. Geoffrey Fryer spotted a large patch of liverworts on a rock by the beck, which proved to be the attractive thalloid liverwort *Preissia quadrata*. There was some acidic influence in the back with *Hyocomium armoricum* on some of the rocks.

Some time was spent on Breaksay Moss, where seven common species of *Spaghnum* were seen, and also *Aulacomnium palustre* and *Pleurozium schreberi*.

Because of the ground covered during the day, recording was to some extent carried out on the run. Trees were given insufficient attention and the beck in the lower part of the gill was not examined at all. The whole area is worthy of a more comprehensive survey. Despite this a very satisfactory total of 97 taxa was recorded.

Mycology (J. O. K. Webb)
A total of 34 species was found, comprising 17 Ascomycetes, 11 Basidiomycetes and 5 Myxomycetes. Most were growing on dead herbaceous plants, or on wood; a few were associated with dung, such as *Panaeolus campanulatus* the Bell-shaped Mottlegill. Three species of *Galerina* were in bog flushes, growing with moss.

LICHENOLOGY (A. Henderson)
The lichenologists of the party concentrated on trees, hedgerows, fencing and stone of the farm fields within a mile of Greenwood Hall. Mature hedgerow trees had considerable foliose lichen cover with *Flavoparmelia caperata, Hypotrachyna revoluta, Parmelina tiliacea, Parmotrema chinense* and *Punctelia subrudecta,* among crustose assemblages including *Lecidella elaeochroma, Ochrolechia androgyna, Pertusaria albescens, P. pertusa, Phlyctis argena* and the *Xanthorion* species expected in such an agriculturalised ambience. Of the 40 corticolous species observed, 3 were fruticose and 15 foliose.

Stone boundary and barn walls were dominated by mainly crustose associations except that exposed coping frequently bore *Pseudovernia furfuracea*. Sunny wall bases had occasional *Xanthoparmelia conspersa*, while the tiny folioles of *Agonimia tristicula* were in fruit on moss-covered stretches and growing over *Collema auriforme*. Crustose plants most in evidence were *Tephromela atra, Lecanora gangaleoides, L. campestris, L. muralis, Ochrolechia parella, Acarospora fuscata, A. smaragdula* and *Rhizocarpon geographicum* agg.

The total of 89 species listed does scant justice to the rich interest of this day in the field. It goes without saying that the gill is a must for a future visit, as evidenced by two collections made by J. Lambert and G. Fryer as they explored the gill with the main party, which were later determined as *Solorina saccata* and *Peltigera membranacea*.

OLD HALL FARM, SKEFFLING (VC61) 26 July 2003

INTRODUCTION (J. Lambert)
This newly acquired reserve comprises several fields on either side of Out Newton Road to the north of Skeffling village. Some of the fields were under arable cultivation; others, such as Bettywells and Gilcross Road Close appeared to have been uncultivated for many years. A hay field which had been cut allowed the necessary car parking. In his introduction, Stephen Warburton (YWT Conservation Manager) told us how the land had been bought by the Trust, and Andrew Gibson (Spurn Reserves Officer) talked about the more practical aspects of the reserve's management. The weather was fine and sunny when the party of 19 started fieldwork. The dry conditions of the previous weeks made recording more difficult. There were signs of Fox and Badger, but Brown Hare and Rabbit were seen, and Smooth Newt and two species of Stickleback, *Gasterosteus aculeatus* and *G. pungitius*, were also reported.

The meeting for tea and reports was held in Skeffling village hall. Fifteen attended with the President, Dr Derrick Boatman, in the Chair. Twelve Affiliated Societies were represented. A vote of thanks was given to Stephen Warburton and Andrew Gibson for introducing us to the reserve, and to Mrs Catherine Beadle for the use of the village hall.

ORNITHOLOGY (W. Curtis & J. Dale)
The morning was spent in the large meadows (Bettywells) to the east of the road. Here at least four pairs of Sedge Warblers were actively engaged in feeding young. Family parties of Whitethroats were present including two males giving brief snatches of song. A male Reed Bunting was present in suitable breeding habitat, and Garden Warbler was located in the dense roadside hedge. At least 20 Swallows were feeding overhead at midday. Woodpigeon, Meadow Pipit, Dunnock and Chaffinch were also recorded in this area.

During the afternoon we followed the mature hedgerows along the northern boundary of the site to the Paddock. Family parties of Greenfinch and Linnet were found on several occasions; Wrens were heard calling, and a male Yellowhammer was noted. At least six Skylarks were present, and a Kestrel was hovering over the southern part of the reserve. Over 20 Willow Warblers, including both adults and juveniles, were feeding along field boundaries in the southern part of the reserve. Two sightings of Barn Owl were reported by other members of the party.

The site is a relatively small island of excellent breeding habitat for certain passerines, surrounded by intensively farmed country. It will be interesting to record the progress of species populations in the years ahead. Being less than two miles from the East Coast, the site will probably afford a temporary haven for recently arrived migrants.

CONCHOLOGY (A. Norris)
Lymnaea peregra, Carychium minimum, Oxyloma elegans, Columella aspera, Arion ater, Aegopinella nitidula, Deroceras reticulatum, Monacha cantiana, Trichia hispida, Cepaea nemoralis and *Helix aspersa* were found in the area of the stream bordering the road, close to the allocated parking area, with the exception of the *Columella* which was recorded from fern fronds by J. Lambert in Gilcross Road Close.

LEPIDOPTERA (J. Payne & R. Atkinson)
The day was warm and sunny; butterflies were on the wing. The flowers on the road verge between the two areas proved to be the site where showier butterflies were feeding and displaying in the sun; these included Large White *Pieris brassicae*, Small White *P. rapae*, Green Veined White *P. napi*, Peacock *Nymphalis io*, Small Tortoiseshell *Aglais urticae*, Painted Lady *Vanessa cardae*, and Red Admiral *Vanessa atalanta*. The hedgerow of Holmpton Byway Close, where a few flowers remained after the hay had been cut, was a good area, though it was rather windy when observed. Along the grassy bank of the wheat field, the paddock and Gilcross Road Close were Meadow Brown *Maniola jurtina*, and Ringlet *Aphantopus hypercanthus*. Small Skippers *Thymelicus sylvestris* were seen intermittently through the grassy places, but were nowhere numerous. An abundance of "whites" were in the headland near the mown field of oilseed rape. Excluding "whites", 52 butterflies were counted by one person on the site.

Moths were in small numbers, Silver Y being the most frequent, and a couple of Shaded Broad-Bar were noted. A single Brimstone moth flew from the hedge and the less common Dusky Sallow was resting on a flower. Although there was an abundance of ragwort the yellow and black striped Cinnabar larvae were not particularly common. The most interesting find was a colourful, hairy larva, thought to be a member of the Acronictinae, swept by F. Kenington; unfortunately this was parasitised and did not reach maturity.

Few "micros" were recorded. *Udea lutealis* was noted and a species of *Yponomeuta* was flying, having probably emerged from webs on the hawthorn. A. Norris found a single reed mace occupied by the larvae of *Limnaecia phragmitella*.

COLEOPTERA, (F. Kenington)
Operations commenced with sweeping and beating northwards along the hedge in Bettywells. The first capture was the pretty Chrysomelid *Crepidodera fulvicornis* off *Salix*; the beetle shines metallic green or bronze at different viewing angles and is usually to be found where *Salix* species occurs. Three species of 'ladybird' were found, *Coccinella 7-punctata, Propylea 14-punctata* and *Coccidula rufa*, the last being an orange-red unspotted ladybird of more linear shape. The Tenebrionid *Lagria hirta* was swept, a species whose larvae are reputed to feed on decaying matter in leaf litter and turf and which is locally distributed throughout Yorkshire. Other finds were *Dromius linearis* a common ground beetle, *Brachypterus glaber* a 'Flower Beetle' akin to the Rape Fly *Meligethes aeneus* but with abdominal segments visible beyond the elytra, the common weevil *Sitona lineata,* and *Protapion apricans*, a small black pear-shaped weevil with mainly black legs and antennae.

The centre of Bettywells contained many plants of *Angelica sylvestris,* and umbels standing above the grass were attracting many Hover Flies, other Diptera and Hymenoptera. A Scorpion Fly *Panorpa communis* was identified.

After lunch hay not collected by the baler from the field to the west of the road was sieved and contained the ground beetles *Pterostichus strenuus*, and more *Dromius linearis,* small staphs, *Sepedophilus marshami, S. nitidipennis,* and *Stenus juno* and the very common *Tachyporus hypnorum*. Larger staphylinid beetles in the hay were *Philonthus cognatus, P. longicornis, Quedius curtipennis* and a weevil *Ceutorhynchus pallidactylus*.

Dipping in the roadside ditch produced the dytiscid water beetle *Agabus bipustulatus, A.*

paludosus and *A. didymus*, and sweeping the ditch vegetation produced another small weevil *Perapion violaceum* and a flea beetle of willowherbs *Altica lythri*. Later at the village hall in Skeffling Peter Cook presented a weevil found on his jacket sleeve which proved to be the Cruciferae-dwelling *Ceutorhynchus obstrictus*.

Surprisingly, in these large mainly grass areas, no Elateridae (Click Beetles) were found, and other visits to the site have yet to produce specimens of this family.

PLANT GALLS (K. Payne)

The galls of 13 species were noted, of which six were the work of gall midges, three of mites, two of gall wasps, and one each of a sawfly and a psyllid. All are common and widespread species. As examples of the effects of the species recorded on the host plants, the following may be noted: *Diplolepus nervosa* causes the well known 'pea galls' on rose leaves. If the galls carry spikes the gall causer is this species but if no spikes are developed it may be the work of *D. eglanteriae* and determination necessitates breeding out the adult gall wasps. The mite *Cecidophyes galii* causes twisting, inrolling and thickening of the edges of leaves of Cleavers. The larvae of the midge *Contarinia jacobeae* cause a pear-shaped distortion of the flower heads of Ragwort.

A list of the species recorded is available on request from the contributors.

BOTANY (R. Middleton)

The main objective of the visit was to examine the various habitats represented on the land recently acquired by the Yorkshire Wildlife Trust, with a view to suggesting management regimes that would help improve its biodiversity. The arable land was under wheat but a heavy spraying regime had virtually eliminated all but the more common 'weed' species such as *Persicaria maculosa, P. lapathifolia, Geranium dissectum, Epilobium tetragonum* and *Veronica persica*, with the occasional bright patch of *Anagallis arvensis*. Even *Coronopus squamatus*, a frequent Holderness plant, was only encountered as a single colony on an adjacent track.

The Paddock, a sandy and slightly elevated area of scrub and rough grassland, provided more botanical interest with a wider variety of grasses including *Cynosurus cristatus* and *Anthoxanthum odoratum*. The more acid nature of the substrate here was indicated by the presence of *Rumex acetosella*. Unfortunately, the extensive area of permanent grassland had been recently cut, leaving only tantalising marginal fragments. A large part of the farm had been abandoned for some time, leaving areas of rank vegetation with invading scrub. Such a field, to the east of the road, was dominated by tall coarse grasses including *Dactylis glomerata* and *Arrhenatherum elatius* along with large quantities of *Angelica sylvestris, Torilis japonica, Picris echioides* and *Sonchus arvensis*. The boundary hedges were in most places dominated by *Prunus spinosa* and *Crataegus monogyna*, with a sparse herb flora including *Silene dioica, Geum urbanum, Stachys sylvatica* and *Glechoma hederacea* with very occasional *Tamus communis*. Punda Drain supported a lush vegetation including the usual *Apium nodiflorum, Rorippa nasturtium-aquaticum, Epilobium hirsutum* and *Mentha aquatica*.

Although 104 taxa were recorded on this visit, nothing unusual or particularly notable was seen. With the exception of The Paddock, the YWT appears to be starting with a blank slate. It is to be hoped that bold and imaginative management regimes will be implemented to restore the flora to the diversity that it clearly once enjoyed.

MYCOLOGY (J. O. K. Webb)

Following several dry weeks, the arid nature of the Skeffling site was no help to the fortunes of the mycologist. No Agarics were found, and only two Basidiomycetes, these being *Schizophora paradoxa* on *Crataegus*, and *Cylindrobasidium laeve* on *Fraxinus*. A good number of common Ascomycetes was gathered on herbaceous stems, twigs and litter; of these, seven were probably new to VC61. Worth mentioning is *Pyrenochaeta fallax* on a dead stem of *Urtica*, first recorded in Yorkshire in Bramley's *Flora* (1985). *Enteridium intermedium* on *Crataegus* was the only Myxomycete.

LICHENOLOGY (A. Henderson)

Intensive farming in surrounding areas has strongly influenced the atmosphere and substrates on this newly established reserve, so that the trees and hedgerows in these mainly grassland/pasture reaches bear only a limited lichen flora, only 20 corticolous species being recorded and a fine old *Fraxinus* producing only a poorly developed *Xanthorion*. Occasional pebble-gravel overlays and concrete posts added a further 15 species.

A measure of resultant frustration led to brief visits to Welwick and Skeffling churchyards, adding a further 17 species to the day's list; of most interest were *Dirina massiliensis* forma *sorediata* from Welwick church wall and an extremely nodulose and odd-looking, mite-chewn *Ramalina farinacea* from Skeffling church façade.

SYKES HOUSE, FADMOOR (VC62) 9 August 2003

INTRODUCTION (J. M. Blackburn)

On a weekend when, nationally, temperature records were broken, a party of 36 assembled in a field at Sykes House, at the invitation of the owner Mr Tom Denney. The 21 hectare farm, operated under a Countryside Stewardship Scheme, is used partly for hay and grazing, whilst the remaining land is left in its wild state. The land is almost at the southern limit of the acidic sandstone. The area was well covered by members, early on particularly the field edges, where tree cover gave welcome shade on a day of increasing heat. The boggy areas received a great deal of attention, much discussion centring on the presence of Western Gorse *Ulex gallii*. Harland Beck proved rewarding. Several groups took advantage of permission to visit the adjacent Harland Moor.

The indoor meeting, held in Fadmoor Village Hall, was attended by 24 members representing 19 Affiliated Societies. Reports were heard, and votes of thanks were given to Mr Denney and the Divisional Secretary.

MAMMALS AND LOWER VERTEBRATES (M. J. A. Thompson)

Although 11 species of mammals have been listed in the past as being present on the farm, only four were seen or evidence of their presence noted. Rabbits were numerous, with extensive burrows in some areas, especially near the gorse. Brown Rats were seen, notably in one of the ditches. Grey Squirrel was reported from a woodland area, along with typical squirrel-nibbled Scots pine cones. The only other mammal report was evidence of the Badger, with badger tracks and a large sett found at Faddell Rigg, outside the study area. Besides those recorded on the day, the remaining seven species known to be in the area include Weasel, Stoat, Fox, Hedgehog, Roe Deer, Brown Hare and a species of Pipistrelle. No doubt other small mammals will be in the vicinity, but to identify them would probably need a trapping session. Based on present evidence, the area has a reasonable mammalian fauna, with some local 10 km squares, such as 44/76, having records of 25 species.

With extensive areas of heather moorland and with ambient temperatures reaching 28°C, it was expected that three of Britain's reptile species would be seen. In the event, only the Common Lizard was recorded, with several sightings mentioned, mostly of adults. Also known to be present on the farm are Adders and the Slow Worm.

Common frogs were present in the pond next to the house, along with either smooth or palmate newt tadpoles.

ORNITHOLOGY (M. J. A. Thompson)

As expected in August and due to the very warm conditions, there were very few birds about. However, in the course of the day, 20 species were seen or heard. The most interesting was a Nightjar that flew up off the ground and landed in a tree. According to the owners, Tom and Janet Denney, Nightjars are seen and heard in small numbers each year around the heathland habitat. Other heathland species noted were Red Grouse, Meadow Pipit and three Curlew flying due west. Summer migrants were still feeding young, with Spotted Flycatcher and a Whitethroat doing likewise. Swallows were circling and feeding around the farmhouse. The Finch family was well represented, with Bullfinch, Greenfinch, Chaffinch and a small flock of Goldfinches being present. Twittering amongst the treetops were Redpolls, along with some Linnets. Of the Tit family, only Coal Tits were reported. Other birds seen were Mistle Thrush, Song Thrush, Blackbird, Wren, Woodpigeon, Pheasant and Jay.

CONCHOLOGY (A. Norris)
Six individual 1 km squares (two within Sykes Farm and four to the south and east) produced a total of 77 records for.the mapping scheme. The area within Sykes Farm was mainly acidic and only 17 species were recorded, 17 from SE6691 and five from SE6692. A further three species were added to SE6691 from more calcareous woodland outside the farm. The other four squares produced the following numbers of species: SE6689, 14; SE6790, 15; SE6791, 10; and SE6890, 13. These included some interesting records: *Acanthinula aculeata* from under holly leaves; *Zonitoides excavatus* from two different areas of acid plantations; *Boettgerilla pallens* from a roadside quarry; *Deroceras panormitanum* from a village green; and *Ena obscura* and *Balea perversa* from an old boundary wall at SE44/67855.90307.

LEPIDOPTERA (J. Payne)
With the help of Dr P. Tannett and Miss Heather Walker, 14 species of butterfly were recorded: Small Skipper, Small Copper, Large, Small and Green-veined White, Painted Lady, Small Tortoiseshell, Peacock, Comma, The Wall, Gatekeeper, Meadow Brown and Small Heath. Small Copper and Meadow Brown were the commonest species.

An exposed group of nettles in the pasture near the farm bore webs showing they had been the feeding ground of Small Tortoiseshell larvae and a small Painted Lady caterpillar was swept there.

Several macromoths were reported. The geometrids were Common Carpet, Silver-ground Carpet, Twin-spot Carpet and Light Emerald. The only noctuids were Large Yellow Underwing and Silver Y. Larvae of Buff-tip were reported and Dr M. Thompson found a spectacular full-grown caterpillar on Knotgrass. Noticeable micros were the Straw Belle *Udea lutealis* feeding on the flowers of scabious in the lane. The commonest micros were members of the Crambinae which appear quite large in flight, but seem to disappear because their wings fold up like a fan and they rest parallel with the grass stalks.

DIPTERA (R. Crossley)
A total of 19 crane-flies and 27 empidoids is quite satisfactory for the time of year, and especially so in view of the past hot weeks, and is more than expected. Many occurred in the shaded habitats by the two streams, there being few species of any kind in the open exposed areas, except for a few hover-flies seeking nectar amongst the heathers. All the species are common and widespread in their respective habitats, and call for little comment. The large red-legged bibionid *Bibio pomonae* is found on the North York Moors and is regarded as an upland species. Likewise, the dolichopodid *Dolichopus rupestris* is a moorland species, but it also occurs in peaty lowland areas. The syrphid *Sphaerophoria philanthus* is a typical species of drier heathland. The North York Moors contain many fine entomological sites, and the indications are that the Sykes House site will be as typical as any on the sandstones.

COLEOPTERA (F. E. Kenington)
Due to the hot weather, the stream in the valley bottom was not explored. Only 18 species were recorded. Beating and sweeping of the vegetation around the car parking field produced *Meligethes aeneus* the common flower beetle or Rape Fly, present in Sow Thistle flowers, several specimens of *Propylea quattuordecempunctata* the 14-spot Ladybird, *Cryptocephalus pusillus*, a Leaf Beetle new to this observer, and *Phaedon tumidulus*, another Leaf Beetle, reputed to be a pest of celery. *Eutrichapion ervi*, a pear-shaped weevil

whose larvae develop most frequently in the flower buds of *Lathyrus pratensis* and on *Vicia* species was also seen. From thistles came *Cassida rubiginosa*, the green Tortoise Beetle, so flat and wide that the legs are barely visible, and under a log in the field corner was *Nebria brevicollis*, a fairly common ground beetle. Beating gorse on the hillside produced *Micrambe vini* and *Aridius nodifer*, a small black Lathrid with large nodules on the elytra, which presumably gave rise to its name. Searching bracken debris produced *Platynus assimilis*, better known as *Agonum assimilis*. About halfway down the hillside a small stream passed under a stone slab bridge and along the edge of a grass paddock. Many piles of flood debris, mainly leaves, twigs and soil, were trapped against the rocks and roots and the rest of the afternoon was spent in the shade sieving this material, which produced two more ground beetles *Bembidion aeneum* and *Dromius linearis*, and six species of *Staphylinidae*, *Lesteva longoelytrata, Anotylus rugosus, Stenus clavicornis, S. juno,* (*Stenus* species are soon recognised by their huge eyes), *Rugilus erichsoni* and *Tachyporus obtusus*, which is mainly orange-brown.

PLANT GALLS (K. G. Payne)

Bill Dolling noted stem galls on *Potentilla erecta*, no doubt those of the Cynapid *Xestophanes brevitarsus*. Bert and Gill Brand brought in a specimen of the mite gall *Aceria fraxinivorus*, which converts the inflorescence of Ash into a woody cauliflower-like growth. The mite gall *Eriophyes sorbi* was common as pustules on the leaves of *Sorbus aucuparia* and the leaf-edge rolling galls of the mites *Eriophyes similis* and *Phyllocoptes goniothorax* were plentiful on *Prunus domestica* and *Crataegus monogyna* respectively in the hedges as were the erinea of *Aceria pseudoplatani* on sycamore. The only other gall noted was that of the gall midge *Dasineura urticae* which causes swellings on the leaves and pedicels of nettles and is often very common.

BOTANY (D. R. Grant)

Sykes House Farm is situated on the Jurassic series of rocks which are represented by the Estuarine series of sandstones; these give rise to mildly acidic soils, but some small pockets of calcareous soils do occur.

Along the field boundaries there were some fine specimens of *Prunus avium, P. domestica* and *Malus sylvestris*. There was also a large *Populus tremula* on the way over to Harland Moor. The fields were improved pastureland with the usual common species. Most of the time, members examined the marshy edge of Harland Beck; with *Calluna vulgaris, Erica cinerea* and *Tricophorum caespitosum* on the drier parts, the land sloped down towards the beck. In the very wet part of the marsh there was a large colony of *Hydrocotyle vulgaris* growing with *Juncus acutiflorus, Viola palustris, Lychnis flos-cuculi* and *Valeriana dioica*. In open grassy areas there were the sedges *Carex panicea, C. echinata* and *C. viridula* subsp. *oedocarpa*. Another wet area had *Dryopteris carthusiana*. The dry *Calluna vulgaris* area had *Ulex gallii*, very rare in the eastern parts of the country, growing with *Agrostis canina*. An unusual bramble here was *Rubus lindebergii*. One small calcareous wet area had a small colony of *Carex viridula* subsp. *brachyrrhyncha*. The very wet areas bordering the beck had small colonies of *Narthecium ossifragum*.

The roadside near Sykes House had many *Prunus domestica* trees in full fruit. Brambles were scarce with only a little *Rubus dasyphyllus* and *R. eboracensis*. However a colony of *R. warrenii* was found, and a bush of *R. echinatoides* in the hedgerow opposite Fadmoor Village Hall. The sunny south-facing drier roadside banks had large stands of *Knautia arvensis* and a *Hieracium* species of the Sabauda group.

BRYOLOGY (J. M. Blackburn)

The generally acidic nature of the ground covered during the day put a limit on the anticipated findings. The first hour was spent on the field boundaries which had a decent, shade-providing tree cover. Epiphytes were limited to several common species. Considerable attention was given to the boggy lower ground in which much rush and four common *Sphagna* species were evident, including including *Sphagnum palustre* and *S. squarrosum* which enabled their differences to be demonstrated. Despite much searching amongst the ground litter under the rushes and *Molinia* grass, only two leafy liverworts were found, *Calypogeia arguta* and *C. muelleriana*. However, *Calliergon cordifolium* was seen here. Grassy areas had *Hylocomium splendens, Thuidium tamariscinum* and *Pleurozium schreberi*.

Harland Beck had much *Hyocomium armicum, Dichodontium pellucidum* and *Rhynchostegium riparioides*, whilst the rocky banksides produced *Tetraphis pellucida* and *Lophozia ventricosa*.

There was insufficient time for even a short visit to Harland Moor; nevertheless, 49 taxa were recorded.

MYCOLOGY (G. Brand)

On a very hot summer's day many of the fungi found were either parasites on plants, small fungi, mainly Discomycetes and Hyphomycetes, occurring down amongst the litter, particularly on woody debris, or species fruiting on incubated rabbit dung samples. The plant parasites included the third county record of *Peronospora lotorum* on *Lotus pedunculatus,* made by C. Yeates, and the apple powdery mildew *Podosphaera leuchotricha* on crab apple. However, the day was distinguished by John Webb who found eight species of Myxomycete, including *Cribraria mirabilis*, new to VC62. The most striking find, by Pat Wood, was of *Onygena equina*, fruiting on one horn of a sheep's skull on Harland Moor. This ascomycete occurs on hoof and horn, and the horn was studded with stubby nail-shaped fruit bodies less than 1 cm high. In the field with heath vegetation and the adjacent Harland Moor a substantial number of larger basidiomycete fruit bodies were found under birch and pine trees. The majority of these, species of *Amanita, Boletus, Lactarius, Paxillus* and *Russula*, are mycorrhizal with birch and pine. The final list does not reflect all the species of *Russula* present as some of the over-ripe fruit bodies lacked sufficient characters for specific identification. Another visit to the site would be well worthwhile.

LICHENOLOGY (A. Henderson)

The morning passed in a gradual descent towards Harland Beck, hedges and trees receiving prime attention *en route*. Lichen diversity increased as the more humid sheltered lower land nearing the beck was reached. It was here that the most notable of the day's species occurred. *Dimerella pineti* was a considerable presence in shady niches and stretches of bark. *Crataegus* bore fine thalli of *Ramalina farinacea* and *Evernia prunastri*. *Hypocenomyce scalaris* was in long dull green stretches on various deciduous trees. *Lecanactis abietina* was locally abundant on *Fraxinus*, accompanied by *Arthopyrenia punctiformis, Pertusaria albescens, P. pertusa* and *Platismatia glauca*. *Porina aenea* was frequent on smooth, shaded bases of younger trees. Further exploration than was allowed by the upward return for lunch by the roadside would certainly have increased the diversity of the lichen list.

Disappointingly, the stretch of Harland Moor visited in the afternoon was comparatively unproductive. Fine clumps of *Cladonia squamosa* and *C. subulata* were among the best finds, along with profusely fruiting *Baeomyces rufus, Micarea lignaria* and *Trapeliopsis granulosa*. The day's list totalled 62 species.

BOOK REVIEWS

Freshwater Fishes in Britain: the species and their distribution by **Cynthia Davies**, **Jonathan Shelley**, **Paul Harding**, **Ian McLean**, **Ross Gardiner** and **Graeme Pierson**. Pp. 176, including 16 colour plates and numerous line drawings, figures & maps. Harley Books, Colchester. 2004. £25.00 hardback.

This work is based wholly on new information obtained from the Database and Atlas of Freshwater Fishes (DAFF). This project, which ran from 1998 to 2002, was supported by the Centre for Ecology and Hydrology (CEH), the Joint Nature Conservation Committee (JNCC), and the Environment Agency (EA) and brought fish in line with the other vertebrates in having their British distribution monitored by a digitised mapping system.

Commencing with a wide-ranging introductory chapter, and chapters on distribution and the history of the Atlas project, the book is a vehicle for a fascinating series of species accounts containing sections on identification, biology, behaviour, habitat, British and world distribution, status, hybrids, related species and, finally, relationship with man. Each species section is accompanied by a 10 km square dot-distribution map, produced on Dmap by Henry Arnold and his staff at the Biological Records Centre. Each species account is accompanied by a fish portrait; examples are largely taken from Francis Day's (1880-84) lithographs, but for recently introduced species, illustrations have been commissioned from Michael J. Roberts (late of the Sorby Natural History Society). A final chapter deals with the conservation management of freshwater fish and the whole is adorned with vignettes culled from Yarrell's *A History of British Fishes* (1835-36). This quite encyclopaedic book includes very useful appendices on fish legislation, websites, a chronological list of books on fish identification and distribution in Britain 1686 to 2004. There is an extensive bibliography, glossary and index.

An ensemble of contributions from fish biologists in our (Yorkshire Ouse and Lower Trent) region is welcome. These include sections by Paul Frear on Lampreys, Miran Aphrahamian on Shads, Keith Easton on Burbot and David Hopkins on Ruffe. More dubious recognition of our region takes the form of a half page colour photograph of an angling match on the River Torne, on the Humberhead Levels. Sadly its effect is to contrast the treeless and heavily engineered nature of some of our lowland river systems with the bosky view of the River Don in Aberdeenshire on the same page.

An examination of the bibliography and distribution maps reveals disappointing omissions of datasets published in the Yorkshire (mainly YNU) literature; these include Les Magee's work on grayling, Kirk and Howes on smelt, Barry Kirk on angling fish in East Yorkshire and burbot on the River Hull, Howes on burbot on the Lower Derwent, and sturgeon and shads in the Humber tributaries. From elsewhere it omits the results of Robin Lawson's molecular review of three-spined and nine-spined stickleback, which includes work on Yorkshire populations. Surprisingly the Yorkshire translocation site for the arctic charr is not featured and the distribution maps fail to reflect the return of barbel and salmon to the Don catchment in South Yorkshire.

Despite these sample omissions, this landmark publication is excellent, highly recommended and will undoubtedly encourage another generation of naturalists to 'get hooked' on the natural history of freshwater fish.

CAH

Evolving Eden: An Illustrated Guide to the Evolution of the African Large-Mammal Fauna by **Alan Turner** and **Mauricio Antón.** Pp. xviii + 269, with drawings and photographs. Columbia University Press, New York. 2004. £24.50 hardback.

This is a sumptuously illustrated book, unique in its array of artistic reconstructions of extinct mammals juxtaposed with accurate drawings of the fossilized skeletal specimens from which they were derived. Most of the illustrations are in black and white. There are, however, sixteen plates comprising colour photographs of the modern fauna, and some artistic reconstructions in which the artist has speculated on the pelage of extinct mammals. The zoological text is arranged systematically, with every mammalian Order receiving individual attention. The treatment of Primates, including genus *Homo* and extinct relatives, is particularly detailed: the large number of genera of hominins (Tribe *Hominini*: Humans and Closest Relatives) now described surprised me as a spectator to this field.

There are five chapters: the first concerns dating, continental drift and climate change. This is a necessary prelude to the remainder which include a general background to mammalian evolution on the continent, comparisons between living and extinct mammals, a review of fossil sites in Africa, and an overview acknowledging the problems that 'beset any attempt at a synthesis' of the changes in the fauna in relation to a background of chaotic environmental flux over a 35 million year period. It must be conceded that the authors have made an excellent attempt at such a synthesis, and their Epilogue is an eloquent plea for conservation of what remains of the present-day African fauna, itself a pale shadow of the richness of the past.

There is a bibliography, organized by topics, useful for anyone wishing to pursue further any particular interest. I strongly recommend this book as an authoritative source of reference to anyone with interests in zoology, and evolution, and even (as a challenging read) to the ecotourist en route for Africa.

DJH

Guide to Shieldbugs of the British Isles by **Bernard Nau**. Available from Field Studies Council Publications, Preston Montford, Shrewsbury, Shropshire SY4 1HW. Price £3:50, including postage and packing.

This laminated fold-out chart is one of a series of AIDGAP keys produced by the Field Studies Council with the support of the Royal Entomological Society and the Linnean Society, and the usual high standard is maintained here. Written and illustrated by the eminent hemipterist Dr Bernard Nau, who is no stranger to many YNU members, the quality is guaranteed.

This colourful guide is packed with useful information about a fascinating group of insects (which here also includes Coreids), and will ensure accurate identification, and hopefully will act as a stimulus to expand study of the order. Whilst not detracting from the high quality of the publication, the invention of contrived English names for all species, and giving these precedence over the time-honoured Latinised scientific ones, is much to be deplored. This increasingly popular practice has, no doubt, the worthy intention of making entomology more easily 'accessible' to beginners of all ages, but it is of little service to those who proceed further with their studies, and who then discover that the normal method of communication with their peers (of all nationalities) is formal scientific nomenclature. As a high respected educational body, the Field Studies Council should set a better example and return speedily to what are called these days 'old fashioned values'.

RC

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A manuscript plus disc (WORD format) OR two manuscripts, typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5cm 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. Table 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. Photographic illustrations, normally black and white, will be considered for inclusion. **Publishable manuscripts not conforming to the above requirements will be returned for alteration.**

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THE WASPS AND BEES (*HYMENOPTERA: ACULEATA*) OF THREE MORE REMNANT SITES IN WATSONIAN YORKSHIRE: HAW PARK, STUTTON AND FULFORD INGS, YORK

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Lowland landscapes in Britain are highly fragmented and semi-natural habitats often only surviving as isolated patches. This paper considers three such isolated sites. Haw Park and Stutton are embedded in an intensive agricultural landscape and Fulford Ings, York is surrounded by urban development.

Fulford Ings (SE6049) (York Unitary Authority) has an area *c.* 28 ha. and is situated in the Vale of York and Mowbray Natural Area. It is a linear site along the east bank of the river Ouse in a southern urban area of York. The site consists of the river bank itself, a path and an extensive marshland to take the overflow from the river when it is in flood. The bank and path are devoid of vegetation in places and the exposed silty soil provides nesting sites for species of subterranean nesters. The bank and marsh are rich in herbs, e.g. *Tanacetum*, and shrubs, e.g. *Crataegus*, which provide food resources. Dead wood and plant stems, e.g. *Rubus*, provide nesting sites for the aerial nesting species.

Haw Park (SE3615) (Wakefield Unitary Authority) has an area of *c.* 84a. and is situated in the Coal Measures Natural Area. The site mainly consists of coniferous woodland but with deciduous woodland patches (oak, birch, aspen) and willow shrub and marshland surrounding a disused canal. The banks of the disused canal are often bare and provide nesting sites for subterranean nesting species. The wide rides of coniferous woodland and the banks of the discused canal are herb-rich areas with some *Rubus*.

Stutton (SE4741) (North Yorkshire County) has an area of *c.* 31 ha. and is situated in the Southern Magnesium Limestone Natural Area. The site consists of an embankment that once carried the old London road with surrounding meadows which generally have not been improved with fertilizers. Parts of the embankment have been bared by rabbit activity and in one place a cut-through has been made for a road. The bare banks provide nesting sites for subterranean nesting species. The embankment is rich in herbs and shrubs. There is also some marshland along side the river Cock which is also herb-rich. Dead wood and wooden fence posts with dead *Rubus* stems provide nesting sites for aerial nesting species.

METHODS

Between 1992 and 2002, 24 visits were made to Fulford Ings distributed throughout the year as follows: April (3 visits), May (5), June (5), July (5), August (5) and September (1). In addition, R. S. Key visited Fulford Ings during August 1980 and recorded *Mellinus arvensis*, which has been seen by the author.

Between 1985 and 1999, 17 visits were made to Haw Park as follows: April (1), May (4), June (4), July (4), August (3) and September (1). In addition, J. H. Flint visited Haw Park six times between July 1967 and April 1969 and recorded eight species (*Andrena bicolor, A. clarkella, A. scotica, Lasioglossum fratellum, L. villosulum, Sphecodes geoffrellus, Nomada goodeniana, N. marshamella*), seven species of which were later also found by the author (Archer sample) and one, *S. geoffrellus*, not found in the Archer sample. All the Flint specimens have been seen by the author.

Between 1991 and 2002, 16 visits were made to Stutton as follows: April (2), May (3), June (4), July (3), August (3) and September (1). In addition, J. H. Flint visited the site during July 1947 and 26 July 1976 and recorded three species (*Pompilus cinereus, Symmorphus gracilis, Mellinus arvensis*) of which one species *P. cinereous*, was not found later by the author. Only the Flint specimen of *S. gracilis* has been seen by the author.

All the Archer visits were made during warm sunny weather. Each visit usually lasted for *c.* 2-3 hours when all species of aculeate wasps and bees were recorded and usually collected with a hand net for identification.

In the following account, the nomenclature can be related to that of Kloet and Hincks (1978). An up-to-date checklist can be found on the Bees, Wasps and Ants Recording Society (BWAS) web pages at http://www.bwars.com.

Species Present and Seasonal Progression of Species

A full list of recorded species is given in the Appendix. Tables 1 and 2 show the taxonomic distribution of species and records. A record represents a specimen differing in one of the following variables: name, sex and day of visit. The solitary wasp family, Sphecidae, and the solitary bee subfamilies, Andreninae and Halictinae, are the dominant taxa in terms of number of species and records, although the bee subfamily, Anthophorinae, is also important at Haw Park. On average, more records of solitary species per visit were made at Stutton than Haw Park and Fulford Ings.

Table 3 shows the number of species and when species were first recoded for each month. The most productive months for the solitary wasp species were June, July and August with generally June and July the best months for the first recording of species. The most numerous records of solitary wasps from Fulford Ings were *Lindenius albilabris, Crabro peltarius, C. cribarius, Mellinus arvensis* and *Oxybelus uniglumis*. All these species are subterranean nesters and fly hunters although *L. albilabris* will also take heteropteran bugs. These species were found nesting in the bare path.

Very few solitary wasp species were found at Haw Park, the two most frequent being the spider hunter *Arachnospila spissa* and the larval beetle hunter *Odynerus spinipes*. At Stutton, the most frequently recorded subterranean nesters in the bare banks were the fly hunters *Mellinus arvensis* and *Crossocerus tarsatus* and the larval beetle hunter *Odynerus spinipes* with its cleptoparasite *Chrysis viridula*. The most frequently found aerial nesters were the fly hunters *Crossocerus cetratus* and *Ectemnius cavifrons* and the aphid hunter *Pemphredon lugubris*. Other species of *Chrysis* were also found, but their hosts which are

Table 1

The number of species of aculeate wasps and bees recorded from Fulford Ings, Haw Park and Stutton.

	Fulford	Haw Park	Stutton
Solitary wasps			
Chrysididae	2	0	5
Sapygidae	1	0	1
Pompilidae	1	3	2
Eumeninae	2	2	2
Sphecidae	21	6	14
Total solitary wasps	27	11	24
Solitary bees			
Colletinae	3	0	2
Andreninae	9	14	12
Halictinae	9	11	17
Megachilinae	2	1	1
Anthophorinae	4	9	5
Total solitary bees	27	35	37
Total solitary species	54	46	61
Social wasps and bees			
Vespinae	5	3	3
Apinae	9	9	9
Total social species	14	12	12
Total wasps and bees	68	58	73

TABLE 2
The number of records of aculeate wasps and bees recorded from Fulford Ings, Haw Park and Stutton (Archer sample).

	Fulford	Haw Park	Stutton
Solitary wasps			
Chrysididae	3	0	9
Sapygidae	1	0	1
Pompilidae	1	8	2
Eumeninae	4	4	4
Sphecidae	84	6	27
Total solitary wasps	93	18	43
Solitary bees			
Colletinae	9	0	2
Andreninae	57	53	51
Halictinae	32	38	51
Megachilinae	2	1	3
Anthophorinae	11	35	17
Total solitary bees	111	127	124
Total solitary species	204	145	167
No. records of solitary species per visit (Archer sample)	8.5	8.5	10.4

TABLE 3
The number of species, and when species first recorded, per month of solitary species at Fulford Ings, Haw Park and Stutton (Archer sample)

	Apr	May	Jun	Jul	Aug	Sep
No. species – Wasps						
Fulford	0	0	16	20	15	1
Haw Park	0	1	3	6	6	0
Stutton	0	0	9	17	8	2
No. species – Bees						
Fulford	8	14	13	8	7	0
Haw Park	9	19	18	14	11	3
Stutton	11	20	19	11	9	4
No. species first recorded – Wasps						
Fulford	0	0	16	10	0	1
Haw Park	0	1	2	4	4	0
Stutton	0	0	9	13	1	0
No. species first recorded – Bees						
Fulford	8	8	3	4	4	0
Haw Park	9	14	5	2	4	0
Stutton	11	11	8	4	1	2

species of *Ancistrocerus* were not found.

The most productive months for solitary bee species were May and June with April and May the most productive months for the first recording of species (Table 3). At Fulford Ings the most frequently recorded species were the spring mining bees *Andrena haemorrhoa* with its cleptoparasite *Nomada ruficornis* and *A. barbilabris* (these three species were often taken on the flowers of hawthorn); the sweat bees *Lasioglossum* *calceatum* with its cleptoparasite *Sphecodes monilicornis*, and *Halictus rubicundus* with its cleptoparasites *S. gibbus* and *S. monilicornis*. The silk bee *Colletes daviesanus* was often found on the flowers of *Tanacetum*. All these species are subterranean nesters. The cleptoparasite of *A. barbilabris*, *S. pellucidus*, and of *C. daviesanus*, *Epeolus variegatus*, were not found.

At Haw Park the bare banks of the old canal attracted species of spring mining bees with their cleptoparasites given in brackets: *Andrena scotica* (*Nomada marshamella, N. goodeniana*), *A. nigroaenea* (*N. goodeniana*), A. *cineraria* (*N. lathburiana*), *A. chrysosceles* (*N. fabriciana)* and *A. fucata* (*N. panzeri*); also the sweat bees *Lasioglossum rufitarse, L. fratellum, L albipes* and *L. calceatum* with their cleptoparasites of the genus *Sphecodes* and mining bees such as *Andrena minutula* (*Nomada flavoguttata*) and *A. bicolor* (*N. fabriciana*) which are present during both the spring and summer.

The most frequently recorded species at Stutton were again mainly subterranean nesters such as the sweat bees *Lasioglossum smeathmanellum, L. calceatum* and *Halictus tumulorum* with their cleptoparasites of the genus *Sphecodes*; and the mining bees such as *Andrena minutula, A. scotica, A. bicolor* and *A. nigroaenea* with their cleptoparasites of the genus *Nomada*. The small aerial carpenter bee, *Chelostoma florisomne* with its nest parasite, *Trichrysis cyanea* was also relatively frequently noted.

Estimating the Potential Number of Solitary Wasps and Bee Species

One of the problems in the study of any site is the difficulty of not knowing how many species are present at the site, but as yet unrecorded. Recent advances in non-parametric statistical procedures offer a way of addressing this problem. Chao (in Colwell & Coddington 1994) and Heltshe and Forrester (1983) describe procedures to estimate the potential number of species (species richness) likely to be found on a site after a number of samples have been taken. The presence/absence quantitative estimate of Chao is based on the number of species that are recorded in one (unique species) or two (duplicate species) samples. The Jackknife estimate of Heltshe and Forrester is based only on the unique species. Because some aculeate species are only active in the spring or the summer it is advisable that samples be distributed throughout the months of adult activity. The software to carry out these statistical procedures was provided by Pisces Conservation Ltd.

The statistical procedures were run 30 times for each site. Each time the software takes 1, 2, etc. samples at random, each time calculating a mean estimate of species diversity. With a small number of samples the estimates are erratic or too small, but as more samples are selected the estimates may stabilise giving confidence in the estimates. For all three sites the Chao and Jackknife estimates stabilise and for each site the two estimates are similar to one another giving further confidence in the estimates (Figs 1-6, Table 4). At all three sites it is estimated that over 70% of the solitary species have been recorded.

The Natural History or Conservation Value of Each Site

At a national level according to Shirt (1987), Fulford has one RDB species, *Argogorytes fargeii*, which Falk (1991) downgraded to Notable List A and added *Hylaeus signatus* as a Notable List B species. Haw Park has no species of national importance while Stutton has five species of national importance: *Argogorytes fargeii, Crossocerus binotatus* (Notable A), *Monosapyga clavicornis* (Notable B) and *Sphecodes crassus* (Notable B). In addition, recent work by BWARS indicates that *Chrysis viridula* should have a Notable B status.

With the help of the latest information from the BWARS, all species may be given one of six national statuses depending on their rarity and distribution (Archer 2002). The definitions of these six statuses are given in Archer (1999, 2002). Adding the status scores for each species from a site gives a national Quality Score, while dividing the Quality Score by the number of species found on the site gives a national Species Quality Score (SQS) (Table 5). Although quality scores are greatly influenced by the area of sites, the SQSs are relatively independent of site area (Archer 1999) and can be used to compare different Yorkshire sites.

TABLE 4
Non-parametric estimates of species richness of solitary species at Fulford Ings, Haw Park and Stutton (Archer sample)

	Chao estimate	Jackknife estimate
Fulford Ings		
No. species – recorded	54	54
– estimated	69	72
95% confidence limits	54-84	62-82
% of estimated species found	78%	75%
Haw Park		
No. species – recorded	45	45
– estimated	59	61
95% confidence limits	43-75	52-70
% of estimated species found	76%	74%
Stutton		
No species – recorded	60	60
– estimated	82	83
95% confidence limits	62-103	69-98
% of estimated species found	73%	72%

SQSs from 28 Yorkshire sites range from 1.2 to 2.9. These sites can be divided into three groups dependent on their SQSs as follows: first class 2.4-2.9 (e.g. Crow Wood), second class 1.8-2.3 (e.g. Duncombe Park) and third class 1.2-1.7 (e.g. Burton Leonard Lime Quarries). The lowest possible SQS is 1.0 when only 'Universal Species' are found on a site. Using the SQSs from Table 5 Fulford Ings and Haw Park are third class sites and Stutton a second class site.

In a Yorkshire context, the following species are considered to be rare (Archer 2002): *Stigmus solskyi* from Fulford Ings and *Sphecodes crassus* from Stutton. The discovery of *Dolichovespula saxonica* at Fulford Ings should also be noted as it is a recent new species arrival for Yorkshire.

Also in a Yorkshire context, using the number of species recorded from a site can be regarded as a crude measure (since area and altitude influence species diversity) of the quality of the site as follows: less than 40 species, poor; 40-49 species, mediocre; 50-59 species, promising,; 60-79 species, good; 80-99 species, very good; and over 100 species, excellent. On this basis, Haw Park is a promising site and Fulford Ings and Stutton are

TABLE 5
The Archer national quality scores of the solitary species recorded at Fulford Ings (F), Haw Park (H) and Stutton (S)

National status	Status value (A)	No. species (B)			Quality Scores (A x B)		
		F	H	S	F	H	S
Universal	1	39	35	40	39	35	40
Widespread	2	13	11	16	26	22	32
Restricted	4	0	0	0	0	0	0
Scarce	8	1	0	4	8	0	32
Rare	16	1	0	1	16	0	16
Total (Quality Score)		54	46	61	89	57	120
Species Quality Score (Quality Score/B)					1.7	1.2	2.0

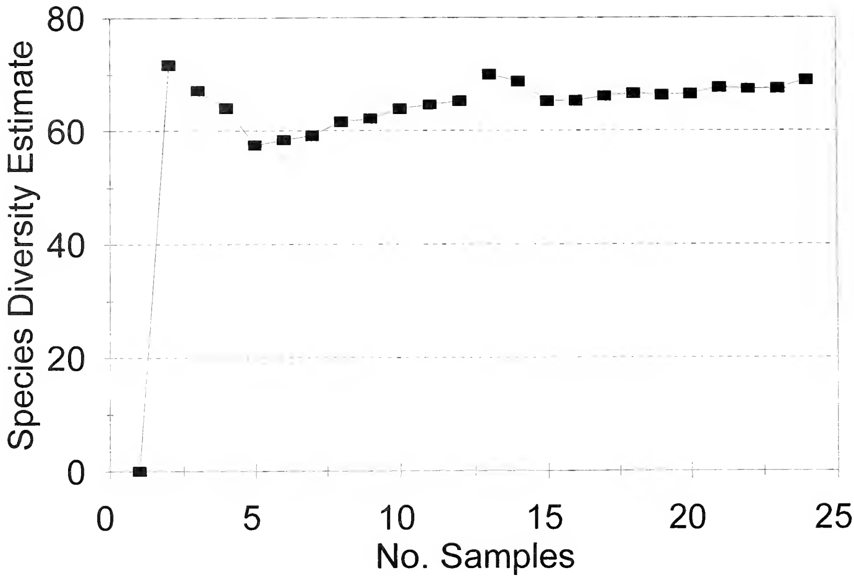

FIGURE 1.
Chao presence/absence estimates of species richness of solitary wasps and bees from Fulford Ings.

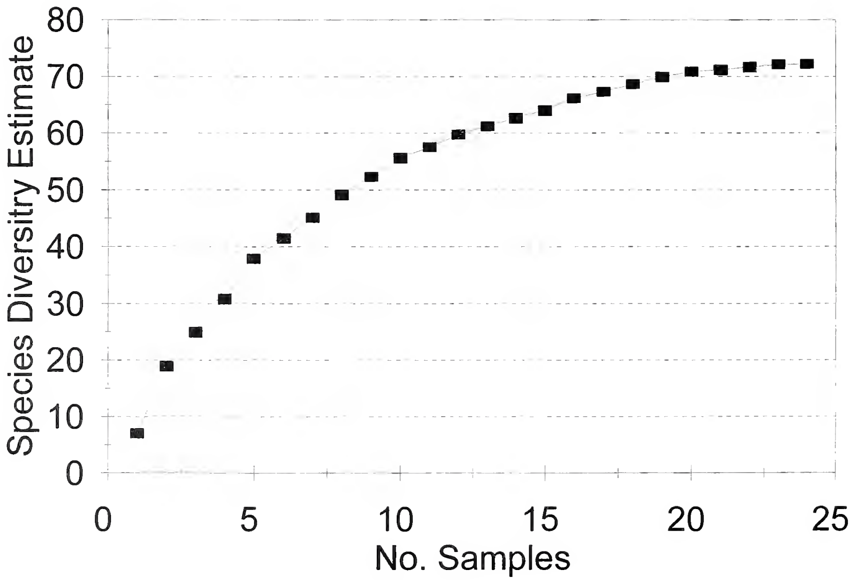

FIGURE 2.
Jackknife estimates of species richness of solitary wasps and bees from Fulford Ings.

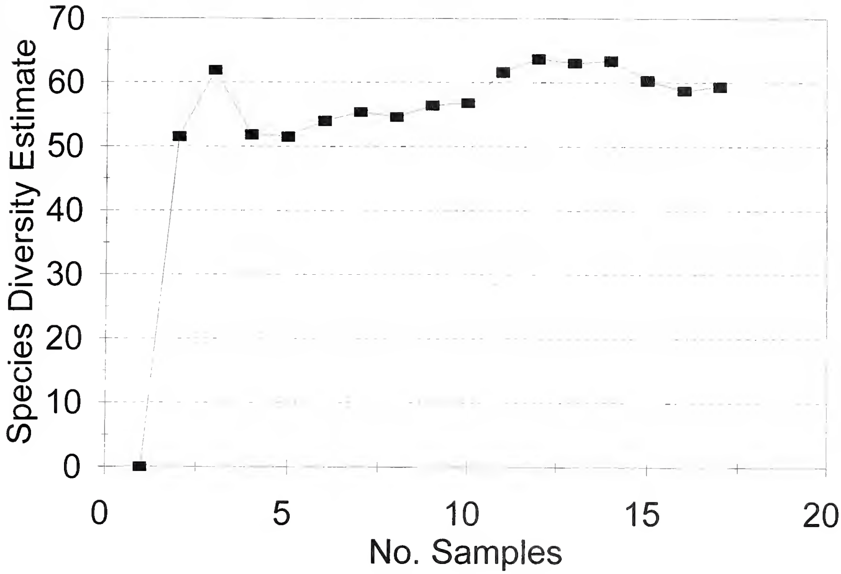

FIGURE 3.
Chao presence/absence estimates of species richness of solitary wasps and bees from Haw Park.

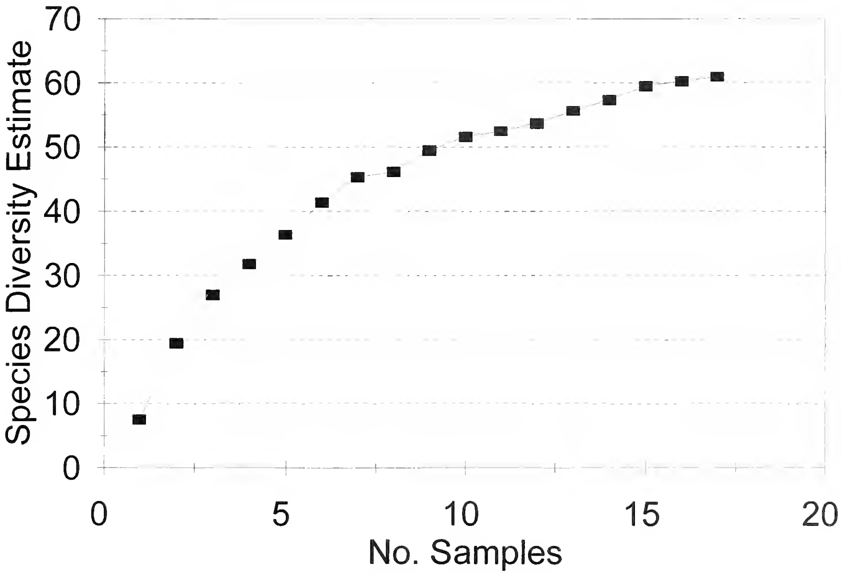

FIGURE 4.
Jackknife estimates of species richness of solitary wasps and bees from Haw Park.

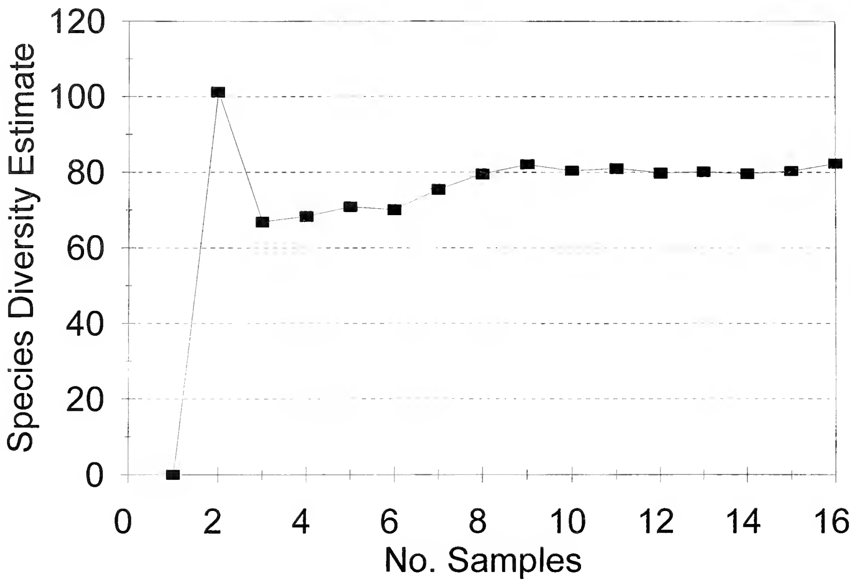

FIGURE 5.
Chao presence/absence estimates of species richness of solitary wasps and bees from Stutton.

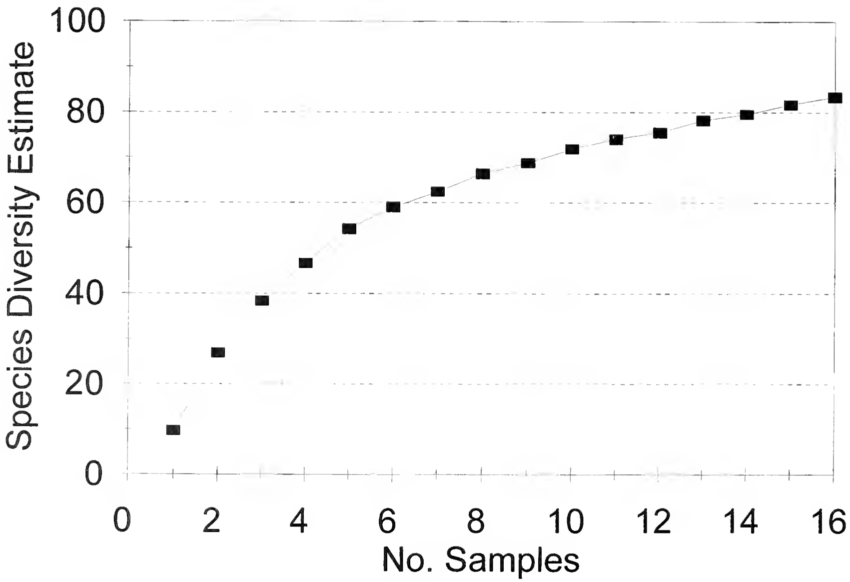

FIGURE 6.
Jackknife estimates of species richness of solitary wasps and bees from Stutton.

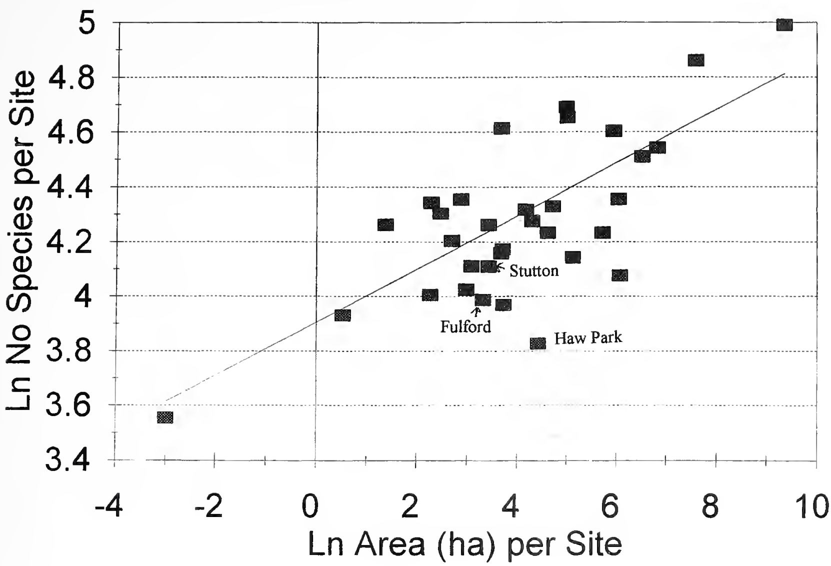

FIGURE 7.
Species-area plot for sites from the north and north Midlands of England.

good sites.

COMPARISONS WITH OTHER SITES

Since the species diversity investigations have shown stable estimates for the three sites sufficient species have been recorded from each site to carry out comparisons with other sites. Comparisons will be made as to areas of sites, cleptoparasitic loads and aerial nester frequencies.

The number of solitary species can be related to site area. The area of Haw Park is clearly defined on an Ordinance Survey map while the study areas of Fulford Ings and Stutton which each consist of a path with surrounding area can be readily determined.

The species-area relationship can be found by plotting the number of solitary species

TABLE 6
The relative frequency of the cleptoparasitic (or parasitoid) species among the solitary species recorded from Fulford Ings, Haw Park and Stutton.

	No. hosts (H)	No. cleptoparasites (C)	Cleptoparasitic load CL = 100 x C/(H+C) species
Solitary wasps			
Fulford	24	3	11.1
Haw Park	11	0	0.0
Stutton	18	6	25.0
Solitary bees			
Fulford	20	7	25.9
Haw Park	22	13	37.1
Stutton	26	11	29.7

recorded at a site against the area of the site, with both the number and area expressed as natural logarithms (ln). Figure 7 shows a species-area plot of 33 sites from the north and north Midlands of England including the current three sites. The regression line for 30 sites, i.e. excluding the current sites, is also given on Figure 7. The correlation coefficient for the 30 sites is 0.769 which results in a highly significant ($p < 0.001$) positive relationship between area of site and number of species. The coefficient of determination of 59.1% (square of 0.769) indicates that nearly 60% of the variation in the number of species between sites is determined by the area of a site. The dots for Fulford Ings and Stutton are associated with the other 30 sites indicating these sites have the number of species that can be expected on a site from the north and north Midlands of England. In contrast, the dot for Haw Park falls below the other dots indicating that this site is less favourable for aculeate solitary wasp and bee species. The most likely explanation for this unfavourable condition is the presence of the coniferous plantation which shades potential nesting sites and inhibits the occurrence of food resources.

TABLE 7
The nesting habits of the solitary species recorded from
Fulford Ings, Haw Park and Stutton

	No. aerial nesters (A)	No. subterranean nesters (S)	Aerial nester frequency AF = 100 x A/(A+S)
Solitary wasps			
Fulford	12	12	50.0
Haw Park	4	7	36.4
Stutton	12	6	66.7
Solitary bees			
Fulford	4	16	20.0
Haw Park	2	20	9.1
Stutton	3	23	11.5

Cleptoparasitic Load

The cleptoparasitic load (CL) is the percentage of aculeate species that are cleptoparasitic (or parasitoids) on other host aculeates. Wcislo (1987) showed that parasite behaviour among aculeate Hymenoptera correlated with geographical latitude. Thus parasitic rates are higher in temperate regions, as host populations are more synchronised in their life-history characteristics than in tropical regions. This finding probably does not hold for desert regions where the occurrence of rainfall would tend to synchronise life history characteristics. From a review of the literature Wcislo found that the CLs for bees varied between 16% and 33%, with a range of 17%.

For 23 Yorkshire sites, the author found that CLs for solitary bees varied from 25 to 40% giving a range of 15% (Archer, unpublished), which is very close to the range found by Wcislo. The CL values for solitary bee species from Fulford Ings, Haw Park and Stutton (Table 6) fall within this range, and supports Wcislo's hypothesis.

Wcislo gave no CLs for solitary wasps but from 25 Yorkshire sites CLs varied from 10.3 to 25.0% giving a range of 14.7% (Archer, unpublished). The CLs from Fulford Ings and Stutton fall within this range. At Haw Park no cleptoparasites (or parasitoids) were represented in the very small number of records that were made. Therefore, either the host populations were not large enough to support cleptoparasites or my search patterns failed to find the cleptoparasites.

Aerial Nester Frequency

The aerial nester frequency (AF) is the percentage of host aculeate species that have aerial nest sites. Aerial nesters mainly use old beetle burrows in dead wood and central stem cavities such as dead bramble. Subterranean nesters nest in the soil, usually in burrows dug by themselves, but sometimes holes and crevices are used after being altered.

The AFs for the solitary species are given in Table 7. The AF for all British species of solitary wasps is 46.2% and for solitary bees is 17.9%. From 26 Yorkshire sites the AFs for solitary wasps varied from 0 to 90% and for solitary bees from 6.7 to 40.0% (Archer, unpublished). The Fulford Ings AFs are similar to the British values but the AFs for Haw Park and Stutton are higher for the solitary wasps but lower for the solitary bees. The lower solitary bee AFs is probably a consequence of the bare sandy banks in warm sunny situations which are particularly attractive to subterranean nesters.

Conclusions

1. Fulford Ings with 68 recorded species and Stutton with 73 recorded species are good sites in a Yorkshire context, while Haw Park with 58 recorded species is a promising site.
2. Fulford Ings and Haw Park are third class conservation sites while Stutton is a second class conservation site. Stutton has five species and Fulford Ings two species of national significance. Stutton and Fulford Ings also each have one Yorkshire rare species.
3. Two estimates of potential species diversity give estimates for all three sites which closely agree with each other. It is estimated that over 70% of the potential species have been recorded from each site.
4. The species-area investigation indicates that for the area of Fulford Ings and Stutton the expected number of solitary species has been recorded. For its area fewer species than expected were recorded at Haw Park probably because the coniferous plantation provides a less favourable habitat.
5. Cleptoparasitic Loads support the hypothesis of Wcislo except for the solitary wasp species at Haw Park where no cleptoparasitic species were recorded.
6. The low Aerial Nester Frequencies for the solitary bees at Haw Park and Stutton probably indicates the importance of the bare banks for subterranean nesters.

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Appendix

The list of aculeate wasps and bees recorded from Fulford Ings, York (F), Brayton Barff (B) and Stutton (S).

Chrysididae: *Chrysis angustula* Schenck (F, S), *C, ignita* (Linn.) (S), *C. impressa* Schenck (F, S), *C. viridula* Linn. (S), *Trichrysis cyanea* (Linn.) (S).

Sapygidae: *Monosapyga clavicornis* (Linn.) (S), *Sapyga quinquepunctata* (Fab.) (F).

Pompilidae: *Dipogon subintermedius* (Magretti) (S), *Pompilus cinereus* (Fab.) (S), *Arachnospila anceps* (Wesmael) (F, H), *A. spissa* (Schiødte) (H), *Anoplius nigerrimus* (Scopoli) (H).

Eumeninae: *Odynerus spinipes* (Linn.) (H, S), *Ancistrocerus oviventris* (Wesmael) (H), *A. trifasciatus* (Müller) (F), *Symmorphus bifasciatus* (Linn.) (F), *S. gracilis* (Brullé) (S).

Vespinae: *Dolichovespula media* (Retzius) (F), *D. norwegica* (Fab.) (F), *D. sylvestris* (Scopoli) (F, H, S), *Vespula rufa* (Linn.) (H), *Paravespula germanica* (Fab.) (F, S), P. *vulgaris* (Linn.) (F, H, S).

Sphecidae: *Trypoxylon clavicerum* Lepeletier & Serville (H, S), *T. figulus* (Linn.) (S), *Crabro cribrarius* (Linn.) (F), *C. peltarius* (Schreber) (F), *Crossocerus annulipes* (Lepeletier & Brullé) (F, H, S), *C. binotatus* Lepeletier & Brullé (S), *C. elongatulus* (Vander Linden) (H), *C. cetratus* (Shuckard) (F, S), *C. megacephalus* (Rossi) (F, S), *C. podagricus* (Vander Linden) (F), *C. pusillus* Lepeletier & Brullé) (F, H), *C. quadrimaculatus* (Fab.) (F, H, S), *C. tarsatus (*Shuckard) (F, S), *Ectemnius cavifrons* (Thomson) (F, S), *Oxybelus uniglumis* (Linn.) (F, S), *Lindenius albilabris* (Fab.) (F, H), *Psenulus concolor* (Dahlbom) (F), *Stigmus solskyi* Morawitz (F), *Pemphredon inornatus* Say (S), *P. lugubris* (Fab.) (F, S), *Passaloecus corniger* Shuckard (F), *P. singularis* Dahlbom (F), *Mellinus arvensis* (Linn.) (F, S), *Argogorytes fargeii* (Shuckard) (F, S), *Gorytes quadrifasciatus* (Fab.) (F), *Harpactus tumidus* (Panzer) (F).

Colletinae: *Colletes daviesanus* Smith (F, S), *Hylaeus communis* Nylander (F, S), *H. signatus* (Panzer) (F).

Andreninae: *Andrena barbilabris* (Kirby) (F, S), *A. bicolor* Fab. (H, S), A. *chrysosceles* (Kirby) (F, H, S), A. *cineraria* (Linn.) (H), *A. clarkella* (Kirby) (H), *A. denticulata* (Kirby) (F), *A. fucata* Smith (H), *A. fulva* (Müller *in* Allioni) (F, H, S), *A. haemorrhoa* (Fab.) (F, H, S), *A. helvola* (Linn.) (S), *A. lapponica* Zetterstedt (H), *A. minutula* (Kirby) (H, S), *A. nigroaenea* (Kirby) (F, H, S), *A. semilaevis* Pérez (=*A. saundersella*) (F, H, S), *A. scotica* Perkins (F, H, S), *A. subopaca* Nylander (F, H, S), *A. wilkella* (Kirby) (H, S).

Halictinae: *Halictus rubicundus* (Christ) (F, H, S), *H. tumulorum* (Linn.) (S), *Lasioglossum albipes* (Fab.) (H, S), *L. calceatum* (Scopoli) (F, H, S), *L. cupromicans* (Pérez) (F), *L. fratellum* (Pérez) (H), *L. fulvicorne* (Kirby) (S), *L. leucopus* (Kirby) (F, S), *L. nitidiusculum* (Kirby) (S), *L. punctatissimum* (Schenck) (S), *L. rufitarse* (Zetterstedt) (H), *L smeathmanellum* (Kirby) (F, S), *L villosulum* (Kirby) (F, H, S), *Sphecodes crassus* Thomson (S), *S. ephippius* (Linn.) (H, S), *S. geoffrellus* (Kirby) (F, H, S), *S. gibbus* (Linn.) (F, H, S), *S. hyalinatus* von Hagens (H), *S. monilicornis* (Kirby) (F, H, S), *S. pellucidus* Smith (S), *S. puncticeps* Thomson (S).

Megachilinae: *Chelostoma florisomne* (Linn.) (S), *Osmia rufa* (Linn.) (F), *Megachile versicolor* Smith (H), *M. willughbiella* (Kirby) (F).

Anthophorinae: *Nomada fabriciana* (Linn.) (H, S), *N. flavoguttata* (Kirby) (F, H, S), *N. goodeniana* (Kirby) (F, H, S), *N. lathburiana* (Kirby) (H), *N. marshamella* (Kirby) (F, H, S), *N. panzeri* Lepeletier (H), *N. ruficornis* (Linn.) (F, H), *N. striata* Fab. (H), *Anthophora furcata* (Panzer) (H, S).

Apinae: *Bombus lucorum* (Linn.) (F, H, S), *B. terrestris* (Linn.) (F, H, S), *B. lapidarius* (Linn.) (F, H, S), *B. pratorum* (Linn.) (F, H, S), *B. hortorum* (Linn.) (F, H, S), *B. pascuorum* (Scopoli) (F, H, S), *B. bohemicus* (Seidl) (F, H, S), *B. sylvestris* (Lepeletier) (H), *B. vestalis* (Geoffroy *in* Fourcroy) (F, S), *Apis mellifera* Linn. (F, H, S).

LICHEN FLORA OF THE WEST YORKSHIRE CONURBATION – SUPPLEMENT VII (1999-2004)

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The undoubted improvement in urban air quality over the past few decades is at long last having a major impact on the lichen flora of the West Yorkshire conurbation. The adoption by lichens of the wide variety of man-made and semi-natural habitats has been much more dramatic over the past five years than noted in previous surveys (e.g. Seaward & Henderson 1991, 1999; Seaward *et al.* 1994). It is clear that once the predominating factor, namely air pollution, has been largely eliminated, then the multifarious habitats afforded by urban environments in terms of substrata and microclimates will be highly conducive to lichen colonization. Indeed, there is strong evidence to show that in many European cities, as exemplified by Leeds, the diversity of the lichen flora is richer in suburbia than in rural areas adjacent to the urban boundaries (cf. Seaward 1997). Even suburban trees close to roads with dense traffic frequently support relatively diverse lichen floras with high cover values; however, in such cases, the dominating lichen community is not only indicative of the reduction in sulphur dioxide pollution, but of a pronounced increase in nitrogenous substances derived from gaseous sources (e.g. NO_X, NH_3) and chemically-enriched dusts (e.g. agrochemicals). The effects of these substances are so pronounced that the term 'hypertrophication' is more appropriate than 'eutrophication' to describe the resultant phenomenon (Seaward & Coppins 2004), with nitrophytic epiphytic floras, particularly on twigs, composed mainly of *Xanthoria* and *Physcia* spp., being widespread on a variety of trees (e.g. *Acer*, *Fraxinus*, *Malus*, *Salix*, *Tilia*) throughout the conurbation.

Over the past five years, lichenological surveys of sites within 20 km of the centre of the West Yorkshire conurbation have profited not only from the attention of individuals, but also through important observations made on Yorkshire Naturalists' Union excursions (Henderson 2001, 2004). Of particular note is the work of Dalrymple (2002) on the lichen recolonization of trees in south-western Bradford: twenty-five years prior to this study in 2001, only two species, *Lecanora conizaeoides* and *Lepraria incana*, were to be found growing epiphytically; as a consequence of her detailed investigation of 372 trees, 28 lichen species were identified, including some not seen in Bradford and its environs for a century or more, such as *Flavoparmelia caperata* and *Parmotrema perlatum*. Rather interestingly, although *Lepraria incana* was still common throughout the study area, *Lecanora conizaeoides* had lost its stranglehold, being only occasionally recorded on tree trunks; this is also the case for much of the West Yorkshire conurbation, although the latter is frequently to be found growing on lignum.

Fieldwork has been complemented by literature and herbarium studies in order to gauge the past *vs* present status of lichen species. Of particular value in this respect has been the detailed on-going investigation of the Manchester Museum (MANCH) Lichen Herbarium (Seaward 2003) which contains a rich source of Yorkshire material, including numerous specimens collected from the West Yorkshire conurbation in the 19th century, particularly those of John Bohler (1797-1872) and William West (1848-1914), several of whose records are enumerated below.

The following list of lichens provides additions to the flora over the five-year period January 1999 – December 2004 based on recording units illustrated in Seaward (1978, Fig. 1 & Table 1); recording units **A** to **S** are within urbanized areas of the conurbation and **T** to **W** are mostly non-urbanized but within 20 km of the centre of the West Yorkshire conurbation (referred to hereafter as WYC). It should be noted that since the delimitation of these units 35 years ago (Seaward 1973), the rural component of **T** to **W** and some inter-urban areas has been significantly reduced by urban development of the adjacent units. This being the case, the area (1257 km^2) covered within a radius of 20 km of grid reference 44/200.300 has not only a much higher percentage of urbanization, as would be expected, but also a much more integrated urban ecosytem. Collectors are abbreviated as follows: SD = S.Dalrymple, OLG = O.L.Gilbert, AH = A.Henderson, CJBH = C.J.B.Hitch and MRDS = M.R.D.Seaward.

Acarospora smaragdula (Wahlenb.) A.Massal. add **J**
Agonimia tristicula (Nyl.) Zahlbr. add **U** on mosses over stonework, Harewood House, 2001, AH (new to WYC)
Amandinea punctata (Hoffm.) Coppins & Scheid. add **K**, **T**, **V**, **W**
Anisomeridium polypori (Ellis & Everh.) M.E.Barr add **M** on *Sambucus*, Meanwood, 2003, CJBH (new to inner urban area of WYC)
Aspicilia contorta (Hoffm.) Kremp. add **K**, **U**
Bacidia rubella (Hoffm.) A.Massal. add **(J)** Huddersfield, *c*.1840, J.Bohler (herb.MANCH)
Buellia aethalea (Ach.) Th.Fr. add **U**,**W** on siliceous stone, Bretton Park, 1999, OLG (new to WYC)
Caloplaca crenulatella (Nyl.) H.Olivier add **M** on calcareous paving, St Chad's graveyard, Leeds, 2003, CJBH & AH (new to WYC)
C. decipiens (Arnold) Blomb. & Forssell add **K**
C. flavescens (Huds.) J.R.Laundon add **J**
C. flavocitrina (Nyl.) H.Olivier add **J** on calcareous paving stone, Castle Hill, Huddersfield, 1998, CJBH *et al*. (new to WYC – but overlooked), **M**
C. holocarpa (Hoffm.) A.E.Wade add **J**
C. saxicola (Hoffm.) Nordin add **J**
C. teicholyta (Ach.) J.Steiner add **U** on calcareous stonework, Harewood House, 2001, AH (new to WYC)
Candelariella reflexa (Nyl.) Lettau add **B**, **E**, **U**
Catillaria chalybeia (Borrer) A.Massal. add **B**, **H**, **J**
C. lenticularis (Ach.) Th.Fr. add **T**, **W**
Cladonia cornuta (L.) Hoffm. add **M** on industrial wasteland, Kirkstall Forge, 1994, AH (new to WYC)
C. humilis (With.) J.R.Laundon add **B**, **J**
C. rangiformis Hoffm. add **M** on industrial wasteland, Kirkstall Forge, 1994, AH (new to inner urban area of WYC)
Clauzadea monticola (Ach.) Hafellner & Bellem. Add **V**
Cliostomum griffithii (Sm.) Coppins add **U**
Collema auriforme(With.) Coppins & J.R.Laundon add **M** on unfashioned limestone gravestone, 1999, CJBH (new to inner urban area of WYC)
C. crispum (Huds.) F.H.Wigg. add **H**
C. tenax var. *ceranoides* (Borrer) Degel. add **T**
Dimerella pineti (Ach.) Vězda add **V**, **W**
Evernia prunastri (L.) Ach. add **B**, **F**, **W**
Fellhaneropsis vezdae (Coppins & P.James) Sérus. & Coppins add **U** on stone urn, Harewood House, 2001, OLG (new to WYC)
Flavoparmelia caperata (L.) Hale add **B**, **E**, **T**
Hypogymnia physodes (L.) Nyl. add **J**, **N**
H.tubulosa (Schaer.) Hav. add **B**, **M**, **U**

Hypotrachyna revoluta (Flörke) Hale add **E**, **U**
Lecania cuprea (A.Massal.) Van den Boom & Coppins add **U** on stone terrace, Harewood House, 2001, OLG (new to WYC)
L. cyrtella (Ach.) Th.Fr. add **U**
L. inundata (Hepp ex Körb.) M.Mayrhofer add **U** on stone terrace, Harewood House, 2001, OLG, CJBH & AH (new to WYC)
Lecanora albescens (Hoffm.) Branth & Rostr. add **J**, **P**
L. chlarotera Nyl. add **(J)** Huddersfield, *c*.1840, J.Bohler (herb.MANCH), **U**, **W**
L. crenulata Hook. add **J**
L. expallens Ach. add **E**, **K**, **M**, **U**
L. polytropa (Hoffm.) Rabenh. add **J**
L. saligna (Schrad.) Zahlbr. add **B**, **W**
Lecidea fuscoatra (L.) Ach. add **J**
Lecidella elaeochroma (Ach.) M.Choisy add **(J)** Huddersfield, *c*.1840, J.Bohler (herb.MANCH), **U**
Lepraria lobificans Nyl. add **M** on moss over calcareous stone and base of ornamental shrub, Lawnswood Cemetery, 1999, CJBH (new to inner urban area of WYC), **T** (but predated by collection in herb. Taunton from Wicken Crag, *c*.1905-9, T.Hebden (new to WYC)
Leproloma vouauxii (Hue) J.R.Laundon add **M**
Leproplaca chrysodeta (Vain. ex Räsänen) J.R.Laundon add **M** on shaded calcareous stone, Lawnswood Cemetery, 1999, CJBH (new to WYC)
Leptogium biatorinum (Nyl.) Leight. add **H** on clay soil of footpath, Cromwell Bottom, 2002, AH (new to inner urban area of WYC)
L. gelatinosum (With.) J.R.Laundon add **T**
L. turgidum (Ach.) Cromb. add **M**
Melanelia exasperata (De Not.) Essl. add **U**, **W** on bark, Bretton Park, 1999, OLG (new to WYC)
M. fuliginosa ssp. *glabratula* (Lamy) Coppins add **E**, **W**
M. subaurifera (Nyl.) Essl. add **M**, **N**, **W**
Micarea denigrata (Fr.) Hedl. add **H**, **J**, **W**
M. erratica (Körb.) Hertel, Rambold & Pietschm. add **M**
M. prasina Fr. add **B**
Opegrapha parasitica (A.Massal.) H.Olivier add **U** on *Verrucaria* sp. on stone urn, Harewood House, 2001, CJBH, AH & OLG (new to WYC)
Parmelia sulcata Taylor add **F**, **J**, **N**
Parmotrema perlatum (Eschw.) M.Choisy add **B**, **E**, **M** on *Salix*, Adel, 1999, MRDS (new to inner urban area of WYC), **T**, **U**
Peltigera hymenina (Ach.) Delise ex Duby add **H**, **K**, **P**, **T** (first records for WYC for more than 100 years)
Phaeophyscia nigricans (Flörke) Moberg add **W**
Physcia adscendens (Fr.) H.Olivier add **F**, **J**, **K**, **N**
P. aipolia (Ehrh. ex Humb.) Fürnr. add **U** on orchard tree, Harewood House, 2001, AH & OLG (new to WYC)
P. caesia (Hoffm.) Fürnr. add **J**
P. tenella (Scop.) DC. add **F**, **J**, **N**
Placynthiella dasaea (Stirt.) Tønsberg add **B**
P. icmalea (Ach.) Coppins & P.James add **B**, **J**, **K**, **P**, **V**
Platismatia glauca (L.) W.L.Culb. & C.F.Culb. add **W**
Porina chlorotica (Ach.) Müll.Arg. add **M** on granite gravestone, St Chad's churchyard, 2003, CJBH & AH (new to inner urban area of WYC)
Porpidia crustulata (Ach.) Hertel & Knoph add **W**
P. soredizodes (Lamy ex Nyl.) J.R.Laundon add **V**
Punctelia subrudecta (Nyl.) Krog add **U**, **W**

P. ulophylla (Ach.) Herk & Aptroot add **E** on bark, SW Bradford, 2001, SD (new to WYC, although some earlier records of *P. subrudecta* are referable to this species)
Ramalina farinacea (L.) Ach. add **N**
Rhizocarpon distinctum Th.Fr. add **U**, **V**
R. petraeum (Wulfen) A.Massal. add **T**, **V**
R. reductum Th.Fr. add **M**
Rinodina gennarii Bagl. add **J**
Sarcogyne regularis Körb. add **J**
Sarcopyrenia gibba (Nyl.) Nyl. add **U**
Scoliciosporum umbrinum (Ach.) Arnold add **J**
Stereocaulon pileatum Ach. add **J**
Strangospora pinicola (A.Massal.) Körb. Add **M**
Tephromela atra var. *torulosa* (Flot.) Hafellner add **(J)** Huddersfield, *c*.1840, J.Bohler (herb. MANCH) (new to WYC)
Theldium decipiens (Nyl.) Kremp. add **U** on stonework, Harewood House, 2001, AH (new to WYC)
Trapelia obtegens (Th.Fr.) Hertel add **J**
T. placodioides Coppins & P.James add **H**, **J**, **M**
Trapeliopsis flexuosa (Fr.) Coppins & P.James add **M**
Usnea subfloridana Stirt. add **B**, **M**, **U**
Verrucaria elaeina Borrer add **M** on marble grave edging, St Chad's churchyard, 2003, CJBH & AH (new to WYC)
V. nigrescens Pers. add **J**, **P**
V. viridula (Schrad.) Ach. add **K**
Xanthoria candelaria (L.) Th.Fr. add **M**
X. parietina (L.) Th.Fr. add **F**, **J**, **P**
X. polycarpa (Hoffm.) Th.Fr.ex Rieber add **B**, **E**, **J**, **P**, **T**, **W**
X. ucrainica S.Kondratyuk add **M** on *Fraxinus*, beside driveway to St Chad's churchyard, 2003, CJBH & AH (new to WYC)

As a consequence of the above work, the lichen flora of the West Yorkshire conurbation can be summarized as follows: 373 lichen taxa (cf. 845, excluding lichenicolous fungi, for the county as a whole – Seaward 1994 plus recent additions) have been reported from the area within 20 km of the centre of the conurbation, of which 5 are doubtful in the absence of supporting herbarium material and at least 38 are extinct in the area; 260 have been recorded during the present survey (October 1967 – December 2004).

Acknowledgements

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BOOK REVIEWS

A Guide to Common Fossils (2004), **A Guide to Common Minerals** (2004) and **A Guide to Rocks** (2003) by **Chris Pellant** and **Helen Pellant.** Available from Field Studies Council Publications, Preston Montford, Shrewsbury, Shropshire SY4 1HW. Price £3.25 each, plus postage and packing.

The Field Studies Council has recently released a new *Guide to Common Fossils* to complement its two other full colour, earth science fold-out charts, A *Guide to Common Minerals* and *A Guide to Rocks*. These form part of the growing AIDGAP series of 17 x 24.7 cm user-friendly identification guides covering plants, animals and other aspects of natural history. This useful trio of guides each consists of 12 fold-out pages of profusely illustrated plastic-laminated text and illustrations which are sufficiently robust to survive extended periods of practical field use.

The new *Guide to Common Fossils* is a marked improvement on the two earlier guides in providing a clear statement of the size of the illustrated specimen for each of the 71 fossils depicted. The illustrations are not only clear but have also been sensibly chosen to represent fossils that are frequently found in Britain, with specimens being illustrated from many of the more commonly visited fossiliferous locations. The accompanying notes provide an excellent, succinct introduction to the main groups of fossils and include a simple but effective geological time scale that indicates the periods when different types of fossils were deposited in sedimentary rocks. The guide is likely to be of considerable use to anyone starting to study fossils and clearly would be of value to school-teachers who need to provide simple robust guides for student use.

A Guide to Rocks provides six pages of introductory notes, which should furnish the beginner with a useful introduction to a wide range of rock types that are commonly encountered in Britain. Further carefully selected information to help aid identification accompanies the coloured photographic illustrations of over sixty rocks types. It is unfortunate that the illustrations rarely give an indication of the size of the sample and that the chosen samples, though usually clearly depicted, inevitably suffer from the impossibility of representing the range of forms which any particular type of rock may possess. However, as a practical, well produced, reasonably priced field guide, the publication may well help many people to further their interest in identifying and improving their knowledge of rocks.

A *Guide to Common Minerals* differs from the other two publications in that it devotes three pages to a large table which itemises the key properties of the 71 minerals that are illustrated. Despite the title a few of the minerals are not especially common and it might have been preferable to have reduced the number of minerals depicted and to have shown the variant forms of some of the more common minerals such as calcite. The illustration of fluorite shows the uncommon green form rather than the more frequently encountered white/blue/purple samples though these other colours are mentioned in the table of properties. Once again, the publication is of a high standard and complements the other two to provide a valuable introductory guide to the world of geological materials.

DEC

The Butterflies of Yorkshire edited by **Howard M. Frost.** Pp.310, with colour photographs, diagrams, graphs and distribution maps. 2005. £30.00 (softback) inc. postage & packing from: Butterfly Conservation (Yorkshire Branch), 10 Chellsway, Withernsea, Hull HU19 2EN.

In 1995 a team of over 40 lepidopterists started work on this book which covers all 36 breeding species as well as over 25 other rare, extinct or exotic species of butterfly recorded from the traditional (Watsonian) county of Yorkshire. As Howard Frost writes in the introduction, the book is 'a statement of what is known about Yorkshire butterflies at the beginning of the 21st century'.

This attractively presented paperback has full colour on every one of its 310 glossy pages. The butterflies and their habitats are lavishly illustrated by photographs and are supplemented by detailed paintings by Nick Lawman and other artists. Most of the book (*c.* 236 pages) is devoted to species accounts which include identification tips, photos of variants, local and national status information, life history, historical reviews and conservation guidance. National distribution maps based on 10 km x 10 km squares and regional tetrad distribution maps are reproduced in colour for every resident species (by courtesy of Butterfly Conservation's Millennium Atlas Project).

Other background sections include geographical information about Yorkshire's landscape and geography, a historical review of recorders and butterfly recording in the region, and information on local record centres. An analysis of 200 years of weather records is an unusual and notable contribution, and helps in understanding the sections on historical changes of butterfly distribution. The effects of changing land use are also considered. Brownfield sites are highlighted as threatened habitats important for conservation and there is a thoughtful discussion on the pros and cons of butterfly introductions. There are also brief sections on Yorkshire moths, locations of important regional lepidoptera collections and discussion of migrations, as well as an extensive bibliography.

It is difficult to produce a book of this type which is useful both to the specialist but still accessible to the novice. It would be easy to fall between the two stools by producing an indigestible technical account or a superficial picture book. The authors are to be congratulated on achieving a publication that should be useful and interesting to both types of reader.

It was unfortunate that during the printing stage computer problems resulted in the disruption of a part of the reference section and the reincorporation of some previously corrected typographical errors into the text, but this does not detract from its being a visually attractive, generally well produced and enormously authoritative book, which will be of great value to the general naturalist, novice and specialist lepidopterist, both within the county and elsewhere in the British Isles, for many years to come.

TW

THE LAND AND FRESHWATER MOLLUSCA OF AIRY HOLME WOOD, NORTH-EAST YORKSHIRE

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Introduction

"Airy Holme Wood . . . possesses more claims for celebrity than any other wood which I have seen recorded; since there are perhaps more rarities found in it, within the compass of a few hundred yards, than in the same area anywhere in the North of England or the South either." So began an article about the Mollusca of Airy Holme Wood, written 150 years ago by J. W. Watson (1854). Coupled with its unusually early date, this article is of interest because of the level of detail it contains, in narrative form, about the species known to inhabit the wood at the time. Watson states that he recorded 36 terrestrial species and "two or three" freshwater ones, although regrettably, not all are named. As a century and a half have elapsed since this first known survey of the molluscs of Airy Holme Wood was published, a reassessment of its molluscan fauna seems to be timely.

Airy Holme Wood, centred on grid reference 45(NZ)/580113 in VC62, is about 7.5 ha in extent. It is on an approximately south facing slope at an altitude range of about 130 to 180 m. The tree species present are predominantly ash (*Fraxinus excelsior*) with sycamore (*Acer pseudoplatanus*) and an understorey of hazel (*Corylus avellana*) in places; there are also some oaks (*Quercus* sp.), beech (*Fagus sylvatica*), holly (*Ilex aquifolium*) and hawthorn (*Crataegus* sp.). The wood has undergone considerable change since the mid-19th century (see below), Watson describing it as a woodland composed chiefly of oak.

Airy Holme Wood is considered to be an ancient semi-natural woodland i.e. to have been in existence since at least 1600 A.D. but probably much older (Carter 1987). Part of the evidence in favour of this view is that it has populations of at least five flowering plants that appear to be associated with ancient semi-natural woodland elsewhere in VC62, namely *Anemone nemorosa*, *Oxalis acetosella*, *Lysimachia nemorum*, *Galium odoratum* and *Luzula sylvatica* (Wardhaugh 1997). Watson also considered this to have "been a wood for centuries", basing this conclusion on "the very great depth of vegetable mould in all parts".

A feature of particular importance in the recent history of the wood is that it lies partly on the Cleveland Dyke, a 58 million-year old igneous intrusion of tholeiite, a material much used in road construction and quarried locally in the 19th and 20th centuries. Indeed, Watson (1854) was concerned for the future of what he saw as an ancient and unspoilt woodland for he wrote "Ah! lovely Airy Holme Wood, I trust thou art not to fall just yet". His fear was, however, that it may lie on the ironstone that was just starting to be exploited commercially in the neighbourhood. Regrettably, the concern expressed by Watson was not unfounded; some 25 years later Ashford (1879) quotes Watson as writing to him "its glories as a conchological locality are I am sorry to say a thing of the past. The Whinstone Trap Dyke [i.e. the Cleveland Dyke] crosses the lower end of the wood, and quarrying has destroyed all its beauties, and, it is to be feared has exterminated some of its rarer species".

Quarrying has long since ceased but even a cursory inspection of the wood at the present time indicates the damage done in the past. The large majority of trees are far from old and appear to post-date the quarrying era, the contours of the land seem quite unnatural in places and there are extensive areas of spoil hidden by a fairly sparse veneer of herbage. Moreover, comparison of the present day extent of the wood with its size as shown on the First Edition Ordnance Survey map indicates that part has been lost entirely, the area concerned being quarried, then used as a landfill site and finally grassed over and turned into pasture in the third quarter of the 20th century (see Fig. 1).

The history of Airy Holme Wood outlined above renders a comparison of its molluscan fauna of 150 years ago, prior to mineral extraction, with that of the present day of particular interest. The most significant question to consider is how well the molluscan fauna of the wood has survived.

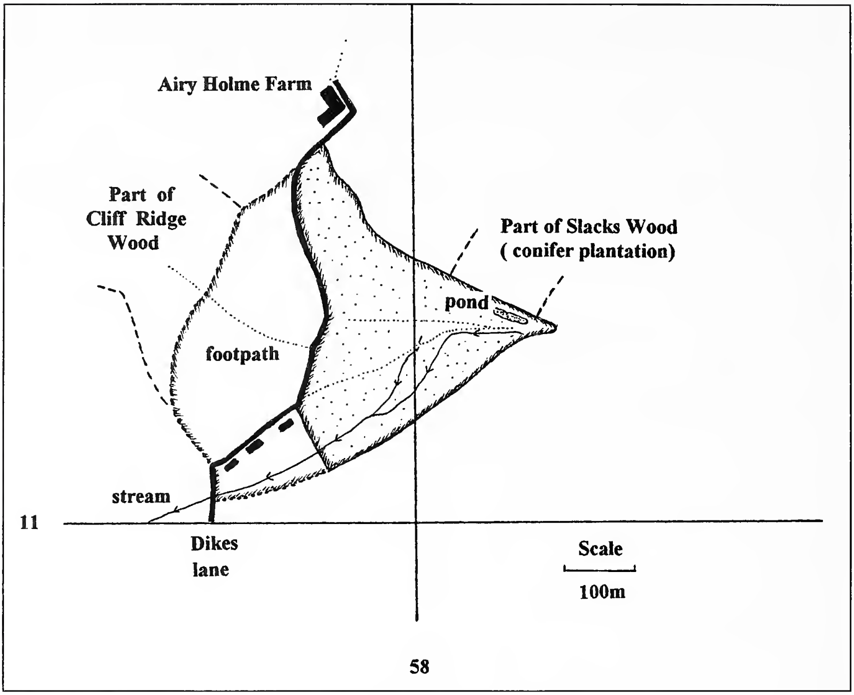

FIGURE 1.
Sketch map of Airy Holme Wood. Current extent stippled with boundary shown as a solid line with hatching. Approximate extent on first edition Ordnance Survey map to west and south shown with boundary dotted and hatched. National grid lines at one km intervals are indicated.

RECORDS FOR THE WOOD

Molluscan records for the wood fall into two categories: firstly, the original account by Watson together with a few other scattered 19th century records; secondly, the findings of more recent surveys comprising a visit by the Yorkshire Conchological Society (YCS) on 7 October 1972, information collected by the present author since 1995, and a second visit by the YCS on 8 May 2004.

Watson (1854) states that he knew of 36 terrestrial species, providing information as a narative in which, regrettably, only some are named as indicated in Table 1. However, more of the species he recorded can be inferred from the statement that he found "all of the *Zonites* except *excavatus* and *lucidus* (= *Zonitoides excavatus* and *Z. nitidus*). The scientific nomenclature of the British Mollusca has undergone numerous revisions since the mid-19th century, but the species Watson is alluding to here can be listed with some confidence through reference to an identification guide to non-marine molluscs which he co-authored at the time (Dixon & Watson 1858); these species are indicated in Table 1, but with a different notation. Thus in total 23 terrestrial species are named or can be inferred from Watson's paper, leaving a further 13 unknown; a significant proportion of these seem likely to be slug species, of which Watson makes no mention.

The species recorded during the YCS visit of 1972 and in the period 1995 to 2004 are listed separately in Table 1, their combined total being 54 (47 terrestrial & 7 freshwater).

This is impressive and makes Airy Holme Wood comparable with other ancient semi-natural woodlands in the area in terms of both species number and quality (Wardhaugh 1996, 1997). Just two species recorded by Watson were not re-found in the period 1972 to 2004: *Spermodea lamellata* and *Balea perversa*. Both have been searched for specifically in likely habitats during recent visits and although a negative record is impossible to prove from a practical viewpoint, this is not a large woodland and it is reasonable to conclude that both are very probably no longer present. *Spermodea lamellata*, a species indicative of ancient semi-natural status, is considered to be intolerant of disturbance (Kerney & Stubbs 1980; Kerney 1999). So even though suitable habitat remains, such as areas of deep oak and beech litter (albeit of limited extent) and beds of *Luzula sylvatica*, its demise is perhaps unsurprising. Even in the mid-19th century Watson described it as scarce. The apparent loss of *Balea perversa* is part of a wider pattern both nationally (Holyoak 1978; Kerney 1999) and locally (Wardhaugh 1999), and may well represent loss as an adverse reaction to atmospheric pollution. Watson states of it "let us look under the lichen (*Parmelia saxatilis*) which covers the stems of trees and we shall there probably find a few specimens of *Balea perversa*". Hence, the loss of trees during quarrying may also have contributed to its disappearance. *B. perversa* is known to have occurred in a number of woodlands in the north-eastern part of VC62 in the 19th century (Wardhaugh 1999) but in spite of much searching in the period 1982 to 2004 it has not been found in any of these, nor any other nearby site, by the present author. It seems to be locally extinct, with the nearest populations occupying calcareous districts along the southern edge of the North York Moors (Wardhaugh 1999).

The higher species total recorded in the period 1972 to 2004 compared with that of Watson (1854) can be explained at least in part by two factors. Firstly, several taxa recognised as single species in the mid-19th century are now considered to be two or more species: *Carychium minimum* agg. (= *C. minimum* & *C. tridentatum*), *Succinea putris* agg. (= *S. putris* & *Oxyloma pfeifferi*), *Cochlicopa lubrica* agg. (= *C. lubrica* & *C. lubricella*), *Arion circumscriptus* agg. (= *A. circumscriptus*, *A. silvaticus* & *A. fasciatus*), *V. crystallina* agg. (= *V. crystallina* & *V. contracta*), *Euconulus fulvus* agg. (= *E. fulvus* & *E. alderi*, re-named *E. praticola*). Secondly, the slugs *Tandonia budapestensis* and *Deroceras panormitanum*, now found in the wood, are introduced species having first been recorded in Britain during the intervening period (Kerney 1999).

It is, of course, almost impossible to form any impression of how population sizes of individual species may have changed over the last 150 years but one feels that there must have been some declines, if only because of the reduction in size of the wood. Watson (1954) does, however, provide a few interesting comments on populations and habitats, the following passage being almost as true at present as when it was first written. In autumn one can find "*H. fusca* [= *Perforatella subrufescens*] in considerable numbers crawling up fronds of *Dryopteris felix-mas* or the stems and leaves of *Stachys sylvatica*. In company with this may be found in abundance *Succinea putris*, *Helix hispida* [= *Trichia hispida*] and crawling up the stems of young trees chiefly *Clausilia nigricans* [= *C. bidentata*]." For *Dryopteris felix-mas* and *Stachys sylvatica* one might nowadays substitute *Urtica dioica* and *Mercurialis perennis*. Watson regarded *Acicula fusca*, *Leiostyla anglica* and *S. lamellata* as "the chief rarities . . . none of which are abundant - the collector may think himself fortunate if he finds half a dozen at a forage". The last of these may no longer be present (see above). *Acicula fusca* has proved to be very elusive indeed. Since 1995, just two specimens have been found (one live individual on 16 July 1995 under a stick by a spring, and one empty shell on 10 September 1995 at a different site in deep, moist beech litter). Interestingly, Ashford (1879) describes it as "not uncommon some years back". In contrast, there is an apparently thriving colony of *Leiostyla anglica* in a boggy area of *Chrysosplenium oppositifolium* close to the stream.

Acicula fusca, Vertigo substriata, Leiostyla anglica, Spermodea lamellata and *Perforatella subrufescens* all appear to be associated with ancient semi-natural woodland at least in VC62 (Wardhaugh 2000), which strengthens the case for Airy Holme Wood being

TABLE 1
Mollusca of Airy Holme Wood, north-east Yorkshire

Species	Watson (1854)	Ashford (1879)	Hudson (1886)	Taylor (1894-1921)	Y.C.S. (1972)	1995-2004
Potamopyrgus antipodarium					*	*
Physa fontinalis					*	
Lymnaea truncatula					*	*
Lymnaea peregra					*	*
Ancylus fluviatilis					*	
Pisidium casertanum					*	
Pisidium personatum						*
Acicula fusca	*	*			*	*
Carychium minimum agg.	*					
Carychium minimum seg.					*	*
Carychium tridentatum					*	*
Succinea putris agg.	*					
Succinea putris seg.						*
Oxyloma pfeifferi					*	*
Azeca goodalli	*	*	a			*
Cochlicopa lubrica agg.	*					
Cochlicopa lubrica seg.					*	*
Cochlicopa lubricella					*	*
Columella edentula agg.	*					
Columella edentula seg.			b		*	*
Vertigo substriata	*					*
Vertigo pygmaea	*				*	
Leiostyla anglica	*	*			*	*
Lauria cylindracea	*				*	*
Acanthinula aculeata	*				*	*
Spermodea lamellata	*					
Ena obscura		*				*
Punctum pygmaeum					*	*
Discus rotundatus					*	*
Arion ater agg.					*	*
Arion subfuscus						*
Arion circumscriptus						*
Arion silvaticus						*
Arion fasciatus					*	*
Arion hortensis agg.					*	
Arion distinctus						*
Arion intermedius					*	*
Vitrina pellucida	*				*	*
Vitrea crystallina agg.	*					
Vitrea crystallina seg.					*	*
Vitrea contracta				c	*	*
Nesovitrea hammonis	o			d	*	*
Aegopinella pura	o				*	*
Aegopinella nitidula	o				*	*
Oxychilus cellarius	o				*	*
Oxychilus alliarius	o				*	*
Tandonia budapestensis					*	*

Continued on next page

TABLE 1 *(Continued)*
Mollusca of Airy Holme Wood, north-east Yorkshire

Species	Watson (1854)	Ashford (1879)	Hudson (1886)	Taylor (1894-1921)	Y.C.S. (1972)	1995-2004
Limax maximus					*	*
Limax marginatus						*
Deroceras laeve			*	e	*	*
Deroceras reticulatum					*	*
Deroceras panormitanum						*
Euconulus alderi						*
Euconulus fulvus					*	*
Clausilia bidentata	*				*	*
Balea perversa	*	*				
Perforatella subrufescens	*				*	*
Trichia striolata					*	*
Trichia hispida	*				*	*
Cepaea nemoralis					*	*
Cepaea hortensis			*			*
Helix aspersa						*

Nomenclature follows that of Kerney (1999).
o = Presence implied but not directly stated by Watson (1854). See text.
a = In the Baker Hudson shell collection, dated 1882, in the Dorman Museum, Middlesbrough.
b = In the Baker Hudson shell collection, dated 1884, in the Dorman Museum, Middlesbrough.
c = Attributed to W. D. Roebuck, listed as *V. crystallina* var. *contracta*.
d = Refers to Watson's original record of 1854.
e = Refers to Hudson's original record of 1886.

of this class. In any event the wood has a remarkably rich molluscan fauna in spite of past disturbance.

ACKNOWLEDGEMENTS

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BOOK REVIEW

Pollen: the hidden sexuality of flowers by **Rob Kesseler** and **Madeline Harley**. Pp.264. Papadakis Publisher, London. 2004. £35.00 hardback.

This magnificent volume is the result of a unique collaboration between a botanist (Madeline Harley, Head of the Palynology Unit, Kew Gardens) and a visual artist (Rob Kesseler, Central St Martins College of Art & Design). They explore and portray the sexual reproduction of flowering plants, focussing on the pollen grain and its morphology. There are four main chapters, by far the longest (half the length of the entire book) being devoted to a detailed consideration of the biology of flowers. Although the book is clearly aimed at a general market, the large number of technical terms in this chapter will make it heavy going even for a professional botanist or palynologist. By contrast, the shorter chapters on the history of botanical and the visual depiction of flowers and pollen flow more easily. The authors stress the beauty as well as the functionality of pollen, and the inclusion of poetic extracts and references to spiritual matters raise fascinating questions about the relationships between art and science.

The book is illustrated in full colour throughout by photographs and photomicrographs of the highest standard. The stunning close-up images of flower parts and the SEM images of the surface morphology of pollen grains are thoughtfully presented to illustrate the book's theme of the sexuality of flowers (a theme which some previous generations found embarrassing in its echoes of human sexuality!). Particularly striking are the paired images of flowers and their pollen grains in the final chapter, chromatically manipulated to emphasise the links between them. This is truly a book to treasure – the ultimate coffee-table volume for the botanical cognoscenti!

MAA

THE HUMPBACK WHALE *MEGAPTERA NOVAEANGLIAE* IN THE NORTH SEA: HISTORICAL CONTEXT FOR THE FIRST YORKSHIRE COAST AND DUTCH RECORDS

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INTRODUCTION

The humpback whale (*Megaptera novaeangliae* Barowski, 1781) was hunted extensively in the north Atlantic from the 18th to the early 20th century, resulting in severe depletion of its stocks and necessitating its complete protection (since 1955) (Evans 1980). Figure 1 illustrates the decline in numbers caught by whaling companies operating out from north-west Ireland, the Outer Hebrides and Shetland during the early part of the 20th century. The relatively small numbers involved suggest that stocks in British waters were limited and incapable of sustaining uncontrolled commercial exploitation. Further evidence of their scarcity is the absence of strandings on the British coast since the cetacean stranding monitoring scheme was instigated in 1913 (Evans 1980). Though in 1884 one was killed in the Tay estuary (Corbet & Southern 1977) and in September 1894 a 7.6m specimen was washed ashore at Mumby Chapel near Skegness, Lincolnshire (Blathwayt 1912).

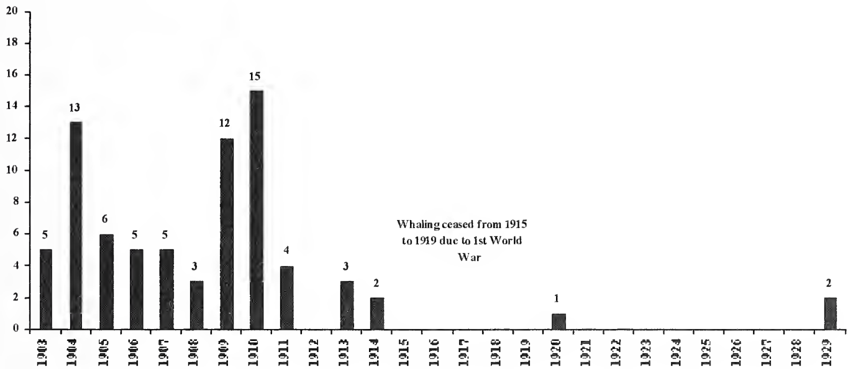

FIGURE 1.
Total annual catches of Humpback whales from the Shetland, Outer Hebrides and Irish whaling stations 1903 to 1929 (based on data in Brown 1976).

During the mid-1970s, the combined western and eastern North Atlantic populations were thought to consist of fewer than 2000 animals, the smaller eastern population representing only a third of the total, although about this time there was some evidence that stocks were beginning to recover (Evans 1980).

In the UK, baleen whales, including the humpback whale, typically trawl for planktonic invertebrates and schooling fish along the edge of the continental shelf off the west coast of Ireland and northwest Scotland. Those entering the shallow southern North Sea tend to be vagrants from this seasonal feeding migration, though there now seems to be a population of the smaller minke whales (*Balaenoptera acutorostrata*) resident off the Yorkshire coast.

An examination of cetacean records (stranding and sightings) in Yorkshire waters shows the extreme scarcity of baleen whale species; however, Figure 2 shows that although numbers were tiny, with the equivalent of 2.1 per decade from 1900 to 1984, from 1985 to

2004 occurrences rose to the equivalent of 8.5 per decade, with seven records from 2000 to 2004.

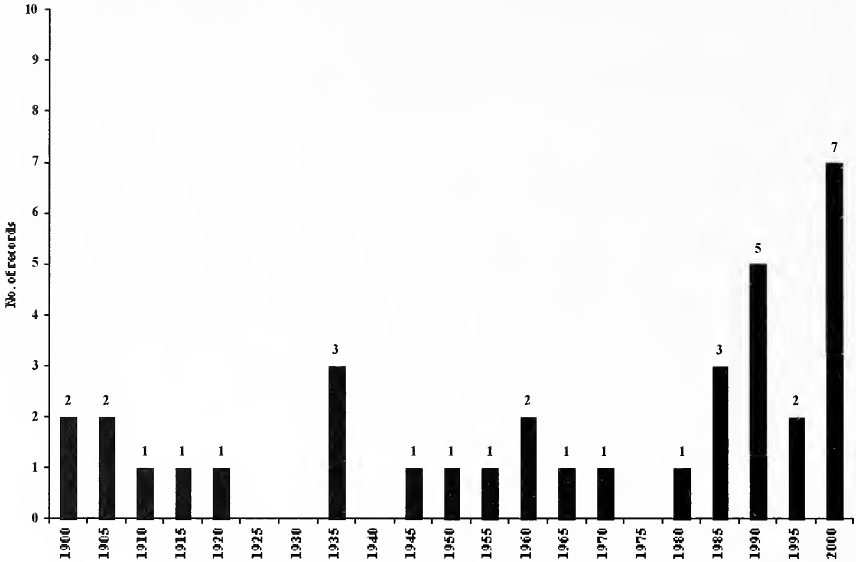

FIGURE 2.
Numbers of baleen whales recorded in Yorkshire waters in 5-year periods from 1900 to 2000 (Based on YNU records).

RECENT RECORDS FROM THE NORTH SEA

The following humpback whale records are entered in chronological order:

1) April 1982 – one was sighted off Lossiemouth in the Moray Firth (http://www.crru.org.uk; www.loupers.com).
2) 24 July and 12 August 2002 – an 11.5m specimen was seen close inshore off Banff in the Moray Firth; according to tail pattern characteristics, it is believed to be a female from the western Greenland population (http://www.seawatchfoundation.org.uk).
3) 12 December 2002 – a young 8m specimen entered the naval harbour of Frederikshavn on the northern Kategat coast of Denmark, where it remained in the harbour all day, feeding on shoals of small fish (http://www.hvaler.dk).
4) 13 February 2003 – an adult (*c.* 15m) and a juvenile (*c.* 10-12m) were seen off Cove near Aberdeen; they swam slowly north past Grindleness and were observed breaching about a mile offshore in Aberdeen Bay (Hobbs & Wier 2003, http://www.seawatchfoundation.org.uk).
5) From 15 February to mid-March 2003 – a 13m specimen, initially tangled in a rope of fishing netting, frequented the Firth of Forth (http://wwwcrru.org.uk).
6) 29 September 2003 – the corpse of a large whale floating 8km west of the Hook of Holland was identified from photographs as *M. novaeangliae*; this was the first record of the species from the Netherlands (http://groups.Yahoo.com/group/UKCetnet).
7) 18 December 2003 – an adult male and a young specimen, estimated to be 18m and 8m respectively, were swimming towards the coast near The Hague; the local lifeboat team attempted to deflect them from swimming ashore, but lost them at dusk about 10km south of The Hague. Their identification was confirmed by photographs taken by the

lifeboat crew. Tragically, on 20 December 2003, the pair died after being trapped in fishing nets and stranding at Katwijk aan Zee on the Dutch coast. (http://groups.Yahoo.com/group/UKCetnet).

8) 30 May 2004 – a *c*.9m sub-adult specimen appeared at Whitby (Hobbs 2004). It was first seen by the crew of the *Esk Bell*, then by Barry Seddons, skipper of the *Mary Ann Hepworth*, with which it stayed for up to ten minutes during which Mr Seddons and his passengers took photographs, those taken by the former being published in *The Whitby Gazette* (31 May 2004) (see also http://www.whitbytoday.co.uk). It remained off Whitby on 31 May and at 2pm it swam for about 45 minutes amongst the yachts and other pleasure craft between the bell buoy and the harbour mouth; it was also observed by members of the public from the outer pier. This is the first record for Yorkshire.
9) 22 June 2004 – a freshly dead 8m female, exhibiting scars of nylon fishing gear, was stranded on the Dutch island of Vlieland (http://www.vlie.nl/waddennieus).
10) 24 June 2004 – an 11.5m adult was monitored at close range for 2.5 hours from an inflatable survey craft 3 miles from the southern coastline of the outer Moray Firth. Digital images of its tail have been compared with the North Atlantic database of humpback whale tail flukes held by the Marine Mammals Laboratory, University of Maine, USA, identifying the Moray Firth specimen as being from a population of animals studied off Greenland (www.crru.org.uk).

Recent records from the English Channel

Although at the southern mouth of the North Sea, the following English Channel occurrences may be associated with an eastward movement from the Atlantic via the western approaches rather than being part of a southerly movement down through the North Sea:

1) 3 June 1995 – a 10m specimen which entered the Rivers Orwell and Stour on the Essex coast was diverted back to the open sea by a flotilla of small boats (Dobson 1999).
2) 21 March 2001 – a 28 tonne specimen stranded alive on the gently sloping beach at Sandwich, Kent had to be humanely killed (http://www.bdmlr.org.uk).
3) 23 March 2003 – a single specimen was sighted from the Calais to Dover ferry (http://www.seawatchfoundation.org.uk).

Discussion

Former distribution and status reviews (Evans 1980, Macdonald & Barrett 2002) specifically exclude the North Sea and the Baltic from the north Atlantic range of the humpback whale. The absence of strandings on the Scottish and English North Sea coastline from 1913 (Evans 1980) and the Dutch coast line before 2003 (this study) suggests that the species was indeed absent in the past. The series of 15 records dating from 1982 to 2004 from both western and eastern shores of the North Sea and the eastern end of the English Channel would seem to be monitoring a historically new distributional development for this species. The origins of these whales are not known although single specimens in the Moray Firth in July 2002 and June 2004 were identified as originating from the Greenland population.

During the early years of the 20th century when humpback whales were commercially hunted in western Irish and Scottish waters, most were caught between June and August, confirming a summer migratory season. Current notions of the winter distribution of humpback whales in the north Atlantic places them in lower latitudes, notably around the Cape Verde islands, for mating and calving (Macdonald & Barrett 2002). It is curious, therefore, to note that half of the recent North Sea occurrences have been during the winter months of December, February and March, which would suggest that these huge migratory animals are becoming trapped in the relatively constricted and shallow topography of the southern North Sea. A tragic implication of this may be the high incidence of fatalities (5 fatal strandings from 15 occurrences), particularly on the shallowly shelving eastern shoreline.

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JOHN RAY'S JOURNEYS IN YORKSHIRE BETWEEN 1660 AND 1671

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Raven (1942) pieced together the travels of John Ray from his works and correspondence, and divulged, albeit in an abstract fashion, some of the places visited by Ray and his companions. Ray travelled widely in Britain and continental Europe, and his journeys incorporated four visits to Yorkshire.

Ray's first visit was during a tour of northern England and the Isle of Man in June and July 1660, accompanied by Francis Willughby. Until this tour, Ray's studies had been confined to botany; however, the work of Willughby inspired Ray to extend his interests to zoology. The tour included visits to Halifax, Keighley, Settle, 'Hinckelhaugh' and Ingleborough.

Ray also spent time in Yorkshire during an extensive tour of northern Britain between 26 July and 7 September 1661, accompanied by Philip Skippon and a servant. According to Raven (1942), this journey appeared to be planned rather more for the visiting of cathedrals and great churches than for botanical and zoological collecting. The tour included visits to Kingston-upon-Hull, Beverley, Pontefract, Leeds, Knaresborough, Harrogate, Ripon, York, Scarborough and Whitby.

Ray paid two further visits to the county. During July 1668 he travelled alone for a fortnight in Yorkshire and Westmorland and collected plants from "meadows and pastures about Sheffield". On 3 July 1671 he embarked upon a journey to northern Britain, accompanied by Thomas Willisel, which included a visit to Settle.

As regards the 'Hinckelhaugh insect' (Grayson, 2005), this was probably collected during the exploration of 'Hinckelhaugh' carried out by Ray and Willughby during 1660; however, this is not entirely certain because Ray had an allusion to follow in Willughby's footsteps during subsequent tours.

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YORKSHIRE DIPTERA IN JOHN CURTIS' *BRITISH ENTOMOLOGY* (1824-1839) AND NOTES ON OTHER PRE-1851 YORKSHIRE DIPTERA RECORDS

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Introduction

Having established that *Musca Apiformis montana, corpore breviore, thorace nigro, abdomine annulis nigris et rubris alternis vario* in John Ray's posthumous *Historia Insectorum* (Raio & Lister, 1710) was probably not a dipteran (Grayson, 2005), and that a record of *Haematopota pluvialis* (Linnaeus, 1758) reputedly mentioned in Hutton (1781) according to Grimshaw (1907) is spurious (Grayson, 2003), the question of what is the earliest Yorkshire Diptera record remains to be answered.

Harris (1782), Donovan (1793-1813), Curtis (1824-1839), Stephens (1846) and Walker (1851-1856) were early major works which divulged some data and dealt, at least in part, with British Diptera; one of these, Curtis (1824-1839), contains several references to Yorkshire Diptera.

Yorkshire Diptera in Curtis' *British Entomology*

It is probable that the oldest published reference to a species of Yorkshire Diptera is contained in the first part (issued to subscribers on 1 January 1824) of John Curtis' monumental series entitled 'British Entomology'. Here, whilst referring to *Ctenophora (Ctenophora) flaveolata* (Fabricius, 1794), Curtis states "Mr. Haworth also possesses a very rare species of this genus, which there is very little doubt is the *T. flaveolata* Fab., taken many years since by Mr. Rippon in Yorkshire". Such was the demand for 'British Entomology', that after five years of publication Curtis had to re-issue the first few parts, and he did so with altered text; therefore, in the 1829 re-issue of part 1 we find the statement "Mr. Haworth possesses a female of this rare insect, taken many years since by Mr. Rippon".

The following records and annotations are quoted *verbatim* in the style and chronological order of appearance in Curtis (1824-1839). The number given in bold type is the plate number, the name in higher-case italics is the representative of the genus illustrated on the plate, and the date is that given on the plate. The accompanying text was written by Curtis "one month, and frequently in the summer, two or three months in advance" of the dates of issue given on the plates. Diptera material from Yorkshire probably survives in the Curtis' Collection held at Melbourne Museum, Australia.

5. *CTENOPHORA ORNATA*. Jan: 1. 1824.
"Mr. Haworth also possesses a very rare species of this genus, which there is very little doubt is the *T. flaveolata* Fab., [*Ctenophora* (*C.*) *flaveolata* (Fabricius, 1794)] taken many years since by Mr. Rippon in Yorkshire."

5. *CTENOPHORA ORNATA*. Jan: 1. 1824. [Reprint issued 1829]
C. flaveolata Fab., "Mr. Haworth possesses a female of this rare insect, taken many years since by Mr. Rippon".

337. *BERIS GENICULATA*. Dec: 1: 1830
B. geniculata Hal. [*Beris geniculata* Haliday in Curtis, 1830] "Mr. Davis, from Hebden Bridge". *B. clavipes* Linn. [*B. clavipes* (Linnaeus, 1767)] "From Hebden Bridge, Yorkshire, Mr. Davis". *B. vallata* Forst. [*B. vallata* (Forster, 1771)] "Hebden Bridge".

513. *HELEODROMIA BISTIGMA*. Aug: 1: 1834
H. bistigma Curt. [*Wiedemannia* (*W.*) *bistigma* (Curtis, 1834)] "the Rev. G. T. Rudd has

favoured me with the sexes and the following memorandum: "I find it abundant on the edges of large stones on the rocky shores of the Tees, between Middleton and Croft. The insect is difficult to see, and still more difficult to capture."". *H. stagnalis* Hal. [*Clinocera stagnalis* (Haliday, 1833)] "The Hon. C. A. Harris and myself found this insect the beginning of October flying over and alighting on little puddles in a brick-field near Pool." [I include Curtis' notes on these two species here, because the data may refer to Yorkshire. The Tees between Middleton and Croft is the vice-county border: Pool may refer to the Yorkshire town.]

697. *PHASIA SPECIOSA*. June 1: 1838
"Robineau Desvoidy has divided Meigen's genus into several others." II. *Alophora* Desv. 3. *hemiptera* Fab. [*Phasia* (*P.*) *hemiptera* (Fabricius, 1794)] "Mr. Simmons took one off flowers of the cow parsnep [sic] last September in Melton Wood, near Doncaster."

721. *HETERONEURA ALBIMANA*. Dec: 1: 1838
H. albimana Curt. [*Clusiodes albimanus* (Meigen, 1830)] "On the 5th of July, 1836, after a most awful thunder-storm at Ingleton in Yorkshire, I took a female *Heteroneura* on the inside of the window of the inn."

737. *BACCHA ELONGATA*. Apr: 1839
B. tabida Meig. [*Baccha elongata* (Fabricius, 1775)] "Middle of June, Knaresborough, hovering about flowers in shady places".

753. *SYRPHUS LUCORUM*. Aug: 1: 1839
"*Viduus* Meig. – *viduata* Fab. – *Bardus* Harris pl. 32 f. 39? [*Cheilosia albitarsis* (Meigen, 1822)] June, Knaresborough".

OTHER PRE-1851 YORKSHIRE DIPTERA RECORDS

During the second half of the 19th Century, several Yorkshire-based naturalists published papers containing Yorkshire Diptera records. The first to do so were Peter Inchbald (1815-1896) and Richard Henry Meade (1814-1899), neither of whom were originally native to the county. Inchbald mainly wrote on plant galls, his relevant papers being published 1859-1889; whereas, within Diptera, Meade mainly wrote on Muscomorpha, most of his relevant papers being published 1872-1899. Inchbald, and Meade to a lesser degree, tended to omit localities of capture from their papers, but some were divulged by subsequent authors. Most of Meade's early papers were concerned with arachnids, but there is a Diptera record in Meade (1850) *viz*. "A few days back I found *Porphyrops latipes* of Macquart [= *Rhaphium fascipes* (Meigen, 1824)], in the neighbourhood of Bradford".

Grimshaw (1907) contained an abstract of Curtis' "*Ctenophora flaveolata*, F." record, plus a record of "*Ceratopogon pulicarius* L." [*Culicoides* (*Culicoides*) *pulicaris* (Linnaeus, 1758)] from "*Clitheroe*, 1832, (T. Garnett)". Grimshaw may have known that this record emanated from the Yorkshire side of the county boundary; however, Clitheroe and its immediate environs are about one kilometre outside this.

Skidmore *et al.* (1987) stated that a collecting party believed to include John Curtis (1791-1862) and James Charles Dale (1792-1872) visited the Doncaster area in 1837. This visit produced a record of *Geomyza apicalis* (Meigen, 1830) from Thorne Moors, probably taken on either 28 July 1837 or 11 August 1837 (Skidmore *et al.*, 1987). This record emanates from the Dale archives at the Hope Department, Oxford, and was gleaned from either James Charles Dale's entomological diary or Charles William Dale's (1851-1906) Catalogue of the Dale Collection (M. Limbert, *pers comm.*). Dale's Collection at Oxford conceivably contains further Yorkshire material, and could repay investigation if coupled with the Dale archives. Collin (1961) stated that Dale's Collection contained specimens of *Wiedemannia* (*Chamaedipsia*) *lota* Walker, 1856 (sub nom. *Clinocera unicolor*) which were taken at Scarborough on 24 July 1861 according to his diary. Smith (1956) mentioned a "pencil note in J. C. Dale's catalogue" of *Physocephala rufipes* (Fabricius, 1781) taken "nr. Scarborough, Yorks., Wilkinson 1 seen by J.C.D./61".

NOTES ON THE PROBABLE AUTHENTICITY OF RECORDS DIVULGED ABOVE

I have not seen material relating to the above records; however, conjecture can be offered relating to their probable authenticity. Curtis (1824-1839) contains beautiful and accurate illustrations, text notes and tables of species; some of his references to Yorkshire Diptera can be trusted to refer to the species we currently recognise under the names given by him, or the accepted synonyms of his species names. The additional single records in Meade (1850), Grimshaw (1907) and Skidmore *et al.* (1987) are questionably authentic. The specimens of *Wiedemannia* (*Chamaedipsia*) *lota* mentioned by Collin (1961) were apparently identified as such by James Edward Collin (1876-1968) and ought to be trustworthy. J. C. Dale's record of *Physocephala rufipes* may be correct; however, the specimen is not in J. C. Dale's Collection, furthermore, Dale once confused this species with *P. nigra* (De Geer, 1776) (Smith, 1956).

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AQUATIC PLANTS IN SLACK WATER AND RIVERSIDE POOLS IMMEDIATELY DOWNSTREAM OF COW GREEN DAM: COMPENSATION FOR LOSS OF THE WEEL OF TEES?

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INTRODUCTION

The Tees in Upper Teesdale, Northern England, is a rapid-flowing river with a scoured bed of rock slabs and boulders. An exception to this used to be the Weel of Tees. The Weel was a slow-flowing length of river held back by a barrier of hard igneous Whin Sill rock, close above the Cauldron Snout cascades, at about National Grid Reference NY 814 290. It extended upstream for about 2.2 km to where the tributary, Weelhead Sike, joined the Tees: width was about 35 m, depth up to 2 m under normal flow conditions, and the bed was of soft materials overlain with mud (Armitage *et al.*, 1974; Crisp *et al.*, 1974). The Weel was entirely lost through the construction of the Cow Green Dam, begun in 1967, and the filling of the reservoir (area 312 ha) which was completed by winter 1971-1972 (Crisp, 1977). Maps showing the outline of the reservoir, superimposed on the course of the Weel, are included in Armitage *et al.* (1974) and Crisp *et al.* (1974): the course of the Weel is indicated on modern Ordnance Survey maps by the Cumbria-Durham county border meandering across the reservoir.

The loss of the Weel is regretted by Crisp and Kelly (2003) because its diverse aquatic flora, reminiscent of a more lowland river, is gone while the reservoir has very sparse aquatic vegetation. My observations in July 2005 along about 900 m of the north-east shoreline, south-eastwards from the boat house at Cow Green, were of a vegetation-free stony strand sloping into transparent, peaty-brown tinged water with a bottom of stones and boulders, largely without silt-filled pockets, and with neither submerged nor emergent vegetation; nor were any loose macrophyte fragments observed even though there was a strong onshore wind.

Less disappointing was the river immediately downstream of the dam. Here, below the dam but upstream of the discharge of water into the river from the reservoir, was an area of slack water in which were conspicuous beds of floating-leaved plants. Furthermore, there were rock pools, separate from but alongside the eastern side of the river, that contained diverse aquatic vascular plants. The observations described in this paper were made to test the hypothesis that this aquatic vegetation, to a degree, provides recompense for the loss of the vegetation that formerly grew in the Weel.

AQUATIC PLANTS IN SLACK WATER AND RIVERSIDE POOLS IMMEDIATELY DOWNSTREAM OF THE DAM

The alignment of the dam wall is roughly east-west. It is *c*. 550 m long: the western half is an earth bank, that blocks the former river channel, while the eastern half is concrete. There is a spillway over the concrete wall, below which is an oblong stilling pool of estimated width about 70 m and length from the dam base to the parallel weir in front of it about 25 m. When the site was visited in July and October 2005, the stilling pool was standing water: there was no flow over the spillway and only a trickle over the weir. The principal discharge from the reservoir was from one of two valves on the west side of the river immediately downstream of the stilling weir. Flow was, therefore, largely close to the west bank, leaving quiescent water on the eastern side. About 100 m downstream of the stilling weir is a concrete weir by which the width of the river has narrowed to *c*. 25-30 m. Below this weir the whole width of the river was fast-flowing white water over stone slabs down to the road bridge at about 250 m downstream of the dam. A sketch map of this length of river is provided by Armitage (1978).

The rock pools, which extend haphazardly along the eastern margin over about 200 m downstream of the dam, are mainly about 1-2 m in breadth and 2-5 m in length. They are unconnected to the river and some were perhaps gouged out when the present river channel, part of which is east of the natural channel, was made during construction of the dam. In July and October 2005 these pools contained a few centimetres depth of water. They are presumably filled by rain, some by seepage from adjacent land, and some by river water when the spillway is in use. Crisp (1977) reported discharge over the spillway in 18 out of 48 months in 1972-1975, all between November and June.

Aquatic vascular plants were recorded in river and rock pools, over the *c*. 250 m of the eastern river margin, between the foot of the dam and the road bridge. Nineteen species, based on the checklist of aquatic plants found in England and Wales by Palmer and Newbold (1983), together with charophytes, were found (Table 1). Nomenclature of vascular plants follows Stace (1997), and that of charophytes Moore (1986).

The conspicuous beds of floating-leaved vegetation, that occupied the still water on the eastern side of the river upstream of the lower weir, were of *Potamogeton polygonifolius*. Under this the charophyte, *Nitella flexilis* var. *flexilis*, was abundant. Otherwise, vegetation in the river was sparse and largely comprised scattered plants of *Agrostis stolonifera, Carex nigra, Glyceria fluitans, Juncus effusus* and *J. bulbosus* close to the margin.

The abundant aquatic vegetation of the rock pools, or of distinct areas within them, was often dominated by one species. Thus there were pools which were wholly or partly colonized by *Eriophorum angustifolium, Carex rostrata, C. nigra, Eleocharis palustris, J. bulbosus, Myriophyllum alterniflorum, P. polygonifolius, Ranunculus flammula* or the charophyte, *Chara vulgaris* var. *papillata*. Also recorded in pools and around their edges, but not on the Palmer and Newbold (1983) checklist, were diverse sedges and rushes (*Carex echinata, C. viridula, Juncus articulatus, J. conglomeratus* and *J squarrosus*). The conspicuous moss, *Fontinalis antipyretica*, was present, attached to stones in the river.

The relative luxuriance and species richness of aquatic plants, concentrated in the small compass of river and rock pools over 250 m downstream of the dam, has botanical conservation value within the context of generally sparse aquatic vegetation in the rocky, fast-flowing upper Tees and the barren Cow Green Reservoir. The individual taxa were largely not, of themselves, of notable conservation interest. Some were not recorded in the Tees, or along its banks, over the 10 km downstream of Cow Green Dam by Holmes and Whitton (1977) in their comprehensive 1975 survey (Table 1). These non-recorded species were *Agrostis stolonifera, Chara vulgaris, Juncus bulbosus, Littorella uniflora, Potamogeton polygonifolius, Drosera rotundifolia, Equisetum palustre, Eriophorum angustifolium* and *Galium palustre*. All of them, however, except perhaps *Littorella uniflora,* are found elsewhere in Upper Teesdale and many are abundant (Eddy & Welch, 1967, Stewart, 2004).

The most interesting records were *Nitella flexilis* var. *flexilis* and *Littorella uniflora*. *Nitella flexilis* var. *flexilis*, determined by P. J. Cook, was monoecious with mature antheridia and oospores of appropriate dimensions. Moore (1986) has no post-1960 records for this taxon in north-east England although there are recent records in the Lake District, west of Upper Teesdale. *Littorella uniflora* comprised one patch about 50 cm x 50 cm, growing submerged in a rock pool in July 2005, but not re-found in October. It is not recorded in Upper Teesdale by Eddy and Welch (1967), although there are 19th century records for the area (Baker, 1906) and it is widespread in the Lake District, and also in Galloway, north-west of Upper Teesdale (Preston *et al*., 2002).

Comparison with aquatic plants formerly in the Weel of Tees

Aquatic plants in the Weel were recorded by R. W. Butcher in 1929-1932 (Butcher, 1933; Butcher *et al*., 1937) and by the Rev. H. G. Proctor in 1967-1968 (Proctor, 1971). Comparison of aquatic plants then present in the Weel with those now found immediately downstream of Cow Green Dam is complicated by the lack of published checklists. Six species were recorded in the Weel in 1929-1932 and 18 in 1967-1968, comprising 19 species in all (Table 1). Ten of the species formerly in the Weel were present immediately

TABLE 1
Aquatic plants in and beside the River Tees downstream of Cow Green Dam and in the Weel of Tees before inundation

	0-250 m downstream 2005[a]	0-10 km downstream 1975[b]	The Weel 1929-1932[c]	The Weel and its edges 1967-1968[d]
Submerged and floating leaved plants				
Callitriche hamulata	-	+	+	+
C. platycarpa	-	+	-	+
C. stagnalis	+	+	-	+
Chara vulgaris	+	-	-	-
Chara sp. or spp.	-	-	-	+
Juncus bulbosus	+[e]	-	-	-
Littorella uniflora	+	-	-	-
Myriophyllum alterniflorum	+	+	+[f]	+
Nitella flexilis	+	+	-	-
Nitella sp.	-	-	-	+
Potamogeton alpinus	-	-	+	+
P. natans	-	-	-	+
P. polygonifolius	+	-	-	+
Ranunculus aquatilis	-	-	-	+
Sparganium angustifolium	-	-	+	-
S. emersum	-	-	+	+
Emergent plants				
Agrostis stolonifera	+	-	-	-
Caltha palustris	+	+	-	-
Carex nigra	+	+	-	-
C. rostrata	+	+	-	+
Drosera rotundifolia	+	-	-	-
Eleocharis palustris	+	+	-	+
Equisetum fluviatile	-	+	-	+
E. palustre	+	-	+	+
Eriophorum angustifolium	+	-	-	-
Galium palustre	+	-	-	-
Glyceria declinata	-	-	-	+
G. fluitans	+	+	-	-
Juncus effusus	+	+	-	+
Mentha aquatica	-	+	-	-
Myosotis scorpioides	-	+	-	-
Nasturtium officinale agg.	-	+	-	-
Ranunculus flammula	+	+	-	+
Veronica beccabunga	-	+	-	-

(+) Indicates present; (-) not recorded.
The taxa included are those on the Palmer and Newbold (1983) checklist of aquatic plants that occur in England and Wales plus charophytes: [a]from field observations July and October 2005; [b]from Holmes and Whitton (1977); [c]from Butcher (1933) and Butcher *et al.* (1937); [d]from Proctor (1971); [e]also present as emergent plants; [f]originally recorded as *M. spicatum* (see Proctor, 1971 and Holmes and Whitton, 1977).

downstream of Cow Green Dam in summer 2005 (*Callitriche stagnalis, Carex rostrata, Chara vulgaris, Eleocharis palustris, Equisetum palustre, Juncus effusus, Myriophyllum alterniflorum, Nitella flexilis, Potamogeton polygonifolius* and *Ranunculus flammula*). This assumes that the *Char*a and *Nitella* spp. recorded by Proctor (1971) were *C. vul*garis and *N. flexilis*. Thus, to a limited degree, the aquatic vegetation that has colonized the slack water and rock pools downstream of the dam compensates for the loss of the Weel vegetation.

Most of the aquatic vascular plants that were formerly in the Weel but were not found immediately downstream of the dam in 2005 (Table 1) are plants that are not particularly associated with the uplands (Preston & Croft, 1997) and were found in the Tees within 10 km of the dam (Table 1) or further downstream by Holmes and Whitton (1977). Thus their loss from the Weel was probably not significant in the context of botanical conservation. This group of six taxa comprised *Callitriche hamulata, C. platycarpa, Potamogeton natans, Sparganium emersum, Equisetum fluviatile* and *Glyceria declinata*.

There were only three species lost from the Weel that were recorded neither immediately downstream of the dam in 2005 (Table 1) nor along about 110 km of river downstream of the dam by Holmes and Whitton (1977), namely *Potamogeton alpinus, Ranunculus aquatilis* and *Sparganium angustifolium*. Of these, *P. alpinus* was recorded by both Butcher (1933) and Proctor (1971), while *S. angustifolium* was recorded only by Butcher (1933). Both are northern and western, often upland, species (Preston & Croft, 1997) and their loss is of conservation significance.

Crisp and Kelly (2003) comment that the angiosperm flora of the Weel resembled that of a more low-lying water body and it is evident that its loss largely does not represent the loss of vegetation characteristic of upland standing or slow-flowing waters. Indeed, aquatic plants (i.e. those on the checklist from Palmer & Newbold, 1983) in Upper Teesdale are largely to be found in bogs, marshes and flushes (Pigott, 1956; Bradshaw & Clark, 1965; Eddy *et al.*, 1969). Upper Teesdale does not have the abundance of tarns, with characteristic upland littoral and open-water aquatic vegetation (often including, for example, *Isoetes lacustris, Littorella uniflora* and *Lobelia dortmanna*), that is associated with the Lake District (Stokoe, 1983) and to some degree with Galloway (Raven, 1985).

It is also relevant that the Weel suffered considerably from pollution during the early 20th century. Barytes was mined at Cow Green from 1900-1921, between 1924 and 1927 (Butcher *et al.*, 1937) and between 1935 and 1954 (Beadle, 1968). Hynes (1960) describes how inert suspended solids from mining activity may settle in rivers when flow is diminished and smother aquatic vegetation. Proctor (1971) recounts how, following the reopening of the mine in 1935, he observed in 1937 that settled solids in the Weel reached almost to the surface while aquatic vegetation was reduced to a marginal fringe of *Carex rostrata*. Later, settling pools were constructed, and by the time of Proctor's 1967-1968 survey of plants the mining had ceased and the layer of sludge, which he estimated as 0.6-1.8 m deep, had been flushed out. Proctor (1971) considered that the increase in number of aquatic plant species in the Weel between 1929-1932 and 1967-1968 may be related to incomplete recovery, at the time of the first survey, from pollution incurred during an earlier period of mining. Alternatively, he suggested that grazing by domestic geese, summered on the Weel up to around 1937, may have been responsible for fewer species being recorded in 1929-1932. Furthermore, some of the increase between 1929-1932 and 1967-1968 may be more apparent than real: some species (e.g. *Carex rostrata, Juncus effusus, Ranunculus flammula*) that were recorded by Proctor (1971) were very likely present but not recorded in the earlier survey.

The Weel was no Eden of upland aquatic plants. Its loss was possibly a greater blow to aesthetics and landscape value than to conservation of aquatic plants. Its vegetation was, nevertheless, of interest and it is pleasing that some of the aquatic plant species formerly in the Weel are still to be found immediately downstream of Cow Green Dam.

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BOOK REVIEWS

Keys to the Freshwater Fish of Britain and Ireland, with notes on their distribution and ecology by Peter S. Maitland. Freshwater Biological Association Scientific Publication Special Publication No. 62. Kendal, Cumbria 2004. £22.00 paperback.

A new Key to the Freshwater Bryozoans of Britain, Ireland and Continental Europe with notes on their Ecology by Timothy S. Wood and Beth Okamura. Freshwater Biological Association Scientific Publication No. 63. Kendal, Cumbria 2005. £16.00 paperback.

A guide to the identification of genera of Chironomid Pupal Exuviae occurring in Britain and Ireland (including common genera from Northern Europe) and their use in monitoring lotic and lentic fresh waters by Ronald S. Wilson and Leslie P. Ruse. Freshwater Biological Association Special Publication No. 13. Kendal, Cumbria 2005. £20.00 paperback.

These three publications by the Freshwater Biological Association, in conjunction with the Environment Agency, are the most recent in a long and distinguished series.

Never has it been more important for us to accurately record our flora and fauna and the many changes that are taking place, and to pass on this information to the various regional and national recorders. These changes are partly due to the effects of climate change, but also to many other factors, not least of which is the pressure for water resources. The apparent extinction of native fish such as the Burbot, *Lota lota* (Linnaeus, 1758), a species previously known from some Yorkshire rivers, should be worrying for all of us. If high profile species such as this cannot be saved with all the funds available to anglers, what chance have the lesser-known inhabitants of our waterways?

The key to freshwater fish should be of interest to a wide readership amongst anglers as well as freshwater biologists, but the other two keys are aimed primarily towards the latter. Nationally, our knowledge of the Bryozoans is still extremely limited, but it is even more so within Yorkshire, with so very few people working on this fascinating group of animals. The key to the chironomid pupal exuviae may appeal to those members who feel that killing any living thing, just to identify it, is a problem for them. The key allows the study of this group by collecting the flotsam which accumulates on strand-lines. Although the key has its limitations in that it covers less than a quarter of the species recorded from Britain, nevertheless, like the other two publications, it is a very useful addition to our library of resources.

I can highly recommend all of these publications to those interested in understanding our freshwater faunas more fully.

AN

Darwin's Other Islands by **Patrick Armstrong**. Pp.xiv + 266, with numerous b/w plates and maps. Continuum, Bristol. 2004. £75.00 hardback.

Patrick Armstrong has written a most thoughtful account of Darwin's epoch-making voyage on *H.M.S.Beagle*. He enhances our understanding of how critically important Darwin's observations, based on a comparative study of at least 40 islands, would prove to be, not only to his development of the theory of evolution but also to his interpretation of other natural phenomena such as coral island formation and the distinctiveness of island biotas. The author, having visited most of these islands himself, provides a vivid chronicle of Darwin's travels, as well as revealing on the one hand Darwin's extraordinary eye for detail and on the other his remarkable ability to appreciate the wider picture. Rather expensive for the individual's pocket, but strongly recommended for purchase by libraries.

MRDS

AN EIGHTEENTH CENTURY REFERENCE TO YORKSHIRE LEPIDOPTERA BY JAMES BOLTON, AND A NOTE ON THE HISTORY OF LEPIDOPTERAN ILLUSTRATION

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In a search for historical information on the butterflies of the Huddersfield area, the earliest located records were for 1846 and 1847 (Fryer & Lucas, 2001). Considerably earlier were paintings by James Bolton published in 1796 of which some at least were probably made from locally obtained insects, but this could not be proved. Nor could the provenance be established of a Small Copper, *Lycaena phlaeas*, painted by the same artist-naturalist in 1792, or of two other butterflies on now lost paintings made between 1785 and 1795 (Fryer, 2000). Bolton did, however, refer specifically to the occurrence of at least one local butterfly, the Painted Lady, *Cynthia cardui*, in the 18th century. This was mentioned by Crossland (1910) in a lecture to the Halifax Scientific Society originally printed in the *Halifax Guardian* and subsequently issued by its author in an expanded form as a booklet. Crossland cited the information given by Bolton as an example of long continued observations by that naturalist, but did not say where it was recorded. Attempts to trace this source for long proved fruitless. However, by sheer chance I eventually discovered it when, taking the opportunity to browse in a library copy of Bolton's *An History of Fungusses growing about Halifax* (1788–1791), I was suddenly confronted by the passage concerned! One does not expect to find information on butterflies in a volume devoted to fungi.

The relevant passage, which differs slightly from what proves to be a somewhat condensed quotation given by Crossland, actually mentions two butterflies and a moth, though, as Crossland noted, concerns particularly the Painted Lady. It appears on page xv of the introduction, published in 1788, and merits citation in full. To set it in context it should first be noted that it follows a discussion on the "constancy of place" or otherwise of local fungi, of which Bolton notes how some species appear regularly in the same place season after season, while others appear once, and in abundance, then are seldom, or never, seen again. He cites what he called *Peziza cornucupoides* (now *Craterellus cornucupoides*) – the Horn of Plenty fungus – which "came up abundantly in one place" in 1785 but had not grown there since, and *Halvella mitra* (now *H. elastica)* which grew plentifully in a wide range of habitats in 1777 but of which in the next ten years he had "not met with more than three or four specimens".

Bolton then goes on to say that "These observations bring to mind others of a like nature, which I have formerly made on the sugacity (sic) of some insects, viz. the *Painted Lady Butterfly, (Papilio Cardui*, of LINNAEUS) [he, probably inadvertently, used a capital C] was so plentiful about *Halifax*, in 1780, that scarce a field was without them; in fields where flowering plants grew, particularly the *Scabiosa succisa*, and *Trifolium pratense,* it was easy, with a common bag net, to catch ten or fifteen specimens in the space of an hour or two; but since that time, or for ten years before, that insect has been very rarely, or not at all seen in this part of *Yorkshire*. The like remarks hold good in a lesser degree, in respect to the *Papilio atalanta*, *Phaelaena meticulosa*, &c. and to some Birds, viz. the *Lanius collurio*, *Loxia recurvirostra*, *Turdus turquatus* (sic) &c"

This not only provides a definite record of the Painted Lady for 1780 but refers to its status in the Halifax area in the previous ten years, i.e. as far back as 1770, with the implication that Bolton knew it before that. While its occurrence there so long ago is no surprise, it is of considerable interest from several standpoints. It is perhaps the earliest published record of a Yorkshire butterfly. Of another early report, Rimington (1987, 2005) finds little reason to doubt Haworth's reference in 1803 to the occurrence of the Swallowtail, *Papilio machaon*, near Beverley in about 1778. It occurred there earlier but there seems to be no definite dated record. Almost equally early is a painting of the Holly Blue, *Celestrina* *argiolus*, by Sabine Winn, signed June 12, 1780, evidently made from a Yorkshire insect, whose entomological interest was recently brought to notice by Marie-Christine Frost (2005). While again no surprise, Bolton's record of the Red Admiral, now called *Vanessa atalanta*, near Halifax before 1788, appears to be the earliest for this species.

Bolton tells us that he caught butterflies with "a common bag net", that is, a device like a modern butterfly net. According to Salmon (2000), who describes the sort of net used by entomologists of different periods, in the 18th century it was the clap- or bat-fowler's net, a cumbersome two-handled device, originally used to catch small birds and bats, that was favoured. Such a net is shown, both folded and in use, in the delightful frontispiece of *The Aurelian* of Moses Harris (1766), of which a facsimile was published in 1986, and from which Salmon also reproduces the frontispiece, and also gives an enlargement of that portion of it which shows the net being used. Such a net is also shown in a vignette of entomological apparatus used in Harris' time on the page opposite his frontispiece, which is also reproduced by Salmon. Here it is accompanied by two racket nets – but no bag net.

According to Salmon (2000), by the end of the 18th century lepidopterists had become so adept in the use of the clap-net that there was no incentive to abandon it in favour of a simple bag net, then called a muscipula, which was already in use in continental Europe, and of which the first known example brought to England apparently came from Holland in 1711. Salmon describes how such nets were copied in England but did not immediately find favour, and that during the 18th and early 19th centuries few of the principal collectors used anything other than a clap-net. He cites as an exception Laetitia Jermyn, who advocated use of the bag net in *The butterfly collector's vade mecum* (1824), but who also used a clap-net. He also reproduces two amusing paintings by E. W. J. Hopley (1816–1869) entitled "The chase" and "Bagged" which portray a lepidopterist pursuing and capturing a butterfly with a bag net. These appear not to be dated and may have been painted late in the artist's life, by which time, in the 1860s, the clap-net began to lose favour and was then quickly replaced by the bag net. The former, however, persisted longer in some places, as Salmon gives a photograph of an entomologist armed with a clap-net in about 1900.

Bolton evidently used a bag net a century or so before it came into common use. One can only speculate as to the reason, but it might be suggested that, as he and his entomologist brother would probably either have to make their own nets or have them made locally, he or both of them opted for a simple and, as it eventually proved, more convenient, device than the clap-net. They may indeed have designed such a net. So simple is the concept that its independent adoption seems almost self-evident. Possibly relevant is that most references to early collecting gear appear to refer to southern England, and it may be that different preferences were general in the north. Information on this would be of interest.

Bolton's comparison of the local abundance of the Painted Lady in 1780 and its scarcity or absence in many other years with a similar pattern shown by certain fungi was perceptive, but he was in fact considering two very different phenomena. The Painted Lady owes its intermittent presence in Britain to migrants originating in North Africa, whose populations are supplemented by local breeding either here or en route. That such purposeful migration occurred was unknown in Bolton's time. When the possibility was later mooted, even the idea that wind-blown butterflies could reach this country was dismissed by Haworth (1803) as "an idle conjecture", and more than half a century after that Edward Newman was ridiculed for suggesting that certain Lepidoptera might arrive in Britain from abroad. Bolton thus had no idea that the unusual abundance of the Painted Lady was the result of an influx of migrants. The cause of its abundance was at that time an insoluble mystery.

Another butterfly, the Red Admiral, *Vanessa atalanta,* and a moth, the Angle Shades, *Phlogophora meticulosa,* were reported by Bolton as displaying a similar pattern of occurrence as the Painted Lady. He was therefore familiar with these species around Halifax before 1788. Like the Painted Lady, the Red Admiral for long owed its presence here entirely (or almost so) to migrants from the Mediterranean region but, presumably as a consequence of climatic warming, cases of hibernating adults are now increasing, and over-wintering larvae are known from southern England. Of the Angle Shades moth some individuals are residents, others migrants.

Bolton extended his comparison to birds of three species whose apparently erratic occurrence seemed to him to resemble that of certain fungi and butterflies. However, while interesting as references to the Red-backed Shrike, Common Crossbill and Ring Ouzel, in Yorkshire more than 200 years ago, these are not susceptible to the same explanation as the behaviour of the Lepidoptera to which he referred, though two of them are migrants. Apparently noticeable season to season changes in abundance of the Ring Ouzel are intriguing and surprising, but at this remove defy explanation.

Although the record for the Painted Lady in the Halifax area in 1770 or thereabouts is perhaps the earliest for any Yorkshire butterfly, James Bolton was certainly familiar with other species at specific sites earlier than this, of which he left no record. Moreover, the collection of Lepidoptera already assembled by his older brother, Thomas, by 1763 or earlier would include, perhaps predominantly, locally collected insects. Although we have no details of the butterflies in this collection, two moths, the Grey Scalloped Bar, *Discia fragaria*, and what was almost certainly the Lead Belle, *Scotopteryx chenopodiata*, of which the former was collected "on the moor", "near Hallifax" (sic) and the other probably in the same area, were recorded by Moses Harris in *The Aurelian* (1766), having been sent to him by one of the Bolton brothers (Fryer, 2000). Thus, a moth, the Grey Scalloped Bar, recorded near Halifax sometime before 1766 is perhaps the earliest record of any member ,of the Lepidoptera to be recorded from a definite locality in Yorkshire. However, as butterflies have long been specifically recognisable, it is possible that even earlier records exist in unexpected places. It is even possible that lists made by 18th century collectors exist somewhere.

Butterflies, and, less frequently, moths, have featured in paintings, illuminated manuscripts, and the like since very ancient times, the earliest being perhaps butterflies depicted in an Egyptian tomb fresco at Thebes in about 1400 BC. The species concerned, of which several individuals are portrayed in various postures, evidently in flight, may have been the African Monarch, also called the Plain Tiger, *Danaus chrysippus*. In general shape and coloration the paintings agree reasonably well with such an identification. This is a large, conspicuous species, likely to catch attention when in flight, and a suitable race occurs in the area, and probably did so in the past. There are also few alternatives, save perhaps for its mimic, *Acrea encedon*!

In a Yorkshire context, many quarries of a stained glass window in the Church of St. Denys, York, dating from the third quarter of the 14th century, are each almost entirely filled by a butterfly, but these are schematic (and biologically grotesque) and while of great interest in several respects, throw no light on the history of the Yorkshire butterfly fauna. Of well depicted early examples in illuminated manuscripts, a splendid Small Tortoiseshell, *Aglais urticae,* with wings spread, appears in the Bellville Breviary (1323–1326), where it is also shown with its wings folded together, while in the early 14th century Ormesby Psalter, which also uses butterflies elsewhere for decoration, there is an ill-shapen butterfly, whose colour pattern, including blue borders to the wings, leaves no doubt that it represents a Small Tortoiseshell. An inferior example of the same species – a favourite in such productions – appears in a book of hours, *Les Très Belles Heures de Notre Dame du Duc Jean de Berry*, produced over several years between c.1380 and 1412. The Small Tortoiseshell is also most beautifully portrayed in *The Hours of Catherine of Cleves*, c.1435–1440 (which also illustrates the Red Admiral and Wall, *Lasiommata megera*,), and again – with three other species – in the *Hours of Englebert of Nassau*, c.1477–1490. It also appears in a book of hours by the Master of Mary of Burgundy c.1485–1490, which, remarkably, includes a good illustration of a larva, almost certainly of this species.

Later portraits are not necessarily better than their predecessors. For example, a boldly painted Wall in a German psalterium of 1516, based on a psalter of 1457, while recognisable, and probably a female, is inferior to butterflies painted almost 200 years earlier. Moreover, not all the butterflies in such paintings represent attempts to copy particular species accurately, and some are clearly fanciful. Examples of such unidentifiable, or purely imaginary, insects are to be found in books of hours from the 15th and 16th centuries where they feature in what are often naturalistic decorative borders composed mostly of branches, sprays of leaves, flowers and fruits, sometimes frequented by birds, butterflies, and other insects. A reasonably well depicted caterpillar appears in at least one such, dated 1528. Of those paintings that clearly intend to represent particular species, however, the standard of the best examples was remarkably high, and was indeed vastly superior to that of the crude woodcuts in Mouffet's *Insectorum Theatrum* of 1634, where, in the first entomological text to be produced in Britain, they appeared with the express purpose of distinguishing individual species. In fairness to Mouffet and his collaborators, these woodcuts were inferior to the original drawings. Better drawings were produced at various times by James Petiver (1663–1718), and sometimes coloured, and his *Papilionum Britannicae Icones* (1717) gave acceptable engravings of the then known species, but not until 1720, in Eleazar Albin's *Natural History of English Insects*, were coloured portraits of British butterflies produced that rivalled some of the medieval masterpieces painted purely for decorative purposes.

Butterflies also feature in paintings of various kinds. As early as about 1339, Antonio Pisanello, who prepared sketchbooks of animals, and whose *Vision of St. Eustace* (in the National Gallery, London) includes excellent Red Deer, a Hare, a Brown Bear, and various birds, enhanced a portrait of Margherita Gonzaga with flowers, a Red Admiral with wings spread and another with them folded together, a female Clouded Yellow, *Colias crocea*, (with wings spread, which it is not its habit to do except during courtship), and a Scarce Swallowtail, *Iphiclides podalirius*. More recently, meticulously depicted butterflies were not infrequently added to 17th century paintings of flower arrangements, baskets of fruit and similar still life studies, several species being portrayed. Even an occasional caterpillar makes its appearance. Among many splendid, but apparently little known, portraits of butterflies that appear in such 'habitats' a few deserve special mention.

In a painting by Ambrosius Bosschaert II (1609–1645) there is a superb portrayal of a Wall, and in another, dated 1631, an equally splendid Large White, *Pieris brassicae*. These bear comparison with the best of paintings specifically intended to illustrate the butterflies in question. Ambrosius Bosschaert the Elder illustrated the Red Admiral and Large Skipper, *Ochlodes faunus*, (?) in similar settings, without however, achieving the same standard. Nevertheless, in a painting of Tulips in a glass vase, he included a splendid Common Blue, *Polyommatus icarus*, with wings almost closed. The fore wing shows the cell spot which rules out its confusion with most other species. Indeed an extra spot is present, but the level of accuracy is still excellent! Jan van Kessel (1626–1679) also included splendid paintings of butterflies in such studies. One – *Flowers in a glass vase on a table* – 1652, includes a Large White, a female Orange Tip, *Anthocaris cardamines*, a Clouded Yellow, and a Queen of Spain Fritillary, *Issoria lathonia*, with wings almost closed and displaying the conspicuous silver reflecting spots that are such a striking feature of the underside of the hind wing. Another – *Flowers in a blue and white porcelain vase on a table* – includes a splendid Large White, a dark butterfly not easily seen, and two moths mentioned below. Another includes an equally fine Large White, a female Clouded Yellow, and a Red Admiral. Also worthy of mention is the work of Jan Davidz de Heem (1606–1684) which includes a splendid painting of a male Orange Tip, as well as good renderings of a Brimstone, *Gonepteryx rhamni*, Large White, Peacock, *Inachis io*, and Red Admiral. Nicolaes van Veerendael's paintings of Lepidoptera were also of a high standard, and as well as a good male Orange Tip, included a Purple Emperor, *Apatura iris*, with wings nearly closed, which is very good except that the just visible part of the upper surface is painted as the under surface. Among the butterflies included in several of the paintings of Balthasar van der Ast (1593/4–1657) one of his depictions of a Painted Lady is perhaps his best. These, no more than a sample of the best examples, give some indication of the rich butterfly fauna illustrated by mostly Dutch and Flemish artists during a period of roughly 200 years from the late 16th century, and particularly during the 17th century.

The practice of including butterflies in such still life studies continued, though less frequently, in succeeding centuries, where again they were sometimes very accurately painted. However, single plants were sometimes adorned with butterflies. Barbara Regina Dietzch (1706-1783) painted a splendid Queen of Spain Fritillary settled on a Dandelion, and a female Clouded Yellow and a Common Blue on Roses. Georg Dionysius Ehret (1708-1770) – whose work, incidentally, served as a model for James Bolton (Nelson, 1981) – also adopted this practice. For example, he added a Peacock to a study of a Daffodil that was used by Christopher Jacob Trew in his *Hortus Nitidissimus*, put together between 1768 and 1786, to which he was the principal contributor. Ehret's own *Plantae et Papiliones Rariores* (1748-1759), which consists of just 15 plates, portrays exotic butterflies of less relevance in the present context. Moreover, by this time coloured illustrations of butterflies, made with a scientific purpose in mind, had begun to appear, and rapidly multiplied. A late example of the addition of butterflies to still life studies in keeping with 17th century tradition is provided by a composition of flowers and fruit by Johan Laurentz Jenson, painted in Sorrento in 1834, which includes a Wall and an excellent Southern Gatekeeper, *Pyronia cecilia*.

That butterflies attracted attention long ago is also shown by three lively early 14th century illustrations. One of these, in the Queen Mary Psalter, shows boys playing with butterflies tethered at the end of long strings; the others, in *The Romance of Alexander*, of similar age, show ladies catching them by use of an unidentified contrivance or, in one case, someone perhaps trying to strike down a very crudely drawn butterfly with a short pole, though he is looking in the wrong direction. In all these the butterflies are grossly enlarged, and no fewer than 16 are shown in the scene in which they are being pursued. All are unrecognizable though one may be intended to be a species of *Colias* and others just possibly represent the Small Tortoiseshell.

Moths too were long ago illustrated. An inaccurate, yet attractive, moth – with but a single pair of wings, but undoubtedly a moth (!) – inhabits a capital letter P in folio 63 recto of the *Book of Kells* which dates from about 800, and merits mention if only for its great antiquity. More realistic, secreted in the famous Chi-Rho page of the same illuminated manuscript, are two moths which lie head to head. While it may be fanciful to claim an identity for these, one bears golden marks on the wings which resemble those borne by the Northern Spinach Moth, *Eulithis populata,* which are particularly conspicuous in darker forms of the insect such as prevail at the latitude of Kells in County Meath, or the island of Iona, at which, or at both places, this manuscript was probably produced. Some 600 years later, but still very early, and very remarkable, is an immediately recognisable Great Peacock Moth, *Saturnia pyri,* Europe's largest moth, which decorates a treatise on the virtues and vices written by a member of the Cocharelli family of Genoa. Accompanying it is a butterfly, ill drawn but displaying a wing pattern and coloration remarkably like that of the underside of the hind wing of the Southern White Admiral, *Limenitis reducta*, which was surely its model, as well as a grasshopper, a zygopteran dragonfly, a beetle, several hymenopterans, and a millipede. (Even scholarly commentaries have misidentified some of these creatures; for example, the moth has been described as a Peacock Butterfly, and the millipede as a caterpillar.) This remarkable manuscript page is one of several, others of which portray insects, arachnids, crustaceans, molluscs, birds and mammals, whose illustrations are attributed to Cybo d'Hyères, and dated about 1380. Another moth, and two skipper butterflies, of which one looks like the Grizzled Skipper, *Pyrgus malvae*, as well as several other insects, adorn another page of the same work.

Moths appear much less often than butterflies in more recent still life studies where, not surprisingly, strikingly coloured species attracted most attention. The second painting of Jan van Kessel mentioned in relation to butterflies includes an exquisite portrait of a Garden Tiger, *Arctia caja*, whose wing pattern is depicted with photographic exactitude. A Garden Tiger is also included in a study of flowers and fruit by Cornelis de Heem. The van Kessel painting also includes what at first glance looks like a predominantly white butterfly with wings part-closed in a manner expected of, say, a Large White. Careful inspection, however, shows it to be, not a butterfly but a Magpie Moth, *Abraxas grossulariata*, and that such markings as it displays are very accurately portrayed, but its posture is completely wrong. The artist was obviously unfamiliar with the habits of his subject. His portrait reflects a mixture of meticulous inspection of details and an incorrect assumption that it behaved like a very different species! Ironically, an immediately recognisable and well painted example of this very distinctive species at rest, with wings spread, as is its wont, appears in the 1671 painting of Nicolaes van Veerendael mentioned in connection with the Purple Emperor butterfly. An Underwing Moth, probably the Large Yellow, *Noctua pronuba*, is also portrayed in an improbable posture by Jan Davidsz de Heem in order to reveal the hind wing pattern. Of more recent vintage, an instantly recognisable and beautifully painted Buff Tip, *Phalera bucephala*, appears in a painting of Jan van Os (1744–1808).

Although less successful, what is obviously intended as a hovering and feeding Elephant Hawk, *Deilephila elpenor*, is included in the painting of Jan van Kessel that features the Queen of Spain Fritillary and other butterflies. What appears to be a better rendering of this species appears in a mezzotint of *c*.1790, based on a still life painting by Johann Daniel Bager, and printed in colours, of which I have seen only a small black and white photograph. This also includes a resting butterfly, a Silver-washed Fritillary, *Argynnis paphia*. A moth in a painting by Osias Beert I (*c*.1580-1624) poses problems. It has distinctive wing bars like The Passenger, *Dysgonia algira*, which rule out most other species, but does not correspond to this predominantly southern European species in other respects.

The van Kessel painting includes a striking object, well painted but not entirely life-like, which is undoubtedly a larva of the Pale Tussock Moth, *Calliteara pudibunda*. A larva of the same species appears in a later painting by Johann Georg Pickhart I (d. 1728) which better captures the 'jizz' of this striking caterpillar, but is not entirely accurate. It is interesting that two artists were inspired to include this eye-catching larva in one of their compositions, having clearly been attracted by its conspicuous and attractive appearance, but it seems that neither of them was a naturalist with an appreciation of its anatomy. Pickhart's painting also includes a Small Tortoiseshell butterfly.

Such portraits of course seldom provide information about the provenance of their subjects, but more recent examples may be more forthcoming in this respect and may yet reveal valuable historical information to some fortunate naturalist aware of the potential of such illustrations to do so.

Acknowledgements

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SOWERBY'S FRESHWATER JELLYFISH *CRASPEDACUSTA SOWERBII* LANKESTER 1880 (CNIDARIA: LIMNOMEDUSA) IN BRITAIN

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The freshwater jellyfish, *Craspedacusta sowerbii* Lankester 1880, evidently a native of tropical Central and South America, is now a naturalised species in still or slow moving waters in many tropical and warm temperate regions of the world. More sporadically it has naturalised in higher latitudes in artificially heated conditions such as in aquaria and tropical lily tanks in botanic and zoological gardens. In Britain, populations have also been known in unheated outdoor situations since 1928 and have increased markedly since the 1980s in such habitats as canals, shallow freshwater lakes, reservoirs and flooded sand quarries.

Origins of the British populations

On 9 June 1880, William Sowerby (1827-1906), Director of the Royal Botanic Gardens in Regent's Park, London, discovered large numbers of small fresh-water jellyfish in the tropical water lily tank containing the celebrated Giant Amazon Water Lily (*Victoria amazonica* (Poepp.) Sow.), in the garden's revolutionary new heated conservatory (W. Sowerby 1800, A.D. Sowerby 1941).

The sudden and inexplicable appearance of an unknown freshwater jellyfish in such a socially and scientifically high profile institution required explanation and at least an identification. Specimens were sent to the scientific elite of the day, including three professors who collectively determined it to be new to science. Sowerby's challenge generated a rash of papers in the scientific literature, four appearing within weeks and the saga was reported in *The Times* newspaper. By 17 June 1880, Professor Edwin Ray Lankester had proposed the medusa as belonging to a new genus *Craspedacusta* and had dedicated its specific name, *sowerbii*, to its finder William Sowerby (Lankester 1880). A rival paper by Dr G. T. Allman (1880) proposed the generic name as *Limnocodium*, but since Lankester's paper had appeared seven days earlier, his nomenclature ultimately took precedence according to taxonomic protocol.

Other work on the Regent's Park specimens included that by Romanes (1880, 1881), Sowerby (1880), Squire (1883), Fowler (1890), Gunther (1894), Browne (1906), Potts (1906), Lankester (1910), Boulenger and Flower (1928), and Flower (1928).

The tiny tentacle-less hydroid (polyp) stage of this organism was independently named and described as *Microhydra ryderi* (Potts 1906), but the link between sexual medusoid generation of *C. sowerbii* was made by Browne (1906) and Boulenger and Flower (1928). A summary of the life history, ecology and distribution of *C. sowerbyi* is provided by DeVries (1992).

The organism, probably in its hydroid (polyp) life stage, almost certainly arrived in Britain amongst aquatic plants collected by the plant hunter and explorer brothers Richard and Robert Schomburgk from their 1835-1839 expedition to British Guiana. Significantly, the Schomburgk specimens included propagules of the now legendary Giant Amazon Water Lily (*Victoria amazonica*). The cultivation and management of this huge aquatic plant ultimately required the construction of specially heated water tanks maintained in conditions of tropical heat and humidity under the largest glasshouse structures hitherto constructed. Evidently these conditions suited the survival of *C. sowerbii* and enabled it to express all its life stages.

As the Giant Amazon Water Lily achieved cult status, its acquisition by the then lavishly funded botanic gardens of Victorian Britain evidently triggered the inoculation of *C. sowerbii* into heated lily tanks wherever the plants were cultivated from vegetative propagules. After its discovery at Regent's Park, other populations were noticed in botanic gardens in Sheffield (Lankester 1893), Birmingham, Boscome, and Edinburgh (Russell 1953).

There have also been records of jellyfish, presumably of this species, in heated freshwater aquaria. Notable amongst these were the populations that appeared during the 1960s in the tropical aquaria at the Manchester Museum (Seyd 1967).

International trade in plants for aquaria and tropical aquatic gardens has led to *C. sowerbii* being accidentally liberated throughout tropical and temperate regions of the world. Records to hand are from Australia, Brazil, Canada, mainland China, France, Germany, Guam (Micronesia), Hawaii, Hong Kong, Italy, Japan, Malaysia, Mexico, New Zealand, Panama, Portugal, Southern Africa most states in the USA and Yugoslavia.

Spread of outdoor feral populations in Britain

The first discovery of its occurrence outdoors in Britain (and indeed for Europe) was in the Exeter Ship Canal, Devon (SX/9291) in 1928 and 1929 (Valentine 1930) and again in the 1970s (Aves & Nichols 1977). In 1948, it appeared in a colliery reservoir in Monmouthshire and in Whitcomb Reservoir, Gloucestershire (Russell 1953, Kidd 1956). In May 1952, after noticing large numbers of tiny jellyfish in a tropical aquarium kept by a Mr W. F. Edwards of Oldham, Leonard Kidd of Oldham Museum discovered that the source of these had been a supply of oxygenating pondweed (*Elodea* sp.) obtained from the Rochdale Canal near Oldham (SD/80) (Kidd 1956). On 22 July 1982, four medusae were brought to Bolton Museum for identification. They had been collected by Mr S. Jones in the short, isolated Bolton branch of the Manchester, Bolton and Bury canal at Little Lever (SD/7406) (Hancock 1983). During the late 1990s, the feeding ecology of a population was studied in a backwater of the River Thames at Teddington, Middlesex (TQ/16) (Green 1998).

Yorkshire outdoor records

In the Sheffield Canal Basin (SK/361877), five specimens were collected on 14 August 1992 by Stephen Blakeborough and identified by staff at Sheffield Museum. Specimens were still present on 25 August (Richards & Whiteley 1993). While scuba diving in the canal basin at Victoria Quays during the summer of 2001 and July 2003, medusae were again encountered (P. Hardy *pers. comm.*).

During the summer of 2002, medusae were present at Hatfield Water Park (SE/6610; 6710), a 22-acre, 45ft deep flooded sand quarry, excavated in 1972 for the construction of the adjacent M18. Medusae were first noticed by Water Park Staff in mid-July, and subsequently local anglers counted at least 27 at the northern end of the lake on 3 August. Martin Limbert monitored their presence through August until early September. On 17 August, the author and Elizabeth Farningham found thousands of 2cm diameter transparent medusae swimming in the upper 50cm of water along the sheltered southern shoreline, with smaller numbers in the clear water at points all around the lake edge. Sample surveys in shallow warm waters around the beds of submerged pondweed (*Elodea canadensis* and *Myriophyllum spicatum*) along the southern shore resulted in counts of up to 45 per square metre. On 15 September, the author and Derek Allen found fewer specimens (0 to 5 specimens in previous sample sites) but were able to count an accumulation of 40 specimens in a $2m^2$ area of calm, shallow, warm (20°C) water in the south-western corner of the lake. None were seen during visits a week later or into October (Howes 2003).

Media coverage of the Hatfield Water Park occurrence together with the publicity on the YNU website (www.YNU.org.uk) and in Howes (2003) resulted in additional populations being reported to the author from the following sites:

Shatterford Lakes, Kidderminster, Worcestershire (SO/7981). During warm and sunny weather on 7 and 8 July 2003, hundreds of medusae about 2cm in diameter were seen moving just below the surface of 'Erics' lake (Mark Weldon *pers. comm.*).

Parkers Pool, Ketley, Telford, West Midlands (SJ/6710). Hundreds of medusae were seen on 28-30 July 2003 (Alan George *pers. comm.*).

Bridgewater Dock, Bridgewater, Somerset (ST/2937). Over 100 medusae were present on 1-2 August 2003 and specimens were present on 6-8 June 2004 (Mrs P. M. Wright *pers comm.*).

Ardenshaw Reservoir adjacent to Denton Golf course, Greater Manchester (SJ/9096). Medusae were present on 21 August 2004 (J. A. King *pers. comm.*).
Radbrook Green Pond, Shrewsbury, Shropshire (SJ/477113). Hundreds of medusae were present on 12 and 14 July 2005 in this small pond. The mean temperature from 10 sample sites was 27.3°C (Sophie Lines *pers. comm.*).

SEASONALITY OF THE MEDUSOID STAGE

According to dates of occurrence gathered from outdoor sites in Britain (Figure 1), medusoid stages begin to appear in mid- to late June. The main 'blooms', when largest numbers are noticed close to the surface during warm bright sunny weather, occur through August and September when water temperatures have been recorded at 20°C at Hatfield Water Park, Doncaster and 22°C in the Exeter Ship Canal. Numbers quickly decline and vanish during October.

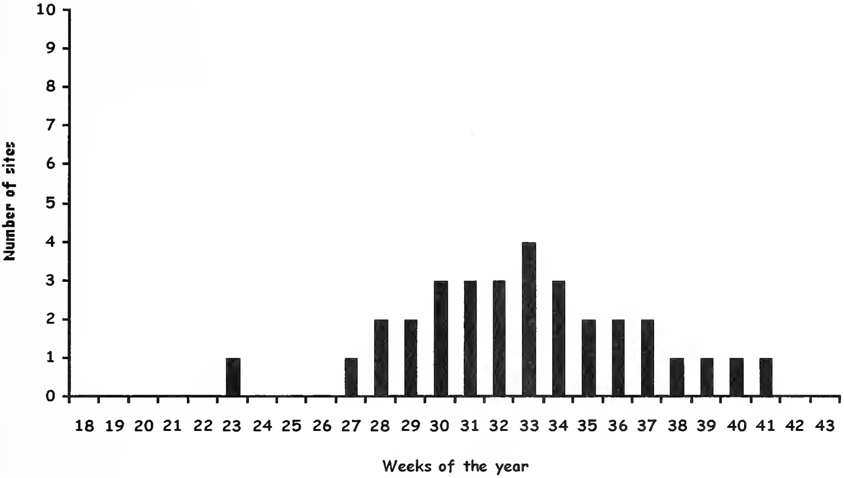

FIGURE 1.

Seasonality of the medusae of *Craspedacusta sowerbii* in outdoor sites in Britain from beginning of May (week 18) to end of October (week 43).

MEANS OF INTRODUCTION

The means of introduction to aquaria and outdoor sites has been attributed to various causes, Seyd (1967) ascribing the Manchester Museum aquaria occurrences to plants and fish imported directly from the countries of origin. The Shatterford Lakes' population may have been transferred via imported sport fish stocks since the site is noted for its large carp and wels catfish (*Silurus glanis*) (Mark Weldon *pers. comm.*). Transfer of hydroid or gelatinous larval life stages on damp, water sports equipment (windsurfing, sub-aqua equipment, wet suits etc.) has also been suggested after it appeared that enthusiasts had used the same equipment in freshwater sites in Brazil, Sheffield Canal Basin and Hatfield Water Park.

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I would like to thank R. Lawton and P. Scowcroft of Hatfield Water Park, Elizabeth Farningham and Derek Allen of the Doncaster Naturalists Society and my colleague Martin Limbert for help with surveys at Hatfield Water Park. Additional anecdotal records were received from Alan George, P. Hardy, James A. King, Sophie Lines, Mark Weldon and Mrs P. M. Wright.

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ADDITIONS AND CORRECTIONS TO THE YORKSHIRE DIPTERA LIST (PART 1)

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The only published county list of Yorkshire Diptera is that of Grimshaw (1907) which includes details of records for 368 species. The author of this paper is in the process of conducting an extensive literature search in preparation for the publication of a new checklist of Yorkshire Diptera. Where necessary and feasible, material has been re-examined, and many organisations and specialists have been approached regarding the data etc. that they hold. These activities have consequently necessitated much updating of the Yorkshire Naturalists' Union Diptera records.

Species are conceptually 'added' to the county list when their occurrence in Yorkshire is published in books and journals. Additions made here have apparently not been previously published. This paper excludes from the Yorkshire list species which have definitely, or in some cases almost certainly, been recorded in error. Species also excluded here include *nomina dubia* (*sensu* Chandler, 1998) and species recorded from Yorkshire but not regarded as British. Names appended by an asterisk indicate that the species concerned is British, but the name was incorrectly applied to another British species by earlier authors. Deletions and exclusions include records of species contained in certain unpublished documents, such as internal reports carried out on behalf of organisations and lists circulated to select individuals and organisations, and "published" via the Internet, such as those made by the Ryedale Natural History Society (www.ryenats.org.uk).

The literature pertaining to Yorkshire Diptera contains many specific names neither in current usage, nor to be found in Chandler (1998). I am indebted to Peter Chandler, who has been an invaluable help with the application and interpretation of these names, most of which are synonymous with species already known from Yorkshire, but some refer to non-British species which have almost certainly been recorded in error. The papers of Cheetham occasionally give records under manuscript names suggested by Edwards, but some of these are *nomina dubia* as descriptions or figures were never published, and the names are not recognised.

Initials used below refer to the following: PJC = P. J. Chandler, JDC = J. D. Coldwell, MC = Mrs M. Crittenden, RC = R. Crossley, RHLD = R. H. L. Disney, FWE = F. W. Edwards, WAE = W. A. Ely, GJK = G. J. King, PS = P. Skidmore, DWT = D. W. Twigg, PW = P. Withers.

Additions to Yorkshire Diptera List

TIPULIDAE

Tipula (*Lunatipula*) *alpina* Loew, 1873 [= *brevispina* Pierre, 1920]. (61) Burton Pidsea, 5.7.1941, A. Brindle, (sourced from Brindle's record cards held at The Manchester Museum).

BIBIONIDAE

Bibio anglicus Verrall, 1869. (63) Tinsley Sewage Farm, SK4092, 10.7.1987, D. Whiteley.
B. edwardsi Freeman & Lane, 1985. (63) Thundercliffe Grange, SK3894, 27.5.1982, WAE.
B. ferruginatus (Linnaeus, 1767). Cheetham (1935) erroneously recorded this species from Tanfield, the specimen being a ♂ *B. varipes* Meigen, 1830 (det. A. Grayson, 2004). Other records of *B. ferruginatus* are (62) Sand Dale, SE857848, 6.6.1990 (several specimens taken of both sexes), A. Grayson; (63) South of River Ryton and Access track to Fan Field, Lindrick Dale, SK5482, 23.7.1977, Ms P. G. Stenton & Ms J. E. Addey, det. WAE; Langold Lake, SK5786, 14.6-22.9.1978, MC & DWT, det. WAE.

BOLITOPHILIDAE

Bolithophila (*Cliopisa*) *pseudohybrida* Landrock, 1912. (63) Blacktoft Sands, (at light), 10.1976, A. Greive, det. PS; Whitgift, (at light), 1.10.1976, A. Grieve, det. PS; (64) Canal Gardens Tea Rooms, Leeds, 7.11.1992, GJK; Nedber Wood, Malham Tarn, SD911633, 10.9.1979, RHLD, det. PJC.

B. (*C.*) *rossica* Landrock, 1912. (65) Kisdon Force, NY896010, 5.10.1985 (♀), I. F. G. McLean, det PJC.

PSYCHODIDAE

Boreoclytocerus dalii (Eaton, 1893). (63) Rushy Moor, (open fen), 14.7.1982, PS.

Pericoma (*Pericoma*) *exquisita* Eaton, 1893. (62) Hayburn Wyke, 7.1996, PW; (64) Kettlewell Cran, 27.4-2.6.1997, det. PW; (65) Aysgarth Falls, 3.7.1984, PW; Cotterdale, Hawes, SD828921, 22.9.1986, J. H. Cole.

Paramormia decipiens (Eaton, 1893). (62) Ebberston, 16.5-2.6.1997, PW; Forge Valley, 17.7.1996, PW.

Telmatoscopus ellisi Withers, 1987. (64) Malham Tarn, 6-7.6.1982, det. PW.

Vaillantodes miksici (Krek, 1979). (62) Forge Valley, 17.7.1996, det PW.

TRICHOCERIDAE

Trichocera (*Metatrichocera*) *parva* Meigen, 1804. (63) Brookhouse Dike, Thurcroft, SK58E, 12.11.1989, A. R. Godfrey, det. A. E. Stubbs; Morley Plantation, SK4096, 25.10.1987, WAE; Anston Stones Wood, SK58, 17.10.1989 (♂), WAE; Thorne Moors, 1990, per PS.

SCATOPSIDAE

Thripomorpha bifida (Zilahi-Sebess, 1956). (62) Strensall Common, SE6461, 16.7.1991, A. Grayson; (63) Packman's Bridge Marsh, SK4488, 1.7.1979, 25.7.1982, WAE; Thorne Moors, 1990, 1991, per PS.

T. paludicola Enderlein, 1905. (61) Skipwith Common, SE6537, 16.7.1996 (2♂, 1♀), ARG.

T. verralli (Edwards, 1934). (63) Old Flatts Farm Marsh, SK4388, 27.9.1978, MC & DWT, det. WAE.

Swammerdamella acuta Cook, 1956. (64) Malham Tarn, 4.9.1975 (2♂ in water trap at edge of lawn in front of Tarn House, det. RHLD [1♂ teste E. F. Cook], 14-15.9.1980 (♂ in malaise trap on Tarn House lawn, RHLD.

SIMULIIDAE

Simulium (*Nevermannia*) *armoricanum* Doby & David, 1961. (65) Colsterdale, SE1280, 26.6.1981, WAE.

CERATOPOGONIDAE

Neurohelea luteitarsis (Waltl, 1837). (65) Colsterdale, SE1280, 26.6.1981, WAE.

Bezzia (*Homobezzia*) *annulipes* (Meigen, 1830). (61) Hornsea Mere, (at light), no date [late 1970s], R. Hawley, det. PS; (63) Fairburn Ings, (at light), 1.8.1977, S. C. Madge, det. PS.

Sphaeromias fasciatus (Meigen, 1804). (63) Middle Pond, Ravenfield Park, SK4995, 6.7.1985, WAE; Ulley Country Park, SK453875, 1.7.2000, WAE.

Atrichopogon (*Atrichopogon*) *pavidus* (Winnertz, 1852). (65) Colsterdale, SE1280, 26.6.1981, WAE; Mill Beck Wood, NY9126, 21.6.1981, WAE.

Forcipomyia (*Euprojannisia*) *titillans* (Winnertz, 1852). (63) Footpath 21 to Wath Wood, between Wath Wood Drive and Flintway, SK4399, 9.6.1983, WAE.

CHIRONOMIDAE

Chironomus (*Camptochironomus*) *pallidivittatus* (Malloch, 1915). (63) Catcliffe Flash, SK4288, 13.7-1.11.1978, MC & DWT, det. WAE; Thrybergh Country Park, SK476962, 23.5.1989 (♂), J. A. Newbould, det. WAE.

C. (*Chironomus*) *prasinus* Meigen, 1804. (63) WAE has identified material from the following localities: Catcliffe Flash & tip, SK4288; Dog Kennel Pond, SK4096; Don Canal, SK4092; Hawks Wood, SK525817; Treeton Dyke Marsh and its environs, SK4386 & SK4387; Winney Lane, SK494792.
C. (*C.*) *salinarius* Kieffer in Thienemann, 1915. (63) WAE has identified material from: Bessy Gill fishpond, SK3997; Bluebell Wood, SK464960; Fitzwilliam Canal, SK4394; Greasbrough Dam, SK414961, Greasbrough Stream, SK4394; Manor Farm, Main Street, Ravenfield, SK4894; Norwood Locks, SK4782; Winney Lane, SK494792.
C. (*C.*) *venustus* Staeger, 1839. (63) WAE has identified material from: Bluebell Wood, SK464960; Hawks Wood, SK523816; Middle Pond, Ravenfield Park, SK4995; Treeton Wood, SK4487; Union Plantation, SK4684.
Cryptochironomus psittacinus (Meigen, 1830). (63) Harthill Reservoir, SK4880, 10.8-18.10.1978, MC & DWT, det. WAE.
C. redekei (Krusemann, 1933). (63) Thrybergh Country Park, SK4796, 25.8.1987 (♂), WAE.
Dicrotendipes notatus (Meigen, 1818). (63) WAE has identified material from: north-east lake at Firbeck Hall, SK5688; Hawks Wood, SK522819, SK525827 & SK526814; Laughton Pond, SK543896; woodland strip along Sandbeck Lane, SK571918; Shireoaks Quarry, SK5581; Syke's Quarry, SK4981; former fishpond, Thundercliffe Grange, SK377936.
Glyptotendipes (*Glyptotendipes*) *scirpi* (Kieffer, 1915). (63) Great Pond, Ravenfield Park, SK4895, 3.7.1982, WAE; Middle Pond, Ravenfield Park, SK4995, 3.7.1982, WAE.
G. (*Phytotendipes*) *barbipes* (Staeger, 1839). (64) Fairburn Ings, SE42, 18.9.1982, WAE.

Exclusions from Yorkshire Diptera List

TIPULIDAE

*Prionocera subserricornis** (Zetterstedt, 1851). First documented by Cheetham (1938) from Austwick Moss, but this and all other pre-1960 records refer to *P. pubescens* Loew, 1844. A record of a ♀ from Thorne Moors, 1972, is doubtfully authentic (RC, *pers. comm.*).
Tipula (*Vestiplex*) *nubeculosa** Meigen, 1804. All purported material checked has proved to be *T.* (*V.*) *hortorum* Linnaeus, 1758, and remaining records are suspect. (RC, *pers. comm.*).

LIMONIIDAE

Dicranomyia (*Dicranomyia*) *frontalis* (Staeger, 1840). A record from Lady Spring Wood, 1996, in Stubbs (1996 & 1996a) is erroneous (A. E. Stubbs *pers. comm.* to RC).
D. (*Melanolimonia*) *pseudomorio* Alexander, 1920. Edwards (1921) had no doubt that he had correctly determined specimens from Loch Assynt as *D.* (*M.*) *pseudomorio*. He subsequently reported the species from Ingleborough, 1925, (Cheetham, 1926); however, this is a Japanese species and was presumably recorded from Britain in error (PJC, *pers. comm.*).
Elliptera omissa Egger, 1863. Recorded from Pateley Bridge, 6.1924 as pupae by Edwards (1938). Brindle (1967) indicated an error of identification, stating that *E. omissa* was only retained on the British list due to the record of empty pupal skins found by FWE near Pateley Bridge; and furthermore, these were apparently not preserved amongst Edwards' material held in The Natural History Museum, London.
Idiocera jucunda (Loew, 1873). A record from Mulgrave Woods in Edwards (1937) was presumably a misidentification. *I. jucunda* is a European species, but not British (PJC, *pers. comm.*).
Matalimnobia (*Metalimnobia*) *quadrimaculata* (Linnaeus, 1761). A record from Thorne Moors, 1983, is erroneous (Skidmore *et al.*, 1987).
Orimarga (*Orimarga*) *attenuata** (Walker, 1848). Records refer to *O.* (*O.*) *juvenilis* (Zetterstedt, 1851). First documented [sub nom. *alpina* Zetterstedt] from Norber by Cheetham (1931).
Phylidorea (*Phylidorea*) *longicornis* (Schummel, 1829). A record [sub nom. *glabricula*

(Meigen)] from Fylingdales, 1996, GJK (www.ryenats.org.uk) was discounted by Grayson (2005) on advice from the recorder.
Rhabdomastix (*Sacandaga*) *schistacea* (Schummel, 1829). Documented from Coverham by Cheetham (1925) but presumably in error because this species is not known from Britain (PJC, *pers. comm.*).
Symplecta (*Symplecta*) [*novaezemblae* (Alexander, 1922)] subspecies *scotica* (Edwards, 1938). Yorkshire specimens first documented as being thought to be this species (Chandler, 1989) are *S.* (*S.*) *chosenensis* (Alexander, 1940) (Chandler & Crossley, 2003).

BIBIONIDAE
Dilophus bispinosus Lundström, 1913. A 'Scarborough' record in Walsh (1956) results from an error in application of synonymy, as it doubtlessly originates from Burkill (1897) who did not record *D. bispinosus* but *D. albipennis* Meigen, 1830 which is synonymous with *D. femoratus* Meigen, 1804.

BOLITOPHILIDAE
Bolitophila (*Bolitophila*) *tenella* Winnertz, 1863. Old records, e.g. Cheetham (1923) and Cheetham (1927), were probably misidentifications of *B.* (*B.*) *basicornis* (Mayer, 1951) (JDC *pers. comm.*).

MYCETOPHILIDAE
Allodia digitata Edwards (manuscript name). This is a *nomen nudum* because Edwards did not publish a description (PJC, *pers. comm.*). Cheetham (1923a) added *A. digitata* to the Yorkshire list in anticipation that Edwards would subsequently describe his species as new to science.
*Mycomya (Mycomya) ornata** (Meigen, 1818). Added by Cheetham (1927b), but no authentic specimens are known and all Yorkshire records are probably erroneous (PJC, *pers. comm.*). Older records are likely to refer to another species, whilst three later records from the Doncaster area are not supported by specimens in Doncaster Museum.
M. (*M.*) *punctata** (Meigen, 1804). Recorded from Middleham (Cheetham, 1922); however, pre-1925 records of this species refer to *M.* (*M.*) *marginata* (Meigen, 1818) (PJC, *pers. comm.*).
Rymosia signatipes (van der Wulp, 1859). A record in Coldwell (2004) is erroneous (JDC, *pers. comm.*).
Sceptonia concolor (Winnertz, 1863). Recorded from Austwick by FWE (Cheetham, 1923a). The specimen was subsequently re-identified as *S. fumipes* Edwards, 1925 (Cheetham, 1925).

SCIARIDAE
Leptosciarella (*Leptosciarella*) *viatica* (Winnertz. 1867). The records from Gunthwaite Dam and Nabs Wood in Coldwell (2000) are erroneous (JDC, *pers. comm.*).
Phytosciara (*Prosciara*) *ungulata* (Winnertz, 1867). A record from Keld Head, Pickering, 1997, GJK (www.ryenats.org.uk) was discounted by Grayson (2005) on advice from the recorder.

CECIDOMYIIDAE
Asphondylia miki Wachtl, 1880. Excluded from the British list by Chandler (1998). Recorded [sub nom. *mikii*] from Yorkshire as "Burkill's record" by Bagnall and Harrison (1918).
Dasineura brunnelae (Kieffer, 1909). Considered to have been recorded as British in error (Chandler, 1998). Record [sub nom. *Perrisia brunellae*] from Stainton (62) by Bagnall and Harrison (1918, 1921).
Dirhiza rhodophila (Hardy, 1850). Listed under *nomina dubia* by Chandler (1998). Recorded from Great Ayton by Bagnall and Harrison (1921) and 'East Yorkshire'

[apparently the entire eastern half of Yorkshire] by Falconer (1922).
Jaapiella thalictri (Rübsaamen, 1895). A record in Fordham (1922) is based on Fordham (1919) and therefore a transcription error for *Ametrodiplosis thalictricola* (Rübsaamen, 1895).
Misospatha palearum (Kieffer, 1890). A record in Coldwell (1999) is based on Falconer (1924) and is therefore a transcription error for *Rhopalomyia ptarmicae* (Vallot, 1849).
Oligotrophus fagineus Kieffer, 1909. Recorded [sub nom. *Hartigiola faginea*] from Leeds by Bagnall and Harrison (1921). Chandler (1998) excluded this species from the British list; however, a re-instatement is probable.
Planetella kneuckeri (Kieffer, 1909). Listed under *nomina dubia* by Chandler (1998). Recorded from Askham Bog by Falconer (1922a).
Trotteria umbelliferarum (Kieffer, 1901). Excluded from the British list by Chandler (1998). Recorded from Gunnergate, Yorkshire by Bagnall and Harrison (1921), and Gunnergate, Durham [presumably in error for Yorkshire] by Bagnall and Harrison (1918).

SCATOPSIDAE
Ectaetia lignicola Edwards, 1925. A record from Keld Head Springs, Pickering, GJK (www.ryenats.org.uk) was discounted by Grayson (2005) on advice from the recorder.

CULICIDAE
Anopheles (*Anopheles*) *atroparvus* van Thiel, 1927. A circulated record from Keld Head Springs, Pickering results from an incorrect interpretation of synonymy involving the species complex *Anopheles* (*Anopheles*) *maculipennis* Meigen, 1818 [*sensu lato*]. Yorkshire specimens of *A.* (*A.*) *maculipennis* [*s. l.*] are probably either *A.* (*A.*) *atroparvus* or *A.* (*A.*) *messeae* Falleroni, 1926: these species are morphologically identical, except for the patterning on the decks of the eggs (Rees & Snow, 1990).

CERATOPOGONIDAE
Culicoides cunctans Winnertz, 1852. This is a *nomen dubium* (Chandler, 1998). A circulated record exists for Cusworth Park, 30.6.1975.
Forcipomyia (*Forcipomyia*) *braueri* (Wasmann, 1893). Donisthorpe (1919) stated that J. E. Collin was of the opinion that a specimen bred from a pupa taken on the underside of a stone over a *Formica* nest at Grassington on 5.5.1918 was *F.* (*F.*) *braueri*: Donisthorpe believed it to be a gynandromorph, but Collin was apparently unconvinced. Chandler (1998) excluded *F.* (*F.*) *braueri* from the British list on the basis that Edwards (1926) had not seen the specimen.
Forcipomyia (*Forcipomyia*) *tenuis* (Winnertz, 1852). Recorded from Malham Tarn, 1976, but presumably in error because it is not a British species (PJC, *pers. comm.*).

CHIRONOMIDAE
Corynoneura minuta Winnertz, 1846. Added by Cheetham (1919), but regarded as a *nomen dubium* by Chandler (1998).
Tanytarsus pusio Meigen, 1830. Regarded as a *nomen dubium* by Chandler (1998). Yorkshire records are contained in Ashworth (1907), Ashworth (1908), and Ashworth and Cheetham (1920).
Chironomus rufinatus Edwards (manuscript name). Recorded from Ilkley, G. Grace by Hincks (1927), but Edwards did not subsequently publish a description of his species.
Cricotopus angustatus Goetghebuer (Verrall manuscript name). This is a *nomen dubium.* Cheetham (1927a) published a record from Bramhope, 22.5.1927, FWE.
Orthocladius (*Eudactylocladius*) *mixtus* (Holmgren, 1869). This was added to the British list by Cranston (1982), but was a misidentification according to P. H. Langton in Chandler (1998). The first British record was from Malham Tarn, 1977.
Parachironomus cinctellus (Goetghebuer, 1921). Recorded from Castle Howard, 4.7.1926, FWE (Cheetham, 1927); however, Chandler (1998) excluded this species from the British list stating that it "was added by Lehmann (1970), but this was believed to be in error by

[P. H.] Langton (*pers. comm.*)".
Parorthocladius nudipennis (Kieffer in Kieffer & Thienemann, 1908). A circulated listing sourced from '*The Naturalist* 1930-1939' is a transcription error for *Smittia nudipennis* (Goetghebuer, 1913).
Thienemannimyia laeta (Meigen, 1818). A record from Burley-in-Wharfedale, 1905, in Grayson (1994) results from an incorrect application of synonymy involving *Chironomus laetus* Meigen, 1818. Grayson (1994) should have listed *Polypedilum* (*Polypedilum*) *laetum* (Meigen, 1818).
Tanypus flaviceps Verrall (manuscript name). Ashworth and Cheetham (1920) published a record from Austwick, 18.9.1919, per Edwards under this *nomen dubium*: according to Fordham's record cards, the specimen was *Conchapelopia pallidula* (Meigen, 1818).
Tanytarsus heusdensis Goetghebuer 1923. A circulated record based on exuviae collected at Keld Head Springs, Pickering, should be disregarded pending expert confirmation (GJK, *pers. comm.*).

Further Notes

CECIDOMYIIDAE

Rhabdophaga clausilia (Bremi, 1847) [description of gall only] and its synonym *inchbaldiana* (Mik, 1886) [description of adult] were tentatively listed as *nomina dubia* by Chandler (1998) at the suggestion of Stelter (1993) who obtained no Diptera, only mites, from the galls. Inchbald (1887) succeeded in obtaining adult Diptera from the galls after a number of fruitless attempts. No locality was given by Inchbald (1887), and Mosley (1892) simply stated that Inchbald had recorded it in Yorkshire. Bagnall and Harrison (1918 & 1921) stated the species to be "fairly general" in the county. Some localites were divulged by Winter (1923) *viz.* (62) Middlesbrough; (63) Huddersfield; (65) Bedale.
A typographical error in Burkill (1922) caused C. A. Cheetham to produce YNU record cards for "*Perrisia bridgmani* Cam." and "*Perrisia pedunculi* Hartig.": these refer to the gall-causing sawflies *Pontania bridgemanii* (Cameron, 1883), and *P. pedunculi* (Hartig, 1837) (Hymenoptera: Tenthredinidae).
Inchbald (1860) wrote notes on a "Yellow Gall-Gnat (*Cecidomyia Achilleae*?)", but it is unclear to which species this name refers. The locality from which the galls were collected was not stated, but would probably have been in the vicinity of Storthes Hall, near Huddersfield.
Inchbald and Meade (1886) wrote on *Wachtliella caricis* (Loew, 1850) [sub nom. *muricatae* (Meade in Inchbald & Meade, 1886)]. The material was possibly from Yorkshire, but no localities were given, nor were any divulged by Inchbald (1887).

Acknowledgements

I am grateful to everyone who has helped with this on-going revision of the Yorkshire Diptera list, particularly Peter Chandler, and in the compilation of this first part, the following deserve special mention for supplying records and information, and giving access to collections: Peter Chandler, John Coldwell, Jon Cole, Roy Crossley, Henry Disney, Bill Ely, Andy Godfrey, Geoff King, Dmitri Logunov, Adrian Norris, Phil Rispin, Peter Skidmore, Clare Stringer, Helen Walsh, Derek Whiteley and Phil Withers.

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BOOK REVIEW

Guide to Grassland Plants 2 (Chalk and Limestone). 12-page laminated fold-out chart. Field Studies Council. Price £4.25 (including postage) from FSC Publications, Preston Montford, Shrewsbury SY4 1HW.

This is the latest in the FSC's series of fold-out charts which give guidance to groups of flora and fauna. The front of the chart depicts an eclectic selection of 61 plant species which grow on chalk and limestone. On the reverse of the chart a further 15 species are shown in black and white along with a simple key which starts with descriptions and drawings of leaf formation and leads onto species via further descriptions of the plants. This is fine if the plant one is attempting to identify is one of those on the chart but it must have been difficult to decide which species to choose considering the hundreds of species which may be found in this habitat. Plants growing in other habitats have been dealt with in earlier charts. Only two monocots are included, both of them orchids, so that, if one tries to key out an *Allium* for instance, one is led inevitably to "orchids". The chart has a southern bias due to the fact that Anne Bebbington, the author, taught for many years at Juniper Hall Field Centre in Surrey. However, this attractive chart gives a useful pointer to where to start looking in a more comprehensive flora.

PPA

YORKSHIRE NATURALISTS' UNION EXCURSIONS IN 2004

Compiled by
A. HENDERSON and JANETTA LAMBERT

THIMBLEBY ESTATE (VC62) 22 May 2004

INTRODUCTION (J. M. Blackburn)

A party of 22 met at Chequers Farm on Osmotherley Moor for the first Excursion of 2004. The day, with sunshine increasing, was spent on the estate with the kind permission of Mr and Mrs Brown. Access to the grouse moors was limited to footpaths and stream edges in order to protect the young grouse stock. Otherwise most of the estate was visited, particularly Upper and Lower Oakdale Reservoirs and Big Wood.

Following the field meeting, refreshments were taken in the newly extended tea-rooms at Chequers Farm, where the indoor meeting was held, attended by 19 members representing 15 affiliated societies. Discussions were lively. The clearly expressed view was that the woodlands had an over-abundance of sycamore, rhododendron and conifers. The damp lower slopes were dominated by alder, with willows in limited areas only. The absence or paucity of old woodland plant species aroused much discussion and speculation on past management of the estate. Thanks for a very interesting and rewarding day will be passed on to the owners, and also to Emma McDonald for allowing us the exclusive use of one end of the tea-rooms for our meeting.

MAMMALS, AMPHIBIANS AND REPTILES (M. J. A. Thompson)

Some of the numerous molehills in the area were of more recent appearance. Hedgehog droppings were noted in the heather moorland habitat. There were numerous reports of Rabbit, with frequent burrows. A Stoat was observed dragging a recently killed Rabbit. Stoat scats were found on the tops. A single Weasel was seen in the moorland area. Roe Deer slots were found in the woodlands, where the deer appear to be quite common.

The Common Frog was reported by several observers, with recently hatched tadpoles found in both reservoirs, but especially in Lower Oakdale Reservoir. A Common Toad was discovered in an old stone wall on the tops.

Three yearling Common Lizards were seen on the tops amongst the heather moorland habitat.

ORNITHOLOGY (W. F. Curtis & J. E. Dale)

During the morning we followed High Lane northwards from Chequers, and in open meadows to the west found Red-legged Partridge, Skylark, Meadow Pipit, Starling and Linnet. The woodland to the north held Wood Pigeon, Great Spotted Woodpecker, Blackbird, Willow Warbler, Goldcrest and Magpie. In rough meadows to the east, along the moorland edge, Lapwing and Curlew were present with active young, and a Snipe was in a likely breeding area. Further to the east on Pamperdale and Osmotherley Moors, Colin Simms found single Merlin and Short-eared Owl as well as Wheatear, Whinchat and Reed Bunting. In the vicinity of Chequers, Dunnock, Robin, Wren and Swallow, Blue Tit and Great Tit were added to the list.

The afternoon was occupied fully with a visit to Oakdale with its diverse woodlands and reservoirs. On the open water, Greylag Goose, Canada Goose, Mallard and Moorhen all had young, as had both Grey and Pied Wagtails on the reservoir margins. A pair of Mute Swans and an Egyptian Goose were also present. The woodlands held a good variety of species including Kestrel, Song Thrush, Blackcap, Chiffchaff, Wood Warbler (one heard), Long-tailed Tit, Coal Tit, Nuthatch, Treecreeper, Jackdaw, Greenfinch, Lesser Redpoll and Green Woodpecker. Other observers added Tree Pipit, Redstart and Garden Warbler to the list, and in all 54 species were recorded.

CONCHOLOGY (D. Lindley & A. Norris)

The meeting was an interesting one conchologically. The area of the lower reservoir and Big Wood were searched during the morning. Within the reservoir was a sizeable population of the operculate *Bythinia tentaculata*, commonly found in this type of habitat and probably introduced accidentally with plants. No species of Planorbid was found in either reservoir despite conditions appearing to be suitable for at least one. Big Wood provided further surprises; Adrian Norris made a good find in a specimen of *Spermodea lamellata*, which is an old woodland indicator with a north-western but very local distribution in Britain. It is a species which likes some lime; however, about 2 feet from this specimen was *Zonitoides excavatus* the only British calcifuge. A further interesting find was the ash-black slug *Limax cinereoniger*, another old woodland indicator with a widespread but local distribution.

The afternoon was spent examining two spring flush sites, Jenny Brewster's Spring and one on the opposite valley side. Jenny Brewster's was by far the more interesting due to the higher lime content. *Vertigo substriata* and *V. antivertigo* were found in the field and there appeared to be sizeable populations of both. *Potamopyrgus antipodarum*, a species introduced towards the latter end of the 19th century which spread rapidly throughout the river systems, was also found in this flush. This was an unusual site for it, although it has been noticed in other flushes within the North York Moors area. Samples of litter taken from the flushes revealed that *V. substriata* was present in both and that *Leiostyla anglica*, yet another old woodland indicator with a local north-western distribution, was also present at Jenny Brewster's Spring.

In total, 40 species were found from four 1 km squares; of these, only 8 were known from the 10 km square, poorly recorded in the past; there were 23 new 10 km square records and 9 confirmed records from the late 19th and early 20th centuries. It was noticeable that no records were made of larger species, probably due to the dry weather in preceding weeks. Other areas of the estate can be expected to produce further species.

COLEOPTERA (M. L. Denton)

Most of the day was spent in Big Wood but, due to an abundance of non-native trees (Sycamore and various pines), clumps of Rhododendron, a lack of age structure in the dead wood and the general lack of nectar sources, the coleoptera were rather impoverished. The Rhododendrons, although excellent cover for the released Pheasants, are likely to spread throughout the wood, which without severe management will eventually lose the habitats required by native fauna. On the positive side, a lone Rowan in a clearing produced two Nationally Scarce weevils, *Involvulus cupreus* and *Anthonomus conspersus*, both species specific to Rowan and requiring the host tree in an open situation, preferably in glades or rides. The distribution of *Involvulus cupreus* within Yorkshire is rather curious as the host is so common. With the exception of a record from VC63 in 1985, the 14 other localities which have yielded records are all in VC62, but only four of these are post-1980. *Anthonomus conspersus* is northern in distribution and has previously been recorded from only five Yorkshire localities, all in VC62 with the exception of a single record in VC63 during 1985.

Lower Oak Dale Reservoir produced only the ladybird *Scymnus auritus*. Generally associated with oak, this species has previously been recorded from 18 Yorkshire localities, most of them in the southern half of the county. The return route back to Thimbleby Moor revealed a number of brightly coloured species: the Green Tiger Beetle *Cicindela campestris*, the Click Beetle *Ctenicera cuprea*, the Leaf Beetle *Chrysomela aenea* and the Rove Beetle *Staphylinus erythropterus*. *S. erythropterus* is 13-17 mm long with a dull red elytra and tufts of golden pubescence on the abdominal segments; although it is widely scattered in the county, there are few recent records. Although usually associated with Alders, the single *Chrysomela aenea* was beaten from a hedgerow Hawthorn.

Despite diligent searching for saproxylic species, only eight were recorded. The total number of beetle species found was a meagre 54.

Diptera and Hymenoptera (A. Grayson)
The sunny weather conditions with light winds produced a list of typical late Spring moorland and woodland species. Amongst Empididae these included swarms of *Hilara maura* above the stream, and *Empis stercorea, Rhamphomyia crassirostris* and *R. stigmosa* on the hillside flushes. The following local species occurred at the moorland edge: *Tachina ursina, Bombus monticola* of which workers were frequent on a solitary *Sambucus* tree on the hillside flushes, and a single *Chrysotoxum arcuatum* amongst low vegetation beside the path on the descent into the dale. *Trichiosoma lucorum* (det. A. Grayson) was beaten from *Crataegus* by Mike Denton.

Plant Galls (K. G. Payne)
Two plant galls were brought in for identification: pustules on the leaves of *Alnus glutinosus* were caused by the mite *Eriophyes laevis* and a puffy Oak Apple contained larvae of a gall wasp *Biorhiza pallida*.

Flowering Plants and Ferns (J. G. Lambert)
Starting from Chequers Farm, the discovery of *Trientalis europaea* amongst dead bracken by the track to Oakdale was the first good find of the day. Other moorland species, such as *Eriophorum vaginatum, Molinia caerulea* and *Vaccinium vitis-idaea*, were recorded by Margaret Hartley. In the valley bottom, there was some fine alder woodland where new *Athyrium felix-femina* fronds grew amidst a carpet of bluebells. Among rocks by the stream, Gill Smith spotted *Oreopteris limbosperma*. Many common species were seen in the hedge-banks and along the lanes, including *Mercurialis perennis*, which appeared to be of limited occurrence in the woodland. *Tamus communis*, which has a somewhat limited distribution in this area, was also seen. Some fine clumps of *Carex pendula* were noted by the stream and also in the gardens of nearby cottages. Eight species of *Carex* were recorded altogether, mainly by Margaret Hartley. Most of them, including *C. pulicaria* and *C. binervis*, were typical of acidic soils. Some of the species found in very short grass, such as *Veronica filiformis* and *Pilosella officinarum*, may have been encouraged by rabbit grazing, reinforced at Upper Oakdale Reservoir by Canada Geese.

A total of 153 species was recorded on the day.

Bryology (J. M. Blackburn & C. Wall)
The first part of the day was spent in the open woodland and in the area of the stream above the bridge below the gamekeeper's house. The willows and elders here immediately produced several new tetrad records, with *Ulota phyllantha, U. bruchii* and *Orthotrichum pulchellum* present. By Lower Oakdale Reservoir, a concrete runnel has *Drepanocladus uncinatus* and *Gyroweisia tenuis*. *Nowellia curvifolia* was found on a tree stump in the wood adjacent to the reservoir.

After lunch the concrete retaining wall on the south side of the reservoir was examined, revealing *Preissia quadrata* and *Bryum inclinatum*, only the second extant record of the latter in VC62, although it is probably under-recorded. Big Wood is largely acidic and whilst the expected woodland species were seen, nothing exceptional was found. The tracks on the west and south end of the wood were profitable, with a fine mat of fruiting *Pleuridium acuminatum* and two tuberous *Dicranella* species. With time running out, one of the streams running into Upper Oakdale Reservoir was examined, particularly the base-rich flushes at the lower end. Eight *Sphagnum* species were recorded in this area.

Thimbleby Estate was visited by the British Bryological Society in 1967 and many of the species recorded on that occasion were refound. There is, however, a list of 26 species seen in 1967 which have not been seen since then, although a more extensive visit to the estate would no doubt remedy that situation. A very respectable total of 152 species has been recorded on the estate since 1991.

MYCOLOGY (J. Payne)
The area explored was at the bottom of the valley between the waterfall and the stone bridge, with woodland between the ghyll and the Helmsley road. Although there were many plants which are often hosts to the parasitic fungi known as 'rusts' and 'smuts' in this very attractive woodland, it was very hard to find any, though an extensive search was made.

A few plants of *Tussilago farfara* bore the aecial stage of *Puccinia poarum* on the leaves; at the same stage was *P. pulverulenta* on *Epilobium hirsutum*. Both are noticeable by their yellow colouration on the undersides, and in some cases uppersides, of the leaves. *Ranunculus ficaria* was affected by *Uromyces ficariae*, at a later stage showing as small black dots which are the spore-bearing sori. The fine stands of *Carex pendula* had remains of sori on the old leaves, no doubt caused by *Puccinia caricina*. Only two smuts were found: *Ranunculus ficaria* was badly affected by the white smut *Entyloma ficariae* and the anthers of a single plant of *Silene dioica* were infected by *Ustilago violacea*.

Another small fungus, *Homotheca robertiani*, found on the leaves of *Geranium robertianum* was once quoted as recorded at more BMS meetings than any other species. Deformed leaves of *Ribes grossularia* in the hedgerow were probably caused by the powdery mildew *Microsphaera grossulariae*, but in the absence of cleistothecia, a positive identification cannot be made.

LICHENOLOGY (A. Henderson)
In the immediate vicinity of Chequers Farm the lichen flora was of limited diversity. Items of interest were *Lecanora aitema* mingling with freely fruiting and pycnidiate *Micarea denigrata* on a fence post, and some struggling colonies of *Collema crispum* on an earthen track. Lignum and stone produced only 25 species. Further afield on the moors in sheltered lower spots there were signs of an incipient *Cladonia* heath with an occasional small colony of red-fruited *Cladonia diversa, C. floerkeana, C. macilenta* and *C. polydactyla* growing over dark crusts of *Placynthiella icmalea*.

In the afternoon, the opportunity was taken to visit nearby Mount Grace Priory, now a National Trust property. Notable among the 54 species recorded here were both the grey and the green morphs of *Haematomma*, var. *porphyrium* and var. *ochroleucum*, and also the two at times deceptively alike species, *Tephromela atra* and *Lecanora gangaleoides*, frequently juxtaposed on the old priory walls. A promise was made to the curators to return later to complete the lichen survey of this ancient site.

BROWN'S KNOLL MEADOWS (VC63) 19 June 2004

INTRODUCTION (M. L. Denton)
The rather dull and cool weather with occasional rain did not perturb the 18 members who met at Stocksmoor Village Hall to visit the 68 acres of land at the confluence of Clough Dike and Town Moor Dike. The area, owned by Harry Clegg and previously referred to as Harry Clegg's place, was recently christened Brown's Knoll Meadows. The diverse habitats, which consist of species-rich unimproved grassland, two deciduous woods, streams, ponds, marshy flushes and scrub, were visited by all members, most of them commenting on the rich assemblages within their speciality.

The tea and meeting, held in the Village Hall, were attended by 15 members representing 11 affiliated societies. John Dale, a past president, chaired the meeting. Thanks were expressed to Harry Clegg for allowing access to his private nature reserve and to the local people who had supplied tea and biscuits. All information relating to the visit, along with that of earlier visits, will be forwarded to Harry Clegg so as to assist future management.

ORNITHOLOGY (J. E. Dale & M. L. Denton)
The two observers covered the area independently and visited Brown's Knoll Wood, Narrow Wood, and the meadows around Clough, Town Moor and Carr Dike respectively.

Brown's Knoll Wood was quite rewarding with a buzz of activity from a number of species which already had young out of the nest. These included Blackbird (several pairs), Wren, Dunnock, Robin, Blue Tit, Great Tit, Greenfinch and Chaffinch. Rather less obvious were Willow Warbler and Treecreeper, although both were seen food-collecting, and a Blackcap was seen and heard singing in an area of tall bracken. A party of more than ten Long-tailed Tits may have included juveniles. Great Spotted Woodpeckers were extremely active and vocal, with one or two individuals visiting tree tops at the eastern end of the wood (two pairs had nested on the reserve earlier in the season). Two adult Nuthatches were seen separately in the wood, both food-collecting, and a third individual, a dull plumaged bird of the year was seen at rest in the fork of a tree. Song Thrush was heard in song from two territories on the woodland edge by the railway line where House Sparrow was present.

Other species associated with woodland and Smith Wood on the northern boundary were Pheasant, Woodpigeon, Jay, Magpie, Jackdaw, Rook and Carrion Crow. Species present along Carr Dike included Mallard, Moorhen, Grey Wagtail and Pied Wagtail, all of which had fledged young along the Dike or ponds earlier in the season. Feeding over Carr Dike were 10 to 20 each of Swallow and House Martin, and also two Sand Martins. A Yellowhammer was singing consistently from bushes south of the dikes, where a few Linnets were in residence, and a Reed Bunting sang occasionally.

Other species recorded were Kestrel, Green Woodpecker, Chiffchaff, Mistle Thrush and Starling, whilst one then two Stock Doves flew between Smith and Brown's Knoll Woods.

COLEOPTERA (M. L. Denton)

The cool conditions, coupled with isolated showers, were not conducive to the study of the beetle fauna. Consequently, the species list for the day was not impressive (totalling only 64). Six saproxylic species were located in Brown's Knoll Wood but, with the exception of *Triplax aenea* which is locally distributed, the others were common. A single male *Meligethes carinulatus*, swept from vegetation near the stream, was, despite being widely distributed in Yorkshire, the first record for the Kirklees Metropolitan Council area.

A visit on 17 May under more favourable conditions had revealed the true potential of the site. Brown's Knoll Wood has produced 14 saproxylic species, of which *Scaphidium quadrimaculatum* is locally distributed and *Hylecoetes dermestoides* is nationally scarce. The ponds with gently sloping edges offer a valuable microhabitat for several invertebrate groups. Beetles located that require this type of habitat include the ground beetle *Agonum marginatum* and *Bembidion dentellum*, the rove beetle *Stenus comma* and the locally distributed water beetle *Dryops ernesti*. *Stenus comma* is said to be common nationally, but within Yorkshire it is known from a further 18 sites only, most of which are in the eastern half of the county. *Dryops*, of which there are eight British species, manage to breathe underwater by carrying air on the hairs that cover the body. The ladybird *Halyzia sedecimguttata*, locally distributed but spreading nationally, has been recorded from a further 13 Yorkshire localities, most of the recent records from the southern half of the county.

BOTANY (M. Jill Lucas)

The unimproved grassland is herb-rich with spreading colonies of *Stachys officinalis, Trifolium medium, Conopodium majus* and *Dactylorhiza fuchsii* and its hybrids. *Potentilla erecta* and *Galium saxatile*, more typical of upland pasture than traditional meadow, are growing in the thin soil of one particular area. *Centaurium erythraea*, a rare plant in the Huddersfield district, was not in flower unfortunately, and *Lychnis flos-cuculi*, seen in various areas, was just going over. Gorse scrub has developed on what is thought to have been a small stone quarry; associated plants included *Campanula rotundifolia, Calluna vulgaris* and *Nardus stricta*.

The drier of the two deciduous woodlands, dating from the late 19th century, has developed on spoil remaining after the construction of the railway tunnel. It is mainly

Birch/Sessile Oak, with some *Sorbus aucuparia* and *Ilex aquifolium*. There is virtually no understorey or ground flora, the latter consisting mainly of rampant Bramble, although some regeneration of Oak was observed. The flora of the wetter wood is typical of the Oak/Bluebell communities usually found in the district. One fern, *Polypodium vulgare*, was recorded on this site.

Stellaria graminea was flowering very well in the boggy area, with *Eriophorum angustifolium, Carex nigra* and *C. panicea*. A sedge which caused some controversy, was finally identified as *C. binervis*. On the banking bordering one of the ponds, *Geranium pratense*, another uncommon species in Huddersfield, was recorded. The older man-made ponds contain planted *Ranunculus lingua*, *Typha latifolia* and the invasive alien *Lagarosiphon major* (not planted), which apparently, despite appearances to the contrary, in winter the ducks keep under control! *Oenanthe crocata, Chrysosplenium oppositifolium, Mentha aquatica* and a patch of *Caltha palustris* with *Alnus glutinosa* border one of the streams, whilst *Rosa arvensis* and *R. canina*, one of the latter the size of a small tree, line the bank. Some of the field boundaries have been planted with a mixture of *Acer campestre, Carpinus betulus, Crataegus monogyna, Prunus spinosa* and *Viburnum opulus*.

The number of species recorded over the past eight years is 176, of which nine have been deliberately planted. Nine species were added to this list, including *Dipsacus fullonum, Galium verum, Tragopogon pratensis*, and a single plant, past its best, of *Dactylorhiza fullonum* requiring further investigation.

Bryology (J. M. Blackburn & C. Wall)

The morning was spent examining the stream and its surroundings in the valley bottom. This produced all the usual species expected in a base-poor environment, with *Brachythecium plumosum* and *B. rivulare, Dichodontium pellucidum, Leptodictyon riparium, Pohlia melanodon* and *Rhynchostegium riparioides* all present. Elders and willows in this area were rewarding, with the usual crop of common *Orthotrichum* species, including *O. pulchellum* in fruit, *Ulota crispa* and *U. phyllantha*. The find of the day, however, was two patches of *Cryphaea heteromalla*, with capsules, on an elder downstream of the area being recorded. This moss is very uncommon in VC63.

Most of the afternoon was spent examining the fields and wooded hillsides. One small area showed heathland characteristics, with *Hypnum jutlandicum* and *Gymnocolea inflata* present. Brown's Knoll Wood, an oak and birch wood with much bramble and coarse grass, does not provide an environment for a rich bryoflora and little was found here except small amounts of *Plagiomnium undulatum* and *Eurhynchium striatum*. The unimproved grassland surprisingly produced little except where bare patches were colonised by common ruderals. The acidic dry stone walls were unrewarding. Despite this, the variety of habitats resulted in a respectable 57 species being recorded on the day.

Lichenology (A. Henderson)

Rich lichen presence is nowhere an obvious feature of this reserve, but some pockets of colonisation hold promise of improvement to come, and two finds were of particular interest. Both of these were on Millstone Grit walls. Several feet of coping under the edge canopy of the small wood by the stream supported several thalli of bright yellow *Candelariella reflexa*, a species increasingly frequent on trees in Yorkshire nowadays in response to intensified eutrophication, but either previously unknown or very rarely encountered on stone. On the same stretch of coping there were also several lichenicolous thalli of a *Caloplaca* species on *Porpidia*, a sample of which sent to Mr Jack Laundon was determined as *Caloplaca* cf. *arenaria*. Altogether 46 species were recorded on the reserve.

HAREWOOD PARK ESTATE (VC64) 3 July 2004

Introduction (A. Norris)

The Harewood House Trust's Director and Chief Executive, Terry Suthers, introduced himself and the estate to our members over a mid-morning coffee, prior to the field meeting, explaining some of the estate's history and allowing us to examine copies of some of the historic estate maps. The rather cold, damp and windy weather, though not conducive to the collecting of insects, did not prevent more intrepid members from examining some of the more remote parts of the estate which produced some interesting results. The tea and meeting were held in the main house. The hospitality and kind assistance given by the Director and all the staff at Harewood made the visit to the estate a remarkably pleasant experience for the 18 members, representing 16 societies, who attended.

MAMMALS AND LOWER VERTEBRATES (A. Norris)
The estate has recently released into the park a herd of Red Deer, adding to the Roe Deer and Muntjac already recorded. Stoats, Rabbits and numerous Hares were seen, and there was evidence of both Badger and Mink.

Large Trout were seen in Eccup Beck and a very large Mirror Carp was seen in the main lake.

ORNITHOLOGY (W. F. Curtis & J. E. Dale)
Before setting out on a circuit of the Park Lake we spent a pleasant half hour in the Bird Garden where it was interesting to see the pair of White Storks feeding well-grown young. We followed the lake-shore westwards to the weir and cottage garden, then eastwards to Rough Bridge, subsequently north to the chapel, and finally back to the car park.

We recorded a total of 41 species, which included on the lake Great Crested Grebe, Canada Goose, Mallard and Moorhen, all with young, and Mute Swan, Tufted Duck and Coot, which also presumably breed here. At least ten Ruddy Duck were present, and to the east of the lake feeding on short-cropped grass c. 60 Greylag Geese were seen. The latter are, along with the Canada Geese, seriously polluting the waters of the lake. This problem occurs elsewhere in Yorkshire where the already high population of Canada Geese has been joined by rapidly increasing numbers of Greylag Geese, particularly in the last 15 years.

Red Kite were soaring overhead throughout the visit, with a maximum of eight visible at any one time. Of other raptors, two Common Buzzards and at least three Kestrels were noted. At least three Grey Herons seen on the lake edges may well be local breeders. Species visiting nest sites, and/or feeding fully fledged young, included Pied Wagtail, House Martin, Swallow, Long-tailed Tit, Blue Tit, Great Tit, Jackdaw, Carrion Crow, Starling, Greenfinch and Goldfinch. Willow Warbler, Chiffchaff, Goldcrest, Blackcap, Wren and Chaffinch were heard to the south of the lake all in suitable breeding habitats. Other species recorded were Black-headed Gull and Common Gull (small numbers over the lake), Swift (up to 50 feeding overhead), Woodpigeon, Sand Martin, Dunnock, Robin and Jay.

A reasonable list for the time available, but it is certain that a longer visit would have resulted in more species being located.

CONCHOLOGY (A. Norris)
A survey of the molluscan fauna of the estate has been under way for the last few years, but even so several species were added to the list bringing the total to 54. To date, 14 one kilometre squares within the estate have been visited, with the highest number of species (27) recorded from SE3143, which is the area of woodland and dams along Eccup Beck. This area suffered from heavy pollution some years ago after a discharge of acid from the water treatment works further up the beck; all the freshwater species recorded prior to this appear to have either recolonised the area or survived the event. The main lake has not been fully surveyed, but a short time spent near the landing stage produced living examples of *Unio pictorum* and *Anodonta cygnaea*. Sir David Lascelles, Chairman of the Harewood Museums Trust, and his party, spoke to David Lindley and Adrian Norris about the condition of the lake and examined some of the specimens found. These finds, it was indicated to them, would suggest that the lake has a much richer molluscan fauna than

hitherto recorded, and that a much larger survey of the lake is needed.

The woodland produced records of several old woodland indicators, including the slug *Limax cinereoniger*.

LEPIDOPTERA (Joyce Payne)

The morning being cool and showery, was spent around the church and churchyard. It was pleasing to see Meadow Brown and Ringlet flying between showers. A green caterpillar found by Mrs P. Abbott on Mayweed, identified as Chamomile Shark *Cucullia chamomillae* (see *YNU Bulletin* **42**: 24, 2004), had reached full size and was still only green and white; a final instar specimen is extremely large and brilliant green, white and scarlet. Most of the other British 'sharks' have brightly coloured larvae but the imagos are all dull grey or fawn. The larvae of Chamomile Sharks are found in arable fields on light soils where sugar beet or oilseed rape is grown, but they stand little chance of establishing a population if chemical sprays are used all over the crop. (The Game Conservancy recommend leaving a 6 metre margin unsprayed around arable fields for the benefit of game birds.) There are only four published records for VC64 in *Butterflies and Moths of Yorkshire* (Sutton & Beaumont, 1989) and no additional records in *The Millennium Review* (Beaumont, 2002), although a fully grown larva was found by Joyce Payne on 10 July 1996, near Shireoaks Wood, Tadcaster, a record until now unpublished.

COLEOPTERA (M. L. Denton)

The weather precluded the use of nets to collect beetles and consequently the only species located along the lake edge were those that were easily visible. The species were all very common, including the leaf beetle *Gastrophysa viridula* and the soldier beetles *Cantharis nigra* and *Rhagonycha fulva*. *G. viridula* feeds on *Rumex* spp. and during the course of the summer the larvae consume the flesh to leave nothing but the veins.

The northern section of Piper Wood (immediately to the south of the lake), although containing a mixture of indigenous and non-indigenous trees, produced a number of saproxylic species in the fungi and under bark of the copious amounts of dead wood. Two of these, *Cis bidentatus* and *Pseudotriphyllus suturalis* are locally distributed (both nationally and within Yorkshire). The southern section of Piper Wood was totally overgrown with Rhododendron and was not worked. This section of the wood, and probably others that were not visited, would benefit from the removal of these non-indigenous species.

David Lindley, who visited Sugar Hills, found the locally distributed fungus beetle *Scaphidium quadrimaculatum*. An annotated list of the 46 species located has been housed with the estate.

HYMENOPTERA (M. Archer)

A total of 12 aculeate wasps and bees, all common in Yorkshire, was recorded, two solitary and one social wasp, and one solitary and eight social bees, even though the weather was not favourable for the recording of insects in general.

PLANT GALLS (K. G. Payne)

It was too early in the year for most galls, but Alder leaves carried the pustules of *Eriophyes laevis*. Sycamore bore the erinea of *Acerina pseudoplatani*, Yew twigs carried the artichoke galls of *Taxomyia taxi*, and Oak leaves had immature spangle galls of *Neuroterus* sp.

BOTANY (P. P. Abbott)

The botanists walked from the house along the north-western arm of the lake and along the southern edge of the lake; they then followed Eccup Beck up to the dams. *Acorus calamus* was a frequent marginal plant. Submerged plants in the lake were few, but *Zannichelia palustris* was seen. In what must once have been a walled garden, now dominated by tall, common grasses, there was one plant of *Hypericum maculatum*, which is uncommon in Yorkshire. A small marsh beside the inflow stream, 100 metres above the lake, held small quantities of *Scirpus sylvaticus* and *Carex paniculata*. The upper dam produced the third county record of *Potamogeton friesii* and a putative *Callitriche truncata*, a first vice-county record. The woodland edge alongside the dam was enhanced by a stand of *Campanula latifolia* and within the wood a rare bramble, *Rubus mucronulatus*, restricted to a few sites in northern Britain, was found.

MYCOLOGY (K. G. Payne)
Few parasitic fungi were in evidence. Regarding rusts, the 'new' Daisy rust was found on *Bellis perennis* and last year's sori of *Puccinia caricina* on *Carex pendula*. As usual, the aecial host, *Ribes*, seemed not to be present. *Melamspora hypericorum* was plentiful on *Tutsan*, and *Mahonia* carried its unusual parasite, *Cumminsiella mirabilissima*. Plenty of *Uromyces acetosae* was on Sorrel. The following mildews were noted: *Erysiphe buhrii* on *Silene dioica*, *E. cichoracearum* on *Mycelis muralis* and *E. circaeae* on *Circaea lutetiana* and either *E. ulmariae* or *Spherotheca spiraeae,* in the conidial stage only, on Meadow Sweet. Other fungi included *Rhytisma acerinum* Sycamore Black Spot and *Taphrina sadebeckii* on Alder leaves.

LICHENOLOGY (A. Henderson)
The meeting gave a chance to add to the records already made in a survey of Harewood's lichens that has been under way since an initial study by Henderson and Seaward in 1975. The morning was mainly occupied in an examination of various bark, lignum and stone habitat niches between the House and Stank, where the continuing decline of the once near-ubiquitous *Lecanora conizaeoides* was again noted. *Micarea prasina* on *Quercus, Cliostomum griffithii* on *Fraxinus*, and *Physconia grisea* on *Salix* were interesting additions to the list, as was *Acarospora smaragdula* on the outer window-sills of the Courtyard complex. In the afternoon, steady progress was made round the west end of the Lake to the Walled Garden, the apple orchard of which has thalli of *Physcia aipolia, Pseudevernia furfuracea, Candelariella reflexa* and *Punctelia subrudecta*, further additions to the Harewood lichen flora.

RIVER SWALE AT CATTERICK (VC65) 24 July 2004

INTRODUCTION (A. Henderson)
22 members from 17 Affiliated Societies and 1 visitor assembled at the end of Swale Lane in comfortably cool conditions, and the party moved off at various paces towards the fishing lakes, examining the treed grassland and pathside hedges and shrubbery *en route*. As requested, members avoided disturbance to anglers, holding mainly to perimeter tracks and areas. Some members made a point of exploring the nearby bank of the Swale with its shingle beds, which it had been pointed out might well be productive of alien plants. Later in the afternoon, three members made their way to the parish church of St Anne just off the village high street to study the churchyard flora. Tea was *al fresco* with the 17 members who stayed for the reports session sitting or lying "couched in grass" and enjoying a *fête champêtre*, very much in the style of the Vice-county Secretary. Thanks were expressed to the Leeds and District Amalgamated Society of Anglers for permission to visit this unusual site.

ORNITHOLOGY (W. F. Curtis & J. E. Dale)
A really enjoyable day in which an excellent total of 58 species was recorded, 45 of them in suitable breeding habitats. Whilst assembling for our meeting a Greenshank was heard; about 50 Lapwings flew west, and at least 100 Greylag Geese moved into the meadow nearby. Starting from our parking area near Catterick village, we went north along the track by the Swale for about a mile to the fishing lakes. A variety of habitats, including scattered trees along the river bank, and hedgerows and scrub to the west of the track, held

Whitethroat, Garden Warbler, Blackcap, Chiffchaff, Willow Warbler, Long-tailed Tit, Willow Tit and Yellowhammer, and more frequently, Chaffinch and Greenfinch. A Kingfisher, feeding from the west bank, was eventually seen taking prey to a nest hole in the east bank. Grey Wagtail and Pied Wagtail were also collecting food for young along the river banks.

On the fishing lakes, Great Crested Grebe, Mallard, Moorhen and Coot all had young; also present here were a Grey Heron, three Cormorants, a pair of Mute Swans, five Oystercatchers and a few Black-headed Gulls. An unexpected fly-over was a single Great Black-backed Gull along with two Common Gulls. Passerine species near the lakes included two pairs of Reed Buntings, feeding parties of about five each of Goldfinches and Linnets, and a large flock of titmice including two Willow Tits, about ten Long-tailed Tits and at least 50 Blue and Great Tits, with adults and young of both species. All three hirundine species were feeding here: well over 100 Sand Martins, with much smaller numbers of Swallows and House Martins. Colin Simms visited an area of the river and found a family party of Lesser Redpolls and also reported Turtle Dove, Redstart and Nuthatch. Only two birds of prey were seen, both near our parking area, a Sparrowhawk flying west carrying prey and a Kestrel hovering over an adjacent meadow. Just after the conclusion of the meeting Bill Curtis saw a Dipper by the river.

CONCHOLOGY (A. Norris)

Three members of the Conchological Section attended the meeting and a total of 40 species were found. Most of the day was spent in the area known as Rough Meadows, on the southern bank of the River Swale, but a little time was spent in the old churchyard and in the village of Catterick. The River Swale proved to be very poor in freshwater mollusca with only five species found, due mainly to the river-bed's cover of large water-worn stones: *Lymnaea peregra*, *Ancylus fluviatilis, Sphaerium corneum, Pisidium nitidum* and *P. subtruncatum*. The fish-ponds were too new to have any significant molluscan fauna, but the site might be worth monitoring over coming years. The village produced a number of additional species not located in the Meadows, including a number of garden pests. The occurrence of the large slug *Arion flagellus* is of particular interest, as it appears to be the first record for VC65.

COLEOPTERA (M. L. Denton)

The meagre list of species recorded was expected because of the habitat and lateness of the meeting. However, river shingle houses a number of specialised species, and searching for these proved very productive. A number of *Bembidion* species were recorded, including the locally distributed *B. litorale* and *B. punctulatum* which has the national status of 'Notable B'. Two river shingle inhabitants known from nearby stretches of the river, the rove beetle *Deleaster dichrous* and *Philonthus rubripennis* , were not located despite much stone turning and shingle splashing. It had also been hoped that the holes of rove beetles belonging to the genus *Bledius* would be evident, but this was not so. A number of decomposing straw bales boosted the species list. A single male *Tasgius* (*Ocypus*) *globulifer* proved to be the first record for VC65; it is widely distributed in Yorkshire, but due to past confusion with *T. melanarius*, may be rarer than the records suggest.

The conchologists present sampled a number of ponds, but remarked on the nearly total lack of water beetles; the only species encountered was *Agabus didymus*, a common and widely distributed species in Yorkshire, but with the national status of 'Local'.

BOTANY (Deborah Millward)

Virtually the whole of the area visited fell within the "local change" tetrad being surveyed for the BSBI; as a consequence, the site already had quite a good floral list. However, a commendable 45 additions were made, a reflection on the pairs of botanical eyes surveying and the calibre of their owners. Of taxa not previously recorded for the site, four were typical *Rubus* species (previously not recorded to species level), and similarly, *Euphrasia* *confusa* (only recorded before as the aggregate). *Mimulus guttatus* had established itself in an overflow channel from the River Swale not previously surveyed, and in the surrounding willow scrub, what was taken to be *Epipactis helleborine* was found; the slight doubt over the identification reflects the fact that it was at the seed-pod stage and that the banks of the Swale have previously been thought to support *E. leptochila*, which has been washed away by violent floodwaters. The Swale here flows very rapidly and no in-channel species were recorded, but the shingle banks support just about anything that grows further up the dale, from *Minuartia verna* to garden throw-outs, such as *Buddleja davidii*, so that the addition of *Lycopersicon esculentum* and *Borago officinalis* is not surprising. Recently recorded *Carex spicata* was refound, and a new sedge hybrid *Carex x pseudoaxilliaris* occurred on the edge of one of the fishing lakes; both parents are not infrequent on the site. The fishing lakes themselves supported *Zannichellia palustris* which had not previously been spotted, but the collective eyes of half a dozen or more botanists failed to find *Cynosaurus cristatus*. This is a site which continues to mature following gravel extraction, and has already developed interesting grasslands and willow scrub. The absence of any agricultural activity has certainly assisted this and rabbits have provided the grazing.

Bryology (J. M. Blackburn)
The first hour was spent along the riverbank. As expected, the shingle itself had no bryophyte cover, but the sandy soil was well colonised by several common mosses, including *Bryum pseudotriquetrum* and *Cratoneuron filicinum*. There were no rocks in the river, which was disappointing, but the damp base of the sandy underbank had the only liverworts found on the day, *Marchantia polymorpha* ssp. *polymorpha*, both the common *Pellia* species, and *Lunularia cruciata*; the mosses *Bryum gemmiferum, Dichodontium pellucidum* and *Pohlia melandon* were also here, and several tree roots supported *Leskea polycarpa* and *Syntrichia latifolia*.

The grassy banks by the lake had several common species, whilst damper spots had *Calliergonella cuspidata* and a small stream running into one of the lakes produced *Brachythecium plumosum* and *B. rivulare*. Epiphytes were sparse but, eventually, willow trees were found which supported *Orthotrichum affine, O, diaphanum, Ulota crispa* and a single tuft of *U. phyllantha*.

The uniformity of much of the ground did not produce a large species count, but 52 taxa were found in this much under-recorded part of North Yorkshire.

Lichenology (A. Henderson)
Just east of the path to the Fish Lakes, a single large *Salix* had much of its lower branches larded with *Candelariella reflexa*, its bold yellow echoing the golden *Xanthorion* on the twigs and smaller branches. Trees and shrubbery on both pathsides were often liberally dotted with *Xanthoria* and *Physcia* species, the result, as mentioned previously in these field-notes, of increased eutrophication. Around the perimeter of the fishermen's area of activity, the stony sward is in places dominated by a *Cladonietum*, mainly *Cladonia furcata* and *C. pocillum*, which to the north-east of the area is invaded by colonies of *Peltigera didactyla* and *P. lactucifolia*. A visit after midday to the nearby churchyard of St Anne's produced a list of 37 species, including: *Lecanora rupicola* and *Polysporina simplex* on a sandstone chest tomb and *Caloplaca decipiens* on a marble memorial. On the return journey, concrete posts in the urbanised roadway had *Caloplaca saxicola, Phaeophyscia nigricans, Catillaria lenticularis* and *Lecanora crenulata*.

WHELDRAKE WOODS (VC61) 7 August 2004

Introduction (Joyce Payne)
On this hot summer day, the Wheldrake Woods proved a good venue, especially for invertebrate specialists, and the diversity of the reports reflects the number of different orders recorded. The meeting had a fine start when Mike Denton (President-elect) turned over a log beneath which two Great Crested Newts were resting and displayed one of them

before most of the party went their various ways. The last visit of the YNU was on 19 June 1965, when there were no conchological, lichenological or mycological reports, and few butterflies were noted, although more moths were listed. Our 2004 visit, seven weeks later in the year, produced a very different report.

On this occasion, a search for plant galls found only a few, as might be expected in an area managed for afforestation. However, an old oak on the edge of the Christmas tree plantation had common Spangle and Knopper Galls. Although *Osmunda regalis* was refound in 1965, and has been seen since, the most recent habitat was well grazed on the present occasion and may have been reseeded and no specimen was seen. To the west of the woodland it was interesting to see two small herds of cattle; one of these was of black-eared White Park cattle, the other of red Longhorns. Some of the party visited Wheldrake Ings, but the hay having been cut and it being the 'off' season for bird watching, things were not seen at their best. The churchyard and its Conservation Area were rewarding hunting grounds for lichenologists and many of the party spent the close of the afternoon there.

The tea and meeting were held in Church Cottage where Mrs Monica Black kindly served tea and hospitality, allowing the Excursion and VC61 Secretaries to give their full attention to the meeting attended by 18 people, four having left earlier. The President, W.F. Curtis, took the chair, and 16 societies answered to the roll-call.

Mammals and Lower Vertebrates (Tony Lane)

Janetta Lambert and Marj Curtis accompanied Tony Lane (Secretary and Recorder for East Yorkshire Bat Group) for an inspection of some of the bat boxes in a project operative since 1994 when 64 boxes were erected in the woodland. Since then, *Pipistrellus pipistrellus* has been the predominant species found each year, particularly in the autumn months when mating occurs. Other bats recorded in boxes include *Myotis brandti* in 7/1997, 10/1997 and 9/1999, *M. mystacinus* recorded in 9/2000, 10/2001, 5/2002, 9/2002 and 4/2003, and *M. nattereri* once only in 9/1999. *Plecotus auritus* was first recorded in boxes in 6/2000 and 9/2000, since when it has been recorded each year 6/2001, 5/2002, 9/2002, 4/2003 (19 bats), 8/2003 (5 bats) and 5/2004 (18 bats). On this occasion there was insufficient time to inspect all boxes, but five boxes each contained a single bat each: two female Common Pipistrelles which came to hand were recaptured ringed bats from the on-going ringing programme at Wheldrake Wood, and the other three bats were too alert and escaped before coming to hand (a problem on warm sunny days). Other mammal species recorded on the day included, Grey Squirrel, Rabbit and Badger (all from characteristic field signs).

A Badger was first recorded by bat group members on the night of 15 June 1996 when one crossed the main track between the Forestry Offices and the visitors' car-park. Grey Squirrels have been particularly destructive of wooden bat boxes, enlarging the bottom access slot and rendering boxes non-functional. It has been found that the experimental flat Warwickshire box has not attracted the attention of squirrels and it has replaced many of the more conventional design boxes. The commercially available Woodcrete (Schwegler) boxes have been trialled replacing existing wooden boxes adversely affected by squirrels; unfortunately, although acceptable to bats, the squirrels also gnaw these boxes. On 1 May 2004, a group of four Fallow Deer were seen during bat box inspections.

Ornithology (W. F. Curtis and J. E. Dale)

During the morning we followed the main track from the car park in a south-westerly direction for about three-quarters of a mile, and then took a path to the northern boundary fence which we followed eastwards, ultimately returning to the car park. Twenty-two species were located, of which Wood Pigeon, Coal Tit, Chaffinch and Dunnock were heard frequently, Green Woodpecker twice, and Wren, Robin and Bullfinch occasionally. Along the northern boundary, a feeding flock of about 30 titmice with at least a dozen each of Blue and Great Tit and one Willow Tit kept our interest for a while, and shortly afterwards both Willow Warbler and Chiffchaff sang briefly. About 200 House Martins and 20 Swallows were feeding over the large meadow adjacent to Blackwood Farm immediately north of the woodland edge; also feeding along the northern boundary were eight Linnets and four Goldfinches. Blackbird, Jay, Magpie, Carrion Crow, Starling and House Sparrow were also seen during the morning. Michael Denton heard young Long-eared Owl calling in the southern part of the wood.

In the early afternoon, a brief visit to a sparsely wooded area near Dodsworth Farm yielded Pheasant, Herring Gull (one flying over), Swift, Great Spotted Woodpecker, Goldcrest and Yellowhammer. In all, 30 species were recorded during the day – early August is often a quiet time!

CONCHOLOGY (A. Norris)

The very hot dry conditions, combined with the acidic environmental setting, made it very difficult to locate mollusca in any numbers. Eight 1 km squares in the neighbourhood of Wheldrake were visited and a total of 28 species (59 site records in total) was recorded. The richest and perhaps the most interesting site was the area surrounding a concrete ramp close to Forest Enterprise's main buildings in SE44/6546. This area is used extensively by the local Thrush populations and produced large numbers of broken shells of several species. This site also had a colony of *Clausilia bidentata*, a species not normally found in such acid conditions, and one which must have been introduced to this remote site. The most interesting record from within the woodland was the calcifuge land snail *Zonitoides excavatus*. This is only the second record for VC61 and the first genuine wild specimen found; the previous record for this vice-county was from a caravan camp at Bridlington and was probably an accidental introduction.

In contrast to the acid woodland, a roadside storage area to the south of the wood produced *Candidula intersecta*, a species of calcareous habitats. The churchyard in Wheldrake also produced specimens of *Arion flagellus*, only the second record for VC61, and a small spring in Wheldrake village produced the only freshwater species of the day.

LEPIDOPTERA (Joyce Payne)

For the 1965 meeting, held on 19 June, over seven weeks earlier in the season than the present occasion, only five butterfly species were recorded, all singles, except for several Small Copper, but more moths were noted. At this meeting, the recording of 18 butterfly species was no doubt helped by the fine weather. On the sandy area known as the Christmas tree plantation, where many of the plants of the old common still occur in the spaces between the young trees, Small Copper and Wall Brown were the most abundant species, most pleasingly as both were scarce in the district in 2003. Common Blue was noticeable with about twice as many males as females, the latter newly emerged, their white fringes contrasting with their almost black wings and body; only a very slight bluish tint could be seen near the thorax. Several Small Skippers were seen and a solitary Large Skipper reported. Gatekeeper and Meadow Brown were plentiful and a single worn Ringlet was still flying. Speckled Wood (seen on 10 July) was also present. Large, Small and Green-veined White were all noted, the latter being the commonest. The rare immigrant Clouded Yellow, another 'white', was reported by two members of the party. The Nymphalidae or 'reds' were scarce, but single Comma, Peacock and Red Admiral were seen. Small Tortoiseshell was noted in the village and Painted Lady on the Derwent Ings.

Moths were few and far between during the day and no light trapping was done. Blood-vein and Common Carpet were flying, a 'hook-tip' was most likely to be Pebble Hook-tip, a Vapourer larva was beaten from beech, Cinnabar larvae in their yellow and black livery were devastating the ragwort, and a Large Elephant Hawk larva was reported. On 10 July over a score of Five-Spot Burnet moths were flying. On the western edge of the woodland a Yellow Tail moth was resting on a tree trunk.

There are noticeably good changes in butterfly distribution since 1965. The Comma was then rarely seen in mid-Yorkshire, the Gatekeeper did not extend into the York area until the 1980s and the Speckled Wood did not arrive in Selby district until the 21st century.

COLEOPTERA (Frank Kenington)

Coleopterists were well represented with four members concentrating on this order. In the wood near the car park were numerous logs, a violet iridescent ground beetle *Carabus problematicus*, dwelling under many of them, making a nice start to the day, as *Carabus* species are less frequently encountered nowadays. Nineteen species of ground beetle were seen throughout the day, including: *Dyschinus globosus*, one of the smallest at 2-3 mm, and *C. problematicus* which sometimes reaches 30 mm in length, one seen here being 22 mm long. At the meeting later it was possible to show the range of size in Carabidae. Three species of *Notiophilus*, rapid runners with huge eyes, the commoner *N. biguttatus* and the less frequently encountered *N. germinyi* and *N. substriatus*, were seen. Others in this family worthy of mention are *Amara tibialis*, perhaps the smallest of its genus at 4.6-5.7 mm, and *Poecilus* (*Pterostichus*) *versicolor* with metallic lustre varying from bluish to golden.

The Christmas tree plantation, with open areas and sprawling vegetation, was a major attraction for the coleopterists and much of the day was spent there. Bill Dolling found *Ampedus balteatus*, an attractive 'click beetle', black with the front two-thirds of the elytra red, and a weevil new to VC61 (five previous Yorkshire records all for VC63), *Curculio glandium*, one of the weevils with a very long slender rostrum, in the female often longer than the rest of the body. The rostrum is used for piercing and boring a hole into the husks or pulp of nuts or fruit kernels, in the case of *C. glandium* acorns. In the north-east corner of this area, 14 species, mainly Staphylinidae, were collected from material surrounding a soft, red, rotten trunk which had partially collapsed into a low heap of mushy wood; these were *Notiophilus biguttatus, Stenichnus collans, Rugilus erichsoni, Othius mymecophilus, Gyrohypnus fracticornis, Philonthus laminatus* and *P. umbratilis, Quedius scintillans, Tachyporus hypnorum, T. obtusus* and *T.solutus, Habrocerus capillaricomis, Tachinus laticollis, T. signatus* and *Aridius nodifer*. Seven species of Coccinellidae were found, including *Halyzia sedecimguttata* apparently new to VC61.

A large weevil *Otiorhyncus ovatus* was abundant in the plantation area. Altogether over 108 species were found, which made for a quite satisfactory day's outing.

ENTOMOLOGY (W. R. Dolling)

47 species of Heteroptera were recorded, including *Schirus bicolor*, which normally feeds on White Dead-nettle, although the two adults found were on Bramble, probably feeding on the unripe seeds, fattening themselves up for the winter (first Yorkshire record 1968, now quite frequent), *Palomena prasina*, of which Stuart Foster's database had only three records (1938, 1987 & 2000) for the county (it is perhaps becoming more frequent in Yorkshire), and *Zicrona caerulea* which was unusually abundant among ground flora in the Christmas tree plantation. *Trapezonotus desertus* and *Orthotylus ericetorum*, heathland bugs, also in the Christmas tree plantation, might be expected to prosper as the heathland habitat is restored.

15 species of Homoptera were recorded, including *Javesella pellucida*, one specimen bearing a 'dryinid' sac containing the larva of a species of the hymenopteran family *Dryinidae*, presumably either *Gonatopus bicolor* or *G. distinctus* (a conjecture based on the recorded host and geographical ranges of dryinids).

Other species recorded were one specimen of *Caecilius fuscopterus*, a taxon possibly associated with ancient woodlands and not recorded in Brown's account of Yorkshire Psocoptera (*Naturalist* **61**: 137-139, 1936), the lacewing *Hemerobius marginatus*, which seems to be quite widespread in the county and perhaps is becoming more frequent, the earwig *Forficula auriculari*, the grashoppers *Corthippus brunneus* and *Omocestus viridulus* and the groundhopper *Tetrix undulata*.

BOTANY (D. R. Grant)

The area visited is situated on the Plain of York where the soils have been deposited by glacial action. The coniferous woodland has been planted on very poor sandy soil which in some places provides small patches of acid heathland. The forest is traversed by wide open rides made with limestone chippings. Some grass verges have one or two lime-loving plants. A small pond at the east end has a large colony of *Potamogeton polygonifolius* which is very local in East Yorkshire. The main ride verges have *Rhinanthus minor*, *Olontites vernus* in several places, and one of the rarer Hawkweeds *Hieracium umbellatum*, which prefers sandy soil and very dry limestone banks, has very narrow linear leaves ascending the flowering stem, making it a very characteristic plant. The wood margins have two of our rarer Yorkshire brambles: *Rubus mucronulatus*, which can be readily identified by its pink flowers and the pronounced mucronate tip of the terminal leaflet, and *R. hylocharis*, which is in the same group as the common *R. dasyphyllus* with the characteristic stem armament of prickles, pricklets, aciciles, hairs and glandular hairs; this species also has pink flowers. Other brambles noted were *R. nemoralis* and *R. eboracensis*. In damper parts, *Juncus acutiflorus, Gnaphalium uliginosum, Hypericum tetrapterum* and *Menta arvensis* were found; one area had a colony of *Sagina nodosa*. In rough open corners there were colonies of *Calamagrostis epigejos, Agrostis canina* and *Senecio sylvaticus*. Bare sandy areas had much *Ornithopus perpusillus*, together with *Hypericum humifusum, Aira praecox, Geranium molle* and *Veronica officinalis*. *Ceratocapnos claviculata* and *Conyza canadensis* were found in two places in open communities.

One objective of the botanists was to locate the rare cudweed *Gnaphalium sylvaticum*, which was found in several places with one site on the edge of a bare woodland ride at SE/6611.4647 where there were dozens of plants in flower. A little conservation work is required here to remove gorse bushes in order to keep the habitat open.

Amsinckia micrantha, a weed of the eastern side of Yorkshire, was noted in an area to the north where the common land adjoins a ploughed field.

BRYOLOGY (J. M. Blackburn)

A walk along the road from the car park produced the common ruderals, and several epiphytes were recorded on the birch trees along the fringe, before the return to the car park and an inspection of the main ride. The coniferous woods were generally too dark to warrant investigation, but the trackside vegetation was quite rewarding; one puzzling moss here was subsequently identified as *Pohlia lutescens*.

A detour to a small pond was worth a visit. The wooden staging area had *Drepanocladus aduncus* around its base, whilst the shaded bankside around the pond had *Pohlia wahlenbergii* and *Calypogeia muelleriana*. The willows around the pond were devoid of bryophyte cover, but some old branches covering a wet inlet were covered with *Leptodictyum riparium*. There were several ditches of various depths in the woods with an abundance of *Dicranella heteromalla, Fissidens bryoides, F. taxifolius* and a small quantity of *Marchantia polymorpha* ssp. *ruderalis*, but were otherwise disappointing. *Dicranella cerviculata* and *Pseudephemerum nitidum*, seen here in 1965, were not refound.

A concrete ramp near the Forestry Commission buildings added several calcicoles to the list, including *Bryoerythrophyllum recurvirostrum*. A side track revealed a small area of true heathland where very small quantities of *Pleurozium schreberi* were found along with *Dicranum scoparium* and *Pohlia nutans*. The visit ended with a look at the sandy ground near the lower car park. *Brachythecium albicans* was growing here, but not much else, although an adjacent ditch finally produced *Eurhynchium striatum* and *Mnium hornum*. A very enjoyable day resulted in a total of 51 taxa being recorded.

MYCOLOGY (J. O. K. Webb)

Myxomycetes: *Cribraria* were expected in the conifer habitat, yet it was still surprising to find three, *C. cancellata, C. macrocarpa* and *C. microcarpa*, all on the same rotting log within but a few centimetres of each other; of the latter two, *C. macrocarpa* is quoted in Ing as "uncommon", and, *C. microcarpa* as "surprisingly rare". Further study of these last two specimens is required for confirmation. A second opinion is being sought on *C.*

atrofusca, which has not been found in the British Isles for more than 40 years. *Diderma effusum*, widespread and usually on beech litter, was found on *Pinus* needles. Beeches were in the vicinity, but there were no signs of *D. effusa* on the litter. *Lycogala epidendrum* was recorded by Bramley in all five VCs, but subsequently the species was segregated from *L. terrestre*; now all *L. epidendrum* prior to the segregation appears in the Checklist as *sensu lato*. Consequently this record from Wheldrake Woods may well be new for VC61.

Basidiomycotina: 14 Basidiomycotina and 13 Uredinales were identified. Of particular interest among the former was *Auriscalpium vulgare* which was recorded by Bolton, and Grainger and Bramley have it as found in all VCs except VC64; it grows on fallen, sometimes buried, cones of *Larix* and *Pinus,* and occasionally on rotting branches; its brown bodies have stalks off-set to one side. *Ramularia agrestis* var. *agrestis* is a new county record.

Ascomycotina: Several *Erysiphes* (powdery mildews) and the Coelomycete, *Seimatosporium krigerianum,* were recorded, the latter being probably under-recorded and not mentioned in Bramley. A full list has been submitted to the Section Recorders.

LICHENOLOGY (A. Henderson)
Wheldrake Woods are in general densely shaded and unlikely to encourage a rich lichen flora, but trees, fencing, concrete posts, stone and some man-made structures yielded a list of almost 50 species. The most intriguing lichen assemblage of all was on a cylindrical iron agricultural storage or mixing tank standing alongside a farm barn on the old Elvington airfield just north of Black Plantation. The red-lead paint and underlying metal surface of the tank were both extensively covered in a *Xanthorion-Physcietum* dominated by *Xanthoria calcicola* and *Physcia caesia* (see *YNU Bulletin* **43**: 42-44, 2005, for illustrations). The afternoon's fieldwork ended with a rather hurried examination of St Helen's churchyard in Wheldrake, where 32 species were recorded. Most noticeable as one enters the churchyard are the white discs of *Diploicia canescens* and the luminescent yellow-green stretches of *Psilolechia lucida*. The day's overall total was 63 species.

BOOK REVIEWS

Fungi of the Scarborough District by **C.R.Stephenson**. Pp.xxv + 198. Scarborough Field Naturalists' Society. 2004. £12.50 paperback, £5.00 CD (together £15.00) from: 5 West Park Avenue, Newby, Scarborough YO12 6HH.

The main body of this catalogue of fungi and lichens to be found in the recording area of the Scarborough Field Naturalists' Society was originally prepared for 2000, but a 6-page list of post-2000 records of fungi has been added since the process of gathering the data and checking and rechecking the nomenclature took longer than expected. Succinct details of substrata, collectors and dates are provided for listed taxa, together with introductory matter, list of collectors, gazetteer, map and index. This catalogue will provide a useful addition to the Yorkshire mycologist's bookshelf and an important baseline for recording fungi locally in the future. Unfortunately the lichen section will be of less value as it is very fragmentary, being composed of 315 taxa (of which 147 are unchecked old or doubtful records), often based on out-of-date nomenclature, incorrect synonymy and poorly transcribed names. A quick check of the national database showed there to be 428 taxa for the area under study prior to 2004, of which 368 have been recorded since 1960. The value of the book would have been much improved by the omission of the lichen section.

MRDS

Energy Beyond Oil by **P. Mobbs**. Pp x + 104. Matador Publishing, Leicester. 2005. £15.99.

This is an easy to read, thought-provoking book, which considers an issue that may well become of great concern within the next decade: namely, what is likely to happen when oil production can no longer be increased to meet the world population's growing demand for energy. A reasonably well-balanced view is taken of the claims and counter-claims that have been made concerning the future availability of fossil fuels and of the likely climatic changes that may arise as fossil fuels are used. After determining that peak oil production is likely to be reached within the next decade, the book briefly explores the options such as nuclear energy, biofuels and other renewable energy sources that some authorities claim will alleviate energy shortages. The author concludes that we should start preparing ourselves for a fundamental change in our lifestyles in order to meet the substantial rise in energy prices that will almost certainly impact on the population within the next generation.

The recent rise in energy prices makes this a timely publication, well suited to the needs of the responsible citizen who wishes to be better informed about our prospects for future access to energy. It avoids the 'gloom and doom' attributes of many earlier publications and contains a very useful 14-page bibliography of free web-based sources of information that repays exploration.

DEC

Greenpeace: an insider's account by **Rex Weyler**. Pp. 624, incl. 17 pp. b/w plates. Rodale/Pan Macmillan. 2004. £18.99 hardback.

This rather large book gives a detailed history of the Greenpeace movement as seen through the eyes of one of its founders, Rex Weyler. It traces the beginnings and development of the NGO through to more recent times. The distribution of text is uneven for the time span involved, with more spent on the first 20 years of its life, which was arguably the period when Greenpeace became best known through its attempts to stop nuclear bomb testing and involved the sinking of its ship *Rainbow Warrior* in New Zealand.

It is clear that we need activists to confront politicians about environmental issues and indeed the early activities were tenaciously followed through, but I am not so sure that this is true for later times. I was not too sure who the book was aimed at, as it reads, as another reviewer said, "like a gripping yarn". I certainly agree about it being a yarn as the detail tends to be obscured by too many small personal details about the actions of the people concerned.

The accounts given are interesting, but excessively long with too much minute detail. In my opinion, the book would have had more impact if it had been 30% shorter!

EGB

Travels in the Interior of Africa by **Mungo Park**. Pp.281, incl. 9 b/w illus. £14.00. **Wanderings in Patagonia: Life among the Ostrich Hunters** by **Julius Beerhohm**. Pp.157, incl. 10 b/w illus. £12.00. **Three Years Slavery among the Patagonians** by **Auguste Guinnard**. Pp.154, £12.00. **At Home with the Patagonians** by **George C.Musters**. Pp.253, incl. 9 b/w illus. £14.00. **Idle Days in Patagonia** by **W.H.Hudson**. Pp.155, incl. 30 b/w illus. £12.00. Nonesuch Publishing, Stround.

The above five paperback titles were all published in 2005 in the 'Travellers, Explorers & Pioneers' series. Written by famous and not-so-famous 18th and 19th century authors, the travelogues contain detailed descriptions of the different landscapes and their people, supplemented by observations on their fauna and flora. The most well-known and indeed influential authors, particularly from a natural history point of view, were Mungo Park

(1771-1806), who courageously attempted to chart the course of the River Niger, and William Henry Hudson (1841-1922), whose early adventures in South America and later accounts as a field naturalist in England continue to win the admiration of readers.

These reissues of works first published between 1860 and 1893 make excellent reads, are charmingly presented, and would make ideal presents for a wide readership.

MRDS

Birds of the Lower Derwent Valley – a historical review 1850-2002 by **Craig Falston.** Pp. 252 with numerous line drawings and b/w and colour photographs. English Nature. 2002. £10.00 softback.

This detailed review, the first of its kind on the birds of this riverine area, is very well researched by the author in co-operation with the Chairman of the Records Committee of the YNU's Ornithological Section. There are 23 pages of Introduction, 183 pages devoted to the Systematic List, a most thorough account of all the 268 species recorded in the Valley since records began, and 36 pages dealing with bird ringing acitivities and results.

The Introduction includes a fascinating account of the early history of the ings and the vast numbers of waterfowl which were slaughtered by the gunners to satisfy the seemingly excessive gastronomic desires of the corpulent landowners of the day. The price of 'fowles' in the York area was decreed by royal proclamation in 1393, *Mallades* being four pence each and *Teales* one penny. We read that, in 1466, a great banquet was held at Cawood to celebrate the enthronement of the Archbishop of York at which 4,000 *Mallades* and *Teales* were just part of the extravagant fare. One is, perhaps, tempted to believe that more birds were being attracted to the ings in those far off days, but traditional sites are slow to lose their magnetic appeal and numbers frequenting the Valley today are impressive: counts of winter Mallard peaked at 8,150 in March 1982, with 3,500 regularly during the 1990s, making the Valley one of the most important sites for this species in Britain; Eurasian Teals regularly numbered 3,000 to 5,000 during the 1980s and 1990s, with a remarkable 10,200 in 1998.

Snowden Slights, the most famous of Yorkshire wildfowlers and an integral part of the history of the ings in their more regularly inundated period, is deservedly given fair coverage, which makes intriguing reading about what must have been his oft-sodden excursions into this soggy world in pursuit of his lacustrine quarry. The changing land uses which have altered the face of the Valley over the decades is outlined. Some stabilization in recent years and the protection now afforded by more informed landowners, land purchase by the Yorkshire Wildlife Trust and administration by English Nature will, hopefully, ensure at least the status quo and perhaps improve this sensitive habitat.

The text is liberally sprinkled with line drawings and also includes numerous excellent photographs of birds and habitats. There are some failings, however, the lack of an index being a serious omission. The author has wisely used the accepted English names for the birds in the Systematic List, as recommended by the British Ornithologists' Union, but whoever was responsible for the lists of ringing and recoveries and for the photo captions has, I fear, succumbed to the use of superseded names, indicating a lack of either awareness, critical proof reading or both. These etymological vagaries apart, the wealth of detail for each species is admirable and the author is to be congratulated on the venture which will be the standard reference for this avian mecca, much beloved particularly by anything with webbed feet or a long bill, for many years to come. The well-produced whole should appeal to anyone with an interest in our avain heritage and every Yorkshire birder should possess a copy – I can think of worse ways of shedding £10.

JRM

CONTRIBUTORS

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The Naturalist

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

Notice to Contributors to 'The Naturalist'

A manuscript plus disc (WORD format) OR two manuscripts, typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5cm 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. Table 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. Photographic illustrations, normally black and white, will be considered for inclusion. **Publishable manuscripts not conforming to the above requirements will be returned for alteration.**

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FORTY YEARS OF NATURAL HISTORY AT BLACKMOORFOOT RESERVOIR

MICHAEL L. DENTON

Presidential address presented to the Yorkshire Naturalists' Union at Huddersfield, 26 November 2005

Blackmoorfoot Reservoir is situated at the base of the Pennines c. 5.6 km SW of Huddersfield, West Yorkshire (GR: SE098127) at an elevation of 256 m a.s.l. Construction began on 1 May 1871 and the reservoir was filled to overflowing on 20 December 1876. As with most Victorian reservoirs, Blackmoorfoot was formed by damming a valley, but due to the topography, it was necessary to build two dam walls, the northern embankment being 713 m long, 122 m wide at the base, and 21 m high and the southern embankment 456 m long, 73 m wide at the base, and 12 m high. The total cost of the reservoir was £260,549. A curious optical illusion can be seen from the Wessenden Head Road (3 km to the SSW) when viewing the inflow conduit as it passes from Brow Grains at 267 m to Blackmoorfoot, as the water appears to be flowing uphill (Woodhead 1939).

The surface area of the reservoir is relatively large (c. 41 ha) but being situated at the base of the Pennines, with a maximum depth of 12 m and no submerged or marginal plant communities, it offers no attraction to wintering surface feeding wildfowl (although Mallard *Anas platyrhynchos* are constantly present and other dabbling ducks *Anas* spp. are recorded on passage). In the past, small numbers of diving duck (Tufted Duck *Aythya fuligula*, Pochard *A. ferina* and Goldeneye *Bucephala clangula*) wintered, but these have decreased to the point of becoming virtually nonexistent. A large gull roost is one of the few winter attractions, but in times of water shortage, the gently shelving western bank can provide a good feeding habitat for passage waders etc. Plantations of deciduous woodland (in which Rhododendron is dominant) fringe the west and east banks and there is a more extensive wooded area on the western half of the south bank. A small oak woodland (Orange Wood) lies immediately to the south of the reservoir and is included in the recording area.

Being situated between the Colne Valley to the N and the Holme Valley to the S, the reservoir not only attracts birds flying along the river systems, but is ideally placed for visible migration observations. Spring migration is generally rather weak, but autumn migration tends to be more obvious. The governing factor regarding the impetus for bird migration is the weather, light SW winds with little cloud cover producing the optimum conditions. Autumn migration, which can be observed anytime between mid-August and late October, is generally more productive during the first two hours of daylight, when birds may be seen flying in a southerly or westerly direction. Species involved include wintering thrushes, Meadow Pipit *Anthus pratensis*, Swallow *Hirundo rustica*, House Martin *Delichon urbicum*, finches and, occasionally, buntings.

As the title of this address indicates, my involvement with natural history at Blackmoorfoot began in 1965, 40 years ago. Bird records, however, date back to the 1950s and observations began to proliferate after the Huddersfield Naturalists', Photographic and Antiquarian Society were given permission by the land owners (the then Yorkshire Water Authority) to erect a hide along the west bank in 1959. This hide was replaced by the Huddersfield Birdwatchers' Club in 1970 and observations continue to this day. Over the years the number of man-days has fluctuated annually, but during the last 30 years it has averaged 338 days per annum. This impressive coverage of the reservoir by birdwatchers has enabled the Huddersfield Birdwatchers' Club to publish three reviews which embraced the periods 1959-73 (Bray 1974), 1974-84 (Denton 1985) and 1985-2003 (Denton 2004).

Since 1961 the winter gull roost has attracted considerable attention and observations have resulted in the identification of 13 species, including Yellow-legged Gull *Larus michahellis*, which has only recently been elevated to species level. The roost regularly holds in the order of 7,000 individuals which nowadays mainly consists of Black-headed

Gull *L. ridibundus* and Common Gull *L. canus*. Large numbers of both Herring Gull *L. argentatus* (up to 2,000) and Great Black-backed Gull *L. marinus* (up to 600) utilized the roost until 1976. The closing of a number of local refuse tips at this time, however, denied these species a food source and numbers plummeted: Herring Gull have only occasionally reached 600 and Great Black-backed Gull usually remain at less than 250.

Bird ringing at Blackmoorfoot has added considerably to our knowledge and understanding of movements (see Denton 1998). The ringing carried out between the early 1960s and 1998 has indicated the origin and destination of many bird species, the following being some of the more interesting: a pullus Lapwing *Vanellus vanellus* shot in Spain the following January (1255 km SSW); winter ringed Snipe *Gallinago gallinago* recovered during the winter at Selby, North Yorkshire (55 km ENE), in Denmark (845 km ENE) and Spain (1955 km SSW); a number of Black-headed Gulls from Scandinavia, the most interesting involving a colour-ringed adult from Denmark which commuted between Denmark and Blackmoorfoot for at least 11 years, being in Denmark from March to June and Blackmoorfoot from July until February; a juvenile Swallow controlled in Spain (2050 km SSW) a month after ringing; an adult House Martin found dead in France (1200 km SSE); a juvenile Pied Wagtail *Motacilla alba* shot in Portugal (945 km SSW); a first-year Wren *Troglodytes troglodytes* killed by a car in Dyfed (230 km SW); a number of Blackbirds *Turdus merula* recovered in Scandinavia; a first-year male Fieldfare *Turdus pilaris* shot in France (845 km SSE); a first-year Blue Tit *Parus caeruleus* controlled in Nottinghamshire (68 km SE) and a winter ringed adult male Chaffinch *Fringilla coelebs* found dead in Norway (978 km NE).

The foreign recoveries outlined above are typical for the species and parallel the national findings of the British Trust for Ornithology (BTO) ringing scheme. The most significant recoveries to stem from ringing at Blackmoorfoot originate from the 328 Twite *Carduelis flavirostris* handled in late July 1976, five being recovered abroad and one in Britain; three were in Belgium during November (two in 1976, one in 1977) and two in the Netherlands (October 1976 and February 1977). The British recovery, a first-year bird, had shown interesting fidelity to its wintering grounds, being controlled at Hythe, Colchester (265 km SE) in both February 1979 and January 1980. In addition, an adult which had been colour-ringed in Lincolnshire during the winter of 1986/87 was seen at Blackmoorfoot on 31 March 1990 (157 km NW). The ringing of Twite in the Pennines has shown that they migrate south-east to winter on the coast between the Wash and the Thames but with the exception of individuals in north-eastern France and northern Italy, those outlined above remain the only foreign recoveries reported to the British ringing scheme (Wernham *et al.* 2002) and therefore add considerably to our knowledge of the species.

The easiest means of gauging the magnitude of bird numbers passing through an area is to compare the annual ringing totals for that species: for Willow Warbler *Phylloscopus trochilus,* although numbers at the reservoir fluctuated annually, in most years up to 200 were handled, with 374 in 1986, 427 in 1987, 403 in 1989 and 414 in 1990 being the maxima. Without ringing, the impression of the number of passerines present is generally far lower than the daily ringing total. On a number of occasions species were caught which had previously not been located in the field, e.g. Grasshopper Warblers *Locustella naevia,* Sedge Warblers *Acrocephalus schoenobaenus,* Reed Warblers *A. scirpaceus,* Lesser Whitethroats *Sylvia curruca* and a Pallas's Warbler *Phylloscopus proregulus*.

My main interest in birds at Blackmoorfoot has been concerned with the fluctuation in numbers of the commoner species, rather than the rarities. By keeping records on a near daily basis patterns of occupancy emerge and, over time, allow for a better understanding of bird populations and movements. It has long been appreciated, thanks to work by organisations such as the BTO, that bird populations tend to fluctuate annually. Some of these fluctuations are triggered by natural occurrences, eg. the catastrophic drop in the Kingfisher *Alcedo atthis* population after the severe winter conditions of 1962/63. Some, however, are man-related and most seed-eating farmland birds have decreased alarmingly over the last 25 years due to his activities. Populations of birds at Blackmoorfoot have tended to parallel the national trend and a number of species are discussed below in more detail.

As with most ornithological sites, the casual visitor to Blackmoorfoot may consider it to be ornithologically uninteresting. Many days can be rather quiet and, unless observers are prepared to work the area on a regular basis and in all weather conditions, they may come away feeling unrewarded. Over the years the number of bird species recorded from the reservoir (excluding obvious escapes such as Egyptian Goose *Alopochen aegyptiaca*, Wood Duck *Aix sponsa* and Ring-necked Parakeet *Psittacula krameri*) stands at an impressive 206.

Selected Bird Species

The following bird species have been selected for discussion as they are unusual in a Yorkshire context, not commonly recorded from an inland locality (mainly seabirds) or, over time, have shown marked changes in population. For completeness, records of species prior to my involvement are included. All references to the species' Yorkshire status are taken from Wilson and Slack (1996) unless otherwise stated.

Red-throated Diver *Gavia stellata*

Of the three diver species which have occurred inland in Yorkshire, this is the most numerous. There are five records from Blackmoorfoot, all involving singles for a day's duration and all falling in the winter months between October and February.

Black-throated Diver *Gavia arctica*

Inland records of this species in Yorkshire have always been rare, and even along the coast records are scarce. Two individuals have occurred at the reservoir: singles for a day's duration in November 1977 and December 1983.

Great Northern Diver *Gavia immer*

This species is scarce in Yorkshire, even along the coast, and is the rarest of the three diver species which have occurred inland in the county. A single was shot at Blackmoorfoot in the winter of 1900/01; birds present for a day's duration concerned one in full summer plumage in July 1962; singles in February 1985 and November 1990 and a bird in full summer plumage in April 2002. A single remained for two days in October 1981 and one which arrived in late December 1983 remained for 14 days.

Diver sp. *Gavia* sp.

A single on 22 November 1959, although published as Red-throated by the YNU, was considered by others not to be this species, and is therefore best left unidentified. A diver which flew north on 22 November 1998 could not be identified to species.

Little Grebe *Tachybaptus ruficollis*

Between 1959 and 1973 the species was mainly an autumn visitor (October and early November) with less frequent visits at other times of the year. There was then a gradual increase in records and from 1980 the species has been recorded far more frequently, with a marked increase in spring occurrences. The last 20 years have seen a tremendous upsurge in sightings and, although the majority of records were from the spring and autumn periods, the species was also recorded at other times of the year. Winter records are dependent upon the severity of the weather, but in five of these winters one or two individuals were present throughout the December to February period. Whilst usually present in very small numbers, up to six or seven have occasionally been recorded. Although there has been a tendency for birds to remain at the reservoir for longer periods than formerly, the number of bird-days per annum has fluctuated markedly – in 1988 it was at the all time high of 401, but in 1996 it was only two. Despite these fluctuations, there has still been a marked overall increase in the average bird-days per annum: in the years 1959 to 1973 it was six, between 1974 and 1979 it was nine, between 1980 and 1984 it was 29 but during the last 21 years it had increased to 162.

Great Crested Grebe *Podiceps cristatus*

Between 1959 and 1984 the species was mainly recorded during the spring (March-May) and autumn (July-November) periods in small numbers (maximum of 13 on any one day).

The status of this species has totally changed since this time, birds now being present in larger numbers and from March through to November, with more likelihood of winter (December-February) occupancy. A build-up in numbers commencing in July or August (occasionally in June) occurred annually and between ten and 25 were then present until late September. Larger numbers have occasionally been recorded: in autumn 1986 up to 34 were present for six weeks and in 1994 between 30 and 43 were present from mid-July until mid-August. This increase in numbers can best be gauged by comparing the average bird-days per annum: in the years 1976 to 1984 it was 83 but during the last 21 years it had increased to an amazing 2429. Winter records generally involved one or two birds, but up to nine have occasionally been seen. The first breeding attempt occurred in 1985 and breeding has taken place almost annually since this time. Most attempts concerned nests anchored to willows *Salix* along the west bank, but later in the year they were occasionally built floating on Amphibious Bistort *Polygonum bistorta*. Results have been very variable, with no more than three young reared to maturity in any season (a maximum of two broods in 1998) and only 18 have fledged successfully. The reasons for nest failure included predators (Corvids, Grey Squirrel and Fox), wave action and, the major problem, fluctuating water levels which have flooded or left nests high and dry. A remarkable sequence of events occurred in 1986 when five pairs built a total of 13 nests into which 54 eggs were laid but only three young hatched, all of which eventually fledged (Denton 1986).

Red-necked Grebe *Podiceps grisegena*

There has been a general increase in Yorkshire records since the early 1960s, but inland records have not kept pace with the increase in coastal occurrences. Blackmoorfoot has played host to the species on six occasions: singles, generally for a days duration, but once for nine days and once for 11 days, have been recorded in January, April, September and November.

Slavonian Grebe *Podiceps auritus*

Small numbers of this species are recorded annually from freshwater sites in the county. Many records are from late August onwards and peak in October or early November. There are five records from the reservoir: in 1982 a single on 11 October and between 6 and 9 November may have been the same individual; a bird in full summer plumage was present on 25 April 1985; in March 1988 a winter plumaged bird remained for 16 days; an immature was seen on 6th August 1998 and a single which arrived on 25 December 2000 remained until 10 January 2001.

Black-necked Grebe *Podiceps nigricollis*

In Yorkshire this scarce species is more regularly recorded from inland localities than from the coast. Blackmoorfoot has played host to the species in 14 of the years since the first in 1949, there being records in ten of the years since 1978. Most records fell between August and December, only occasionally in April/May, and usually involved singles for a day's duration. Occasionally, however, individuals remained for up to 13 days, but in 2003 a bird in full summer plumage was present from 27 May until 27 July. Records of more than one were unusual but in September 1959 two were present for three days, four were seen on 26 September 1999 with two remaining for the following 14 days

Fulmar *Fulmarus glacialis*

Inland records of this coastal species, although almost annual since 1960, rarely exceed five per annum, most occurring between May and September. The four records from the reservoir, all of which involved singles, fall into this period: in July 1977, July 1982, July 1989 and May 1996.

Storm Petrel *Hydrobates pelagicus*

Inland records of this species in Yorkshire are rare, there being only 15 during the 20th century, all between 9 August and 20 November (YNU Ornithological reports). A single was present at the reservoir for nearly an hour on 15 November 1988.

Shag *Phalacrocorax aristotelis*

Inland records of this seabird have increased since 1960, there being 123 up to 1992.

Occurrences are erratic and in most years are attributable to birds being "wrecked". Blackmoorfoot has played host to the species on two occasions: three immatures on 22 October 1991 departed west after a five minutes stay and a single, probably first-summer, departed in a westerly direction on 8 August 1996.

Bittern *Botaurus stellaris*

Due to the absence of reedbeds the reservoir offers no habitat for this species, and a single hiding in bracken in the west bank plantation on 2 October 1988 was therefore unprecedented. The only other records from within the Huddersfield Birdwatchers' Club recording area were as long ago as 1891 and 1922.

Little Egret *Egretta garzetta*

Up to the end of 1990 there had been 15 Yorkshire records of this species, all but two since 1967. In line with the phenomenal national increase, a further 59 Yorkshire records had accumulated by the end of 2000, but of the 23 records during that year it was considered that the number of birds involved was perhaps as few as ten (Degnan & Dobbs 2002). Blackmoorfoot has played host to singles on 1 November 2002 and 15 July 2005. The 2002 individual was the first record from within the Huddersfield Birdwatchers' Club recording area.

Grey Heron *Ardea cinerea*

Between 1959 and 1973 the species was predominantly an autumn visitor, but the picture changed markedly during the following decade, with records spanning all months, although most were still concentrated between July and October. This increase and pattern of occurrence continued, although one or two were more frequently seen during the winter months. Previous records had referred to singles, occasionally two and a maximum of four (one day only). Although one or two has been the norm during the last 20 years, up to six or seven were frequently encountered (especially since 1990) with eight or nine occasionally. There were unprecedented numbers in 1993 when between nine and 14 were present daily between mid-July and early August. This increase in numbers can best be gauged by comparing the average bird-days per annum: in the years 1959-1973 it was six, between 1974-1984 it had risen to 27 but during the last 21 years it had increased to an amazing 297.

Bewick's Swan *Cygnus columbianus*

This species has always been a sporadic visitor to the reservoir and has not been recorded annually. Over the years, however, there has been a marked decline in the number of records: from 1959 to 1973 the species was present on 34 days (av. 2.3 days p.a.), in the following 11 years this had fallen to 21 days (av. 1.9 p.a.) and during the last 21 years it had fallen to 16 days (av. 0.8 days p.a.). All records fell between 17 October and 12 January (64% being in November) and were of single figures (1-6) with the exception of a herd of 20 (16 adults and 4 juveniles) on 10 January 1986 and 14 adults on 24 December 1994. Most sightings have involved birds that were present only for the day, although from the herd of 20 on 10 January 1986 two of the adults remained until 12 January (the other 18 having departed westwards at 1520 hrs.).

Whooper Swan *Cygnus cygnus*

Unlike Bewick's Swan (see above), there has been a marked increase in records, and during the last 21 years the species was recorded almost annually. The 24 records during this period all fell between 7 October and 27 March (72% being in October/November) and involved single figures (1-7), with the exception of 18 adults which flew west on 24 December 1986. All records were of a single day's duration, apart from a juvenile which remained for 44 days at the end of 1996.

Canada Goose *Branta canadensis*

The national increase in this introduced species has been reflected in a tremendous upsurge in records. Originally the species was a sporadic visitor with most records in the months of May and June, and occasionally in all other months except July and December. This frequency of occupancy continued until 1990, although small numbers (usually in single figures and never more than 27) were recorded in all other months. Between 1991 and

1995, although not present on a daily basis, records were more frequent (especially in autumn) and involved larger flocks, 48 on 26 August 1995 being the maximum. In most years since 1996, and especially since 2001, there was a marked increase in records between late July and the year end, so much so that in some years flocks in high double figures and occasionally in excess of 120 were present on a daily basis. Although numbers tended to fluctuate daily, there was a maximum of 151 between late October and mid-November 2003 and up to 168 in the month following.

Dark-bellied Brent Goose *Branta bernicla bernicla*

The recent improved fortunes of this species, both nationally and on the Humber, has resulted in an increase in inland records in the county. There are two records from the reservoir: an adult was present on 2 January 1985 and a party of nine were seen on 29 March 1998.

Long-tailed Duck *Clangula hyemalis*

Since the early 1950s this species has become one of the most regular seaduck to be recorded inland in Yorkshire. Nelson (1907), however, could only site 15 inland records and Chislett (1952) only added five for the intervening years. Blackmoorfoot has played host to the species on three occasions: a single on 24 November 1950; a male remained for 25 days in November 1956 and one remained for nine days in October 1982.

Velvet Scoter *Melanitta fusca*

This species is an infrequent visitor to inland sites in Yorkshire, although records (usually only one or two per annum) are now virtually annual. Blackmoorfoot has fared rather well, there being five records, all for a day's duration: singles in July 1950, March 1960, November 1962 and October 1969 with two males on 19 July 1975. Midsummer records are unusual, there only being a handful from inland Yorkshire.

Smew *Mergellus albellus*

Yorkshire does not hold a regular wintering population such as that in south-east England and the species has always been scarce in the county. Blackmoorfoot has hosted the species on a total of 15 occasions since the first on 29 March 1970. Ten of these occurrences (66%) have been between November and January with other records in February (1), March (1) and April (2). Most records have involved singles, mainly 'red-heads', for no more than a day's duration, the exceptions being five 'red-heads' on 8 November 1974, three 'red-heads' on 24 November 1998 and single 'red-heads' in 1999 which remained for eight days in January and nine days in February.

Goosander *Mergus merganser*

Between 1949 (the first recorded occurrence) and 1973 there were 23 records, usually of singles, but once a flock of ten, which were present for no more than a day's duration. The species was mainly recorded between October and December, occasionally in March. A marked increase in records occurred between 1974 and 1984, but the same pattern of occurrences continued, and usually fewer than six were present for no more two days. Between 1985 and 1996, however, there was a marked upsurge in January/February records, with the majority (97%) falling between mid-September and March. Numbers involved at this time were always small, generally singles, but occasionally flocks of up to eight were present. The only records outside this period were of a male and female on 25 June 1986, a flock of 21 on 27 August 1989 and nine on 21 August 1994. After 1996, this pattern of occurrence continued, but the frequency of observations increased markedly. Whereas in the past birds had generally only been present for one day (occasionally up to two or three, and once a pair remained for ten), observations became almost daily between October and March. Up to December 2001 the number of individuals involved was always in single figures, but since that time flocks of anything up to 25 became the norm and up to 41 were present in December 2005. During the last decade, up to six were occasionally present in April, but the only May record involved a female on 18th 1997. This increase can best be gauged by comparing the number of bird-days per annum: in the years 1974 to 1984 it was ten, between 1985 and 1996 it had doubled to 20, but during the last nine years it increased to an amazing 531. Interestingly, most of the records since 1996 have tended to involve birds that were not present during the course of the day, but were observed to fly in during the evening, either to feed or roost. By first light the following morning they had usually departed.

Montagu's Harrier *Circus pygargus*

Yorkshire records of this species have been annual since 1949, but the slight increase in records is probably attributable to the increase in observer coverage during the last few decades. The only record from Blackmoorfoot concerned a 'ring-tail' which drifted west on 14 May 1997.

Sparrowhawk *Accipiter nisus*

The national decrease in this species, caused by the use of chlorinated hydrocarbons during the 1950s and 1960s, resulted in only two records prior to 1972 (singles in July 1964 and July 1971). The banning of these chemicals, however, resulted in a phenomenal increase in the national population, an increase reflected in the Huddersfield Birdwatchers' Club recording area and also at Blackmoorfoot, so much so that between 1980 and 1984 the species averaged 36 bird-days per annum. During the last 21 years, this upsurge in records continued and resulted in an increase to an average of 46 bird-days per annum. As in the past, birds were recorded throughout the year, although they were less apparent between April and June and there was generally a sharp increase in records during the autumn. Most records were of singles, very occasionally two.

Osprey *Pandion haliaetus*

Yorkshire records of passage migrants have increased steadily since 1960 and the number of spring sightings has increased sharply since 1980 (65% of all records now being in spring). Blackmoorfoot has played host to the species on six occasions: singles were seen in late March (1996), May (1971 and 1991), July (2000), August (2002) and September (2003).

Merlin *Falco columbarius*

There has been a marked decrease in records of this species. Between 1974 and 1979 the species averaged 17 bird-days per annum but only nine in the years 1980 to 1984. Since this time there has been another fall in records (only 30 during the last 21 years), giving an average number of bird-days per annum of less than two. All records involved singles, with 64% occurring between mid-July and October and 30% in mid-March/April.

Hobby *Falco subbuteo*

Since 1960 there has been a dramatic increase in Yorkshire records and during the last decade a few pairs have remained to breed. There are four records from the reservoir: an immature on 14 September 1990, a single on 23 June 2003, a single chasing Swallows on 5 September 2003 and one on 24 September 2004.

Stone-curlew *Burhinus oedicnemus*

Formerly a common breeder on the Yorkshire Wolds and on rough unenclosed tracts of heath and warren until the mid-19th century, but persecution and egg-collectors caused their demise, the last pair breeding in 1937 (Mather 1986). Following this extinction as a breeding species, there were only 28 further records by 1993, 22 of these since 1960. Two of these originated from Blackmoorfoot: a single on 7 August 1978 eventually departed to the south-west and a single was in a field to the west of the reservoir (Black Moor) for a few hours on 19 April 1989.

Dotterel *Charadrius morinellus*

Virtually confined to the Scottish Highlands as a breeding species in the British Isles, further south it is a relatively scarce but regular passage migrant to well known stop-over points. Since the 1960s there has been a substantial change of status in Yorkshire and, although the species is recorded with increased frequency, this can only be partially attributed to an increase in observers. The four records from Blackmoorfoot involved up to three birds which were present for up to four days' duration in the first half of May in 1995, 2002, 2003 and 2004.

Grey Plover *Pluvialis squatarola*

This coastal wader was first recorded from the reservoir on 21 December 1969 (a single).

In the years up to 1994, the species was recorded as a sporadic visitor, there being a further 36 records, but none thereafter. The majority of records involved singles, only occasionally two or three, which were present for a day's duration. The only birds which frequented the reservoir for longer periods were a single (from a flock of three) which remained for six days in September 1976 and three which were present for four days in September 1991. Analysis of records from the reservoir shows that they fell between 14 July and 31 December with 31% in August, 26% in September and 28% in October.

Knot *Calidris canutus*

This coastal wader was first recorded from the reservoir on 27 August 1969 (a single). There have been a further 30 records since this time. Between 1972 and 1978 there were up to four records per annum but, although there were records in ten of the following years up to 2003, there were no more than three records each year. Most records involved singles, only occasionally up to six, the following being the exceptions: a flock of ten flew west on 2 September 1973 and 11 (9 + 2) flew west on 17 August 1978. With the exception of an adult in 50% summer plumage which stayed for six days in August 1999, all other records were of a single day's duration. Analysis of records from the reservoir shows that they fell between 19 July and 5 November with 84% falling between mid-July and late September.

White-rumped Sandpiper *Calidris fuscicollis*

This species, which breeds in northern North America and winters in southern South America, was first recorded in Yorkshire in 1957. A single at Blackmoorfoot on 19/20 July 1990 was the 15th county record.

Purple Sandpiper *Calidris maritima*

This species favours rocky coasts and is found during the winter months at several Yorkshire localities. Inland records in the county were infrequent in the 1960s and 1970s with a total of 10 birds during these two decades. Between 1980 and 1992 there was an increase in records, although this could probably be attributed to observer coverage. Blackmoorfoot has played host to the species on three occasions: a bird on 12 August 1976 remained until the 18th but, although probably present was not seen on the 15th or 16th and singles were present on 21 October 1987 and 25/26 October 1989.

Buff-breasted Sandpiper *Tryngites subruficollis*

This species, which breeds in Alaska and north-west Canada and winters in Argentina and Uruguay, was first recorded in Yorkshire in 1954. A single at Blackmoorfoot on 28/29 August 1975 was the third county record. On 15 and 17 September of the same year, it or another individual was present.

Snipe *Gallinago gallinago*

Formerly recorded throughout the year in variable numbers, the totals in winter being governed by the water level and the severity of the weather. A build-up in numbers was apparent in July/August with a peak in October/November (exceeding 50 in most years, with a maximum of 92). After 1978, however, the numbers present decreased by about 50% and, although the level of occurrences persisted until the end of 1991, the numbers present were much reduced (usually less than 10), with the only return to former times occurring during the winter of 1989/90 (almost daily with a maximum of 26 on 4 November) and between September and November 1991 (daily, with up to 47 in October/November). Small numbers probably bred in the boggy fields to the west until 1990, and there were occasional records of pairs nesting within the confines of the reservoir. Since this time, the status of the species has changed yet again and it can now best be classed as a sporadic visitor in very small numbers. Although there was a tendency for there to be more records in autumn, there was no peak and this pattern became even less apparent after 1997. Records normally involved less than 10 individuals (only occasionally higher) the maxima being up to 19 in October/November 1996 and up to 23 in November 1997.

Black-tailed Godwit *Limosa limosa*

Following the first record for the reservoir (a single on 14 August 1974) there were a further 18 occurrences up to 2004. All records were for a day's duration and most involved singles, the following being the exceptions: a flock of five flew west and a party of three departed to the south-west on 19 July 1978; two arrived from the west on 25 July 1994, two were present on 7 July 1995 and a flock of c. 45 circled the reservoir on 15 August 2004. Analysis of records from the reservoir shows that 80% fell between July and mid-August with 10% in both April and June.

Bar-tailed Godwit *Limosa lapponica*

There was a small number of records in each of the years between 1967 and 1984, with the exceptions of 1968 and 1973. Since this time, the number of records has decreased, although the pattern of occurrences remained similar. There were up to four records in eight of the years to 1998, but none thereafter. Most records were of one or two individuals (only occasionally up to six) which usually flew west or departed in a westerly direction, the only flocks in excess being 23 which flew west at 12.35 hr on 11 November 1967 (this flock had flown west at Fairburn Ings, Castleford some 50 minutes earlier), seven flew west on 20 April 1974, seven departed south-west on 7 September 1978 and a flock of 20+ flew west on 30 August 1980. There were five spring records: a single flew south-south-west on 7 April 1972, seven flew west on 20 April 1974, a single flew west on 2 May 1987, one was present on 12 March 1988 and a single flew west on 14 April 1998. The only record outside these periods concerned a single which flew south on 25 January 1987. Analysis of records from the reservoir shows that 75% fell between July and September, 14% in October/November and 9% between mid-March and early May.

Redshank *Tringa totanus*

Between 1959 and 1973 the species was recorded as an annual visitor in small numbers during spring and autumn, with occasional summer records. Thereafter (up to 1984), although following a similar pattern, the species was recorded with increased frequency, with a marked tendency for birds to linger during autumn and occasional winter records. Since then, although the species was recorded annually (save for 2005), records decreased markedly, especially after 1996 (only three in 1999 and one in 2002 and 2003). Spring records (March/April) occurred annually with the exception of 1999 and 2003, and never exceeded three birds, one or two being the norm. Records in autumn (July to mid-October) were annual, with the exception of 2002, and normally involved between one and three individuals (usually one), the only numbers in excess being four on 10 July 1990 and nine on 24 August 1996. Summer records (May/June) were infrequent, but one or two were present on a number of days in 1989, 1990 and 1993, although, unlike 1984, they were not thought to breed nearby. The only winter records involved singles in November 1986, January 1987, November 1988, November 1989, January 1995, November 1999 (two dates) and November 2001.

Terek Sandpiper *Xenus cinereus*

There have been two Yorkshire records of this species which breeds from Finland eastwards to eastern Siberia. The first, in 1971, was the seventh record for Britain. The second, which was the 28th for Britain, concerned an adult in full summer plumage which was present at Blackmoorfoot for about five hours on 16 June 1989.

Turnstone *Arenaria interpres*

This coastal wader was recorded as a near annual visitor between 1970 and 1984, there being a small number of records (1-7 each year) which mainly spanned the autumn period. There has been a marked decline in records since this time and the species was only recorded on a maximum of three occasions in five of the years up to 1991. The majority of records were for a day's duration, only very occasionally two, and involved no more than five individuals with the exceptions of 11 on 18 August 1975, 15 the following day, 8 on 30 August 1975 and 9 on 7 October 1978. Analysis of records from the reservoir shows that 90% fell between mid-July and early October with 44% in August and 7% in May/early June.

Grey Phalarope *Phalaropus fulicarius*

Recorded annually in Yorkshire, generally in small numbers, but larger numbers have occurred during strong westerly winds. Inland records in the county are unusual, there being 25 since 1960, most of these in autumn. Blackmoorfoot has played host to the species on a single occasion: one was present on 28/29 November 1969.

Pomarine Skua *Stercorarius pomarinus*

This is a scarce passage migrant in the British Isles which is recorded annually in variable numbers along the Yorkshire coast. Inland records in the county have always been rare, there being only a handful up until 1981. Since that time, although records have been virtually annual, they were sufficiently unusual to be documented by Wilson and Slack (1996). There is a single record from Blackmoorfoot: a dark-phase immature was seen chasing a Lesser Black-backed Gull *Larus fuscus* on 21 October 1998.

Arctic Skua *Stercorarius parasiticus*

This is much the commonest of the four skua species in Yorkshire, both along the coast and inland. There were four inland records in the first half of the 20th century (Chislett 1952) and a further seven during the 1960s. Since 1972, however, inland records have been annual and increasingly frequent. Blackmoorfoot has played host to the species on five occasions: parties of three were present for a day's duration on two occasions in September and once in August and singles have been observed on two days in September.

Long-tailed Skua *Stercorarius longicaudus*

On 23 September 1988 a party of nine (eight adults and an immature) arrived as the gulls were gathering to roost. After causing total pandemonium amongst the assembled gulls, they departed to the south-west 15 minutes later. This is an incredible record for an inland locality and the highest number recorded inland in Yorkshire. The record coincided with an exceptional movement along the east coast (particularly Yorkshire), where several localities had numbers far in excess of previous records.

Skua sp. *Stercorarius* sp.

For completeness, the two records relating to birds which could not be identified to species are given: on 26 October 1982 a single arrived from the north-east and departed to the south-west and in 1984 a dark-phase, most probably Arctic Skua, flew north on 31 July.

Mediterranean Gull *Larus melanocephalus*

This species was formerly a great rarity in Britain, there being only four records prior to 1940. There were Yorkshire records in 1895 (the second British), 1958 and 1959. Since that time, the species became increasingly frequent, especially since the mid-1970s. All Yorkshire records prior to 1975, however, had involved coastal birds; a first-summer at Blackmoorfoot on 4 August 1975 being the first inland occurrence. Records from the reservoir continued and, up to 1984, there were records in six of these years, generally for a day's duration, but in 1984 at least five individuals gave a total of nine bird-days. With the exception of a juvenile on 2 September the others fell between 9 November and 14 April. Since 1984, the species has been recorded almost annually with most records falling between October and March, a high proportion being from January onwards. All records between October and December involved short stay individuals, with no birds frequenting the roost for more than four days duration. Roosting birds between January and March occasionally stayed for extended periods, with some individuals being present in the roost for up to three months. Analysis of records from the reservoir shows that the age structure is biased towards first-winters and adults, there being only four records of birds in second-winter plumage. Interestingly, Wilson and Slack (1996) show that by the end of June 1992 46% of all specifically aged Yorkshire birds were adults, 36% were first-winters and 18% were second-winters. They break down these figures further and show that inland records of second-winters form 12.6%, but on the coast this rises to 20.8%. Despite the high number of bird-days at Blackmoorfoot during some years (maximum of 33 in 1990), the number of birds per annum (mainly identifiable by head markings) remains low, the highest being six in both 1987 and 2002.

Sabine's Gull *Larus sabini*

Recorded annually from coastal waters in Yorkshire since the mid-1970s, always in small numbers, the majority being associated with the classic east coast seawatching conditions of strong onshore winds. Inland records are extremely rare, but Blackmoorfoot has played host to the species on five occasions. All occurrences, which have fallen between late

August and late October, have involved singles for one day's duration. Two individuals, both in late October (1987 and 1989), roosted with the assembled mass of gulls, but could not be found at first light the following morning. An individual in late October 1987 appeared after very severe south-westerly gales had swept the southern half of Britain bringing unprecedented numbers into the country, probably from the Bay of Biscay (Hume & Christie 1989).

Ring-billed Gull *Larus delawarensis*

The first British record of this species which breeds in North America and Canada was not until 1973. By the end of 1987, however, there were 614 records and the species was removed from the list of species considered by the *British Birds* Rarities Committee (Rogers *et al.* 1993). Despite these national figures the species remains a rarity in Yorkshire, there being 25 accepted records to the end of 2001 (Dobbs 2003). A sub-adult at Blackmoorfoot on 23 December 1979 was the second county record and a second-winter on 11 February 1982 was the fourth.

Iceland Gull *Larus glaucoides*

The gull roost at Blackmoorfoot has long been renowned as a good locality for 'white-winged gulls' (Table 1). The first records for the reservoir involved single birds for one day's duration in February 1960, December 1965 and March 1968. Since 1970, however, birds have been recorded almost annually. With the exception of an isolated second-winter on 24 October and a third-winter in late April, all records spanned the period 1 December to 9 April. Records in December were unusual, the majority of birds occurring in January or February. Most birds only frequented the roost for short periods (usually less than four days, only occasionally up to six), but on occasions individuals remained for up to four weeks. The minimum number of individuals per annum was usually less than four, but at least six different birds occurred in 1974 and 1996.

Glaucous Gull *Larus hyperboreus*

The first records for the reservoir involved single birds for one day's duration in January 1954 (not 1950 as stated in Bray 1974) and January 1965. Between 1970 and 1984 the species was recorded annually; all records (save for one of two birds) being of singles and, with the exception of two isolated individuals in the second half of October, fell between 11 December and 20 April. Since 1984 there has been a decrease in the number of occurrences (Table 1), and there were no records during six of these 21 years. With the exception of an isolated second-winter on 30 October 1996, records spanned the period 26 November to 3 April. As with Iceland Gull, records before the new year were unusual, the majority of birds occurring between January and early March. Most birds were present for one or two days' duration, only infrequently for up to six days (normally in the roost) although occasionally birds remained in the roost for up to seven weeks. The minimum number of individuals per annum was usually less than three, but at least four different birds occurred in 1978, 1993 and 1994.

TABLE 1.

The estimated number of different individual Iceland and Glaucous Gulls recorded during selected periods with the number of winters in which each species was recorded.

	1954/55-1965/66		**1966/67-1975/76**		**1976/77-1985/86**		**1986/87-1995/96**		**1996/97-2004/05**	
	birds	winters	birds	winters	birds	winters	birds	winters	birds	winters
Iceland	2	2	24	7	12	6	20	7	21	7
Glaucous	2	2	19	7	22	8	16	8	16	8

Kittiwake *Rissa tridactyla*

This coastal gull has appeared annually at inland waters in Yorkshire since 1950 (Mather

1986). Between 1957 (the first recorded Blackmoorfoot occurrence) and 1973 the species was a sporadic visitor with records of between one and four birds in January (1), February (3), March (1), May (1), August (1) and November (1). Thereafter (1974-2005), records were more frequent and the species became a near annual visitor with up to nine records per annum which spanned all months of the year, with the exception of June. A high proportion of records (76%) fell between January and April, with 70% of these occurring in March. A smaller peak occurred between mid-August and mid-December, with 79% of these records falling in late October/mid-November. There were four records outside these periods, all involving less than four birds: three in May and one in July. Numbers involved were very variable, usually one or two, occasionally up to six, and rarely up to 32, but there were an unprecedented 226 on 14 March 1985. Most of these last mentioned birds flew west as the gull roost was gathering, only 39 remaining to roost. Interestingly, at about the same time, 165 were recorded at Pugney's near Wakefield.

Sandwich Tern *Sterna sandvicensis*

During the 19th and early part of the 20th centuries this species appeared to have been genuinely rare inland in Yorkshire (Mather 1986). Inland records have now become more frequent, and the species has been recorded annually since 1966. Blackmoorfoot has played host to the species on seven occasions since the first in 1977. Records have occurred in all months between April and October with the exception of May, and have never involved more than three individuals for more than a day's duration.

Little Tern *Sterna albifrons*

Nelson (1907) states that the species was "very rare inland" in Yorkshire and Chislett (1952) could add only four further inland records. Inland records have now become annual, although totals have been roughly stable since the mid-1970s. The first record for the reservoir concerned a single on 9 May 1976. There have been a further 11 records since this time, mainly involving singles, but occasionally two or three, which were present for a day's duration, the only exceptions being a party of nine on 20 September 1976 and an immature which remained for eight days in September 1983. Analysis of records from the reservoir shows that they fell between 8 May and 30 September with 25% in May, 8% in June, 25% in July and 42% in September.

Skylark *Alauda arvensis*

This species breeds in the fields around the reservoir and between 1959 and 1984 was described as a 'common' breeder (Bray 1974, Denton 1985). At the time it was not felt necessary to quantify this statement as nationally the species was a common farmland bird and there was no suggestion of a decline. In line with a number of other farmland species, however, there has been a tremendous decline in the national breeding population (52% since 1970) (Gregory *et al.* 2003). This downward trend has also been apparent at Blackmoorfoot, and no more than five pairs per annum now breed. The breeding habitat has changed little in the last 40 years but, as the majority vacate the area in winter, it is to the wintering areas that we have to look for explanations concerning this decrease. Birds were noted returning to the breeding areas in February or March and most had vacated by mid-October. Between November and January birds were scarce, being recorded in less than 50% of winters. Numbers at this time of year were always fewer than three, with the exception of a flock of 17 which flew west on 1st January 1999 and up to 20+ which fed in a kale field to the north-east of the reservoir for six weeks from mid-December 2002. Although movements were noted annually (usually in October and normally in a westerly direction), the number of birds involved was usually less than 50, but in October 1971 they included 445 and 384 which flew west on 23rd and 24th respectively.

Water Pipit *Anthus spinoletta*

Formerly regarded as conspecific with Rock Pipit *A. petrosus*, but since the British Ornithologists' Union decision to split it to form a separate species (Knox 1988), it has received more attention from birdwatchers. In Yorkshire the species is almost exclusively a winter visitor and spring passage migrant in small numbers. The only record from the reservoir involved a single on 5 November 1978.

Rock Pipit *Anthus petrosus*
There were no inland records of this coastal species in Yorkshire until about 1960. Since that time inland records have become annual and the species has sometimes occurred at up to ten localities in a year (Mather 1986). Blackmoorfoot has played host to the species on six occasions following the first in 1972. All records have been in October and involved one or two individuals which were present for no more than a day's duration.

Yellow Wagtail *Motacilla flava*
From 1957 (the first recorded occurrence) until 1973, the species was mainly a passage migrant in small numbers between mid-July and September, sometimes in May, with nesting (a single pair) being suspected or proven in each of the years between 1969 and 1972. Between 1974 and 1984, although there was no evidence of breeding, the species was recorded annually with a slight increase in records and an upsurge in spring occurrences; the maximum bird-days was 42 (1976) with an average of 21 for the period. The status of the species has changed markedly since this time and, in line with the local and national long-term population trend, has shown a corresponding decline. Although recorded almost annually during the last 21 years, the maximum number of bird-days was only 19 (in both 1989 and 1990) with an average of just over five for the whole period. Spring records occurred in 12 years and fell between 21 April and 12 June with autumn records occurring in 13 years and spanning the period 16 July to 2 October, a large proportion of these being between mid-July and late August. The majority of records involved singles, only occasionally two, rarely three or four.

Redstart *Phoenicurus phoenicurus*
There were 12 records of singles (all during the autumn period) between 1949 and 1973. Thereafter (1974-1984), the species became an annual visitor and there was a marked increase in records (up to ten bird-days per annum), most of which involved singles during the autumn period, but singles were seen in spring during five of these years. During the last 21 years, the species reverted to being a sporadic visitor, there being no more than three records per annum in nine of the years. The autumn records (14) fell between 11 July and 15 September and were for a single day's duration, but a juvenile ringed on 19 July 1990, although not recorded in the interim, was retrapped 13 days later. Thirteen of the autumn records concerned birds caught for ringing and usually involved singles, only exceptionally were two caught. The only spring records involved singles in May 1989, April 1999 and May 2001.

Wheatear *Oenanthe oenanthe*
There were three records prior to 1960, all concerning singles for a day's duration: in March 1948, May 1949 and August 1957. From 1960 until 1981 the species was recorded almost annually in small numbers, being seen during the spring, but particularly the autumn, migration period. A single on 11 August 1985, however, was the first since that time and the species was absent in 1986. Between 1987 and 1995 the species was recorded annually and, although there was an upsurge in spring records, the number of autumn records waned, with occurrences in only four of these years. With the exception of an isolated single on 3 June 1992, the spring records fell between 20 March and 14 May. Up to five individuals were present at this time (usually one to three), but six or seven were occasionally recorded. Autumn records during this period, with the exception of an isolated single on 11 July 1992, fell between 11 August and 28 September and always involved singles. Between 1996 and 2005, the annual occurrences continued, but there was a marked increase, not only in spring records, but also in the number of birds involved. In most years, although there were spring records in all and autumn records in all save for 2000, spring records were more numerous. The records followed a similar pattern to those noted above. Most birds had departed by the end of September however, but there were October records in five of these years (the latest concerned two on 16 October 2002). As noted above, the numbers involved in spring increased markedly and although a good proportion of records were still in low single figures, they not infrequently reached high single figures (occasionally up to 28). In sharp contrast, autumn numbers were always low, the maxima

being five in late August/early September 2002 and 10 on 16 September 2003.

Pallas's Warbler *Phylloscopus proregulus*

This Siberian species is now recorded in Britain almost annually, with a high proportion of records since 1980 which can be partially attributed to the increase in observers. The first Yorkshire record was in October 1960; between then and 1993 no less than 132 were recorded in Yorkshire, a total surpassing that for any other British county. With the exception of a single ringed at Blackmoorfoot on 12 October 1977, the others were all coastal. Inland records in Britain are exceptional, but what makes it more remarkable is the fact that none were found on the Yorkshire coast that year and only five others were reported in Britain, all of which were coastal.

Firecrest *Regulus ignicapilla*

This species is now recorded annually in Yorkshire as a spring and autumn migrant, with most occurring along the coast. Inland records, especially over the last three decades have increased appreciably. Blackmoorfoot has played host to the species on four occasions: single males were ringed in October 1975, March 1977 and April 1977 and a single was seen in April 1996.

Spotted Flycatcher *Muscicapa striata*

Between 1948 (the first recorded occurrence) and 1973, the species was recorded during ten of the 26 years: on 19 occasions as an autumn passage migrant and two as a spring migrant (never more than two birds were involved). Between 1974 and 1984, the species was recorded annually, mainly as an autumn passage migrant, but also in spring, with single pairs occasionally breeding (records never involved more than three individuals). Since then, although recorded almost annually, the number of bird-days per annum never rose above the 16 recorded in 1987 unless the species was breeding. Spring records were infrequent and, excluding the years in which the species bred (see below), only occurred in 1985 (three records), 1986 (two) and 1993 (two), singles were involved on each occasion, the extreme dates being 18 May and 16 June. In years when the species bred (1988-1992 and 2001-2003) breeding pairs were generally absent until June and vacated the area shortly after breeding. Up to two pairs bred in each of these years but had mixed fortunes: in 2001 a pair raised two broods but in 2002 a pair made three failed nesting attempts. Most records were during the autumn period and, excluding the breeding birds, fell between 7 July and 17 September with the exception of an isolated single on 4 October 1999. Number involved were always small (one or two) but four were present on 30 July 1987 and four remained between 13 and 16 September 2003.

Magpie *Pica pica*

The national (and local) increase in the breeding population has not been reflected at the reservoir, as the number of breeding pairs has remained unchanged at about eight for the last 30 years. A winter roost in the south bank plantation (first noted in February 1970) occurred annually, but did not materialize after February 1997. Variable numbers were present in the roost between October and March, less than 100 being the norm, but occasionally in excess, with 130 in early February 1981 being the maximum. The largest concentrations outside this period involved 26 in August 2001.

Carrion Crow *Corvus corone*

Between 1959 and 1973, the species was present throughout the year in small numbers, but birds were less frequent during the summer months and there were no breeding attempts. Thereafter (up to 1984), this pattern of occurrence continued, but single pairs occasionally bred within the reservoir grounds or nearby. Since then, the status of the species has changed markedly and, in line with the national long-term trend, the number of breeding pairs has increased: about eight pairs now breed annually around the reservoir and in Orange Wood. Concentrations of birds were more noticeable when a shoreline was available for feeding, but also on the ice if the reservoir was frozen over. The number of birds present has increased over time; between 1959 and 1984, with the exception of 21 in November 1972, all assemblages had been of less than six, in the next decade up to 11 were regularly recorded, and in 2001 there were 32 in January and 23 in March. An unusual summer assemblage involved 36 in May 2004.

House Sparrow *Passer domesticus*

Formerly recorded throughout the year in small numbers with breeding in both reservoir houses and in the village; occasionally birds roosted along the west bank (maximum of 100) and up to 350 were present with Tree Sparrows in early August 1976. During the last 21 years, although birds were present throughout the year, numbers rarely exceeded double figures and, in line with the national long-term trend, the breeding population decreased. No more than four pairs per annum now breed. There were no roosting congregations or autumn flocks.

Tree Sparrow *Passer montanus*

Between 1959 and 1984, a few pairs bred on an almost annual basis and autumn flocks were evident in most years (up to 200 strong in the mid-1970s), winter flocks of generally less than 50 were present during the first few years of this period (rarely recorded thereafter) and 300 were in the fields to the east in January 1967. The decline in the national breeding population (95% between 1970 and 1999) (Gregory *et al.* 2003) has been reflected at the reservoir. Although single pairs bred in 1985 and 1986, the autumn assemblages never increased to more than six but, rather unusually, two were present for extended periods during the winter months of both years. In 1987 there was a single record of two on 2 March, this being the last recorded instance of the species at Blackmoorfoot.

Twite *Carduelis flavirostris*

Up until 1984, the species was a regular spring (March to early June) and autumn (mid-July to early November) visitor that was recorded annually between 1970 and 1984. During the last 21 years, the species was recorded annually save for 1993, 1995 and 1996, but the number of sightings decreased, there being four or less in nine of these 18 years. Although most records followed a similar pattern to that outlined above, there were occasional winter records. Returning birds (March to early June) appeared in 16 years and were generally in single figures, only occasionally up to 27, but 40+ were present on 4 April 1988 and up to 36 were seen on most dates between 7 and 20 April 2002. Autumn flocks (mid-July to early November) only materialised in 12 years, but, whereas in the past they had tended to be larger than those in spring, this was no longer the case. Most records involved single figure flocks, only occasionally in double figures, the maxima of 57 flying south on 5 October 1986. Records outside these passage periods were rare and involved birds flying in a south or westerly direction, the maximum being 36 to the west on 11 January 1990, but the winters of 1987/88 and 2002/03 were unusual. In 1987/88 a kale field to the east held up to 137 between late November and late January while in 2002/03 a kale field to the north-east had up to seven daily between 30 December and 18 January.

Lesser Redpoll *Carduelis cabaret*

Between 1954 (the first recorded occurrence) and 1970, there were sporadic records of up to five birds in six of the 17 years, all in the second half of the year. In the following four years (1971-1974), there was an increase in records and the species was recorded annually in variable numbers, again mainly in the second half of the year but also between late February and May, and sometimes June; even though breeding was suspected, no proof was forthcoming. The numbers of birds also increased during this period, reaching double figures on occasions, but a heavy passage between mid-October and November 1971 produced high double figures on several dates with 113 on one of these. In 1975 and subsequent years through to 1980, birds were more numerous (although never exceeding 16) and up to two pairs bred annually. Thereafter (up to 1984), a noticeable decline took place, records becoming infrequent and no breeding attempts occurred; most records fell between April and October, only very occasionally in February/March and the number of birds present rarely reached double figures. During the last 21 years, the species was recorded annually, but this roller coaster status continued. Between 1985 and 1991, the number of records increased, the majority spanning the period mid-April to early November and single pairs bred in 1985 and 1990. The number of birds rarely reached double figures, but autumn movements, generally in a southerly direction between mid-

August and October, were noted in most years and produced a maximum of 16 south on 20 September 1985, 20 south on 5 October 1985 and 47 (one flock) south on 13 August 1988. Since then, the species has reverted to being a sporadic visitor with a maximum of 19 records per annum (1997), but usually less than eight. Most records fell between April and November, only occasionally between December and March, but no breeding attempts occurred, birds remaining for no more than a few days duration. Numbers involved were usually in low single figures and never exceeded the nine recorded in November 1994.

Bullfinch *Pyrrhula pyrrhula*

Prior to 1971, there had been one or two records in 1960 and each of the years between 1963 and 1966, all in the second half of the year, save for one in March and never involving more than four birds. Between 1971 and 1978 there was a marked upsurge in records, birds being present throughout the year in very small numbers (maximum of seven, but usually one or two), with at least two pairs breeding in 1971 and 1972 and single pairs in 1974 and 1977. Then followed a total crash in the population, with no records after November 1978 until a pair bred in 1984. During the last 21 years, the species was recorded annually as a regular visitor (in four of these years, however, records were very sporadic) and during the first decade up to two pairs bred annually. In some years, birds were present throughout, but in 13 of these there were no records until April, May, June or even July. As in the past, numbers present were usually small, generally one or two, but occasionally up to six, the maxima being seven on both 1 November 1987 and 7 August 1988. Single pairs bred in four of these years, with two pairs in three.

Reed Bunting *Emberiza schoeniclus*

From 1958 (the first recorded occurrence) until 1970, small numbers (one or two) were recorded almost annually between February and October with single pairs breeding, or suspected of doing so, in most years. Between 1971 and 1978 a single pair bred annually and small numbers, usually one or two and occasionally up to nine, were present throughout the year, but passage on 23 October 1971 produced a total of 23. In the following five years (1979-1983), the species became exceedingly rare with very few sightings of only one or two birds, most of which were during the winter months. The fortunes of the species then rallied until 1991, after which records again became infrequent. Records between 1984 and 1991, which never involved more than four individuals, fell between March and December, with breeding occurring annually: single pairs in 1984-1988 and 1991 with two pairs in 1989 and 1990. Since this time, the species has reverted to being a sporadic visitor (only six records in 1992 and four in 2000) and, although there were records in all months, those between December and March were very infrequent. The majority of records involved one or two individuals, the only exceptions being four in December 1995 and six in May 2000. Even though single males took up territories in four of these years they failed to attract a female.

Corn Bunting *Miliaria calandra*

Formerly recorded to the east of the reservoir, where a small breeding colony (two or three pairs) was present between 1963 and 1971. There have been no records since three singing males were present near Jubilee Quarries in 1974. The national demise of this species has also been reflected in the Huddersfield Birdwatchers' Club recording area; in some years there were no records of what was formerly a widespread breeder.

Other Orders

It was not until the mid-1970s that my interest in natural history broadened and I became interested in Coleoptera (beetles). Since this time a number of specialists have been invited to the reservoir with a view to identifying organisms within their specialisation and insect specimens have also been distributed to a number of entomologists for identification. Spiders were collected during the early part of this period and forwarded to Clifford Smith for identification and eventual inclusion in his *Atlas of Yorkshire Spiders* (Smith 1982). Work on the flowering plants, ferns etc. mainly carried out by Paul Bray, but also David Owen and M. Jill Lucas, has resulted in a total of 426 species. Some of the other orders, as

TABLE 2.

The number of species recorded from Blackmoorfoot Reservoir, with the recognized (JNCC) statuses for invertebrates. Syn = Synanthropic; Nat = Naturalized; pR = pRDBK; Na = Nationally Scarce (Category A); Nb = Nationally Scarce (Category B); L = Local; C = Common; Mig = Migrant; U = Unknown; T = total number of species.

	Syn	**Nat**	**pR**	**Na**	**Nb**	**L**	**C**	**Mig**	**U**	**T**
Fungi										75
Flowering plants, ferns, etc.										426
Slugs, Snails							8			8
Millipedes							7			7
Centipedes							3			3
Damselflies, Dragonflies							11			11
Grasshoppers							2			2
Earwigs							1			1
True Bugs		1					20			21
Alderflies, Lacewings							2			2
Beetles	1	5	1	2	32	181	438		57	717
Scorpion Flies							2			2
Caddis Flies						2	8			10
Butterflies, Moths					2	13	126	4	2	147
Flies					1	17	87		43	148
Fleas									2	2
Sawflies						1	1		3	5
Ichneumons, Ants, Bees, Wasps						3	16		42	61
Woodlice							4			4
Freshwater Shrimps							1			1
Harvestmen							11			11
Spiders	1	1				43	121		1	167
Gall Mite									1	1
Fish										1
Amphibians										3
Birds										206
Mammals										18
										2060

can be seen from Table 2, require further work. The total number of life-forms recorded from the reservoir stands at an impressive 2060.

Work on the beetles by myself and invited specialists culminated in a total of 717 species being identified, 438 of which, as is to be expected, have the national status of Common, but 181 are Local in distribution, 32 are Nationally Scarce (Category B) (thought to occur in between 31 and 100 10 km squares of the National Grid), two are Nationally Scarce (Category A) (thought to occur in 30 or fewer 10 km squares of the National Grid) and one is pRDBK (taxa recently discovered or recognised in Great Britain which may prove to be more widespread in the future. The prefix ‘p’ implies that the grading is provisional).

The west bank of the reservoir, especially the northern half, holds a good assemblage of water margin/wetland beetle species. Amongst these are several ground beetles (Carabidae) of the genus *Bembidion*. Four of these, *Bembidion obliquum* Sturm, *B. gilvipes* Sturm, *B. clarki* Dawson and *B. fumigatum* (Duftschmid) have the national status of Notable B, while *B. dentellum* Thunberg, *B. atrocoeruleum* Stephens and *B. nitidulum* Marsham are local in distribution. Other wetland species, all with the national status Notable B, are the Hydrophilid *Cercyon ustulatus* (Preyssler) and the rove beetles (Staphylinidae) *Stenus europaeus* Puthz, *S. oscillator* Rye, *Falagria sulcatula* (Gravenhorst), *Philhygra* (=*Atheta*) *hygrobia* (Thomson) and *Atheta aquatilis* (Thomson). The record of *Falagria sulcatula* (9 September 1985) was only the second county record and that of *Philhygra hygrobia* (1 February 1989) the fifth (Denton 2003). *Stenus oscillator*, which was first recorded on 1 December 1981 and has been found fairly regularly since, is known to occur at no other Yorkshire locality. Despite diligent searching the species has only been located under grass roots and in moss along the top of a wall and, even though the wall extends for 700 m, it has only been found along a 30 m length. The reasons for this, although intriguing, are unknown.

The belts of woodland around the reservoir are dominated by Rhododendron, but the dead and dying deciduous trees found within offer a niche for saproxylic species (those found in dead wood or the fungi associated with it). Orange Wood, which is predominantly oak *Quercus*, offers a far better habitat for these species. In total 49 saproxylic species have been located. Most of these are nationally common, one (*Euophryum confine* (Broun)) is naturalized and one (*Hylobius abietis* (Linnaeus)) is associated with pines, but 16 are locally distributed and six are Notable B. Despite the national status of 'Local', the rove beetle *Thamiaraea cinnamomea* (Gravenhorst) found on 11 November 1985 provided Yorkshire with its only record. Of the Notable Bs, the rove beetle *Gyrophaena angustata* (Stephens) is widely distributed and frequently recorded in the county and the rove beetle *Phyllodrepoidea crenata* (Gravenhorst), which is widely distributed in northern England and Scotland, has been recorded on a number of occasions from VCs 62, 63 and 64 (although there are only a handful of records since 1980). The Staphylinid (formerly Pselaphid) *Euplectus karsteni* (Reichenbach), which is widely distributed throughout Great Britain but commoner in the south, has only been recorded from four Yorkshire localities, the Blackmoorfoot record (1 October 1986) being the first since 1967. The Latridiids *Enicmus brevicornis* (Mannerheim) and *Latridius consimilis* Mannerheim are both widespread in central and southern England, but in Yorkshire records for each species stem from only four localities. Interestingly, *E. brevicornis* appears to have spread in the last 30 years, and the Yorkshire records were all during 1999 (R.J. Marsh *pers. comm.*).

The Salpingid, *Salpingus reyi* (Abeille) located in Orange Wood on 1 June 1990 was only the ninth Yorkshire locality and the first county record since 1965. The species is predominantly southern in distribution and is associated with burnt wood, particularly scorched twigs. *Magdalis ceraci* (Linnaeus), a widespread Curculionid in central and southern England which becomes more local in the north, was found in Orange Wood on 1 September 1991. The species is primarily associated with oak, but has also been found on species of Rosacaea. Within Yorkshire all records stem from the southern half of the county where it is widely distributed, but less than half of the records are post-1980. The Curculionid (formerly Scolytid), *Scolytus mali* (Bechstein), recorded from the west bank of the reservoir on 17 October 1984, was only the fourth Yorkshire record of what is a widely distributed species in England. The larvae develop in galleries in the sapwood just under the bark but, unlike *S. scolytus* (Fabricius) and *S. multistriatus* (Marsham), the species is not a vector for Dutch Elm Disease *Ophiostoma ulmi*.

As a non-botanist it is difficult to comment on the wealth of plant species that have been recorded from the environs of the reservoir. However, with the help of M. Jill Lucas and Phyl Abbott, I am able to make the following statement. Of the 426 plants species recorded, 99 (23%) are garden escapes/introduced aliens, e.g. American Winter-cress *Barbarea verna,* Flax *Linum usitatissimum,* Thunberg's Barberry *Berberis thunbergii*, Great Barberry *B. glaucocarpa,* three Cotoneasters – Willow-leaved *Cotoneaster salicifolius,* Bearberry *C.*

dammeri and Franchet's *C. franchetii*. Although most of these species tend to be generally distributed and frequent escapes in the county, Thunberg's Barberry and the three Cotoneasters are rare, whilst Great Barberry is not listed in *Alien Plants of Yorkshire* (Wilmore 2000). In years to come it will be interesting to see if these species persist, as they are considered unlikely to spread and cover large areas. By contrast, some alien plants are very invasive, and the recent spread of Indian Balsam *Impatiens glandulifera* along the west bank footpath may eventually cause the demise of plants such as Ragged Robin *Lychnis flos-cuculi* and Sneezewort *Achillea ptarmica*.

The reservoir grounds hold a good assemblage of fern species, amongst which are the Rustyback *Ceterach officinarum*, discovered in 2002, and Royal Fern *Osmunda regalis*, first noted in 2003. Rustyback, an uncommon native in West Yorkshire requiring limestone or limestone mortar grows on a mortared wall at Blackmoorfoot and is the only one so far as is known in the Huddersfield area. Royal Fern, although a native to this country, occurs at only two other sites in the Huddersfield area but is believed to have been deliberately planted at all three (M.J. Lucas *pers. comm.*).

A small number of species occur which are doubtfully native in West Yorkshire e.g. Field Penny-cress *Thlaspi arvense* (recorded 2001), Midland Hawthorn *Crataegus laevigata* and Yellow Bartsia *Parentucellia viscosa* (both observed in 2002) and Smooth Brome *Bromus racemosus* (seen 2004).

The native and more interesting species include the following: Shoreweed *Littorella uniflora* (discovered in 1978) is generally restricted to the drawdown zone of oligotrophic reservoirs/lakes on non-calcarious substrates and is very locally distributed in West Yorkshire, being known from four sites only in the Huddersfield district. Spindle *Euonymus europaeus* (recorded 2001), normally occurs in woodland and in hedges on limestone, and has been encountered only once before in the district. Rat's-tail Fescue *Vulpia myuros* is found in bare areas and on waste ground, but is rare in West Yorkshire. The Blackmoorfoot record (noted in 2002) constitutes the second Huddersfield locality. Water Purslane *Lythrum portula* (observed in 2003) which is usually found on the muddy margins on the drawdown zone of reservoirs has only been recorded from two other sites in Huddersfield. Cornflower *Centaurea cyanus* is nowadays never seen as a cornfield weed, the single plant at Blackmoorfoot (recorded in 2002) being the only Huddersfield record. Hedge Bedstraw *Galium mollugo* (seen 2003) is found mostly in hedges and on field and woodland margins and is almost exclusively confined to Magnesium Limestone. In Huddersfield it is known from three other sites. Common Cudweed *Filago vulgaris* was, according to Lees (1888), very common in sandy or gravelly fields, but Lavin & Wilmore (1994) states "not found recently and may now be extinct". Since this time however, it has been found increasingly on gravelly waste ground, in quarries and beside tracks (Abbott 2005), but the Blackmoorfoot plant (discovered in 2003) is only the second for the district. Black Grass *Alopecurus myosuroides* is found in arable fields and waste places, but is rare in West Yorkshire; the 2003 record is only the second for the Huddersfield area. Musk-mallow *Malva moschata* has a scattered and local distribution in the county, occurring in rough grassland, marginal land and waste ground. Although noted from three other localities in Huddersfield, all prior to 2004, this was the first year it had been recorded at Blackmoorfoot. Northern Dead-nettle *Lamium confertum*, was also observed in 2004 growing on land adjacent to the reservoir. Stace (1991) states that the species is a native of cultivated and waste ground, and is locally frequent near the coast in N, W and E Scotland, Isle if Man and, formerly, NW England. The occurrence of the species some distance to the south of the normal range is difficult to explain, but it has been suggested that it may have been introduced in farm produce or bird-sown from a bird-seed mix (D.R. Grant *pers. comm.*). Unfortunately the plant did not persist, as it could not be found in 2005.

ACKNOWLEDGEMENTS

My interest in natural history commenced at an early age, and I was fortunate in meeting the right people at the right time: the founder of the Huddersfield Birdwatchers' Club, the late T.D. Bisiker, trained me as a bird-ringer in the mid-1960s, and it was he who had the foresight to send me to Johnnie Mather at Knaresborough Ringing Station as a 'finishing school'. At about the same time, I was fortunate in meeting John Cudworth, who taught me much about bird calls as we watched visible migration from the Narrow Neck at Spurn. When my interest in Coleoptera developed in the mid-1970s, the obvious focal point was the YNU Entomological Section. The late Ted Aubrook (who I was fortunate to have known since 1963) became my mentor, and the late John Flint taught me a tremendous amount about beetle identification. My introduction to Colin Johnson in the early 1980s was a turning point: as a specialist in some of the smaller Coleoptera, Colin was able not only to help with my general queries, but also to offer advice on Aleocharinae identification. I would also like to thank John Dale for ferrying me around Yorkshire to many YNU meetings and the photographers Steve Knell and Philip Harrison for supplying slides which so ably depicted the chosen species for my Presidential address.

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THE WILLIAM HINCKS HERBARIUM AT ETON COLLEGE: BOTANY IN EARLY NINETEENTH CENTURY YORKSHIRE

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INTRODUCTION

One can only speculate upon how an old herbarium of some 3800 sheets, that comprises predominantly early 19th century Yorkshire material, might have come to the Eton College Natural History Museum (ECNHM). The collection came to light during a major refurbishment of the Museum (1994-2000) when the ancient cupboards which housed it had to be cleared before demolition. There is no evidence that the collection has ever been formally accessioned, catalogued or given the scholarly attention it clearly deserves.

The existence at Eton of a botanical collection of historical significance was unknown to curators of the herbaria at the Royal Botanic Gardens, Kew (RBGK), the Yorkshire Museum (YM), the Ulster Museum or Trinity College Dublin (TCD). We named the herbarium after its creator and principal collector, the Rev. William Hincks (1794-1871). [The National Register of Archives gives his birth date as 1784, but this is incorrect; his morally upright father (see below) would have been only 17!]. The ECNHM herbarium specimens date for the most part from c.1780-1850, with a strong mode in the late 1830s. Among the 134 identified collectors are many scientists and naturalists of high distinction who comprise a roll-call from the golden age of natural history between the *Systema Naturae* of Linnaeus (1758) and *Origin of Species* by Darwin (1859).

Although the ECNHM collection was neglected, for possibly 100 years or more, and housed in a hostile environment lacking temperature or humidity control for much of that time, it is fortunate that most of the material has survived in fair condition. During 2001-2004, we sorted and arranged the sheets into contemporary genera and families, checked identifications and pencilled in new names on all sheets bearing obsolete or incorrect ones. The collection is now housed in new purpose-built cupboards in a monitored environment and arranged in a systematic order that follows Clapham *et al.* (1962).

The Rev. **William Hincks** was the son of the Rev. Dr **Thomas Dix Hincks** (1767-1857); the latter was a Unitarian minister like his son, a botanist of distinction (Desmond 1977) and member of the Royal Irish Academy. After an influential ministry in Cork, where in 1803 he founded the Royal Cork Institution and contributed a sizeable herbarium to its collections (MacSweeney & Reilly 1957),

FIGURE 1.
The Rev.William Hincks aged about 60 (Courtesy of University of Toronto Archives).

*Corresponding author

Thomas Hicks became Professor of Oriental Languages (Hebrew and Arabic) at the Belfast Academical Institution (BAI). [The BAI was founded in 1810 and, in federation with sister Queen's colleges at Cork and Galway, became the federal Queen's University in 1850].

William Hincks was born in Cork, educated in Belfast and trained for the Unitarian ministry at Manchester College in York (1810-1815). He then exercised successive ministries at Cork (1815-1818), Exeter (1818-1822) and Liverpool (1822-1827) (Orange 1973; Baker 1999b). He was elected a Fellow of the Linnean Society in 1826. In 1817 he married Maria Ann Yandell with whom he had five boys and three girls. Three of William's brothers became clerics, two in the Anglican Church and the other, like William, joined the Unitarian Church (Baker 1999c). The youngest brother Francis emigrated to Canada where he became an important politician (see below).

In 1827, William returned to York, somewhat reluctantly as he was later to observe (Baker 1999c), to teach natural philosophy, botany and mathematics at his *alma mater*. He also became the first Honorary Curator of Botany at the Yorkshire Philosophical Society in 1828 and added a lectureship in botany at the newly founded York School of Medicine in 1834 (Orange 1973).

Manchester College was a 'dissenting academy' that offered a university education to men excluded by the religious tests from the universities of Oxford and Cambridge. Founded in Warrington in 1757, the college moved to Manchester in 1786, York in 1803, back to Manchester in 1840, London in 1853 and, finally, Oxford in 1889. In 1840 it had affiliated with the University of London and acquired the right to present candidates for London degrees. The Manchester curriculum in the early 19th century included science and mathematics and was more modern than anything then on offer outside London (Orange 1973, Baker 1999c). Notable teaching staff had included Joseph Priestley, Unitarian minister and debatably the discoverer of oxygen, the Quaker chemist John Dalton, the classical scholar Francis Newman, brother of Cardinal Newman, and the Unitarian minister William Gaskell, husband of the novelist Elizabeth Gaskell. Around this time York's reputation as a centre of scientific excellence was such that it was chosen by the British Association for the Advancement of Science (BAAS) as the venue for its inaugural meeting in 1831. William Hincks served on one of the first BAAS sectional committees (Orange 1973).

In 1839 William Hincks left York for a Unitarian ministry in London (1839-1847), where he also tutored students at University College London (UCL) and became editor of *The Inquirer*, the Unitarian newspaper. In May 1847, he embarked upon a study tour in America, which was to last until December 1848 (Baker 1999b, Coggon 2002). Intriguingly, there are seven plants in the ECNHM collection donated by the well-known American botanist John Torrey (1796-1873), whom Hincks had met in America (Table 1). In 1849, in his mid-50s, Hincks returned to full-time academia at Queen's College, Cork, now University College Cork (UCC), sister college to the former Queen's colleges at Galway and Belfast), where he became the inaugural Professor of Natural History. In 1853, he emigrated to Canada where his distinguished younger brother Sir Francis Hincks (1807-1885) was at the time Premier (1851-1854). The coincidence of William's departure for Canada, at the age of 59, with his brother's premiership was not fortuitous as, with his brother's help, he had applied successfully for the new Chair of Natural History at the University of Toronto. First advertised in 1851, he was to hold on to this post tenaciously, though without any hint of distinction, for 18 years, until his death in 1871.

William Hincks 'favoured the memorization of outmoded and implausible taxonomic schemes', which stemmed from the French botanist A.-P. de Candolle (1778-1841) and 'was staunchly opposed to Darwinism'. Hincks employed a taxonomic system called 'Quinarianism' (Coggon 2002) – a system of classifying organisms into five-member circles – which had been developed in the 1820s and 1830s at a time when biologists, and the Unitarians in particular, were seeking mathematical patterns in nature as evidence of a divine plan. That Hincks continued to the end of his life not only to use quinary taxonomy but also to teach it won him few admirers in Toronto, especially as one of the other men short-listed for the post occupied by Hincks had been none other than T.H. Huxley.

TABLE 1
Notable contributors to the Hincks Herbarium in the Natural History Museum at Eton College additional to those described in the text

Name	Dates*	Geographical focus	Remarks
Anonymous	1798-1836	British Isles	297 sheets of algae, 'zoophytes' & 'sea-mats'
Anonymous	unknown	Wales	25 sheets of mosses & liverworts
Anonymous	1816-51	British Isles	2188 sheets of vascular plants labelled by WH (Yorks.) and presumed his. A further 99 sheets are signed 'WH' or from Hincks family members
Babington, Prof. C.C.	1808-95	Sussex	Author of *Flora Bathoniensis* (1934), *Manual of British botany* (1843), Prof. of Botany at Cambridge 1861-95 (Randall 2005)
Balfour, Prof. J.H.	1808-84	Scotland	Chair of Botany at Glasgow, then Edinburgh
Banks, Sir Joseph	1743-1820	China (Macao)	President of the Royal Society (1778-1819)
Bell, Prof. T.B.	1792-1880	Scotland	Secretary of the Royal Society, Prof. of Zoology, King's College, London
Bennett, George	1804-93	Bucks.	Expert on *Potamogeton*
Borrer, William	1781-1862	Sussex	Friend of Charles Lyell Snr., W.J. Hooker, Sir J.E. Smith, Dawson Turner. 23 Eton specimens
Bowman, J.E.	(1837)	Denbighs.	18 Eton specimens
Bowring, Dr John	(1831)	Devon	–
Bromfield, Dr W.A.	(1832-43)	Isle of Wight	–
Campbell, W.H.	(1834-8)	Switzerland	–
Forbes, James	(1837)	Isle of Man	–
Gage, Sir Thomas	1781-1820	Suffolk	Well-known lichenologist. The genus *Gagea* Salisbury (Liliaceae) was named in his honour
Gardner, George	(1842)	Pembs.	Pupil of W.J. Hooker, collected plants in Brazil, Director of Botanic Garden, Ceylon
Hore, Rev. W.S.	(1838-45)	Devon	26 Eton specimens
Lees, Edwin	unknown	Worcs, Wales	Author of *The Botanical Looker-out* (1842) & *Botany of the Malvern Hills* (1851)
Leyland, Roberts	1784-1847	Cheshire	*Cupressus leylandii* named in his honour
McNab, James	(1834-7)	Kirkubrights.	36 Eton specimens, mainly Scottish
Newbold, Rev. W.N.	1819-86	Channel Is.	18 Eton specimens

Continued on next page

TABLE 1 *Continued*

Name	Dates*	Geographical focus	Remarks
Ottley, Rev. Francis John	(1858-64)	Eton College	Eton master (1849-68). 166 species
Pierson, Mrs	(1836)	Suffolk, Hants.	Donor of seaweed specimens
Richardson, Sir John	1787-1865	unknown	Inspector of Hospitals, RN, Arctic explorer & friend of W.J. Hooker. He recomended J.D. Hooker as naturalist on the *Erebus* (1839-43)
Sclater, B.L.	(1881-2)	Berks.	13 Eton specimens
'Mr Shepherd' (see text)	(1798-26)	Liverpool, USA	Earliest donor to Hincks' Collection. 110 specimens at Eton, predominantly grasses & foreign plants grown at the Liverpool Botanic Garden
Southwood, Sir Richard	1962-77	Radnors, Berks.	34 bryophytes
Staunton, Sir George	(1848)	Hants.	Chinese scholar, friend of Joseph Banks
Stevens, Samuel	(1838)	Kent	Agent to Alfred Russel Wallace
Torrey, Dr John	1796-1873	USA	Well-known American botanist
Trevelyan, Sir Walter Calverley	1797-1879	Guernsey	Discovered *Romulea columnae* (syn. *parviflora*) (Liliaceae) as British plant. 9 Eton specimens
Tyacke, N.	(1838-48)	Lothians	36 Eton specimens, mainly Scottish
Venning, Mrs.	(1837-40)	Isle of Wight	16 Eton specimens
Ward, James	1802-73	Yorks	13 Eton specimens

*Dates in parenthesis indicate when specimens were acquired, either by Hincks or the ECNHM. For known or inferred Hincks acquisitions, the modal dates 1835-9 indicate in many cases, not their collection dates, but rather the period immediately preceding his departure from York in 1839 when the material was incorporated into his personal collection and labelled in his hand.

Thomas Henry Huxley (later known as 'Darwin's bulldog') was 26 and had recently been elected a Fellow of the Royal Society when he applied for the new chair. His application was supported by the Foreign Secretary, Lord Stanley (Desmond 1994) and by 16 letters from prominent English and French biologists, including Charles Darwin, Richard Owen, Edwin Lankester, George Busk, Edward Forbes, J.E. Gray, Thomas Bell (Table 1), Sir John Richardson (Table 1) and William B. Carpenter (see below), all Fellows of the Royal Society (Craigie 1965). Despite these impressive credentials, Huxley was not appointed. In a letter to Mrs E. Scott in May 1852, he averred 'I believe the chair will be given to a brother of one of the members of the Canadian ministry, who is, I hear, a candidate. Such a qualification as that is, of course, better than all the testimonies in the world' (Desmond 1994).

The Herbarium

Hincks' contribution to the ECNHM herbarium comprises 81 sheets signed 'William

Hincks' or 'WH' and a further 2188 anonymous specimens labelled in his hand; we assume that most of the latter are his since he seems readily to have acknowledged material from other sources. The geographical focus of the c. 2269 'WH' specimens (1816-1851) is Yorkshire (VCs 61-65), since Hincks lived for five years as a student (1809-1815) and 12 years working at Manchester College (1827-1839). The collection also reflects Hincks' ministries in Cork, Exeter, Liverpool and London. Plants presumed to have been collected by Hincks range in Britain from Cornwall in the south to Sutherland in the north, with some from Ireland. There are also specimens from around Cork (16) and Exeter (2) collected by 'Henry Hincks', who may have been a brother or uncle, 'Mrs. Hincks', presumably his wife Ann, and the 'Reverend Thomas Hincks' (the locations suggest that William's botanist father was the donor, but it could have been his son, who shared the same name, style and dedication to natural history).

When William Hincks left York in 1839, he must have removed his personal collection, along with a further 191 specimens labelled 'YMD' (York Museum duplicates). The 'YMD' specimens, unsigned by their collectors, were probably extracted from the collections of the Rev. James Dalton (1827), William Middleton (1827) and Giles Munby (1833), all of which are still housed in the YM. These collections were accessioned and integrated by Henry J. Wilkinson from 1895 to 1907. Having inspected the 19th century plant collections in the YM, we are confident that no Hincks material remains there. Indeed, it seems that Hincks has left no physical trace of his 12-year reign as Curator of Botany at the YM.

There was, however, a substantial worldwide Hincks collection (1800-56) of some 17,000 specimens in the herbarium of UCC (O'Neill 1976). When Professor John Parnell and Dr Wyse Jackson of TCD reported on the UCC herbarium in 1984-1985, they found it 'in a terrible state … housed in domestic freezers … which admit damp' and 'has suffered various forms of insect attack as well as ongoing attack by mice' (Parnell 1985); following this report, the Hincks collection at UCC was broken up and most of it was probably destroyed; a few specimens from South Africa were transferred to TCD (John Parnell, *in litt.*).

Other Contributors to The Hincks Collection at Eton

Henry Baines (1793-1878) was a gardener from the age of 12. He spent most of his life working for the Quaker nurseryman **James Backhouse** (1794-1869) and tending the York Museum Gardens, where he cultivated up to 500 species (Wilkinson 1895-1907; Orange 1973). Baines was the author of *Flora of Yorkshire* (1840), which contains 76 records for Heslington Fields, York and the Bridlington area (Crackles 1990). Baines and Backhouse contributed 47 specimens to the Eton collection, mainly from around York.

Rev. Andrew Bloxam (1801-1878) was the son of Richard Rouse Bloxam DD, Master of Rugby. He was educated at St. John's College, Cambridge and Worcester College, Oxford, where became a Fellow. In 1824 he was appointed naturalist and geologist on the *Blonde* (which conveyed the bodies of the King and Queen of the Sandwich Islands (Hawaii) to be buried in their native land). He made a large collection of natural history specimens, afterwards given to the British Museum (1824-1825). He was Curate of Twycross, Leicestershire (1839-1871) and Rector of Great Harborough (1871-1878); he authored (with Professor Churchill Babington, Table 1) *Botany of Charnwood Forest* (Venn & Venn 1922-1954). The 39 microspecies of *Rubus* that comprise a specialized Bloxam contribution to the ECNHM herbarium may never have been part of the Hincks collection. They are chiefly of interest because Bloxam first described *Rubus calvatus* and *R. mucronatus*, which are among the Eton specimens: therefore, these two microspecies may be type specimens, but further research at Kew is needed to establish this.

William Benjamin Carpenter MD, FRS, FLS (1813-1885), a physician, physiologist, marine biologist, geologist, university administrator and philanthropist, was the son of Dr Land Carpenter (1780-1840), a Unitarian pastor in the West Country. William's highly talented family included a brother Dr Philip Pearsall Carpenter (1819-1877), a Unitarian minister in his earlier life and world-famous conchologist (Baker & Bayliss 2003), and a sister Mary Carpenter (1807-1877), an influential educationalist and social reformer. William Carpenter studied medicine at UCL and Edinburgh. He taught medical jurisprudence and physiology successively at Bristol Medical School, the Royal Institution (where he was Fullerian Professor), London Hospital and UCL. In 1839 he published a great work, *Principles of General and Comparative Physiology*, the first English book to treat biology as a science. This workaholic man was also Principal of University Hall (the UCL hall of residence) (1851-1859) and Registrar of the University of London (the examining body) from 1856 to 1879. His last active public contribution was an involvement in the foundation of the Marine Biological Association and the establishment of its laboratory at Plymouth (Gardiner 2000). During his time in Bristol, he and other members of his family found time to collect plants, of which 14, including the exceedingly rare *Dianthus gratianopolitanus*, are in the Hincks collection at Eton.

William's fourth son, **Philip Herbert Carpenter** ScD, FRS, FLS (1852-1891) was educated at Trinity College, Cambridge and was later an assistant master at Eton (1877-91), where he taught biology and geology (Gardiner 2000; Penny Hatfield, *in litt.*). He was, arguably, the finest scientist and most highly qualified teacher ever to have taught in an English school. He was a renowned expert on the echinoderms, both living and fossil forms (c. 50 papers). His mollusc collection, which included specimens bequeathed by his uncle Philip P. Carpenter (see below), was in the Natural History Museum at Eton until transferred to the Oxford University Museum of Natural History in 1996. Although Philip H. Carpenter was not a botanist, several other members of his family, including his father (see above) and his sister Anna, were plant collectors. We speculate (below) that a member of the Carpenter family may have acquired the Hincks plant collection in the course of a long history of interrelations between the two dynasties of clergymen naturalists. A Natural History Museum had been founded at Eton in 1875 (Card 1994) and it is possible that the Hincks collection was left there by Carpenter, along with his own mollusc collection, following his death by suicide in 1891.

Rev. James Dalton (1764-1843). The first Dalton collection (1780-1820) was deposited at York in 1827, and a second followed in 1887 that included specimens collected by his grandson, Rev. James Dalton Jnr. Although we have only six specimens bearing his signature, an unknown number of the 'YMD' sheets are probably his. A Cambridge graduate, Anglican cleric and FLS, Dalton was a botanist of national repute. He was a close friend of Sir William Jackson Hooker, the first Director at RBGK, and godfather to Sir Joseph Dalton Hooker, who succeeded his father at Kew. It is reasonable to speculate that Dalton forged a link between the provincial Yorkshire and nationwide botanical communities. In the days when Upper Teesdale was accessible only by pony-track, he was the first botanist to explore the area and to recognize its unique glacial relict flora (Wilkinson 1895-1907).

George Claridge Druce, FRS, FLS (1850-1932) was perhaps the last of the classical school of Victorian botany. From a poor background with little education, he was proprietor of a pharmacy in Oxford for 50 years. He became an Oxford MA at 36, Mayor of Oxford at 50 and was elected FRS shortly before his death. He built up the magnificent herbarium and library that are now housed in the Department of Plant Sciences at Oxford. He is perhaps best remembered for his long secretaryship of the Botanical Society and Exchange Club of the British Isles (to which, in its various guises and antecedents from 1836 onwards, all the donors to the Hincks collection probably belonged) and for his *Floras* of Oxfordshire, Berkshire, Buckinghamshire and Northamptonshire, and editions of *Hayward's Botanists' Pocket Book* (Gilmour & Walters 1954).

Samuel Hailstone FLS (1767-1851), a Bradford solicitor, accumulated a herbarium with many prestigious donors, including **William Borrer** FRS, FLS, **R. Kaye Greville** LlD (author of *Flora Edinensis*), **Hewett Cottrell Watson** FLS, **William Arnold Bromfield** MD, FLS and **Richard Spruce**; all these donors are represented in the Eton collection. The Hailstone herbarium was deposited at the YM in 1859 (Wilkinson 1895-1907).

John Stevens Henslow, FLS (1796-1861) was educated at Rochester Grammar School and St. John's College, Cambridge. With Adam Sedgwick, he founded the Cambridge Philosophical Society (1819). He 'excelled at maths and dabbled in chemistry'. At 26 he became Professor of Mineralogy (1822) and, in 1827, added the Regius Chair of Botany. He founded the Cambridge Botanic Garden and Botanical Museum (= Herbarium) (1831). He married the sister of the Rev. Leonard Jenyns, an Old Etonian with whom he and Darwin used to go 'beetling' (Wallace 2005). In 1839 he accepted a crown living at Hitcham, Suffolk, where he instituted educational and social reforms and co-founded the Ipswich Museum (1848). He was Darwin's tutor, mentor and life-long friend, who famously recommended him for the position of naturalist on the *Beagle* (1831). J.D. Hooker married Henslow's daughter Henrietta (Barlow 1967; Russell-Gebbett 1977; Gardiner 1999).

Sir William Jackson Hooker, FRS, FLS (1785-1865) was born and educated at Norwich. In 1815 he married the eldest daughter of Dawson Turner (see below). He was Regius Professor of Botany at Glasgow (1820-1840), Director of the Royal Botanical Gardens, Kew (1841-1865), and knighted in 1836. His botanical focus was mosses (*Muscologia Britannica*, 1818) and liverworts (*British Jungermanniae*, 1816), an interest he shared with his old friend James Dalton (godfather of Sir Joseph Dalton Hooker, the distinguished botanist who supported Darwin and followed his father at Kew) (Desmond 1999). There are 13 letters from William Hincks to W.J. Hooker in the Kew Archives (Michele Losse, *in litt.*).

Oswald Allen Moore (1818-1862), a surgeon at York Dispensary, succeeded Hincks as Curator of Botany at YM in 1840 and continued in the post until his death in 1862 (Wilkinson 1895-1907; Orange 1973).

Giles Munby MD (1813-1876). Munby was born in York, educated at Edinburgh University and studied medicine in Paris and Montpellier before settling in Algeria, where he married the daughter of the British Consul. In 1847 his *Flora d'Algerie* was published in Paris. A friend of J.D. Hooker, his portrait hangs in the galleries at Kew. He contributed 41 specimens to the Hincks Collection at Eton, including many Scottish rarities, such as *Linnaea borealis*.

David Nelson (d. 1789), a gardener at Kew, was selected by Sir Joseph Banks to sail in *Discovery* with Captain James Cook on his third voyage (1776-1780) to the north-west passage. Nelson's brief was to collect plants for Banks from the western seaboard of America and Siberia. After Cook's death in Hawaii, the expedition returned under the command of William Bligh. In 1780 they called at Macao, the Portuguese colony in China (Hough 1994). Remarkably, our collection includes two seaweeds collected by Nelson, labelled '*F*[*ucus*] *tenax* China, Sir J. Banks' – no date and the hand is not Banks'. Nelson's efficiency as a botanist so impressed Bligh that he was appointed horticulturalist to the notorious expedition on the *Bounty* (1787-1789), which carried Breadfruit from Tahiti for introduction to the West Indies. Nelson did not live to see Bligh complete the transplanting of Breadfruit in 1791, since died in Timor five weeks after surviving the famous open boat voyage that followed the mutiny in 1789.

Richard Spruce (1817-1893) was an outstanding Victorian naturalist who devoted much of his life to the exploration of the Amazon and the Andes (Seaward & FitzGerald 1996). His childhood was spent among the small villages scattered around Castle Howard in Yorkshire. In 1837 he was appointed mathematical teacher at the Collegiate School, York, where he befriended Moore, Baines and Backhouse (see above). He was a largely self-taught botanist who developed his skills while exploring, usually with Henry Ibbotson, the Yorkshire dales and moors (Pearson 2000). J.D. Hooker persuaded Spruce to try plant hunting in South America and in 1849 he arrived in Pará (where he met Alfred Russel Wallace) to embark on 15 years of collecting. He returned to England in 1864 with 50,000 plant specimens of over 7,000 species (Gardiner 1994), now housed at Kew. In 1859 he was commissioned by Clements Markham, on behalf of HM Government of India, to obtain seed of *Cinchona succirubra*, the best quinine yielding species, from the Andes of Peru and Ecuador. Spruce managed to collect sufficient seeds to ship to South India where

Cinchona was successfully cultivated to the lasting benefit of gin and tonic aficionados and malaria sufferers the world over. In his old age he was awarded a government pension for services to the nation and retired to Coneysthorpe near Castle Howard (Wilkinson 1895-1907).

Robert Teesdale (1740-1804) was a founder member (1788) of the Linnean Society. He was a gardener to the Earl of Carlisle, author of *Plantae Eboracenses* (1793) and honoured by A. T. Aiton in his naming of the genus *Teesdalia* (Brassicaceae). Though we have only one specimen bearing his name, we believe that several 'YMD' specimens may be his, including the rarities *Ranunculus gramineus* and *Carex divisa* (1895-1907).

Dawson Turner, FRS, FLS was a wealthy banker from Yarmouth, whose principal interest was cryptogams, particularly algae (*British Fuci*, 1802). Although few of the algae in the Eton collection have full provenance, two from Lowestoft in 1800 are signed 'DT'. As our collection has c.184 algae from the East Anglian coast, Turner may have been the collector of at least some of them. In 1806 he first discovered *Matthiola incana* in Britain and our unsigned specimen is probably his. Turner belonged to a circle of cryptogamists that included William Hooker, Sir James Edward Smith, founder of the Linnean Society and author of *Flora Britannica* and *Sowerby's Botany*; Thomas Jenkinson Woodward, William Borrer and Charles Lyell (father of Sir Charles Lyell (1797-1875) whose *Principles of Geology* (1830-1833) so profoundly influenced Darwin, Wallace and J.D. Hooker) (Gardiner 1997, 1998; Slatter 2000). Aged over 70, Turner undertook to write a life of Banks but, after ploughing through 27 volumes of letters (a mere fraction of Banks' output), he threw in the towel (O'Brian 1987).

Hewitt Cottrell Watson FLS (1804-81) was an '*enfant terrible*' of 19th century botany and an early convert to Darwinism (Gardiner 2000); this combative bachelor lived for 50 years at Thames Ditton in Surrey and all his specimens in the ECNHM were collected close to his home. His outstanding contribution to British botany was in the realm of plant distribution: *Outline of the Geographical Distribution of British Plants* (1832), *Cybele Britannica* (1847-1859) and *Topographical Botany* (1873-1874). He devised the Watsonian vice-county system, still in use today, for recording distributions of organisms in the British Isles. Although his main love was botany, he entered many other fields, such as phrenology and radical politics, with equal gusto (Meikle 1949). The botanical journal *Watsonia*, founded in 1949, was named in his honour.

Discussion

We speculate above that the Rev. James Dalton, Rector of Croft in Teesdale (1805-42) and a close personal friend of W.J. Hooker of Kew, may have facilitated links between the Yorkshire non-conformists and botanists of various affiliations elsewhere. The Dalton collection at the YM includes among its donors virtually every botanist of distinction during the years 1785-1835 (Wilkinson 1895-1907; Simms 1968; DASS, personal observation). Furthermore, a fraternity of a dozen or more dissenting botanical pastors scattered throughout the British Isles also enhanced the geographical scope of Hincks' herbarium at Eton. The collectors represented in the Hincks herbarium in the ECNHM mirror many of those in the YM collection of lichens (Coppins & Seaward 1976). Exchange of botanical specimens was much facilitated by the foundation in 1836 of the Botanical Society of London. Essentially the same society underwent a succession of name changes, to London Botanical Exchange Club (1867-1879), Botanical Exchange Club of the British Isles (1880-1910), Botanical Exchange Club and Society of the British Isles (1911-1948) and, finally, the Botanical Society of the British Isles (1948 onwards). It is also possibly significant in the Yorkshire context that there was for a brief period a Thirsk Botanical Exchange Club (1857-1864). It is virtually certain that Hincks, Dalton and many of the other 134 known contributors to the Hincks herbarium would have met at intervals to enthuse over botany and exchange specimens.

The identity of a major ECNHM donor 'Mr Shepherd' (Table 1) is not certain. Unfortunately, we have no specimen of his hand-writing or record of his initials. However,

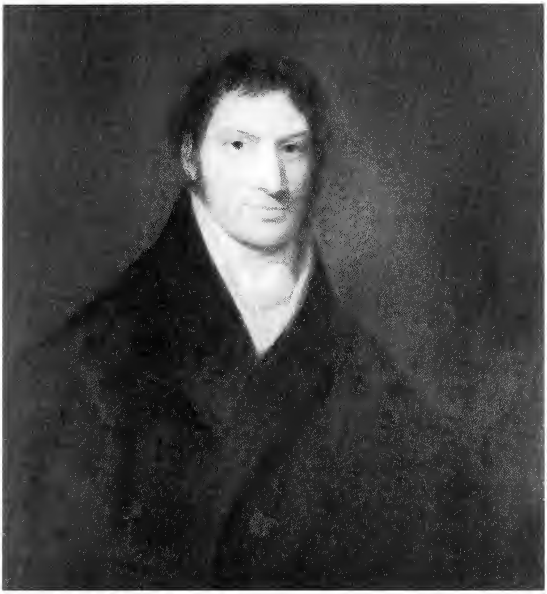

FIGURE 2.
John Shepherd (c. 1764-1836). Photograph of a portrait in oil by John Williamson (c. 1814).
(Courtesy of the Board of Trustees of World Museum Liverpool – Walker Art Gallery.)

his contribution to the collection (1798-1826), acknowledged by Hincks in his own hand merely as 'Mr Shepherd', was 78 specimens, with a further 32 inferred from their location as either 'Liverpool' or 'Liverpool Botanic Garden'. The 'Shepherd' contribution comprises the earliest vascular plants at ECNHM and includes many grasses, both British and foreign, and plants grown in cultivation. From the minority of specimens with provenance, the modal location is Liverpool, with a few from York, Canada and the USA; the modal dates recorded by Hincks (not necessarily the dates of collection) are 1824-1826, coinciding exactly with his Liverpool incumbency at the Unitarian chapel in Renshaw Street.

There are two possible candidates for 'Mr Shepherd'. The first is H. Shepherd FLS (c. 1783-1858) who worked at the Liverpool Botanic Garden from 1809 until at least 1850 (John Edmondson, *in litt.*) and became Curator in 1836. H. Shepherd succeeded his uncle John Shepherd (c. 1764-1836, Fig. 2) on the latter's death; either man could have given plants to William Hincks during his third ministry in Liverpool (1822-1827) but, as the last 'Shepherd' plant is dated 1826, a year before Hincks' departure from Liverpool, and the first is 1798, which precedes by 11 years H. Shepherd's employment at the Garden, John Shepherd, who was Curator from 1803 to 1836, is the more likely donor. The two Shepherds are jointly credited with the first invention of a technique for growing ferns from spores (John Edmondson, *in litt.*; Michele Losse, *in litt.*).

Around this time Liverpool merchants developed close trade links with American ports, including New York, Boston, Philadelphia and New Orleans (Edmondson 2005). Botanical links were also established between the Garden and several American botanists such as Dr

Francis Boott, a Cyperaceae expert, John Bradbury and Thomas Nuttall (Professor of Botany at Harvard in later life); both the latter undertook expeditions up the Missouri on behalf of the garden (John Edmondson, *in litt.*). These links account for the New England component among the 'Shepherd' grasses in the ECNHM; we have no evidence that either John or H. Shepherd actually visited America. Neither can we adduce, beyond a single specimen from York, any 'Shepherd' botanical activity in Yorkshire; for example, the YM holds no 'Shepherd' material (DASS, personal observation). There are, however, 'Shepherd' plants in the herbarium at the Liverpool Museum (John Edmondson, *in litt.*; Gina Douglas, *in litt.*). We have, therefore, circumstantial evidence that, whichever Shepherd was the ECNHM donor, he had collected in the Liverpool area, had had access to plants grown in the Liverpool Botanic Garden and had developed links with North America.

There is some evidence that Hincks' interest in botany intensified during his time in Liverpool, where he befriended an important group of botanical co-religionists that included the Rev. James Yates (1787-1871) and William Roscoe (1753-1831) (Baker 1999c); the latter, who had acquired the Johann Reinhold Forster herbarium in 1799, founded the Liverpool Botanic Garden in 1802 and was a friend of Sir James Edward Smith (Edmondson 2005), who was also a Unitarian. John Shepherd worked under the close direction of Roscoe until 1830 and would have needed permission from the Garden Committee to give plants from the Garden Herbarium to Hincks (John Edmondson, *in litt.*). That none of the 'Shepherd' herbarium sheets at the ECNHM is signed, and most lack precise geographical provenance, suggests that living specimens from the garden were given to Hincks who mounted them himself.

We have shown that the non-conformist communities in York, Liverpool and elsewhere in England, made a major contribution to early 19th century botany that is strongly reflected in the principal donors to the Hincks collection at Eton, as to the contemporary herbarium at the Yorkshire Museum (Wilkinson 1895-1907). In particular, the powerful Unitarian influence on the intellectual climate of the time is summarised by Baker and Bayliss (2003):

> In the nineteenth century Unitarians formed a significant grouping in most provincial cities as well as London and several of their ministers played an important role in the development of provincial scientific societies, serving the local community in civic development, in helping to raise the living standards of the poor and in education.

These issues were of fundamental importance to Unitarians, and both Hincks and Carpenter families were prime exemplars of all of them.

We speculate that social bonds, shared scientific interests and religious empathies between the Hincks and Carpenter families of clergymen naturalists, over an extended period of time (1823-1870), may explain how the Hincks plant collection ended up in an unlikely location such as the ECNHM. Philip H. Carpenter's surprising appointment as a master at Eton in 1877 suggests how a link between the Hincks-Carpenter collections and the ECNHM might have been established; it also shows that science was gaining a long overdue foothold in the Eton curriculum. Carpenter's appointment was part of Eton's reluctant and tardy response to the Public Schools Act (1868), which followed a Committee got up in 1866 by T.H. Huxley and the Reverend Frederick Farrar, a Harrow schoolmaster, to force the issue of science in public schools (Desmond 1994). A further result of the Act was the election in 1879 of Huxley as a Fellow (= governor) of Eton, representing the Royal Society (Card 1994; Desmond 1997). Furthermore, the foundation by the Eton science masters of a Natural History Museum in 1875 confirms that natural history had been acknowledged as a suitable hobby for boys.

Feasible social links between the Hincks and Carpenter families are as follows:

1. William B. Carpenter was born in 1813 in Exeter, where his father, the Rev. Dr Land

Carpenter, was a Unitarian minister. William Hincks' second Unitarian pastorate was also in Exeter from 1818 to 1822 (Orange 1973), when he was 24-28 years old. Moreover, the earliest Hincks plants (1816-1827) in the ECNHM are from Cork (his first pastorate) and the Exeter region. Therefore, it was possibly through Exeter that William Carpenter's father and William Hincks either established the first contact between their respective families, or rekindled an old camaraderie.

2. The Rev. Philip P. Carpenter (1819-1877), William's conchologist brother, was educated at Manchester College in York (1837-1841), where he was taught by Hincks and with whom he established 'a bond of sympathy in his ardent love of natural history' (Baker & Bayliss 2003). Philip graduated BA (London) First Class in 1841, after the College had moved back to Manchester. Some Philip P. Carpenter shells passed through the hands of his nephew, Philip H. Carpenter, to the ECNHM, which suggests the Hincks herbarium may have followed the same route.

3. William Hincks' son, the Rev. Thomas Hincks FRS (1818-1899), was born a year before Philip P. Carpenter; both were born in Exeter and must have known one another as small boys; they may even have been playmates. Although Thomas Hincks would have left Exeter for Liverpool with his father in 1822, he undoubtedly renewed an acquaintance with Philip when the latter joined him in York at Manchester College in 1837; both young men were trained for the Unitarian ministry and taught science by William Hincks. Indeed, it is likely that Thomas and Philip, both destined to become highly distinguished invertebrate zoologists, were friends and classmates. Thomas Hincks graduated BA (London) in 1840 (Baker 1999a).

4. The Hincks herbarium at the ECNHM includes an unattributed sub-collection of 'zoophytes' (Hydrozoa) and 'sea mats' (Bryozoa); many species of both these colonial animal groups grow as epiphytes on the holdfasts, stipes or fronds of algae and the colonies in the ECNHM collection are preserved dry attached to their algal substrate. Each of these groups of marine invertebrates, little known in the early 19th century, was the subject of a pioneering, two-volume monograph by Thomas Hincks: *A History of the British Hydroid Zoophytes* (1868) and *A History of the British Marine Polyzoa* (1880) (Baker 1999a): the presence of both Hydrozoa and Polyzoa specimens among the Hincks plants at Eton suggests they could have been collected by Thomas Hincks. Furthermore, an unknown number of the marine algae in the ECNHM, most of which have no provenance, may have been collected by the noted phycologist Miss Hannah Hincks (1798-1871), William Hincks' sister, who apparently lived all her life in Belfast (Desmond 1977). Six algae collected by her, including the holotype of *Giffordia hincksiae* Hincks 1840, survive in the herbarium of the Ulster Museum (Osborne Morton *in litt.*).

5. We know that William Carpenter went to Belfast several times in the period 1868-70 to collaborate with Wyville Thomson in investigations of the sea-bottom fauna between Ireland and the Faeroes (Gardiner 2000). It is possible, even likely, that Carpenter re-established contact at that time with those members of the Hincks family who had remained in Ulster (e.g. Miss Hannah Hincks), though her father, the Rev. Dr Thomas Dix Hincks, was by then long deceased.

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BOOK REVIEWS

British Geological Survey Publications: The Palaeogene Volcanic Districts of Scotland by **C.H.Emeleus** and **B.R.Bell**. 4th edition. Pp.214. British Regional Geology. 2005. £18.00. **The Skiddaw Group of the English Lake District** by **A.H.Cooper**, **N.J.Fortey**, **R.A.Hughes**, **S.G.Molyneux**, **R.M.Moore**, **A.W.A.Rushton** and **P.Stone**. Memoirs for parts of sheets 22 Maryport, 23 Cockermouth, 24 Penrith, 28 Whitehaven, 29 Keswick, 30 Appleby, 31 Brough and 48 Ulveston. 2004. £35.00. **Geology of the Sidmouth District – a brief explanation of the geological map** by **R.A.Edwards** and **R.W.Gallois.** Sheet explanation of the British Geological Survey. 1:50,000 Sheets 326 and 340 Sidmouth (England and Wales). 2004. £9.00. **Geology of the Country around Flint** by **J.R.Davies**, **D.Wilson** and **I.T.Williamson**. Memoir for 1:50,000 Geological Sheet 108 (England and Wales). 2004. £40.00.

The BGS publications, although most are clearly aimed at professional geologists, have wider value in providing data that can also be utilised by non-geologists such as planners and those with an interest in UK landforms and scenery. Such data are of the highest calibre, although having the background knowledge to understand some of the material is another matter. The publications under review maintain a high standard of production quality, as exemplified by *The Palaeogene Volcanic Districts of Scotland* which is complemented by extremely clear colour illustrations, with excellent sketch maps, photographs of outcrops and thin section photomicrographs.

The Palaeogene Volcanic Districts of Scotland, like others in the British Regional Geology series, places its emphasis on a descriptive approach to regional geology. It covers the northern islands of the Inner Hebrides, with parts of the adjoining mainland and the Isle of Arran, an area commonly studied by earth science undergraduates on field courses. These areas have regions of igneous rocks of Palaeogene age, together with interesting Mesozoic sedimentary rocks. The emphasis on description highlights field sections, with geological maps of, for example, the Mull complex, which provide an excellent resource base for anyone intending to undertake geological or geographical fieldwork in the region.

The text is well written with a good clear structure / layout. The high quality illustrations make this volume a pleasure to consult (particularly Plate 29 illustrating the boundary between an anorthosite and a feldspathic peridotite). If there is any criticism, it is that one would have liked more detail on the Quaternary glaciation of the regions in question.

Geology of the Sidmouth District covers a region with striking coastal scenery in the East Devon Coast World Heritage Site that many earth scientists may well have visited. The rocks here are Triassic Otter Sandstone to Upper Cretaceous Seaford Chalk. Concise and easy enough to read, with adequate illustrations for its purpose, it is an essential geological guide for those undertaking fieldwork along this Jurassic coastline. As one interested in geohazards, I was interesting to see comments in the applied geology chapter on landslips and radon hazards.

The Skiddaw Group of the English Lake District contains a wealth of good detail on biostratigraphy (with illustrations of Acritarchs for example) and lithostratigraphy, with comments on outcrops and field descriptions. The black and white photographs are reasonably clear, although colour illustrations might have been preferable, particularly for the photomicrographs. As for other BGS publications, this volume is packed with information, but one feels that more resources could have been allocated to its presentation.

The *Geology of the Country around Flint* describes the uplands of north-east Wales, the Cheshire Plain and the Dee Estuary. This work integrates subsurface data from the coal, hydrocarbon and water industries with that from site investigations. It is clearly laid out with good use of colour figures to show geological relationships. The black and white illustrations, however, like the *Skiddaw Group* volume, were sometimes a disappointment, although colour photographs were occasionally very good (e.g. Plate 18 of glaciofluvial deposits). Nevertheless, this publication fulfils its intention to be of practical value to a wide range of users.

The value for money of some BGS publications such as *The Palaeogene Volcanic Districts of Scotland* is excellent, but, in comparison, £35-40 for the memoir volumes seems rather expensive, although they are a mine of useful information collected from a variety of sources (of particular use to geological students and professionals rather than interested amateurs) that any library with a geological section would do well to stock. GKG

Storytelling and Ecology: reconnecting nature and people through oral narrative by **Anthony Nanson.** Pp. 71. University of Glamorgan Press (for the Society for Storytellers), Pontypridd. 2005. £6.00.

Story tellers had important roles in 'primitive', generally pre-literate human societies, and still do in some isolated communities. Some believe that they have a role in 'advanced' literate societies where, as the writer of this booklet argues, they can bring home to their listeners in a vivid way matters relevant to our now complicated existence. His concerns are with the relationship of man to his environment and with the concepts of ecology. In crowded, ever more urbanised societies, there are many with almost no understanding of the remarkable natural world in which we live, and it is argued that story tellers can do much to rectify this situation. Some organisations evidently subscribe to this belief as story tellers are engaged by such enterprises as the Eden Project, Slimbridge, the National Trust and English Heritage, to entertain and, one hopes, educate visitors.

In such situations, however, the likelihood is that the storyteller is generally preaching to the already converted. At the other extreme, telling stories to mass audiences tends to become theatre. There are other dangers: story telling can appeal to cults, 'eco-freaks', and lovers of mysticism and strange rituals. Nevertheless, if it can give listeners a feeling of kinship with other organisms and increase awareness of the need to protect their environments, one wishes its practitioners well. One does, however, wonder whether they will ever reach such vast audiences as do the remarkable television programmes on 'wildlife' that are viewed by millions, who evidently appreciate them, but who seemingly in the main remain detached from the real concerns of ecology. These concerns are often essentially what has long been known as natural history. GF

NOTES ON YORKSHIRE MOLLUSCA – 13: THE SMOOTH RAM'S-HORN SNAIL *GYRAULUS* (*TORQUIS*) *LAEVIS* (ALDER, 1838) (MOLLUSCA – PLANORBIDAE) IN YORKSHIRE

ADRIAN NORRIS
Recorder – Yorkshire Conchological Society
17 West Park Drive, Leeds LS16 5BL

The discovery of large numbers of the Smooth Ram's-horn Snail (*Gyraulus laevis*) in stony gravel near the boathouse at Malham Tarn (SD(34)/8967) on 29 August 2004 prompted me to look into the Yorkshire records for this elusive freshwater snail. Although recorded from all five Yorkshire vice-counties, this species has always been regarded as rare. Now extinct in many of its former sites, it is found in significant numbers in only a very few localities within the county and is listed as vulnerable in the Yorkshire Red Data Book for Mollusca (Norris, 1998).

Prior to this interesting find, I knew of no other records from Malham Tarn. However, after a long, tedious and time-consuming search I was able to establish the fact that Dr John Llewellyn-Jones had found several in a bag of drift taken from the north bank of the stream flowing into Malham Tarn in June 1970; subsequently Prof. R.A.D.Cameron had found it in the Tarn in August of the same year. Neither of these records had been brought to my notice.

The most recent Yorkshire record prior to my find at Malham Tarn was that of Ray Eades who, in July 1998, found a single specimen in the flooded base of the old chalk quarry which is now part of the Hessle Country Park. A visit to this site was made in the following year, but no further specimens were found.

Kerney (1999) states that *G. laevis* is a characteristic fossil in late glacial and early post-glacial lake marls, and that its present distribution is partly relict, but results also from an ability to colonize 'raw' man-made habitats of an ephemeral type, and that it probably possesses good powers of passive dispersal. It is known to be a 'clean water' species and does not seem to be able to tolerate much in the way of suspended particles.

The problem with passive dispersal is that it must have a few good sites from which to disperse. Its known Yorkshire habitats at Hornsea Mere and Wintersett Reservoir are also well-established waterfowl habitats and therefore small numbers being dispersed to the Hessle Country Park and the Pocklington Canal are feasible. Malham Tarn is, however, quite a long way from any other sites and it is difficult to believe that this snail was an accidental introduction into the Tarn in 1970. It is now well-established throughout the Tarn, being found in association with *G. albus* (O.F.Muller, 1774).

According to Kerney (1999) there are only five recent British 10 km grid square records (NZ(35)/8528, TA(54)/14, SE(44)/74, SE(44)/3715 and SD(34)/86), which presumably refer to Tarn Dub, Hornsea Mere, Pocklington Canal, Wintersett Reservour and Malham Tarn respectively. The record by D. Whiteley and A. Clarke, for Thrybergh Reservoir, SK(43)/4795 recorded on 31 January 1982, should also have been included in Kerney (1999).

On 1 October 2005, Tony Wardhaugh, Moira Wardhaugh and Beth McClymont found small numbers in Staindale Lake, North Yorkshire (VC 62, SE(44)/8890). This species is equally rare to the west of Malham with no readily identifiable source from which this species could have spread naturally. It is my belief that this snail is a long standing resident of the Tarn, which was overlooked in the past.

YORKSHIRE RECORDS
Gyraulus (Torquis) laevis (Adler, 1838) (syn. *Planorbis laevis*, *P.glaber*)

VC61

TA(54)/0126	25.7.1998	A single specimen found in flooded chalk quarry, Hessle Country Park, leg. Ray Eades. No further specimens have ever been found.
TA(54)/195474	6.1963	Four specimens found in Large Reed Bed, Swan Island, Hornsea Mere (*J.Conch*. **26**: 288).
TA(54)/1946 & TA54/ 1947	18.5.1969	Common in sandy areas, Hornsea Mere, leg. A.Norris.
TA(54)/15	**FOSSIL**	Skipsea, old Mere in boulder clay cliffs, leg. W.Kennard.
TA(54)/2046	**FOSSIL**	Hornsea, in mud cliffs, leg. W.Nelson (*J.Conch*. **5**:139 as *Planorbis parvus*; Petch, 1904).
TA(54)/4119	**FOSSIL**	Kilnsea, old Mere in boulder clay cliffs, leg. A.W.Kennard. This site is now offshore.
SE(44)/786455	27.7.1974	Fairly common in weeds below Sandhill Lock, Pocklington Canal, near Allerthorpe, leg. A.Norris. Not refound in 2004.

VC62

NZ(45)/51	1870	Ponds near Great Ayton, leg. J.W.Watson (Ashford 1879).
NZ(45)/609097	**FOSSIL**	Kildale (Recorder unknown).
SE(44)/65	3.10.1954	Holtby, near York, collector unknown. This record is not shown in Kerney (1999), but is included in the official records of the Conchological Society of Britain and Ireland.
SE(44)/8890	1.10.2005	Found in small numbers Staindale Lake, leg. T.Wardhaugh, M.Wardhaugh & B.McClymont.
SE(44)/99	1900	In one small pond at Suffield, where it was abundant on *Elodea canadensis*, leg. E.A.Wallis, but a careful search in 1920 revealed no specimens (Walsh & Rimmington, 1956).
TA(54)/08	pre-1914 1922	Scarborough, leg. J. Kidson Taylor. Scarborough area (this and the previous record are thought to be from the same site, but the recorder for the latter is unknown).

VC63

SE(44)/02	pre-1885	Near Halifax, leg. E.Collier.
SE(44)/3715	16.10.1969	Six specimens found in Wintersett Reservoir, near Wakefield, leg. L.Lloyd-Evans (also in 1971?).
SE(44)/4017	pre-1885	Wakefield Quarry, near Nostell, leg. W.E Brown (Nelson & Taylor, 1885).
SE(44)/4318	1854 to 1974	Abundant in a small depopulated fishpond, on *Potamogeton crispus*, Ackworth Park, leg. C.Ashford (Ashford, 1874; Nelson & Taylor, 1885).

SE(44)/4517	1870	Ackworth, leg. W.Nelson. This site appears to be the same as the site below which is near Low Ackworth, a mile to the south-east of the above site, but why it is not included in Ashford (1874) is unknown. In Hepworth's Pond near Low Ackworth, leg. G.F.Linney (Nelson & Taylor, 1885).
SE(44)/42	pre-1885	Near Pontefract, leg. J.Hardy.
SE(44)/51	1880	A few in dykes between Smeaton and Campsall, leg. J.Wilcock (Nelson & Taylor, 1885).
SK(43)/4795	31.1.1982	Rare, Thrybergh Reservoir, leg. D.Whiteley & A.Clarke. Due to a date error (recorded as 1882), this record was not included in Kerney (1999).

VC64

SD(34)/76	pre-1880	Clapham, leg. J.R Le Brockton Tomlin.
SD(34)/86	6.1970	Several in bag of drift from north bank of stream flowing into Malham Tarn, leg. J. Llewellyn-Jones.
SD(34)/8966	26.08.1970	Malham Tarn, leg. R.A.D.Cameron.
SD(34)/8967	29.8.2004	Common in gravel near Boat House, Malham Tarn, leg. A.Norris.
SE(44)/27	1855	Near North Stainley, leg. J. Dalton.
SE44)/42	**FOSSIL**	Burton Salmon (Norris *et al*., 1971).

VC65

SD(34)/9392	4.8.1882	Whitfield Gill near Askrigg, a single specimen picked out of moss, leg. W.Denison Roebuck (Nelson & Taylor, 1885).
NY(35)/8528	1966	Tarn Dub, Upper Teesdale, leg. J.C.Peters.

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COMATRICHA FRAGILIS Meyl., A RARE MYXOMYCETE FROM YORKSHIRE

J. O. K. WEBB
34 Kensington Road, York YO30 5XG

A rare Myxomycete, ***Comatricha fragilis*** Meyl. [*Bull.Soc.Vaud.Sci.Nat.* **56**: 70 (1925)], was collected whilst foraying with the Mid-Yorkshire Fungus Group as follows:

On twig litter under *Fagus*, in woodlands above Newmiller Dam (GR: SE3315), 18 Nov. 2004, leg. J.O.K. Webb, conf. B.Ing (Herb. JOKW).

Only one British record (from the Orkneys) appears in the Census Catalogue (Ing 2000) and a search of the British Mycological Society Fungus Record Database (BMSFRD) revealed only two entries as follows: (a) SW Yorkshire (VC 63), 1905, anon. *incertae sedis* (BMSFRD no.818476), a record which should be disregarded (B.Ing *in litt.*), and (b) on *Acer pseudoplatanus* bark, Grimsetter Airfield, Orkney, 14 Dec.1965, leg. Myles Smith (BMSFRD No.200647) [*Trans.Br.Mycol.Soc.* **50**: 555 (1967)], assumed to be that referred to in Ing (1999), although the year given in the latter is 1966.

According to Martin and Alexopoulos (1969), the American Halgestein collected *C. fragilis* in 1935, but the specimen is "an old weathered specimen consisting mostly of the bare stalks and columella. It does have small spores, about 6 µm, but otherwise is past recognition" (Hagelstein 1944). Apparently Halgestein was so doubtful about the identification he did not mention it in his book. *C. fragilis* was described by Meylan, an early 20th century Swiss mycologist, though not without much study and over many years. It is reported "the spores of one collection (undated) by Meylan of *C. fragilis,* were 7-8 µm in diameter and a capillitium with no large branches, and it seems closer to *C. nigra* than to *C. laxa"* (Martin & Alexopoulos 1969). A species of *Comatricha* with spores mostly 4-6 µm, rarely larger, was determined as *C. microspora* by Meylan (1910), soon after renamed by him as *C. nigra* var. *microspora* (Meylan 1913), and later as *C. fragilis* (Meylan 1925). It has also been collected from Switzerland on two occasions in the past 15 years (B.Ing *in litt.*) and recorded from the Netherlands (Ing 1999). A full description of *C. fragilis* is provided by Ing (1999).

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The author is indebted to Prof. B. Ing for his continued support and assistance.

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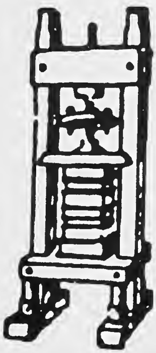

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ECOLOGY OF THE TANSY BEETLE (*CHRYSOLINA GRAMINIS*) IN BRITAIN

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INTRODUCTION

The tansy beetle (*Chrysolina graminis* L.) is a large, iridesçent green chrysomelid and one of Britain's most appealing insects. An observant person walking along the banks of the River Ouse near York in August could see hundreds of them feeding on their host plant tansy (*Tanacetum vulgare* L.) and conclude that the species was thriving. However, tansy beetles have almost certainly been lost from all other previously known British sites, leaving them confined to the Yorkshire Ouse. Because of the conservation concerns raised by this, the species has been the subject of a six-year research programme at the University of York, in collaboration with English Nature. In this article we detail our knowledge of the natural history of the York population of this charismatic insect.

WORLD DISTRIBUTION

Sivell (2003) compiled information on the global distribution of the tansy beetle, concluding that it is patchily but widely distributed throughout the Palaearctic, with records from most mid, northern and eastern European countries, Russia and Mongolia. Indeed, it is even known from the Taimayr peninsula in northern Siberia (Silfverberg 1994). However, where information has been collected, the species is rare or declining across its range, with the exception of the Netherlands, where healthy populations apparently still survive (Jaap Winkelman, *pers. comm.*).

BRITISH DISTRIBUTION AND STATUS

There are 19 hectads (10 km grid cells) in Britain with records of the tansy beetle (Figure 1), but it has only been seen in 11 since 1970, six of which are around York. Given that the species is highly visible and spends its days perched on its host plant, it is unlikely to be missed when an area is surveyed, so we can be confident that the eight pre-1970 hectads have lost the species. A problem with determining its former distribution is the high likelihood that many supposed records are actually misidentified *Chrysolina herbacea* (=*menthastri*) (see Plates 1 and 2) (Oxford *et al.* 2004), which occurs on fenland sites in southern England; for example, we now believe a record from Redmoor, Cornwall was a misidentified *C. herbacea* based on the habitat at the site, and it seems likely that this is also the case for that from the Scilly Isles. The remaining localities are from fen sites in East Anglia and southern England, although we are only confident that the populations at Wicken Fen and Woodwalton Fen, both in Cambridgeshire, were definitely *C. graminis*. Despite intensive beetle surveys, the species has not been seen at Wicken Fen since 1981 (Peter Hodge, personal communication), so is likely to have gone locally extinct there also.

The current designation of the tansy beetle in the UK is Nationally Scarce (A) (currently occupying 15-30 hectads) (Hyman & Parson 1992), leading Oxford *et al.* (2004) to remark that the plight of this vulnerable species is woefully understated.

DISTRIBUTION AROUND YORK

We have mapped the locations of individual beetle colonies along the River Ouse, showing strong but highly localised populations from about 8 km north of York to 2 km upstream of Selby (Fig. 2). Notable areas include Clifton Ings (SE5853), South Ings SSSI (SE5943 and SE5944), Skelton pumping station (SE5755) and Fulford Ings SSSI (SE6049 and SE6048). Apart from some gaps in the survey, this probably represents the entire UK distribution of

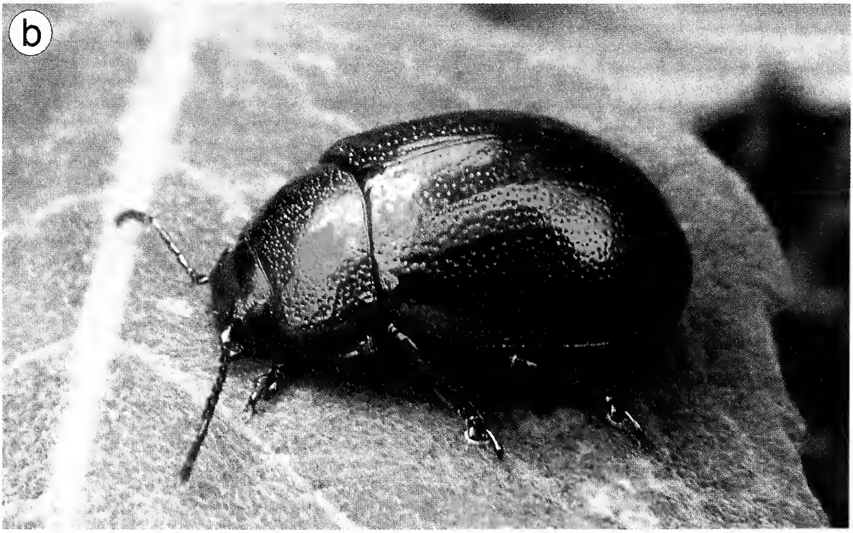

PLATE 1.

Adult (a) tansy beetles (*Chrysolina graminis*) and (b) mint beetles (*C. herbacea*) are extremely similar in overall appearance (for the more subtle differences in external morphology see Oxford *et al*. [2003]). Photograph credits: (a) Geoff Oxford; (b) Frank Koehler.

PLATE 2.
Larvae of the two species are strikingly different, with *Chrysolina graminis* a dirty yellow and *C. herbacea* metallic dark grey. Photograph by Geoff Oxford.

the species. North of York, where we have good data on the positions of the range margins over the last eight years, the beetle's range appears to have fluctuated over a few kilometres but has not shown a trend for decline or expansion. From a conservation point-of-view this apparent stability is encouraging, although we believe beetles were found 8-9 km north of the current range as far as Linton-on-Ouse (SE4960) around 50 years ago so some contraction has almost certainly occurred.

Strong populations are associated with open areas of the bank that are not over-grazed and generally managed by mowing. As a result, these areas have a high density of large tansy plants and the beetle is able to flourish. However, it is clear that there are seemingly suitable areas along the Ouse near York with lots of tansy where it is absent. This is likely to be caused by poor dispersal ability preventing the beetle from reaching these sites.

HOST PLANTS

As its name suggests, the principal food plant of both adult and larval *C. graminis* around York is tansy although we have a small number of observations of individuals feeding on other species. At Fulford Ings, adults and larvae have occasionally been seen feeding on gypsywort (*Lycopus europaeus*) and bushy mint (*Mentha* x *gracilis*) when population densities are high and tansy becomes defoliated. We have witnessed instances of adults feeding on marsh woundwort (*Stachys palustris*) near Bishopthorpe (SE6047), Fulford Ings

SSSI, Wistow Lordship (SE6135) and Nether Poppleton (SE5754). Marsh woundwort is also common at other sites such as South Ings SSSI where, according to our knowledge, beetles have never been observed to feed upon it. Beetles feeding on a mint hybrid have also been found at Rawcliffe Meadows (SE5753) (M. Hammond, *pers.comm.*).

Although tansy is almost always the plant utilised around York, the population at Wicken Fen fed on water mint (*Mentha aquatica*) and other alternatives reported from abroad include sneezewort (*Achillea ptarmica*), oxeye daisy (*Leucanthemum vulgare*), wormwood (*Artemisia* spp.), hemp nettle (*Galeopsis* spp.) and skullcap (*Scutellaria* spp.). Some of these species grow by the Ouse (e.g. sneezewort and skullcap) yet we have never seen tansy beetles feeding on them. Thus, our opinion of the York population is that it specialises on tansy but sporadically resorts to other species when tansy is unavailable.

Life cycle and natural history

The lifecycle is summarised in Figure 3. The species is essentially annual, with adults overwintering in the soil. In the spring the majority of individuals emerge from the soil to feed on tansy and mate. Females lay eggs soon after which hatch into yellow-grey larvae and pass through four developmental instars. It is at this stage that *C. graminis* is differs most in appearance from *C. herbacea* (Plate 2). Final-instar larvae enter the soil and pupate before emerging as new adults in late summer. These feed up for a few weeks before burrowing back into the soil to hibernate. Further details of each stage are given below.

Eggs

Tansy beetle eggs are ovoid, around 2 mm long and range from pale yellow to dark orange. They are laid in clusters on the underside of leaves and stems, generally sticking directly out from their substrate. In captivity, one gravid female laid a total of 562 eggs, while another laid 158 (R. Oxford, *pers. comm.*), suggesting that potential fecundity is high. Despite the dependence of larvae on tansy, female beetles often oviposit on non-host species within or around the periphery of tansy patches.

To investigate this we searched 73 tansy plants occupied by the beetle and a 10 cm zone around these patches for eggs at Fulford Ings SSSI, Middlethorpe Ings (SE6048) and South Ings SSSI for five minutes per patch in the spring of 2005. Tansy patch basal areas and maximum heights were measured and the numbers of adult beetles on each patch counted. Eggs were located on 70 patches, with a mean of 3.63 batches per patch, 61.1% of which were laid off tansy. The mean clutch contained 5.75 eggs (standard deviation of 2.80) and there was no significant difference in the size of clutches laid on or off tansy (N=264, t=0.240, P=0.810).

We speculated that laying eggs off the host plant is a way of avoiding cannibalism of the eggs by other adults, which we regularly observe in the laboratory. However, there was no correlation between the density of adults observed on a patch and the proportion of egg batches laid off tansy (N=70, r=0.102, P=0.402) implying that females do not adapt their oviposition behaviour in response to the risk of cannibalism.

While carrying out these surveys, 40 egg batches (250 eggs) were collected from the field (20 from tansy, 20 from other plants) and the eggs separated from their substrate and each other using paintbrushes and a scalpel with care not to damage them. These were reared individually in tubes with damp cotton wool at 18°C on a cycle of 16:8 hours of light and dark. Eggs were checked daily for hatching until this occurred or the eggs were clearly decomposing, by which point 205 (82.0%) had hatched. Hatching times were between 4 and 13 days, with a mean of 9.07 days.

No parasitoids emerged from any reared eggs suggesting that egg parasitism rates must be very low if present at all. This might be due to the presence of toxic defensive compounds. Other *Chrysolina* species both synthesise and sequester defensive chemicals from their host plants including cardenolides that females secrete over their eggs to deter natural enemies (Pasteels *et al.* 1977, Daloze *et al.* 1979, Van Oycke *et al.* 1987, Hilker *et al.* 1992); it is likely that *C. graminis* does the same.

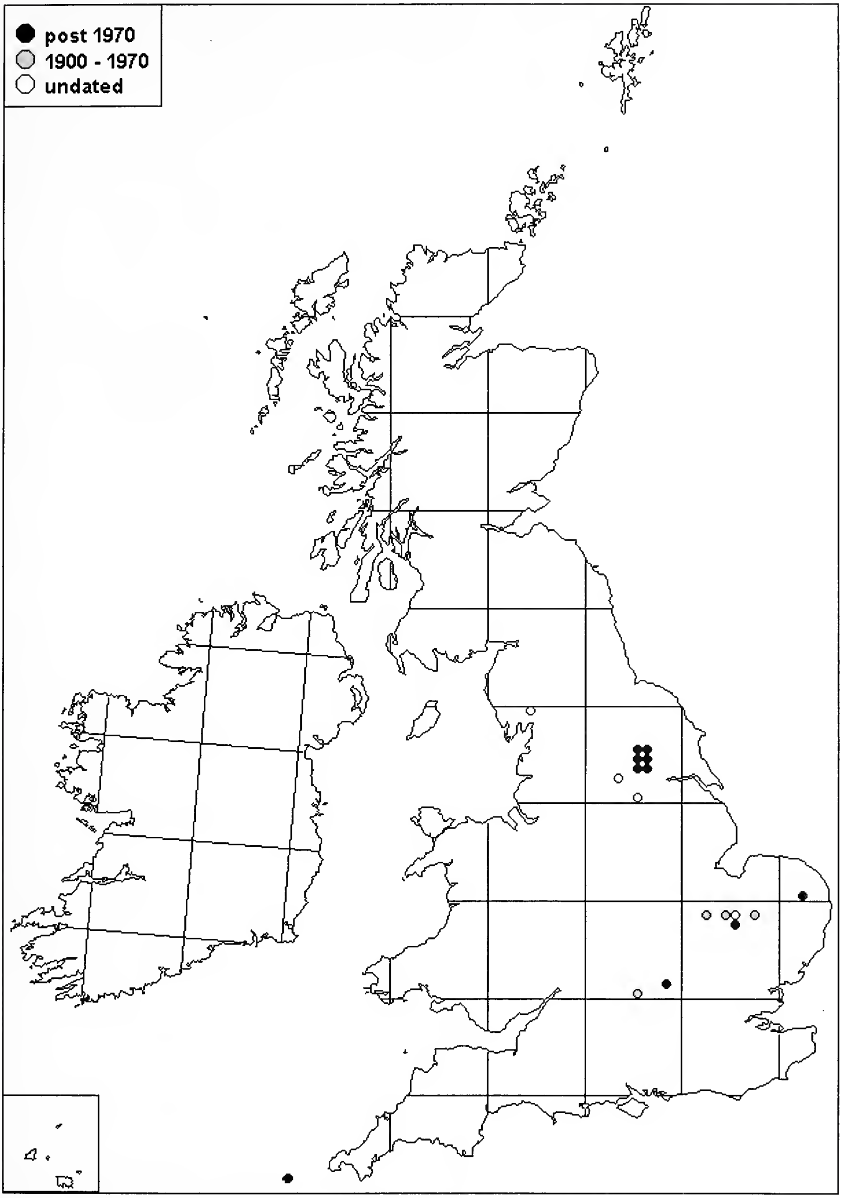

FIGURE 1.
A distribution map for the tansy beetle *Chrysolina graminis* in Britain and Ireland at a 10 km grid cell scale.

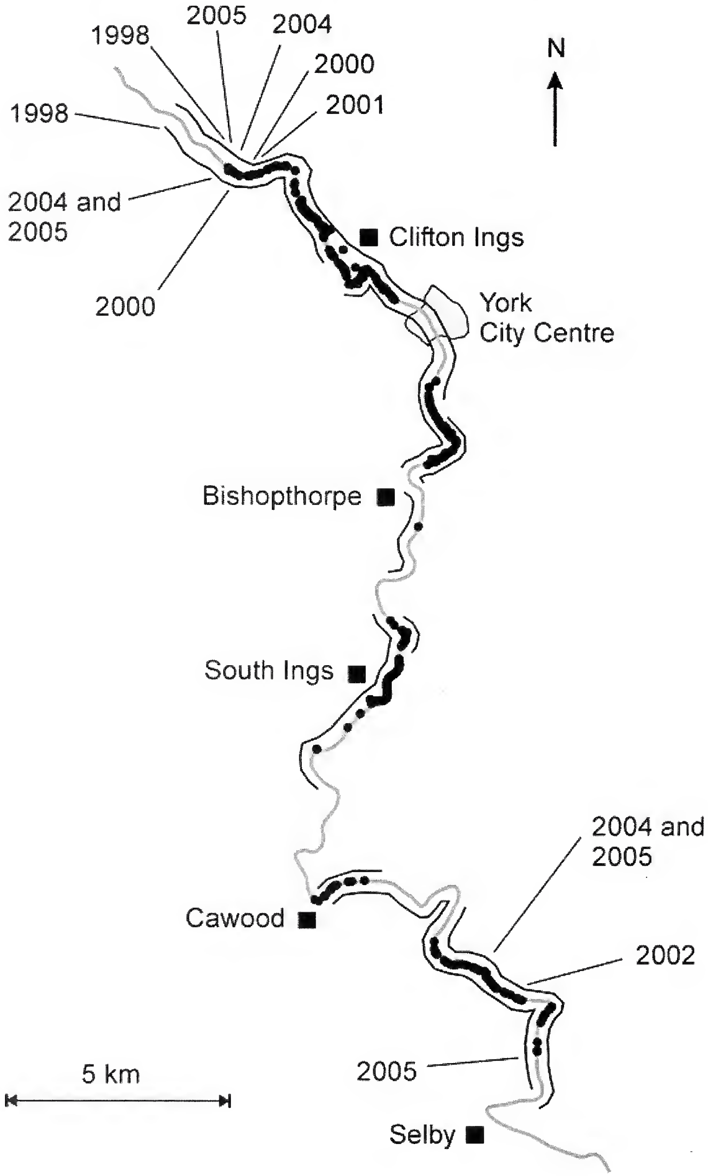

FIGURE 2.
The fine-scale distribution of the species along the Ouse around York in 2004 and 2005. The grey line shows the river, with black borders where our surveys were carried out and black dots for beetle locations along the river. The positions of the range margins on each side of the river during years when surveys were performed by us or by Calvert (1998) are marked and dated.

An analysis of covariance on hatching time (in days) revealed that eggs laid off tansy ($F_{1,200}$=26.89, P<0.001) in larger clutches ($F_{1,200}$=49.12, P<0.001) and from larger tansy patches ($F_{1,200}$=5.703, P=0.018) with low densities of adults ($F_{1,200}$=5.434, P=0.021) hatched earlier than those that experienced alternative circumstances (Fig. 4). Our interpretation of this is that egg cannibalism by adults is more common at high adult densities and that since both general activity and feeding are concentrated on tansy, eggs laid off the host plant are less likely to be discovered and eaten. Thus, the egg batches collected from tansy in high-density patches hatched later because their increased vulnerability to cannibalism meant they were on average younger.

Adults that lay large batches may invest more in their defence, since the clutch represents a higher proportion of total female fecundity. This could account for the finding that eggs from larger batches hatched earlier. Alternatively, higher quality females may lay large batches of high quality eggs that take less time to develop, which would also result in this. Eggs from large tansy patches might have hatched earlier if large patches created microclimates favourable to egg development or promoted early oviposition. Alternatively, they may have contained more varied oviposition sites that lead to lower rates of egg discovery and cannibalism.

Larvae

The larvae of *C. graminis* are soft-bodied, yellowish-grey and vary in length from around 2 mm when newly hatched up to 1 cm in their final instar (Plate 2). They hatch by bursting their eggshells with specialised spines termed oviruptors (Jolivet & Verma 2002). Since most larvae hatch off tansy they must move to a tansy plant in order to survive. Despite this, choice tests in the laboratory have shown that newly hatched first instar larvae are not able to detect tansy by olfaction alone, although further work is needed to demonstrate that they cannot detect their host by a mixture of olfaction and vision. To investigate the length of time that newly hatched larvae have to find their host, 15 larvae (first instar, less than one day old and from eggs reared alone) were deprived of food while 15 others were fed daily with a freshly picked tansy leaflet. Larvae were kept alone in glass tubes with damp cotton wool at 18°C with 16:8 hours light and dark. After eight days, none of the fed individuals had died while all the starved larvae were dead, though all survived for at least four days (Fig. 5). Thus larvae may have a relatively long window of opportunity within which to reach tansy and not require host-detection abilities to achieve this.

One method of supplementing their energy reserves is for newly hatched larvae to eat their own eggshells and cannibalise sibling eggs from the same egg batch (Mafro-Neto & Jolivet 1996), which we have observed in the laboratory. To investigate cannibalism, 83 clutches and their substrate leaves were collected from the field and kept in tubes under the same conditions described above. Each day, the batches were checked and all emerging larvae were removed. Data on the fates of individual eggs (hatched or failed) were then collected (eggs were scored as failed once they were clearly decomposed) and collated with those of the eggs reared singly (described above). Logistic regression analysis of egg fates (N=788) showed that those reared with their siblings had a higher chance of failing to hatch than those reared alone (P=0.002) (Fig. 6) indicating significant levels of egg cannibalism by larvae in their first 24 hours of life. However, clutch size had no significant effect (P=0.875) and larvae from eggs laid on tansy were just as likely to cannibalise their siblings as those from non-host species (P=0.828).

Little is known about the survival or dispersal of larvae, although we would expect them to have extremely limited dispersal ability. As preparation for other experiments, 95 field-collected larvae from all developmental instars were reared in the laboratory for up to two weeks, during which time no parasitoids emerged. Thus, although a generalist parasitoid tachinid fly *Macquartica tenebricosa* has historically been reported to emerge from *C. graminis* larvae from York (Drummond 1952), our results suggest this is probably not currently a significant source of mortality. Predation is likely to be more important, to which larvae may have some kind of chemical defence similar to that of eggs. We have observed a larvae being eaten by a scorpionfly (*Panorpa germanica*) in the field but have no knowledge of other larval predators. However, birds, coccinellids, predatory bugs, lacewing larvae, syrhphid larvae, carabids, ants, wasps, spiders and harvestmen all take chrysomelid larvae (Selman 1994) and are common on tansy. As a defence against attack, both larvae and adults may occasionally exude reflex blood and, more commonly, exhibit thanatosis (dropping and feigning death), which is an effective escape strategy (Sato *et al.* 2005). From our experience of collecting in the field, larvae seem more reluctant to drop than adults, possibly because there is a greater chance they will never re-locate their host plant or be of increased vulnerability to ground-foraging predators.

Mowing of the bank can be catastrophic for tansy beetle larvae, probably with death caused both directly by the mowers and indirectly by the loss of food plant. We have monitored the adult population at Clifton Ings with mark-recapture techniques through 2004 and 2005. A flood embankment at this site, which holds tansy and beetles, is mown every summer in July while the bank-side patches are left untouched. In 2005, none of the mown tansy patches produced any new adults, which we put down to mowing wiping out all the larvae. In 2004, the mown patches did produce adults so the mowing must have occurred when at least some of them had entered the underground pupal stage and were less vulnerable to mowing. This indicates that management for the beetle should be sensitive to annual variation in its phenology.

Unseasonal early-summer flooding is also likely to be catastrophic for beetle larvae as they sink and die after a few hours of inundation in the laboratory. Thus, the summer flooding that occurred in 2000 may have caused the observed population crashes in that year.

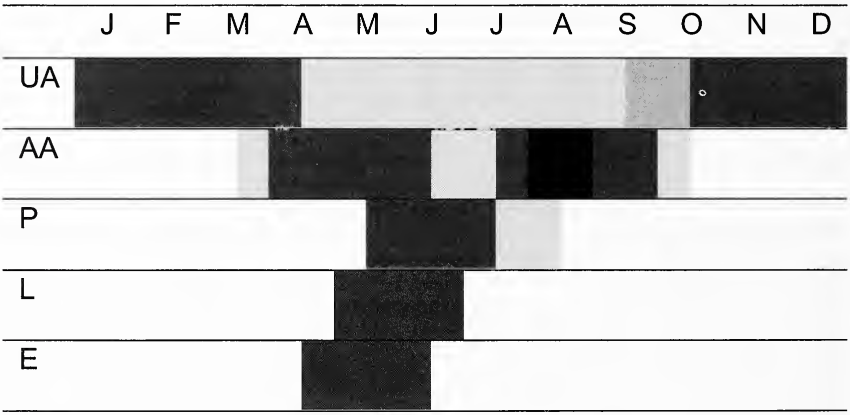

FIGURE 3.
Simplified representation of the lifecycle of the tansy beetle around York.
The different stages of the beetle are shown in different rows (UA = underground adults, AA = active adults, P = pupae, L = larvae, E = eggs) with darker shades for times when that stage is relatively more common.

Pupae

Virtually nothing is known about the pupal biology of the tansy beetle other than that final instar larvae burrow a few centimetres down into the soil below their tansy patch before forming leathery yellowish pupae that take 10-11 days to develop into adults. Chrysomelid pupae are exarate (i.e. the appendages remain free) (Jolivet & Verma 2002) meaning that tansy beetle pupae are probably able to respond to disturbance by moving, although any movement is likely to be limited. Possible natural enemies during this stage could include soil-dwelling fungi, nematodes and moles but we have no data on this. Pupae are resistant to flooding, as evidenced by the emergence of new adults after flooding at Clifton Ings in the summer of 2004.

Adults

Adults peak in abundance in August, just after emergence from pupae. Peak abundances vary considerably between years, which in part may reflect the turnover and dynamics of tansy. Adult sex ratios have also varied considerably between sites and years, with a mean (weighted by sample size) of 1.096 males per female (Table 1). The main activity between emergence and hibernation is feeding, presumably to gain the energy reserves needed to survive the winter, although some mating also occurs at this time. Captive virgin females that mated in autumn but were deprived of access to males in spring were still able to produce viable eggs indicating that they stored sperm over winter.

TABLE 1.
Sex ratios in adult populations censused as part of different studies.

Study	**Study timing**	**Beetle number**	**Males per female**
Skelton 2000	Autumn	133	0.985
Skelton 2001	All year	992	0.780
Clifton Ings 2001	All year	201	1.258
Clifton Short Reach 2001	All year	102	1.267
Fulford Ings 2001	All year	643	0.822
Skelton 2002	All year	2096	0.726
Clifton Ings 2002	All year	236	1.126
Skelton 2003	Spring	207	1.876
Skelton 2004	Spring	255	1.236
Clifton Ings 2004-2005	Two years	2226	1.558

Daily adult survival rates in the monitored populations have consistently been estimated at 92-96% (Sivell 2003). Choice tests have indicated that, like larvae, adults are unable to detect tansy from a distance, so starvation is likely to be an important source of mortality when beetles wander away from their host. Predation rates are probably low because of thanatosis and defensive chemicals such as cardenolides, polyoxygenated steroid glycosides and amino acid derivatives (Pasteels *et al.* 1994). However, predation may still be an important source of mortality, especially during the few days immediately after emergence while the exoskeletons of adults are still hardening. Beetle remains bearing what appear to be the marks of bird attacks have been found by the river and dead beetles have been found in the webs of spiders in a captive population. Parasitism may be of lower importance however as no parasitoids have ever emerged from adults we have kept in the laboratory.

Beetles overwinter in the soil below tansy patches and long-term monitoring has indicated that survival during hibernation is surprisingly high, as autumn and spring population sizes are very similar. This is despite annual winter flooding of the Ouse, implying that overwintering individuals must be extremely tolerant of long periods of inundation and oxygen deprivation. Beetles must also either choose hibernation sites that are frost-free or be highly resilient to freezing. However, this is perhaps not surprising given that the beetle's range includes Siberia and areas north of the Arctic Circle.

An interesting phenomenon we have observed is that around 5% of overwintering adults do not emerge from the soil after the winter, but remain underground in a state of extended diapause for the next year to emerge in the following spring. This is probably a risk-spreading strategy allowing populations to recover from the kind of catastrophic effects

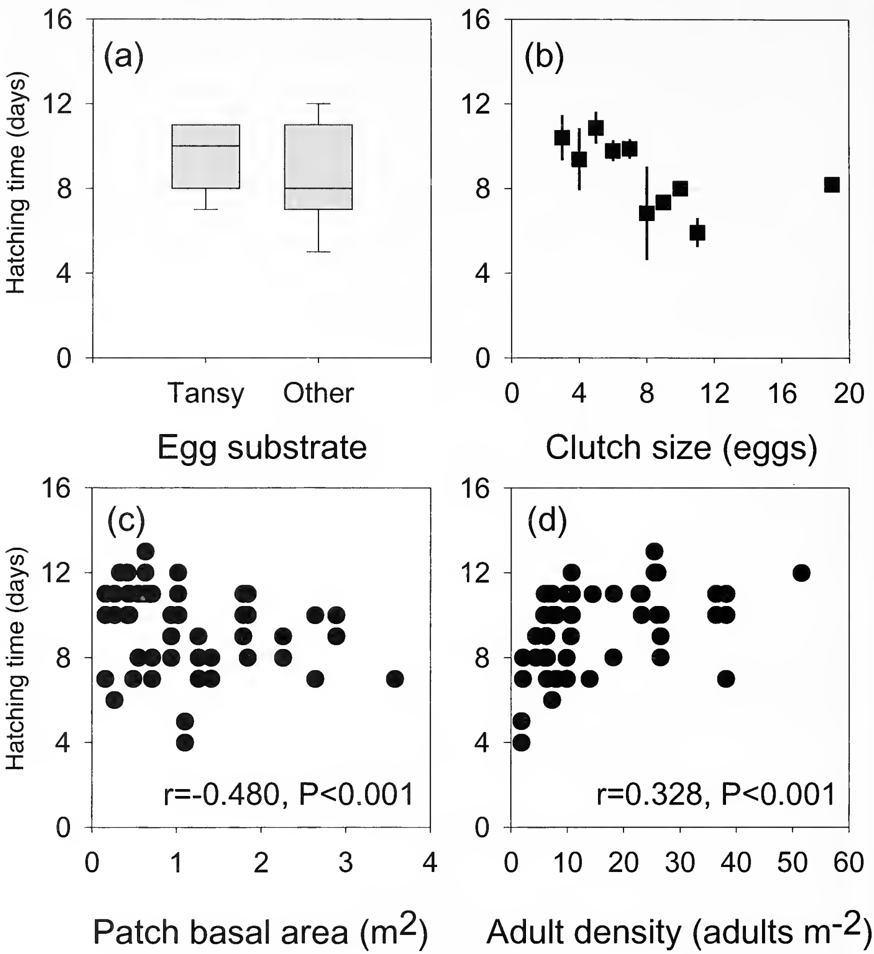

FIGURE 4.
(a) Boxplot of hatching times for eggs collected from tansy and other species. Boxes delimit the interquartile ranges with lines through the medians, while whiskers bound the 90th percentiles. (b) Mean hatching times (with 95% confidence intervals) of eggs collected from different sized batches that were reared singly in the laboratory. Scatter plots of egg hatching time against (c) patch basal area and (d) adult density for eggs collected in those patches and reared singly, with correlation coefficients and P-values shown.

that can annihilate entire cohorts of active individuals, such as temporary tansy patch destruction by large vertebrate herbivores, and is known from other chrysomelids such as the Colorado beetle *Leptinotarsa decemlineata* (Ushantinskaya & Yirkovsky 1976). Many patches suffer annual catastrophes in the form of summer mowing. This kills some of the adult beetles (as we have found the remains of chopped up elytra after mowing) and the survivors then move from the mown patch and either starve or reach nearby intact patches.

As the patch re-grows, the diapausing individuals that have persisted through the mowing can emerge and the subpopulation on that patch can recover.

Some adults also enter diapause at the end of the breeding period in late May and June, only to re-emerge after the winter for a second active mating season, although we do not yet have data on the frequency of such events. Diapause is likely to be under hormonal control and may be in response to changes in host plant condition (Jolivet & Verma 2002).

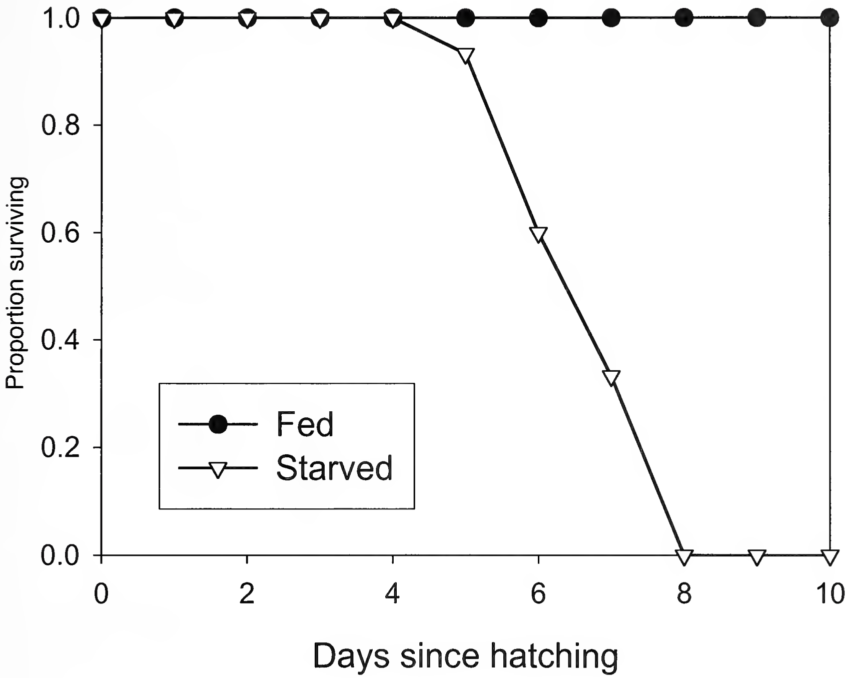

FIGURE 5.
Survival through time in the laboratory of two batches of 15 first instar larvae that were either starved since emergence or fed daily with tansy leaves.

Mating is most common in spring, when copulating pairs can be seen sitting on tansy. In the monitored populations, copulations of the same pair could last over 24 hours, during which time some pairs moved between tansy patches. Mating in a Russian population is preceded by an elaborate ritual involving the male tapping the female's eyes, pronotum and antennae with its antennae (Medvedev & Pavlov 1988). This may be a strategy to prevent inter-specific mating, which is common among *Chrysolina* species in Europe (Jolivet & Verma 2002) though we have never observed such behaviour in the York population, possibly because the extremely similar *C. herbacea* is not present here. We have twice seen male green dock beetles (*Gastrophysa viridula*) attempting to mate with *C. graminis* females, but the size difference and likely variation in chromosome number between these species probably makes such attempts futile.

As well as being adapted to annual winter flooding, adults also seem to be able to cope with rare summer floods, which may totally inundate tansy patches. At Clifton Ings, summer flooding does not result in reduced survival as beetles move away from the immediate riverbank and onto the flood embankment. However, some individuals remain stranded on bank-side patches, where they cluster around the top of the plant as floodwaters rise (see photographs in Oxford *et al.* 2004). If the patch becomes submerged, these individuals can be washed away and could then potentially travel long distances downstream. An observed colonisation of the Esplanade (SE5952), downstream of Clifton Ings may have occurred in this manner as the nearest beetle colonies to this site are isolated by scrubby woodland upstream and York City centre downstream, which are likely to be barriers to normal dispersal. We have also witnessed stranded beetles crawling down tansy stems into the floodwaters. This could enable beetles to persist the flood, assuming they are able to withstand the underwater conditions, perhaps by entering the soil at the base of the plant and locating pockets of trapped air or entering a dormant period in which oxygen is not required.

The principal method of adult dispersal is by walking, as the York population has never been known to fly. We have monitored the movements of marked individuals at Clifton Ings and near Skelton and shown that dispersal ability is limited with a mean fortnightly net displacement of just 11 m, although a small number of longer-distance dispersal events were recorded up to a maximum of 460 m.

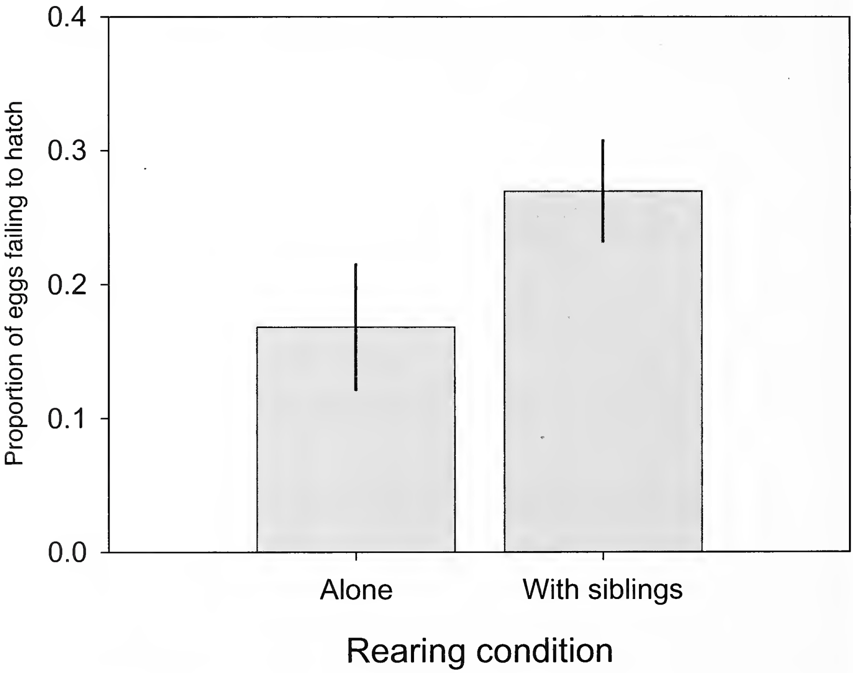

FIGURE 6.
Mean egg failure rates (with 95% confidence intervals) when eggs are reared in the lab alone or with their siblings. The higher mortality of those reared with their siblings was due to egg cannibalism by the newly emerged sibling larvae.

FUTURE DIRECTIONS AND CONSERVATION

Research at York is now focused on understanding the beetle's dispersal and demography to inform conservation measures such as translocations. We have carried out reintro-ductions at five sites north of York between Beningbrough and Linton-on-Ouse, which as well as being a practical conservation measure, will be monitored to test and validate our understanding of their dispersal. We are also working on developing molecular genetic techniques to study population structuring and identify rare long-distance and cross-bank dispersal events.

We have recently sought Biodiversity Action Plan (BAP) listing for the tansy beetle, which if agreed will heighten its profile as a species requiring conservation action. Since our work has shown that the beetle relies on riverbanks with concentrated tansy patches, we would recommend measures to ensure the banks of the Ouse are well stocked with tansy. In our opinion, these include fencing off livestock from parts of the bank and using annual mowing as a method of creating suitable conditions. Generally we would advise that mowing should be responsive to the phenology of the species, with the most appropriate times being in July during pupation and in the autumn when the majority of individuals are below ground. In fact, at South Ings SSSI, English Nature are now carrying out autumnal mowing combined with the avoidance of large tansy patches (S. Christian, *pers. comm.*), which should provide excellent conditions for the beetle.

A simple conservation measure would be to include tansy seed in the mixes sown on newly constructed or repaired flood embankments and other riverside earthworks. We would also like to see measures taken to control invasive plant species on the Ouse, especially Himalayan balsam (*Impatiens glandulifera*), which grows in dense stands in many of the prime beetle locations and in time outcompetes tansy. A further concern is that tansy can be mistaken for ragwort (*Senecio jacobaea*) by inexperienced or inattentive ragwort-pullers. Since tansy is easily recognised by its distinctive odour, minimal training would prevent this.

Conclusions

The tansy beetle is clearly adapted to its environment by the employment of simple strategies, such as host-plant specialisation, fixed oviposition preferences and the loss of flight. Unfortunately, this simplicity means it is very vulnerable to change, such as altered water tables and management regimes, which is probably why it has contracted to the York area. However, the prospects for conserving the York population are good, despite the fact that we still do not understand why the beetle thrives on the banks of the River Ouse but not elsewhere in Britain. As we discover more about the species' requirements and its endangered status becomes more widely recognized, conservation strategies can be better planned, implemented and enforced.

Acknowledgements

Our research has been funded through two NERC PhD studentships with CASE support from English Nature as part of their Species Recovery Programme, a grant from the City of York Council and a British Ecological Society Small Ecological Projects Grant. The Environment Agency provided access to their land for surveying. We thank Roma Oxford for initiating the project and giving comments on the manuscript, Michael Cox for data on the current UK distribution and Daniel Calvert, Martin Hammond and Simon Christian for information on the York population. We are also indebted to Prof. Geoffrey Fryer for providing useful comments on the manuscript and Frank Koehler for the photograph of *C. herbacea*.

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BOOK REVIEW

The Lichen Hunters by **Oliver Gilbert.** Pp. x + 208, plus 16 pp. of colour plates. The Book Guild, Lewes. 2004. £16.95 hardback.

Oliver Gilbert, who sadly died last year, was one of Britain's leading field lichenologists; he had a particular flair for discovering rarities, new British records and species in remote, unusual and indeed unlikely habitats. Since much of this book is autobiographical, it forms a fitting memorial to his lichenological achievements. It traces the role of several key players in the development of field activities within the British Lichen Society since its establishment in 1958, but it is not a history of that Society as purported on the publicity material, added to which a bibliography, in some cases to support some of the factual information, is lacking.

However, in concentrating on fieldwork, the author is able to portray the enthusiasm and excitement engendered by those, particularly amateurs, who play an important role in our understanding of the ecology, distribution and conservation of our flora. Based on his expedition diaries and field notes, the author provides a lively and vivid account of interest to a wide readership.

MRDS

ECOLOGICAL INVESTIGATIONS AT PULFIN, A FEN IN EAST YORKSHIRE

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INTRODUCTION

Pulfin, situated in the flood plain of the River Hull about 2 miles north of Beverley (GR TA050441), consists of about 11 ha. of fen vegetation. It is enclosed by the river on three sides and by grassland and an old flood bank on the remaining (eastern) side. Between the flood bank and the fen there is a strip of *Salix fragilis* woodland, the floor of which is strewn with fallen trees and branches. The fen is the major part of an SSSI, notified under the name of "Pulfin Bog" and, together with about 0.5 ha. of rough grassland, has been owned by the Yorkshire Wildlife Trust since 1980.

When the Trust acquired Pulfin there was a large area of rough ground east of the old flood bank, presumably a site from which clay had been taken to embank the river. In 1983, the Yorkshire Water Authority began deepening and extending this area and by 1989 had created a borrow pit of about 11 ha. that reached the river bank at the northern and southern ends. Before the work was completed the river banks were partially breached forming spillways through which river water could flood into the borrow pit when it reached a level of about 2.5m A.O.D.

The name Pulfin appears to be a corruption of "pool fen" (Allison, 1989), presumably a reference to the several springs that emerge at the surface of the site. It is probably the presence of these springs that has ensured the survival of the fen vegetation. At the time the site was acquired by the Yorkshire Wildlife Trust the line of a former ditch dividing the site into northern and southern sections of similar area could still be discerned, so clearly an attempt was once made to drain the area, probably late in the 18th century.

In 1980, the vegetation north of the ditch was dominated by *Glyceria fluitans* and that to the south by *Phragmites australis*. Immediately north of the ditch, near the centre of the site, were the remnants of a post and wire fence. According to Davies and Boatman (2001), the site was grazed before 1955, but the presence of the fence remnants and the apparent preference of cattle for *Phragmites* over *Glyceria* (see below) suggest that only the northern half was grazed. The probable reason for this is that springs are more frequent in the area south of the ditch than in that to the north. Furthermore the latter are all peripheral so could easily have been individually fenced.

Soon after the site was acquired as a nature reserve, three springs were located near the centre. The orifice of one of the latter, subsequently labelled Spring D, was only about $2m^2$, but it was surrounded by a floating carpet of *Glyceria fluitans*. Another central spring, Spring E, lay beneath a mature specimen of *Salix alba* and was considerably larger. This spring, together with the third, emerged within vegetation dominated by *Phragmites australis*.

During the early 1980s, Spring D was greatly enlarged by removing the floating carpet of *Glyceria fluitans*. The final area was about $250m^2$. Later it was realised that there was another spring orifice close to Spring E. The carpet of *G. fluitans* covering this and that lying between it and Spring E were also removed.

According to Davies and Boatman (2001), Fojt identified the vegetation at Pulfin in 1992 as degraded S24 *Phragmites australis – Peucedanum palustre* tall herb fen (Rodwell 1995). In Britain, this type of vegetation is mainly confined to Norfolk and Cambridgeshire. Indeed on the map accompanying the description of the vegetation in Rodwell (1995), only two locations are shown for the type outside these counties. One is in Somerset and the other appears to be Pulfin.

In the early 1980s, the author began collecting data on the vegetation and environmental conditions represented at Pulfin. Recent events have prompted a thorough re-examination of the information accumulated and it is now believed that the site exhibits features that are probably unique. It is also believed that inferences can be drawn which provide guidance for the future management of the site.

Methods

Vegetation mapping and recording

A base line marked at 100-foot (30.5m) intervals by fence posts was established at right angles to the transverse ditch near the eastern side of the fen (the heavy line extending approx. north/south, see Fig. 1). The plants present in $1m^2$ quadrats placed at 100-foot

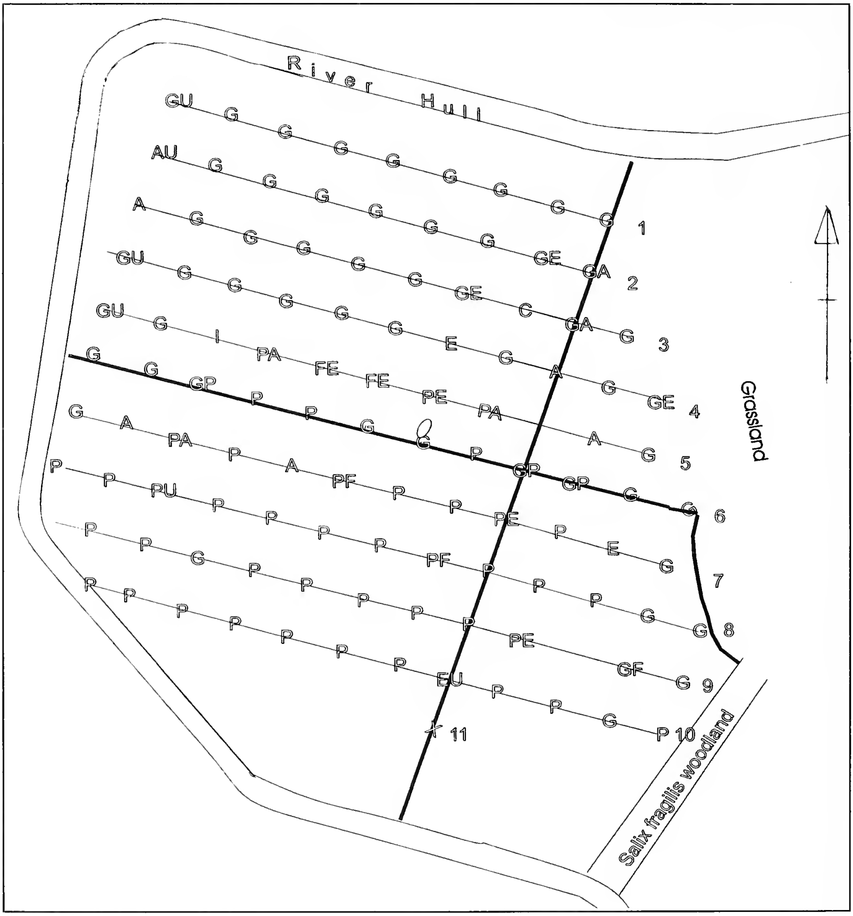


FIGURE 1.
Map of Pulfin showing numbered transects and the species dominant in $1m^2$ quadrats during the period 1982-87. A = *Phalaris arundinacea*, E = *Epilobium hirsutum*, F = *Filipendula ulmaria*, I = *Iris pseudacorus*, G = *Glyceria maxima*, P = *Phragmites australis*, U = *Urtica dioica*. The quadrats are 100ft. apart. The transverse heavy line with an extension to the strip of *Salix fragilis* woodland is the line of a former ditch. The approximately vertical line is the base line (see text). The oval shape above the approximate middle of the ditch marks the position of Spring D.

intervals along transects at right angles to the base line were then recorded and the dominant species noted in each case. One of the quadrats on each transect was adjacent to a fence post. The species present between the quadrats and within a metre of the transect were also noted. The line of each transect was determined by means of a quadratic compass and levelling staff. Measurements of some of the distances between the ends of adjacent transects indicated that the method was accurate to within a few feet. The work was done by members of the Hull Natural History Society in June or July from 1982 to 1987 inclusive.

During the period 1989-1992, rainfall was relatively very low (Fig. 2) and by the end of the period *Phragmites australis* had disappeared from a considerable proportion of the area east of the base line. In 1993, a set of six permanent quadrats was established close to the base line to monitor the composition of the vegetation. To minimize disturbance from trampling, each quadrat was situated about 5m from the posts that marked where transects 7 to 11 crossed the base line (Fig. 1). Most were east of the base line (number followed by 'E'), but there was also another west of post 7. Each quadrat was $1m^2$ and from 1993 until 2000 the species present in each of them were recorded, the dominant noted and the number of *P. australis* shoots counted. Until 1995 recording was done about mid-June, but in that year it was noticed that the number of *P. australis* shoots in some of the quadrats was lower than in 1994. The spring of 1995 was rather cool so in that year recording was repeated in mid-July. Subsequently all recording was done in that month.

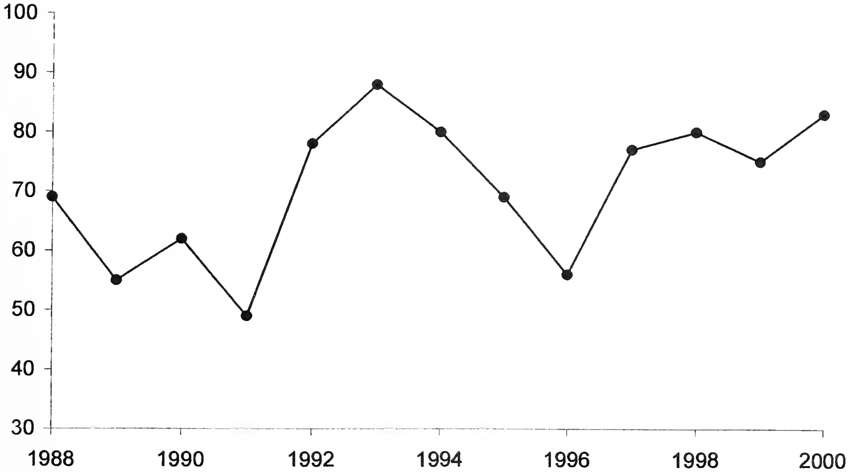


FIGURE 2.
Annual rainfall (cm) at a weather station near Beverley for the period 1988 to 2000 inclusive.

Environmental factors.
From March 1983 until August 1987 and again from January 1991 until May 2000 arbitrary determinations of water level were made against posts inserted into the peat at the sides of Springs D and E. No measurements of water level between 1987 and 1991 are available because the reference posts could not be found, probably because they had been overgrown by vegetation advancing from the sides of the springs. New posts were inserted at the beginning of 1991.

In 1997, the Environment Agency commissioned a topographical survey of the SSSI and the 11ha borrow pit adjacent to it. A consequence of this was that it became possible to relate the determinations of water level in the springs from 1991 to 2000 directly to Ordnance Datum. In both 1983 and 1998, the springs remained full of water throughout the summer, so by comparing the two sets of data an estimate of the water levels with reference to Ordnance Datum in 1983 and from then until 1987 could be made.

In 1993, holes were bored into the peat adjacent to posts 7-11 along the base line and a tube well inserted into each hole. The tubes were 2m long, but unfortunately the lower ends were not covered before insertion and some peat was forced into the lower metre or so of each of the tubes.

In 1986, peat samples were collected from a depth of 12-15cm adjacent to each of the posts along the base line and the pH determined by means of a glass electrode. Subsamples were taken which, after drying at 100°C, were weighed and then ignited in a muffle furnace at 600°C. The remaining ash was weighed and expressed as a percentage of the dry weight of the peat.

Results

The Vegetation

The dominant species in each of the quadrats recorded from 1982 to 1987 is shown in Fig.1. While *Glyceria fluitans* tended to be dominant in the area north of the former transverse ditch (adjacent to Transect 6, see Fig.1) and *Phragmites australis* in that to the south, other species were occasionally dominant or co-dominant in both areas. Most noteworthy is the tendency for *Glyceria fluitans* to be dominant in the two easternmost quadrats of those transects south of the transverse ditch.

Altogether 27 species of flowering plant and a horsetail, *Equisetum palustre,* were recorded in the 110 quadrats surveyed. The number of quadrats in which each species occurred along each transect is shown in Table 1 together with the total number of species recorded in quadrats along each transect. The species marked with an asterisk are "constants" for S24 vegetation (Rodwell 1995). Two more constant species, *Eupatorium cannabinum* and *Mentha aquatica*, were recorded between the quadrats. The three remaining flowering plants named as constants for the vegetation type, *Cladium mariscus, Juncus subnodulosus* and *Peucedanum palustre*, were not recorded at Pulfin.

Several other species included in the list for S24 vegetation by Rodwell (1995) have been recorded at Pulfin. Two that were recorded between the quadrats are *Lathyrus palustris* and *Lycopus europaeus.* A few plants of *Rumex hydrolapathum* also still exist on the site and *Thelypteris palustris* is known to occur in an area of *Salix cinerea* scrub. A single badly eroded tussock of *Carex paniculata* was seen in the mid 1980s, but could not be found after 1992, and *C. appropinquata* was reported still to be present in 1968 (Crackles 1990), but has not been reported since. *Peucedanum palustre* was reported to be abundant "in marshes near Beverley" in 1800 (Crackles 1990), so might have been at Pulfin at one time.

In Figure 3, the number of shoots of *Phragmites australis* counted in each of the six permanent quadrats is shown for the years 1993 to 2000. In 1993, the numbers ranged from 0 in Quadrat 7E to 38 in Quadrat 11E. (Note that the numbers for Quadrats 10E and 11E have been reduced by a factor of 10.) All of the quadrats were within an area where, in the mid-1980s, *P. australis* was dominant (Fig.1). By 1993, however, other species, namely *Epilobium hirsutum, Filipendula ulmaria, Glyceria maxima, Phalaris arundinacea* or *Urtica dioica*, were judged to be dominant or co-dominant. From 1993 until 1996, the number of *Phragmites australis* shoots gradually increased overall in each of the quadrats, but in 1996 they again collapsed. Subsequently they increased again.

Of particular interest is the evidence, presented in Figure 3, that *Glyceria maxima* spread and became a more prominent component of the vegetation near the base line after 1992. In the 1980s, this species was not recorded where Transect 7 crossed the base line, nor in the 100ft sections along the transect east or west of it, although it was present where Transect 8 crossed the line. After 1992, however, its status in the neighbourhood of the base line changed markedly. In 1993, it was present in Quadrat 7E and was dominant in Quadrat 8E.

TABLE 1.
Number of quadrats occupied along each transect.

Transect	1	2	3	4	5	6	7	8	9	10	Total
Total Quadrats	9	10	10	11	11	12	12	13	11	12	110
Angelica sylvestris				1	1						2
Caltha palustris					1		3	1	4	2	11
*Calamagrostis canescens**			2		1		7		2	2	14
Carex acutiformis			1	1	2	2	3	4	2		15
Carex riparia				2	1			4	2	5	14
Cirsium arvense	1			1							2
Epilobium hirsutum	4	4	6	8	9	7	11	8	5	5	67
Equisetum palustre					3						3
*Filipendula ulmaria**		2	4	4	7		8	10	9	10	54
Galium aparine								1	1		2
*Galium palustre**			2						1		3
Glyceria maxima	**9**	**10**	**9**	**10**	**9**	**9**	**2**	**2**	**5**	**4**	**69**
Iris pseudacorus		1		1	3		4	3	1	2	15
Lemna minor							2				2
*Lysimachia vulgare**						1	1				2
*Lythrum salicaria**								2			2
Phalaris arundinacea	1	3	8	2	5		5	2		3	29
*Phragmites australis**				**1**	**6**	**9**	**12**	**11**	**9**	**12**	**60**
Persicaria amphibia	2	3	1	5	2						13
Scrophularia aquatica						1					1
Scutellaria galericulata			3	3	4	1	1	3	1	2	18
Solanum dulcamara		1			1	2			1		5
Stachys palustre		4	3	2	2						11
Thalictrum flavum			1			1	2	2		1	7
Urtica dioica	3	2	2	3	1	5	3	4	3	3	29
Valeriana officinalis		1	1	1			1	2		3	9
Vicia cracca					1		2			1	4
Total species	6	10	13	15	18	10	16	15	14	14	

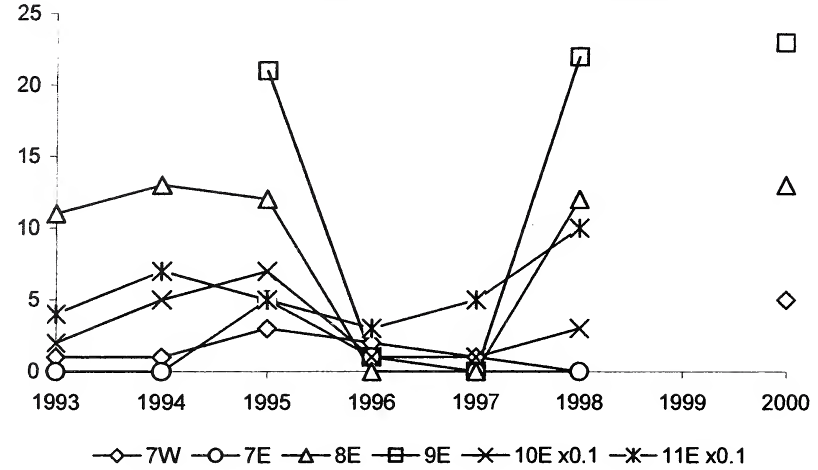
Species marked with an asterisk are constants for S24 vegetation

By 1994, it had become co-dominant with *Filipendula ulmaria* in Quadrat 7E and had appeared in Quadrat 7W. In 1995, it became dominant in Quadrat 7E, but did not become dominant in Quadrat 7W until 2000 though it became co-dominant with *F. ulmaria* in 1997. The species was not recorded in Quadrats 9E to 11E inclusive during the whole of the period for which data are available.

The number of species recorded in each of the permanent quadrats between 1993 and 2000 varied from year to year. Although the number tended to increase in and around 1996 in some of the quadrats and decline again later, there appeared to be no overall relationship between the number of species and the number of shoots of *Phragmites australis.*

pH and Ash Content of the Peat

Values of the pH and ash content at the points where transects 1 to 11 cross the base line are illustrated in Figure 4. The pH drops from 7.1 to 6.1 along that section of the base line crossing the area dominated by *Glyceria maxima* (Points 1 to 5 inclusive), but is relatively consistent at 6.6 to 6.9 further south where *Phragmites australis* was mostly dominant. The



	1993	1994	1995	1996	1997	1998	1999	2000
8E	D	D	D	p	CD	p		CD
7E	p	CD	D	p	D	CD		
7W		p	p	p	CD	CD		D

FIGURE 3.
The number of stems of *Phragmites australis* present in each of six permanent quadrats (7W and 7E to 11E) over the period 1993 to 2000 inclusive (above) and the status of *Glyceria maxima* in three of the quadrats during the same period (below).
D = dominant, CD = co-dominant, p = present.

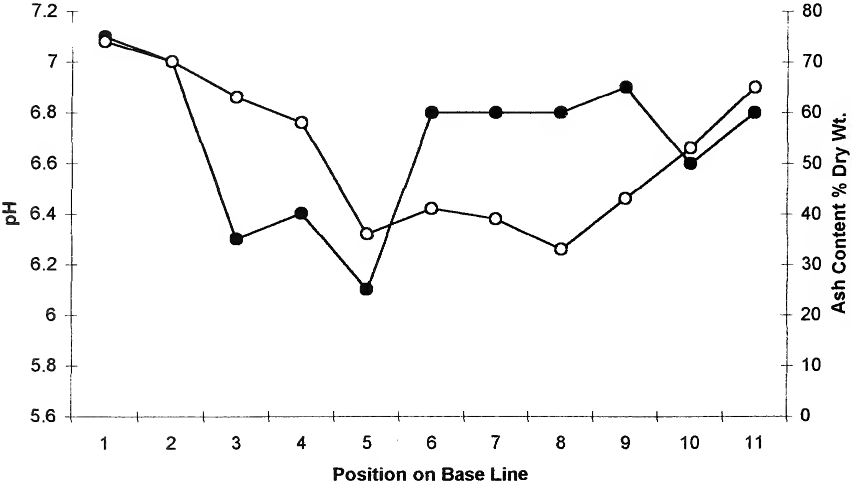


FIGURE 4.
Ash content (○) and pH (●) of the peat at 11 sites along the base line (see Fig. 1)

ash content is surprisingly high at 74% dry wt. near the northern end of the base line, but declines to 30-40% between sites where transects 6 to 9 inclusive cross the line and then rises again to about 65% at Site 11.

Water Levels in Spring D, the tube wells and the Borrow Pit.

During 1994, the water level in Spring D appears to have remained consistently above 2.6m A.O.D. (Fig. 5). In 1995, it declined slowly during the summer and autumn from nearly 2.8m A.O.D to about 2.4m A.O.D. and remained at about that level for nearly 150 days (i.e. until the end of May 1996). Subsequently, however, it began to drop relatively rapidly and continued to do so at an average rate of 4.6mm day^{-1} until near the end of November when there was a small rise following a period of heavy rain. Subsequently the level continued to fall rapidly. The spring became dry at the end of September, but a small pit was then excavated in the floor of the spring so that the further changes of water level could be measured.

In Figure 5 the water levels in those tube wells nearest to and furthest from Spring D are also shown for the first 170 days or so of 1996. These are where transects 7 and 11 respectively cross the base line. For the sake of clarity, only levels that differed from those of Spring D by more than $\pm$ 10mm are shown. The values for the remaining tube wells lay between those shown. The data indicate that the water levels in the tube wells dropped at approximately the same rate as that in Spring D.

A comparison of the water level in Spring D on Day 353 of 1996 (Fig. 5) with that on Day 23 of 1997 (Fig. 6) reveals that it rose more than 0.5m during the intervening period of 36 days. By about the middle of March it had risen another 0.3m to 2.22m A.O.D. A subsequent fall was followed by a gradual tendency to rise, but the spring did not fill until the end of the year or early in 1998. Thereafter, during the whole of 1998, the water level was not recorded below 2.5m A.O.D. (In Fig.6 the water levels for 1998 are shown to the nearest day on which levels were recorded in 1997 for the sake of clarity.)

For the first 3 months of 1996, the water in the borrow pit was at or slightly above 2.4m A.O.D., the level of the lowest part of the northern spillway. Towards the end of April, however, it began to fall and continued to do so steadily until about the end of September when it began slowly to rise again. The rate of decline between the end of April (about day 110) and the end (about day 260) of September was considerably less than that in Spring D (Fig. 5).

A set of 37 water level records is available for Spring D in 1991. From the end of February until the end of June the water level remained high at about 2.6m A.O.D., but then it began to fall rapidly. By the end of the year it was at about 1.7m A.O.D., having fallen at an average rate of 4.7mm day^{-1}, and by the end of February 1992 it was down to about 1.4m A.O.D., below which it could no longer be recorded. The spring remained dry until the end of September 1992, rose slowly to about 1.8m A.O.D. by the beginning of November and then rapidly filled to 2.8m A.O.D. by the beginning of December.

Thus the hydrograph for 1991 closely resembles that for 1996, the water level falling at an almost identical rate once it had begun. Subsequently, however, the spring remained dry for much longer and failed to re-fill until the river flooded the site late in the following year.

Discussion

In his description of the *Phragmites australis – Peucedanum palustre* community, Rodwell (1995) distinguishes five sub-communities, one of which is the *Glyceria maxima* sub-community. According to Rodwell, this sub-community develops in conditions which are more eutrophic than those characteristic of the other sub-communities, while Tansley (1938) states that where *G. maxima* is dominant along the valley of the river Yare in Norfolk it is "probably associated with heavier silting and a higher pH value". Heavy silting, as indicated by the very high ash content of the peat, appears to be associated with the dominance of *G. maxima* on the area north of the transverse ditch at Pulfin (Figs 3 and

1), so it would seem appropriate to refer this area to the *G. maxima* sub-community. The heavy silting is a consequence of water spreading across Pulfin from the northern side when the River Hull is in spate. Similarly, since the source of the River Hull is a series of springs emerging from the Chalk several miles north of Pulfin, the higher pH of the peat towards the northern boundary is a consequence of the mild alkalinity of the water.

The dominance of *Phragmites australis* and the absence or extreme scarcity of species typifying the *Carex paniculata*, *Symphytum officinale* and *Cicuta virosa* sub-communities suggests that the area south of the transverse ditch should be referred to the "Typical" sub-community. However, certain species, namely *Carex acutiformis, Carex riparia*, *Epilobium hirsutum* and *Glyceria maxima*, which are widespread south of the ditch (Table 1), are either absent from or very rare in the Typical sub-community as described by Rodwell (1995). All of these species are widespread in his *Glyceria maxima* sub-community, however, and *Phragmites australis*, a "constant" of the community as a whole, is often abundant in the sub-community. It might be appropriate, therefore, to regard the area south of the ditch as a *Phragmites*-rich version of the *Glyceria maxima* sub-community. South of the area mapped in Figure 1 there is a tongue of vegetation, dominated by *Glyceria maxima*, where the ash content of the peat is similar to that near the northern boundary of the site (Fig.4, Sample 11). This again is a probable consequence of heavy silting from the river where it overflows the southern side of the site. Indeed, as the river floods Pulfin, water has been seen trickling northwards in the middle of the *Phragmites*-dominated area.

In Figure 2, the annual rainfall for the period 1988 to 2000 is shown. After the period of drought starting in 1989 *Glyceria maxima* replaced *Phragmites australis* as the dominant species over much of the area east of the base line and south of the transverse ditch. In 1993, the density of *Phragmites* shoots in the newly established quadrats east of the base line ranged from 0 in the northernmost to nearly 40 in the southernmost. Subsequently densities increased in all quadrats (Fig. 3), but in 1996, when the water levels in the springs began to decline rapidly at the end of May, they collapsed again. After water levels in the springs had recovered the densities of *Phragmites* shoots also began to recover.

Thus the performance of *Phragmites australis* close to the base line appears to be related to the water levels in the central springs. Monitoring of the tube wells along the base line, however, revealed that at least initially the water table in the peat body closely followed that in Spring D. This is remarkable given that the southernmost quadrat is about 100m from the nearest spring and the hydraulic conductivity of peat is known to be extremely low.

A possible explanation of this paradox can be found in the work described by Middleton (1994). From a comparison of 18th and 19th century maps, Middleton concluded that, at the time the Beverley and Barmston Drain was constructed around 1800, the River Hull was diverted to its present course from one that passed through the centre of Pulfin. The openings of the central springs and much of the base line in Figure 1 lie above or close to the old course of the river as shown in Middleton's paper. If the river was indeed diverted, the old course would presumably have been closed. In these circumstances it is possible that *Glyceria maxima* formed a mat floating over the water trapped in at least part of the old course and that now the deeper peat over this area, formed from detritus falling from the bottom of the mat, is still semi-liquid. Thus, when the level of water in the springs drops, that in the tube wells would also be expected to drop vertically under the influence of gravity.

An observation made in 1992 strongly supports this explanation. In June of that year the Yorkshire Water Authority pumped water from the borrow pit onto Pulfin for a period of three weeks at the request of English Nature. At the end of the period, water was pumped directly into one of the springs of the central complex. Two days later, water was seen in another spring about 30m away which had previously been dry. There was no evidence that the water was flowing from one spring to the other across the surface of the intervening peat. When pumping ceased the water in the second spring rapidly disappeared again.

The source of the water in the springs is uncertain, but, after an investigation of the relationship between water levels in the springs at Pulfin and those at the nearest of their boreholes, the Environment Agency concluded that "the most likely source of the water in the bog is chalk groundwater" (letter to the Yorkshire Wildlife Trust). Thus the springs appear to be part of an artesian system whereby the water level is controlled by hydrostatic pressure within the groundwater of the chalk.

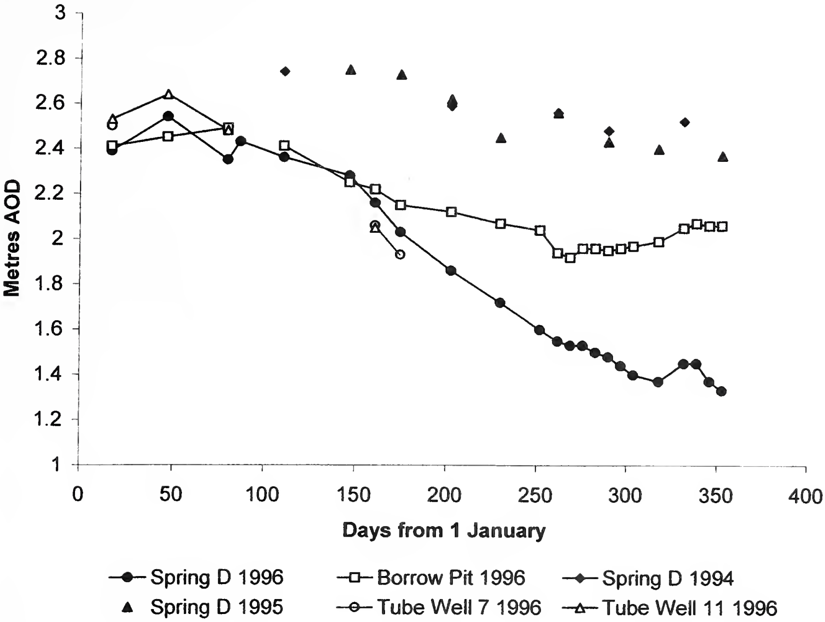


FIGURE 5.
Records of the water level in Spring D, the borrow pit and tube wells 7 and 11 in 1996 and in Spring D in 1994 and 1995.

If this is so, it is to be expected that in "normal" conditions water would overflow from the springs and an aerial photograph, taken during the 1960s, suggests this does occur. What appears to be a water track can be seen extending northwards from Spring D. In these circumstances, however, it is difficult to understand why, in dry years, there should be a sudden, rather than a gradual, change in the rate at which the water level falls as shown for Spring D in Figure 5 and in the hydrograph for 1991 (not presented). It also seems to be a remarkable coincidence that the rate of fall in the two years should be almost identical. Some process appears to cut in which only operates in dry years but there is no evidence to indicate what this could be.

The rhizomes of *Phragmites australis* are at a depth of about 0.5m on Pulfin, so in "normal" years it is unlikely that the level of "free" water in the peat falls below the level of the rhizomes. Consequently it is unlikely that the roots extend very far down into the peat. Thus, in years of low rainfall when the water level in the springs falls by more than 1.5m, it is probable that the plants are exposed to water stress which can be so severe that many of them die. The few that remain are able to develop normally when the stress is removed.

It is to be expected that the interpretation given above would apply only to *Phragmites* growing over or in the neighbourhood of the old watercourse. By and large, this appears to be the situation because even after the prolonged drought from 1989 to 1992 *Phragmites* survived on the western half of the site south of the central drain. However, *Phragmites* also died on the eastern side of the fen, almost certainly away from the old watercourse. At present no explanation of this occurrence can be put forward though it is believed that an investigation of the variation of peat depth on the reserve might provide some clues. Holes bored near Spring D have proved the peat to be up to 5m. deep (Middleton 1994), but it is likely that depth decreases rapidly eastwards towards the end of the clay ridge on which the grassland is situated.

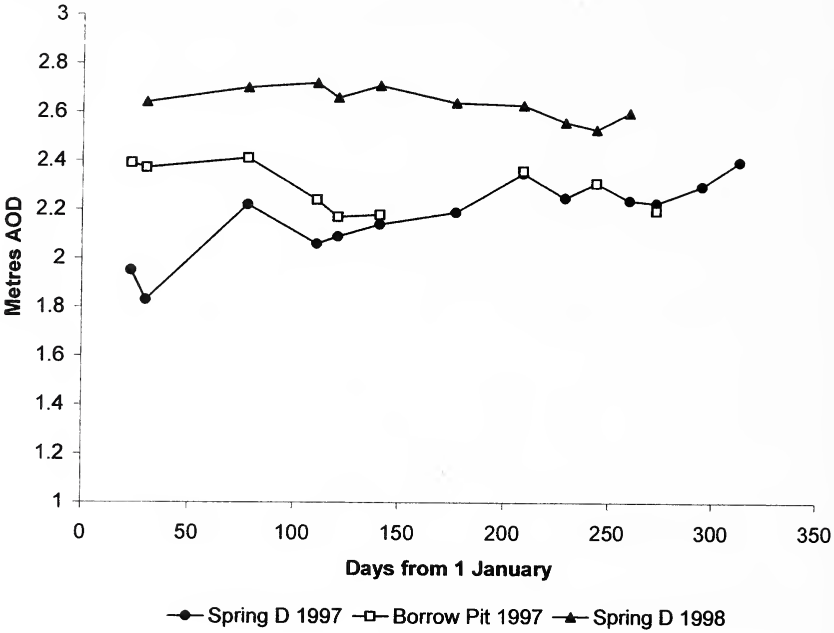


FIGURE 6.
Records of the water level in Spring D in 1997 and 1998 and in the borrow pit in 1997.

When the Yorkshire Wildlife Trust acquired Pulfin, tongues of *Phragmites australis* extended from the transverse ditch into the area dominated by *Glyceria maxima* (Fig.1). The plants within these areas were vigorous, so it seemed that the species was invading the area dominated by *G. maxima* rather than retreating. By 1991, *Phragmites australis* had largely disappeared from these areas, but it began to re-appear after 1996. The area north of the transverse ditch was probably grazed by cattle until about 1955 (Davies & Boatman, 2001), but subsequently it remained ungrazed until the Yorkshire Wildlife Trust re-introduced cattle in 2004. Almost immediately *Phragmites,* which had re-appeared in places north of the transverse ditch, disappeared again. Careful inspection of the vegetation revealed that its shoots had been grazed almost to ground level. It seems likely, therefore, that between 1955 and 1991 the area north of the transverse ditch was progressively reverting to a *Phragmites*-rich version of the *Glyceria maxima* sub-community following the cessation of grazing.

Inspection of Table1 reveals that in the mid-1980s species other than *Glyceria maxima* were considered to be dominant or co-dominant in eight of the ten quadrats along Transect

5 about 30m north of the transverse drain. Furthermore the total number of species recorded in the quadrats of a transect declined steadily from Transect 5 northwards to Transect 1 (Table 1). From Transect 5 northwards along the base line, the ash content and pH of the peat steadily increases (Fig. 5), presumably because of the filtration of silt from the river water as it floods across the site. If this applies generally, the decline in the number of species northwards might be related to this edaphic gradient but most of the more common species individually show the overall tendency to decline and it seems unlikely that they would all respond to the gradient in a similar way. Apart from the notable exceptions of *Persicaria amphibia* and *Stachys palustre*, species that are not included in the list for S24 vegetation by Rodwell (1995) and *Glyceria maxima*, most of the species occur in still more quadrats per transect south of the transverse ditch. It is much more likely, therefore, that by the mid-1980s these plants, like *Phragmites australis*, were gradually invading the *Glyceria*-dominated community from the south following the cessation of grazing before 1955.

Conservation

According to Rodwell (1995), the most widespread human activity on the Norfolk and Cambridgeshire fens and swamps has been mowing for thatch and collection of litter for bedding. Where mowing has been abandoned and dykes become silted up and overgrown, "the reversion of fen to woodland is clearly visible throughout Broadland" as indicated by the abundance of saplings of *Salix cinerea* and *Alnus glutinosa*. Rodwell also points out that places can be found in Broadland where *Peucedano-Phragmitetum* lies between swamp and woodland. Here woodland would be expected gradually to advance into the fen.

At Pulfin, there are a few patches of *Salix cinerea* scrub and some isolated bushes, but no saplings were recorded either within or between the quadrats during the survey of the vegetation undertaken in the 1980s, and the author cannot recall having seen any since. In most winters, the site is flooded, sometimes for considerable periods, and it is possible that the eutrophication caused by the deposition of silt encourages the growth of the dicotyledonous macrophytes *Epilobium hirsutum* and *Filipendula ulmaria* which, together with *Phragmites australis*, in turn prevent the establishment *of Salix cinerea* seedlings. At present it appears that all that is necessary to control invasion by willow scrub is to prevent self-layering of existing bushes.

Although there is no evidence of long-term succession to woodland, the work described in this paper indicates that parts of the site are sensitive to relatively short periods of low rainfall. One obvious method of counteracting the effect of such periods would be to pump water onto Pulfin from the neighbouring borrow pit.

An alternative procedure, considered and partly put into effect by the Yorkshire Wildlife Trust, was to re-excavate the eastern part of the old ditch as far as the central spring and connect it to the borrow pit by means of a pipe through the old flood bank, thereby allowing water to flow from the pit on to Pulfin in exceptionally dry conditions. It was considered that even if the system failed to function as hoped, the additional area of open water would be an asset. In the event, the ditch was re-excavated but it proved impractical to extend it through the strip of *Salix fragilis* woodland to the flood bank. Nevertheless, the ditch could serve a valuable purpose by acting as a conduit for water pumped into it from the borrow pit. Especially as the site is so remote, consideration would have to be given to how the pumping system could be protected against vandalism.

According to Byass (*pers. comm.*), the farmer of the land east of Pulfin, the reed-bed at Pulfin was sometimes burned during the winter. Rodwell (1995) mentions burning of the Broadland fens only in connection with the removal of litter after mowing. Restoring this practice as a management procedure at Pulfin might encourage the spread of some of the rarer fen species but it is perhaps more likely that it would have the adverse effect of encouraging the spread of those species that are already common, namely *Epilobium hirsutum* and *Filipendula ulmaria*. Although, so far as is known, mowing has never been practised at Pulfin, it might be wiser to explore the effect of managing small selected areas in this way instead.

As mentioned above, the Yorkshire Wildlife Trust arranged for grazing to begin again on the northern half of the reserve in 2004, expecting that this would lead to greater plant diversity. However, if the interpretation given above of the data presented in Figure 1 and Table 1 is correct, it is more likely to have the opposite effect. Furthermore, in the discussion of the *Peucedanum palustre – Phragmites australis* community, Rodwell (1955) deals in considerable detail with the effects of mowing and also of peat cutting on the community but makes only a passing reference to grazing. This refers to the effect of grazing on S24 vegetation after it has been embanked and drained.

The area of grassland belonging to the Yorkshire Wildlife Trust on the slope east of the fen has also been included in the grazed enclosure, but during a superficial survey by the author in the autumn of 2005 several of the species listed by Wilder and Boatman (1996) could not be found. A surprising feature of this grassland, which was very tussocky before grazing began, is that there was no evidence of scrub developing even though there are a few mature *Crataegus monogyna* bushes in the vicinity. Altogether, therefore, there appears to be a case for reconsidering how both the *Glyceria*-dominated area and the dryer grassland should be managed, perhaps after another thorough analysis of the composition of the two areas.

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BOOK REVIEW

Richard Spruce: naturalist and explorer by **Michael Pearson.** Pp. iv + 100, with b/w plates. Hudson History, Settle. 2004. £8.00 softback, from Austwick Hall Books, Austwick, via Lancaster LA2 8BS.

Although much has been written, particularly over the last two decades, on one of Yorkshire's greatest naturalists, we are indebted to Michael Pearson for providing an accessible and most readable biography: to cover in words and illustrations the life and work of such an important figure is not easy. An informative text is complemented by plates, including sketches by Spruce made during his travels of South America, and supported by notes on sources and a helpful bibliography. The usefulness of the index is unfortunately marred by the absence in all copies of a section (within O to S). Strongly recommended, particularly to those interested in Victorian exploration and natural history.

MRDS

THE WASPS AND BEES (*HYMENOPTERA: ACULEATA*) OF POLLINGTON QUARRY IN WATSONIAN YORKSHIRE

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Pollington Quarry was brought to my notice by P. Kendall. It is rare to find a Yorkshire site with more than 100 species of aculeate wasps and bees, and even rarer to find such a site that had not been previously explored. Only four other sites, Allerthorpe Common before its coniferization, Strensall and Blaxton Commons and Crow Wood have more than 100 species.

Pollington Quarry (SE6119, SE6120) is a disused sand quarry of c.9 ha situated in the Humberhead Levels Natural Area, c.3 km south-east of Snaith and c.16 km north of Doncaster. The site has extensive bare sandy areas varying from flat to vertical surfaces which provide nesting sites for subterranean nesters. There are a variety of flowers providing pollen and nectar resources including herbs (White Dead Nettle, Bird's Foot Trefoil), shrubs (Bramble, Broom, Hawthorn, Sallow) and trees (Sycamore). There are also a few pieces of dead wood in sunny situations which provide nesting sites for some aerial nesters.

Methods

Between 1998 and 2002, 28 visits (c.3 hours) were made to Pollington Quarry distributed throughout the year as follows: April (4 visits), May (5), June (5), July (5), August (5) and September (4). During each visit, all species of aculeate wasps and bees were recorded and usually collected with a hand net for identification. These records represent the Archer sample.

In addition, P. Kendall made two visits (30 July 1997, 17 June 2000) and J.T. Burn made nine visits (May 2000-July 2003), and made their records available to the author. Specimens collected by P. Kendall have been seen by the author. The records of Archer, Kendall and Burn represent the composite sample.

In the following account, the nomenclature is mainly according to Kloet and Hincks (1978). An up-to-date checklist can be found on the Bees, Wasps and Ants Recording Society (BWARS) web pages at http://www.bwars.com/.

Species Present and Seasonal Progression of Species

A full list of the species recorded is given in Appendix 1. At the family level, Table 1 shows the taxonomic distribution of species and records. A record represents a specimen differing in one of the following three variables: name, sex and day of visit. The wasp family, Sphecidae, is the dominant solitary wasp taxon in terms of the number of species and records and the Chrysididae and Pompilidae are well represented as records, although with a smaller number of species. Among the solitary bee taxa, the Andreninae and Halictinae are dominant in terms of both the number of species and records, although the Colletinae are well represented as records.

Based on the Archer sample, Table 2 shows the average number of solitary species recorded during each visit for each month. June and July were the best months, with an average of c.22 species per visit. The average number of species for all visits was c.16 species.

May to August were the best months for recording solitary wasp species, with May, June and July the most productive months for first recording of species (Table 3). The most frequent species found were the fly hunters *Oxybelus uniglumis* and *Crossocerus quadrimaculatus*, the caterpillar hunter *Ammophila sabulosa*, the aphid hunters *Diodontus minutus* and *D. tristis*, the beetle hunter *Entomognathus brevis* and the spider hunter *Episyron rufipes*. All these species are subterranean nesters in bare sandy areas. Also prominent was the parasite *Trichrysis cyanea*, probably using the aerial-nesters of the

TABLE 1
Number of species and records from Pollington Quarry based on the Archer and Composite (Archer + Kendall + Burn) samples

	Archer Sample		Composite Sample	
	Species	Records	Species	Records
Solitary wasps				
Dryinidae	0	0	5	7
Bethylidae	0	0	1	2
Chrysididae	7	37	7	42
Mutillidae	1	1	1	1
Sapygidae	2	5	2	6
Pompilidae	9	37	9	37
Eumeninae	7	15	7	18
Sphecidae	21	127	24	142
Total solitary wasps	47	222	56	255
Solitary bees				
Colletinae	4	26	4	26
Andreninae	18	86	18	88
Halictinae	19	127	19	129
Megachilinae	5	13	6	15
Anthophorinae	10	36	12	45
Total solitary bees	56	288	59	303
Total solitary species	103	510	115	558
Social wasps & bees				
Vespinae	4		4	
Apinae	9		9	
Total social species	13		13	
Total wasps & bees	116		128	

genus *Trypoxylon* as its host, and the cleptoparasite *Evagetes crassicornis*, whose host was probably the subterranean-nesting *Arachnospila anceps*.

April to August were the best months for recording solitary bee species, with April the most productive month for first recording of species (Table 3). The species most frequently recorded were the following subterranean nesters with their cleptoparasites in brackets: *Colletes daviesanus* (*Epeolus variegatus*), *Andrena bicolor* (*Nomada fabriciana*), *A. nigroaenea* (*N. goodeniana*), *A. barbilabris* (*Sphecodes pellucidus*), *Lasioglossum leucozonium* (*S. ephippius*), *L. villosulum* (*S. geoffrellus*, *S. puncticeps*) and *L. smeathmanellum* (possibly *S. geoffrellus*). One aerial nester, *Hylaeus hyalinatus*, which probably nested in dead plant stems, was also frequently recorded. The mason bee, *Osmia rufa*, was also frequently recorded nesting in hard sandy banks.

Species Quality of the site

Archer (2002) developed a regional quality scoring scheme for the solitary species based upon four statuses: Common, Frequent, Occasional and Rare. Ten regionally rare species have been recorded: *Chrysis rutiliventris, Crossocerus leucostomus, Stigmus solskyi, Cerceris arenaria, Philanthus triangulum, Andrena tibialis, A. ovatula, Lasioglossum morio, Sphecodes reticulatus* and *Nomada fulvicorne* (Table 4). None of the species of social wasps and bees, Dryinidae and Bethylidae are considered regionally rare species.

Few Yorkshire sites have ten or more regionally rare species. At present, only Blaxton Common with ten rare species and Crow Wood with 15 rare species can be grouped with Pollington Quarry although Strensall Common with six rare species and Rossington Bridge with seven rare species are also outstanding sites.

TABLE 2
Mean number and range of species of solitary wasps and bees recorded per month at Pollington Quarry from the Archer sample

April	May	June	July	August	September
11.0	17.4	23.8	20.8	14.8	5.5
7-14	11-21	19-29	17-25	11-20	5-7

According to Shirt (1987), six species are national Red Data Book status species: *Crossocerus leucostomus, Philanthus triangulum, Andrena tibialis, Sphecodes reticulatus, Nomada fulvicornis* and *N. lathburiana*. According to Falk (1991), *C. leucostomus, A. tibialis* and *S. reticulatus* should be downgraded to Notable A status, while *Nomada integra* should be given Notable A status and *Monosapyga clavicornis, Hylaeus signatus, Andrena humilis* and *A. nigriceps* should be given Notable B status.

More investigations by members of BWARS indicate that further status changes are necessary. Archer (1999, 2002) has developed a national quality scoring scheme for the solitary species based on the following six statuses with their official equivalences in brackets: Very rare (Red Data Book status), Rare (Notable A status), Scarce (Notable B status), Restricted, Widespread and Universal. Those with a Very rare, Rare or Scarce status are high quality species, while those with a Restricted, Widespread or Universal status are low quality species. Using this updated scheme, three Rare species (*C. leucostomus, N. fulvicornis* and *N. integra*) and eight Scarce species (*Chrysis viridula, M. clavicornis, Diodontus tristis, H. signatus, A. humilis, A. nigriceps, A. tibialis* and *S. reticulatus*) have been recorded from Pollington Quarry. The distributions of *Philanthus triangulum* and *Nomada lathburiana* are now better known partly due to recent increases in range so that they no longer merit national significance, both being low quality species with Widespread status. Status rank cannot be given to species of Dryinidae and Bethylidae as there is insufficient information about their British distributions.

By giving each of the 109 solitary species of the Composite sample an Archer national quality status, a national quality score of 244 can be calculated (Table 4) with a national species quality score (SQS) of 2.24 (244 divided by the 109 solitary species). How does this SQS compare with SQSs from other Watsonian Yorkshire sites? Archer (2003) divided the SQSs of studied Yorkshire sites into three classes as follows: first class 2.4-2.9; second class 1.8-2.3; and third class 1.2-1.7. Pollington Quarry, rather surprisingly, is a second class site. Currently, Strensall Common and Crow Wood are the only first class Yorkshire sites, although previously Allerthorpe Common, before its coniferization, and Spurn Point were first class sites. The reason why Pollington Quarry fails to qualify as a first class site will be considered in the next section.

TABLE 3
The number of species, and when species first recorded, per month of solitary species at Pollington Quarry (Archer sample)

		Apr	May	Jun	Jul	Aug	Sep
No. species	– Wasps	1	18	26	25	21	9
	– Bees	27	31	31	25	21	6
No. species first recorded							
	– Wasps	1	18	12	10	6	0
	– Bees	27	11	9	5	4	0

Estimate the potential number of solitary Wasp and Bee species

One of the problems in the study of any site is the difficulty of not knowing how many more species are present at the site, but as yet unrecorded. Recent advances in non-parametric statistical procedures offer a way of addressing this problem. Chao and

TABLE 4

The Archer regional and national quality scores of the solitary species recorded from Pollington Quarry based on the Composite sample (excluding Dryinidae and Bethylidae)

Regional Status	No. Species
Common	36
Frequent	33
Occasional	30
Rare	10
Total	109

National Status	Status Value	No. Species		Quality Scores	
		All spp	Tourists removed	All spp.	Tourists removed
	(A)	(B)		(A x B)	
Universal	1	64	52	64	52
Widespread	2	34	26	68	52
Restricted	4	0	0	0	0
Scarce	8	8	8	64	64
Rare	16	3	3	48	48
Total		109	89	244	216

Species Quality Score (SQS) (All species) 244/109 = 2.24
Species Quality Score (SQS) (Tourists removed) 216/89 = 2.43

Bootstrap estimates (in Colwell & Coddington, 1994) and Jackknife estimates (Heltshe & Forrester, 1983) describe procedures to estimate the potential number of species (species richness) likely to be found on a site after a number of samples have been taken. The presence/absence quantitative estimate of Chao is based on the number of species that are recorded in one (unique species) or two samples. The Jackknife procedure is based on the unique species while the Bootstrap procedure is based on the relative abundance of each species. Because some aculeate species are only active in the spring or summer, it is advisable that samples be distributed throughout the months of adult activity. The software to carry out these statistical procedures was provided by Pisces Conservation Ltd. In practice the software takes 1, 2, etc. samples at random, each time calculating a mean estimate of species richness. The procedure is continuously repeated, 50 times for the Pollington Quarry samples. With a small number of samples the estimates are highly variable, but as more samples are selected these may stabilise, giving confidence in them.

The estimates based on the Archer sample at different sample sizes are given in Figs 1a, 2a and 3a. The estimates do not stabilize. Table 5 shows the species richness estimates for the three procedures; with their 95% confidence limits (except for the Bootstrap procedure) after all 28 samples have been considered. The three estimates differ from each other too widely to have confidence in them.

The recorded species at any site could be resident, tourist or vagrant species. Resident species obtain all their resources, mainly nesting sites and food, from the site under study while tourist species, although living in the geographical area of the site under study, do not normally obtain their resources from the site. Vagrant species normally occur away from the geographical area of the site. It is often difficult to separate resident from tourist species. Probably tourist species will tend to be found on one or a few visits, as only small numbers would be expected to be present on the site and hence less likely to be found. Unfortunately, species found on one or a few visits could also be rare resident species which again have small numbers on site and are less likely to be found. No vagrant species were found at Pollington Quarry.

Two suggestions can be proposed to separate out some tourist species: (1) species that

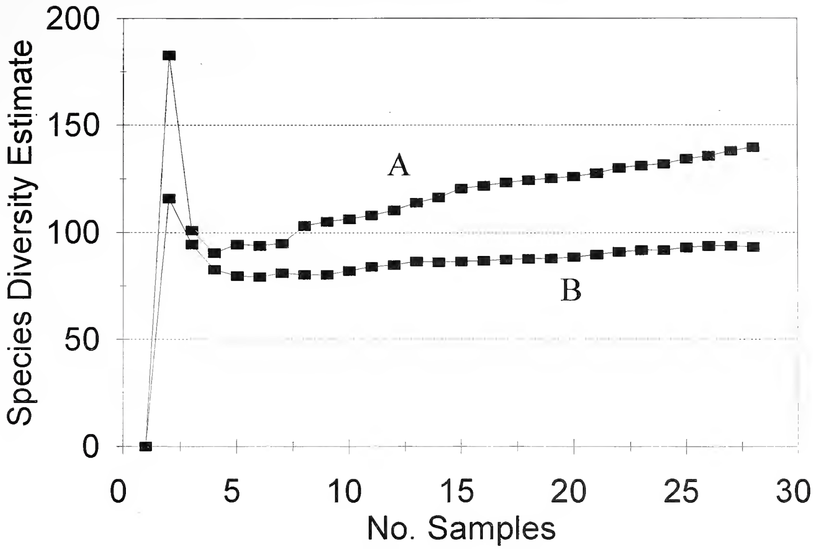

FIGURE 1.
The Chao presence/absence estimate of species richness for Pollington Quarry based on the Archer sample (A) and the Archer sample (B) with tourist species removed.

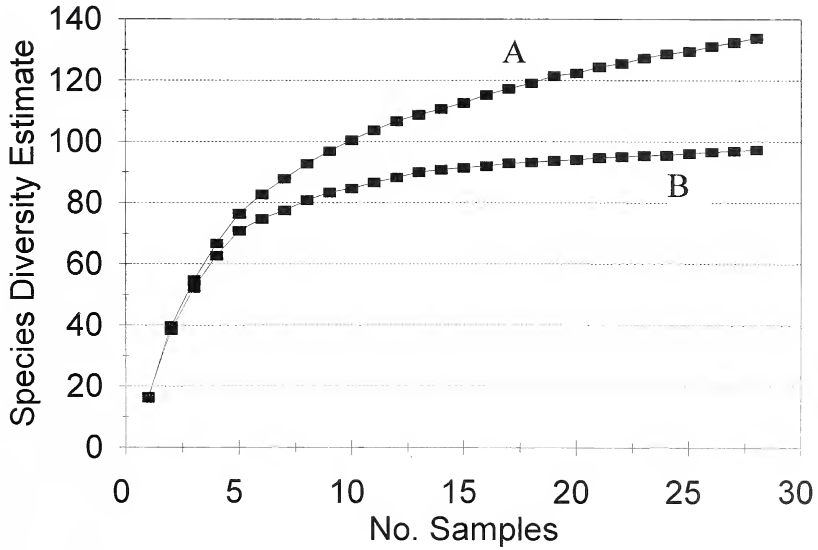

FIGURE 2.
The Jackknife estimate of species richness for Pollington Quarry based on the Archer sample (A) and the Archer sample (B) with tourist species removed.

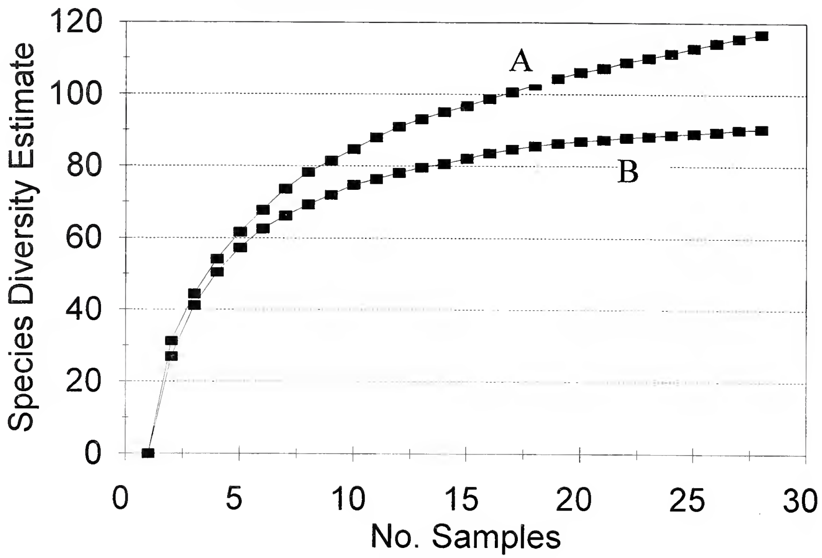

FIGURE 3.
The Bootstrap estimate of species richness for Pollington Quarry based on the Archer sample (A) and the Archer sample (B) with tourist species removed.

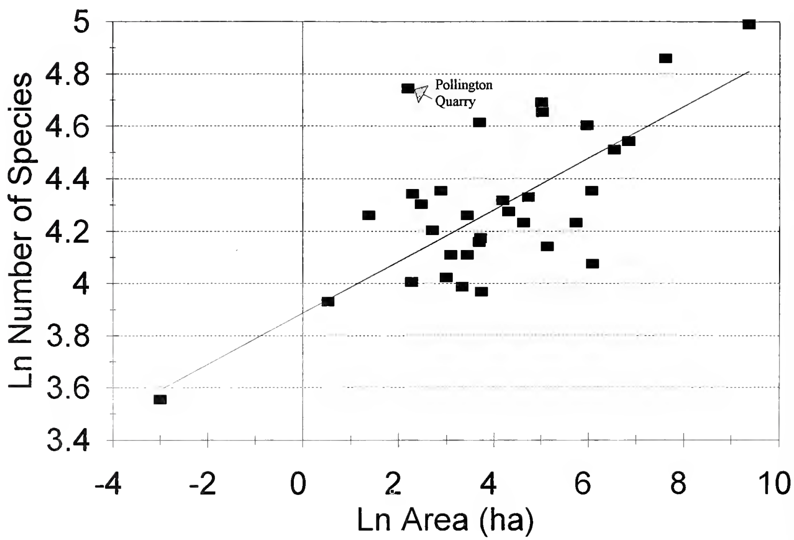

FIGURE 4.
A species-area relationship of 33 sites from the north and north Midlands of England.

are generally common and widespread would be expected to be found on several visits if they are resident species, e.g. *Mellinus arvensis, Andrena clarkella* and *A. cineraria* and (2) Cleptoparasites whose host species are tourist species (from 1), e.g. *Nomada lathburiana* and *N. leucophthalma*. With these two criteria, 20 species can be considered tourist species. These species were removed and the three species richness procedures re-run. The new species estimates are given in Figs 1b, 2b and 3b, and the species estimates after all 28 samples were considered are given in Table 5. The three estimates now stabilize and the stabilized estimates are very close to each other. The confidence limits are also reduced. From this analysis it can be predicted that Pollington Quarry has a resident number of species of solitary wasps and bees of 90 to 97 species, of which 86 to 92% have been recorded, and an unknown number of in excess of 20 tourist species. This is a relatively high number of tourist species recorded from a site.

The 20 tourist species are, as expected, those with a Universal or Widespread status. When these 20 species are removed and the species quality exercise repeated the quality score is 216 and the species quality score 2.43 (216 divided by 89 species). The new SQS now indicates that if only the resident species are considered the site become a first class quality Yorkshire site.

Species-area relationships

The number of solitary species can be related to site area. The species-area relationship can be found by plotting the number of solitary species recorded at a site against the area of the site, with both the number and area expressed as natural logarithms (ln). Fig. 4 shows a species-area plot of 33 sites from the north and north Midlands of England including Pollington Quarry, together with the regression line for 32 sites with Pollington Quarry excluded. The dot for Pollington Quarry falls well above the regression line and further from the regression line than any other site. Normally such a position for a dot would indicate that for Pollington Quarry is more favourable for species of solitary wasps and bees than the other sites. However, in this case, the dot's high position is a consequence of the large number of tourist species recorded from this site. If the tourist species are removed from the list for Pollington Quarry, then the dot becomes closely associated with the dots for the other sites.

TABLE 5
Non-parametric estimates of species richness at Pollington Quarry based on the Archer sample

All species	Chao estimate	Jackknife estimate	Bootstrap estimate
No. species recorded	103	103	103
No. species estimated	140	134	117
95% confidence limits	112-168	124-144	–
% of estimated spp. found	73.6	76.9	88.0
Tourist removed	Chao estimate	Jackknife estimate	Bootstrap estimate
No. species recorded	83	83	83
No. species estimated	93	97	90
95% confidence limits	85-101	89-105	–
% of estimated spp. found	89.2	85.6	92.2

Cleptoparasitic Load

The cleptoparasitic load (CL) is the percentage of aculeate species that are cleptoparasitic (or parasitoids) on other host aculeates. Wcislo (1987) showed that parasite behaviour among aculeate Hymenoptera correlated with geographical latitude. Thus the parasitic rates are higher in temperate regions, as host populations are more synchronised in their life-history characteristics than in tropical regions. This finding probably does not hold for desert regions where the occurrence of rainfall would tend to synchronise life-history characteristics. From a review of the literature Wcislo found that the CLs for bees in Europe varied between 16% and 33%, a range of 17%.

For 27 Yorkshire sites, the author found that CLs for solitary bees vary from 25.6 to 40.0%, a range of 14.4%, which is close to that found by Wcislo. The CL value for the solitary bees with and without the tourist species (Table 6) falls within this range, and supports Wcislo's hypothesis.

Wcislo gave no CLs for solitary wasps, but from 27 Yorkshire sites CLs vary from 10.3 to 25.0%, a range of 14.7%. The CL value for the solitary wasps with the tourist species (Table 6) falls within this range, but without these species falls at a higher value outside this range. Since cleptoparasitic species tend to remain about or near their hosts' nesting sites it can be hypothesised that tourist species will be host rather than cleptoparasitic species. This hypothesis is supported by the solitary wasps species but less so by the solitary bee species (Table 6).

Aerial Nester Frequency

The aerial nester frequency (AF) is the percentage of host aculeate species that have aerial nest sites. Aerial nesters use old beetle burrows in dead wood, central stem cavities (e.g. bramble), crevices in old walls or exposed on the surface of rock or other hard material. Subterranean nesters nest in the soil, usually in burrows dug by themselves, but sometimes holes and crevices are used after being altered.

The AFs for the solitary species with or without tourist species are given in Table 7. The AFs for all the British species of solitary wasps is 46.2% and solitary bees is 17.9%. From

TABLE 6

The relative frequency of the cleptoparasitic (or parasitoid) species among the solitary species recorded from Pollington Quarry based on the Composite sample

All species	No. hosts (H)	No. cleptoparasites (C)	Cleptoparasitic Load CL = 100 x C/(H+C)
Solitary wasps	38	12	24.0
Solitary bees	40	19	32.2
Tourists removed	(H)	(C)	CL = 100 x C/(H+C)
Solitary wasps	27	12	30.8
Solitary bees	33	17	34.0

TABLE 7

The nesting habits of the solitary species from Pollington Quarry based on the Composite sample

All species	No. aerial Nesters (A)	No. subterranean Nesters (S)	Aerial nester frequency AF = 100 x A/(A+S)
Solitary wasps	12	26	31.6
Solitary bees	7	33	17.5
Tourists removed	No. aerial Nesters (A)	No. subterranean Nesters (S)	Aerial nester frequency AF = 100 x A/(A+S)
Solitary wasps	8	19	29.6
Solitary bees	5	28	15.2

29 Yorkshire sites, the AFs for solitary wasps varied from 0 to 90% and for solitary bees from 6.7 to 40.0%. The Pollington Quarry AFs for solitary wasps are just below the British AF and the solitary bee AFs are similar to the British AF. Removing the tourist species has little effect on the values of the AFs.

Conclusions about Pollington Quarry

1. It is an excellent site with more than 100 recorded species, including ten regionally rare species and eleven species of national importance.
2. Three estimates of potential species richness were stable and closely agreed with each other after 20 tourist species had been removed from the samples. It is estimated there is 90-97 resident species of solitary wasps and bees, of which 86-92% have been recorded.
3. After the removal of the tourist species, it is shown that it is a first class conservation site.
4. The species-area relationship indicates that for its area the expected number of solitary species has been recorded after removal of the tourist species.
5. The cleptoparasitic analysis indicates that, at least for the solitary wasp species, the tourist species are host rather than cleptoparasitic species.

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Appendix 1.

List of aculeate wasps and bees recorded from Pollington Quarry.

Dryinidae: *Anteon flavicorne* (Dalman), *A. gaullei* Kieffer, *A. infectum* (Haliday), *A. pubicorne* (Dalman), *Lonchodryinus ruficornis* (Dalman).

Bethylidae: *Bethylus fuscicornis* (Jurine).

Chrysididae: *Hedychridium ardens* (Latreille *in* Coquebert), *Chrysis angustula* Schenck, *C. ignita* (L.), *C. ruddii* Shuckard, *C. rutiliventris* Abeille de Perrin, *C. viridula* L., *Trichrysis cyanea* (L.).

Mutillidae: *Myrmosa atra* Panzer.

Sapygidae: *Monosapyga clavicornis* (L.), *Sapyga quinquepunctata* (Fab.).

Pompilidae: *Priocnemis exaltata* (Fab.), *P. parvula* Dahlbom, *P. perturbator* (Harris), *Dipogon variegatus* (L.), *Pompilus cinereus* (Fab.), *Episyron rufipes* (L.), *Arachnospila anceps* (Wesmael), *A. spissa* Schiødte, *Evagetes crassicornis* (Shuckard).

Eumeninae: *Odynerus spinipes* (L.), *Ancistrocerus gazella* (Panzer), *A. oviventris* (Wesmael), *A. parietum* (L.), *A. scoticus* (Curtis), *A. trifasciatus* Müller, *Symmorphus bifasciatus* (L.).

Vespinae: *Dolichovespula sylvestris* (Scopoli), *Vespula rufa* (L.), *Paravespula germanica* (Fab.), *P. vulgaris* (L.).

Sphecidae: *Dryudella pinguis* Spinola, *Tachysphex pompiliformis* (Panzer), *Trypoxylon attenuatum* Smith, *T. figulus* (L.), *Crossocerus elongatulus* (Vander Linden), *C. ovalis* Lepeletier & Brullé, *C. tarsatus* (Shuckard), *C. wesmaeli* (Vander Linden), *C. leucostomus* (L.), *C. podagricus* (Vander Linden), *C. quadrimaculatus* (Fab.), *Lindenius albilabris* (Fab.), *Entomognathus brevis* (Vander Linden), *Oxybelus uniglumis* (L.), *Stigmus solskyi* Morawitz, *Diodontus luperus* Shuckard, *D. minutus* (Fab.), *D. tristis* (Vander Linden), *Ammophila sabulosa* (L.), *Mellinus arvensis* (L.), *Nysson trimaculatus* (Rossi), *Gorytes quadrifasciatus* (Fab.), *Cerceris arenaria* (L.), *Philanthus triangulum* (Fab.).

Colletinae: *Colletes daviesanus* Smith, *C. fodiens* (Geoffroy *in* Fourcroy), *Hylaeus signatus* (Panzer), *H. hyalinatus* Smith.

Andreninae: *Andrena clarkella* (Kirby), *A. fucata* Smith, *A. fulva* Müller *in* Allioni, *A. scotica* Perkins, *A. bicolor* Fab., *A. cineraria* (L.), *A. nigroaenea* (Kirby), *A. denticulata* (Kirby), *A. nigriceps* (Kirby), *A. haemorrhoa* (Fab.), *A. tibialis* (Kirby), *A. barbilabris* (Kirby), *A. humilis* Imhoff, *A. minutula* (Kirby), *A. semilaevis* Pérez, *A. subopaca* Nylander, *A. ovatula* (Kirby), *A. wilkella* (Kirby).

Halictinae: *Halictus rubicundus* (Christ), *H. tumulorum* (L.), *Lasioglossum leucozonium* (Schrank), *L. calceatum* (Scopoli), *L. fulvicorne* (Kirby), *L. nitidiusculum* (Kirby), *L, rufitarse* (Zetterstedt), *L. villosulum* (Kirby), *L. cupromicans* (Pérez), *L. leucopus* (Kirby), *L. morio* (Fab.), *L. smeathmanellum* (Kirby), *Sphecodes ephippius* (L.), *S. geoffrellus* (Kirby), *S. gibbus* (L.), *S. monilicornis* (Kirby), *S. pellucidus* Smith, *S. puncticeps* Thomson, *S. reticulatus* Thomson.

Megachilinae: *Osmia rufa* (L.), *O. caerulescens* (L.), *O. leaiana* (Kirby), *Megachile versicolor* Smith, *M. willughbiella* (Kirby), *Coelioxys elongata* Lepeletier.

Anthophorinae: *Nomada fabriciana* (L.), *N. flavoguttata* (Kirby), *N. fulvicornis* Fab., *N. goodeniana* (Kirby), *N. integra* Brullé, *N. lathburiana* (Kirby), *N. leucophthalma* (Kirby), *N. marshamella* (Kirby), *N. panzeri* Lepeletier, *N. rufipes* Fab., *Epeolus variegatus* (L.), *Anthophora plumipes* (Pallas).

Apinae: *Bombus lucorum* (L.), *B. terrestris* (L.), *B. hortorum* (L.), *B. lapidarius* (L.), *B. pratorum* (L.), *B. pascuorum* (Scopoli), *B. bohemicus* (Seidl), *B. vestalis* (Geoffroy *in* Fourcroy), *Apis mellifera* L.

BOOK REVIEW

Linnaeus' *Philosophia Botanica*, translated by **Stephen Freer**. Pp. xxvi + 402, incl. several illus. Oxford University Press. 2005. £35.00 paperback.

This is the first full English translation of *Philosophia Botanica*, a major work of Carl Linnaeus who laid the foundation of modern biological systematics and nomenclature. First published in hardback in 2003, this paperback retains the same format and beautiful presentation. As well as providing sample pages from the original Latin text alongside the English translation, the book contains reproductions of all the original plates. The complete translation is supported by Appendices of abbreviations and bibliographies, and two comprehensive indexes of contents and terms and of genera. The translator's meticulous attention to detail and the publisher's lavish production cannot be praised too highly. A valuable resource for taxonomists and of great interest to botanists in general and historians of science.

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AQUATIC PLANTS IN THE LEVEN CANAL, EAST YORKSHIRE: DOES THE WATERWAY CONTINUE TO BE AN IMPORTANT SITE FOR BOTANICAL CONSERVATION?

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INTRODUCTION

Navigation canals in England and Wales that are disused or carry only light boat traffic are often valuable sites for the conservation of aquatic plants and many are designated as Sites of Special Scientific Interest (Briggs, 1996). Important examples include the Montgomery Canal (Lockton, 2000) and in East Yorkshire the Pocklington Canal (Goulder, 2003) and the Leven Canal. Observations on aquatic plants in the Leven Canal were made by Crackles in the 1950s (Crackles, 1952, 1968), and a thorough survey of the vegetation along the entire canal was undertaken in August 1987 (Kendall, 1987), which was repeated in August 1997 (Anon., 1997).

The former Nature Conservancy Council ranked the Leven Canal as fourth in national importance for aquatic plants, with the Pocklington Canal as sixth (Kendall, 1987). The high botanical conservation value of canal sites is not, however, necessarily permanent. Even if not threatened by restored or increased navigation, potential threats include terrestrialization through hydroseral succession, eutrophication, excessive shading by trees, and colonization by alien plant species. It follows that active management is likely to be needed. The Leven Canal by summer 2005 had no management plan in place; the ending in 2000 of a management agreement between English Nature and the site's owners having been followed by litigation (Allen, 2005). The observations that are described in the present paper were made to allow comparison of the present canal vegetation with the 1987 and 1997 surveys, and to show whether its high conservation status is being maintained.

The Leven Canal, dug around 1802, extends from the village of Leven, on the level, for 5.0 km westwards to the River Hull. The channel was excavated across several shallow lakes; remnants of the widespread mediaeval meres of Holderness, and shown to be still extant by a map of about 1775 (Sheppard, 1957). Crackles (1968, 1974) believed that these meres were the likely origin of the present-day aquatic flora of the canal. Navigation ceased in the 1930s after which the entrance lock to the River Hull was sealed (Duckham, 1973). The canal was originally supplied with calcareous water from springs at the eastern end but lately the level has been maintained by allowing inflow of water through a sluice from the River Hull (Kendall, 1987). Samples of surface water taken 12-16 August 2005 had moderately high conductivity and around neutral pH: i.e. 400 μS cm^{-1}, pH 6.8 at about 200 m east of Sandholme Bridge (TA 100 450) and 406 μS cm^{-1}, pH 6.8 at about 485 m west of Sandholme Bridge.

CANAL VEGETATION IN AUGUST 2005

Aquatic plants were recorded at the eastern end of the canal in August 2005; this being where the earlier surveys (Kendall, 1987; Anon., 1997) found greatest species richness. Plants were recorded, westwards from Leven, along two contiguous 500 m lengths of canal, beginning about 250 m west of Canal Head at TA 105 449. Observations were made from the north bank over the first 400 m, to Sandholme Bridge, and then from the south bank. Plants were recorded visually, helped by clear water and >60 grapnel hauls per 500 m. A checklist of aquatic plants that occur in England and Wales was used (Table 2 of Palmer & Newbold, 1983) and, in addition, all species of *Juncus*, the aquatic liverwort *Riccia fluitans*, and charophytes were recorded. An abundance score was estimated for each species: i.e. 1 = <0.1% cover, 2 = 0.1-5% cover, 3 = >5% cover (Holmes, 1983). Nomenclature follows Stace (1997).

The canal had high species richness of aquatic plants. Altogether, 41 species were recorded in the two 500 m lengths of canal that were surveyed; these comprised 18 species of submerged and floating-leaved plants and 23 species of emergent plants (Table 1). Moreover, some of the species found are limited in their national distribution; *Carex elata*, *Myriophyllum verticillatum* and *Potamogeton friesii* are recorded (1987-1999) in <10% of the 1479 10-km squares that are wholly or partly within England while *Hottonia palustris* and *Potamogeton lucens* are recorded in only 10-20% (Preston *et al*., 2002). Others have limited local distribution; *Butomus umbellatus*, *Nymphaea alba*, *Sagittaria sagittifolia* and *Schoenoplectus lacustris* being recorded (1987-1999) in only 10-20% of the 47 10-km squares that are wholly or partly within VC 61 (Preston *et al.,* 2002).

Within the first 500 m length of canal that was recorded, the 400 m east of Sandholme Bridge largely had margins, 1-3 m wide, of emergent plants, mostly *Sparganium erectum* but with substantial stands of *Schoenoplectus lacustris*. The central channel, 6-8 m wide, had about 50% cover of floating water lily leaves (mainly *Nuphar lutea* but with some *Nymphaea alba* – both flowering) together with extensive cover of *Riccia fluitans*. Beneath this was an essentially complete cover of *Ceratophyllum demersum* – a plant that was retrieved in virtually every grapnel haul. There was a notably low species richness of submerged and floating-leaved plants along this first 400 m (Table 1). Only seven species were recorded; i.e. the four mentioned above plus *Lemna minor*, *L. trisulca*, and a solitary detached shoot of *Potamogeton lucens*. Beyond Sandholme Bridge there is a caravan site on the south bank which extends to about 280 m west of the bridge. Here there are timber fishing stages and there had been extensive removal of *C. demersum* and *N. lutea* by grapnels, evidenced by heaps of these plants at the margin of the canal, to create open water for angling. Within this open water, at the westernmost limit of the first 500 m surveyed, there was greater diversity of submerged plants; *Hippuris vulgaris*, *Hottonia palustris*, *Myriophyllum verticillatum*, the stonewort *Nitella mucronata* and the underwater strap leaves of *Sagittaria sagittifolia* now being found.

Within the second 500 m length of canal that was recorded, the initial 180 m also had the caravan site on its south bank, with mown grass right up to the fringe of marginal emergent vegetation and with areas of water cleared of vegetation in front of the fishing stages. The increase in number of submerged species continued, with *Elodea canadensis*, *E. nuttallii*, *Potamogeton friesii* and *Sparganium emersum* now also being found. Further westwards, beyond the caravan site, there was little sign of recent disturbance, apart from at fishing places where the marginal vegetation had been beaten down. The extensive marginal vegetation, largely 2-3 m wide, now included extensive *Phragmites australis*, in addition to *S. lacustris* and *S. erectum*, and within the final 100 m the *P. australis* came to occupy more or less the full width of the canal. In the central channel there was up to about 80% cover by the floating leaves of *N. lutea* with some *N. alba*. *C. demersum* and *R. fluitans* continued to be abundant but also here were other submerged species that were abundant; notably *H. vulgaris*, *M. verticillatum* and *N. mucronata*.

Discussion

A striking change since the August 1987 survey (Kendall, 1987) is the spread of the submerged species *Ceratophyllum demersum*. In 1987, this was recorded only in the most westerly 500 m of the canal; feed water from the River Hull might have brought propagules into the canal. By 1997, *C. demersum* had reached the eastern end of the canal (Anon., 1997), where by August 2005 it had become, in biomass terms, possibly the most abundant species of aquatic plant. This appears to have had a substantial impact on species richness, especially that of the submerged plants; *Chara* sp., *Elodea canadensis*, *E. nuttallii*, *Hottonia palustris*, *Hippuris vulgaris*, *Myriophyllum verticillatum*, *Potamogeton natans*, *P. pectinatus*, *Ranunculus circinatus* and *Utricularia vulgaris* were all recorded east of Sandholme Bridge in 1987 but not in 2005. The situation in 2005 was better west of the bridge, although *Chara* sp., *P. natans*, *R. circinatus* and *U. vulgaris* were not re-found. The greater species richness may to some extent be related to less competition pressure, brought

TABLE 1

Aquatic plants in two contiguous 500 m lengths of the Leven Canal from 400 m east to 600 m west of Sandholme Bridge, August 2005

	Length surveyed	
	0-500 m	500-1000 m
Submerged and floating-leaved plants		
Ceratophyllum demersum	3	3
Elodea canadensis	–	2
E. nuttallii	–	2
Hippuris vulgaris	1*	3
Hottonia palustris	1*	2
Lemna minor	2	1
L. trisulca	2	2
Myriophyllum verticillatum	1*	3
Nitella mucronata	2*	3
Nuphar lutea	3	3
Nymphaea alba	2	2
Potamogeton crispus	–	1
P. friesii	–	1
P. lucens	1	–
P. pectinatus	–	1
Riccia fluitans	3	3
Sagittaria sagittifolia	1*	2
Sparganium emersum	–	1
n of submerged and floating-leaved species	12	17
Emergent plants		
Agrostis stolonifera	–	1
Alisma plantago-aquatica	1	–
Berula erecta	–	1
Butomus umbellatus	–	1
Caltha palustris	–	1
Carex elata	2	2
Carex riparia	1	1
Equisetum fluviatile	1	–
Galium palustre	1	1
Glyceria maxima	2	2
Iris pseudacorus	2	2
Juncus effusus	1	1
J. inflexus	1	–
J. subnodulosus	1	–
Mentha aquatica	–	1
Myosotis scorpioides	–	1
Persicaria amphibia	1	1
Phalaris arundinacea	2	1
Phragmites australis	2	3
Schoenoplectus lacustris	3	3
Solanum dulcamara	–	1
Sparganium erectum	3	3
Typha latifolia	1*	–
n of emergent species	16	18
Total *n* of species	28	35

Numerical values are abundance scores: 1 = <0.1% cover; 2 = 0.1-5% cover; 3 = >5% cover; (–) = not recorded.
*Recorded only west of Sandholme Bridge.

about by the extensive removal of *C. demersum* by anglers. *C. demersum* is an invasive species of eutrophic waters (Preston & Croft, 1997) which in East Yorkshire has been associated with high nitrate availability (Goulder & Boatman, 1971). River Hull water, that is used to top up the Leven Canal, has high concentration of both nitrate and phosphate (Carr & Goulder, 1990); sources include nitrate in feeder springs enriched by nitrogenous fertilization of arable land in the Wolds, and phosphate from the sewage treatment works at Driffield and from fish farms.

The earlier surveys of the whole canal found 55 species (Kendall, 1987) and 51 species (Anon., 1997) of aquatic plants that are on the checklist which was used in 2005; the recording of 41 species in 2005 (Table 1) over only 20% of the canal compares reasonably well with those totals. The species that were present in 1987 and/or 1997, but were not recorded in 2005, comprised seven submerged and floating-leaved taxa and 15 emergent species (Table 2). It is very likely, however, that some of these survived in 2005, but west of the 1 km length of canal that was surveyed. Furthermore, some may have been missed, perhaps because observations were made only in August; species not observed then may have been apparent at other times of year. Many of the species recorded in the earlier surveys but not in 2005 are relatively frequently encountered elsewhere in ponds, drains and at other canal sites in East Yorkshire (Crackles, 1990; Goulder, 2000, 2003; Linton & Goulder, 2000, 2003). Nine of the missing species are, however, recorded (1987-1999) in <20% of vice-county 61 10-km squares (Preston *et al.*, 2002) (Table 2). Kendall (1987) highlighted four of the species recorded in 1987, but not in 2005, as locally or nationally scarce; i.e. *Apium inundatum*, *Ranunculus circinatus*, *Sium latifolium* and *Utricularia vulgaris*. Of these, *A. inundatum*, *S. latifolium* and *U. vulgaris* have both locally and nationally restricted distributions, being recorded (1987-1999) in, respectively, 12%, 4% and 8% of the 1479 10-km squares that are wholly or partly in England (Preston *et al.*, 2002). If these species have gone from the canal, this is a significant conservation loss. Two additional species, recorded in neither 1987 nor 1997, were found in 2005 (*Nitella mucronata*, and *Typha latifolia*).

The species richness of aquatic plants was greater in the Leven Canal than at other canal sites in East Yorkshire. The number of aquatic plant taxa in two 500 m lengths of the Leven

TABLE 2
Aquatic plants recorded in the Leven Canal by earlier surveys but not found in August 2005[a]

Submerged and floating-leaved plants	Emergent plants
Callitriche sp.[b]	*Alisma lanceolatum*[c,d]
Chara sp.[b]	*Apium inundatum*[b,d]
Lemna minuta[c,d]	*A. nodiflorum*[c]
Myriophyllum spicatum[b,c]	*Carex acuta*[b,d]
Potamogeton natans[b,c]	*C. rostrata*[b,d]
Ranunculus circinatus[b,c,d]	*C. vesicaria*[b,d]
Utricularia vulgaris[b,c,d]	*Juncus acutiflorus*[c]
	J. articulatus[b]
	J. conglomeratus[b]
	Oenanthe fistulosa[b,c]
	Persicaria hydropiper[c]
	Ranunculus sceleratus[b]
	Rorippa nast.-aquaticum[b,c]
	Sium latifolium[b,c,d]
	Veronica beccabunga[b,c]

[a] Only 20% of the canal was surveyed in 2005; [b] recorded in 1987 (Kendall, 1987); [c] recorded in 1997 (Anon., 1997); [d] recorded in <20% of VC 61 10-km squares (Preston *et al.*, 2002).

Canal was 28 and 35 (Table 1); this compares with a mean of 16 (range 10-27) for twelve 500 m lengths of the Pocklington Canal and 18 (16-21) in five 500 m lengths of the Driffield Canal (Goulder, 2003). For submerged and floating-leaved plants, the number of species per 500 m in the Leven Canal was 12 and 17, compared to 7 (5-10) in the Pocklington Canal and 6 (3-9) in the Driffield Canal. For emergent plants, the species richness per 500 m in the Leven Canal was 16 and 18, compared to 9.0 (3-17) in the Pocklington Canal and 12 (9-15) in the Driffield Canal.

Species diversity and rarity of the species present are frequently used for assessment of the conservation value of vegetation (Margules & Usher, 1981). On these criteria, the vegetation of the Leven Canal in August 2005 evidently continued to be worthy of conservation. Appropriate management is needed which might include the maintenance of open water through judicious weed removal and/or dredging and investigation and control of nutrient input. A management agreement between English Nature and the canal's owners was reached in October 2005, since when there has been some clearance of scrub from the canal side and of water weeds from the channel (Simon Christian, *pers. comm.*); it is anticipated that there will be a regular programme of weed cutting.

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BOOK REVIEW

Biodiversity by **Christian Leveque** and **Jean-Claude Mounolou.** Pp. xi + 284, with numerous line drawings. John Wiley, Chichester. 2003. £65.00 hardback, £24.99 paperback.

Although the term is relatively new, naturalists have long been concerned with biodiversity. The subject has rapidly achieved prominence: the recent 5-volume *Encyclopedia of Biodiversity* runs to almost 5000 pages. The much shorter book considered here interprets the term very broadly and covers many topics, some of them peripheral. Each chapter is divided into sections (about 200 in all) and there are many 'boxes' in the text with illustrative examples or which deal with matters of related interest – very convenient for those who seek short summaries of particular topics, but the frequently abrupt change of direction is not always conducive to continuous reading. The diversity of topics, too great to summarize, ranges from the origin of life, via genetic diversity and how it arose, to taxonomy, species richness in communities, the functioning of ecosystems and the consequences of human activities, to biotechnology, conservation, and many more. Such a source of easily accessible information should be useful to those who manage nature reserves or to students in need of information on a particular topic. Fortunately the topics are enumerated in a long list of contents, which partially compensates for an inadequate index.

Originally written in French, this work gives an interesting French slant to certain topics, but the translation is often infelicitous. Particularly unfortunate is to refer to the Great Auk as the Emperor Penguin; this error is obvious on the first encounter when only vernacular names are used, and confirmed when the Great Auk's scientific name, *Pinguinus impennis*, is allocated to the Emperor Penguin. The French name for the Great Auk, 'Grand Pingouin', was obviously as confusing to the translator as it is to English speakers in general.

In summary, this book provides information on many aspects of biodiversity in an easily accessible way, but is not without imperfections. The maps on Figure 6.2 are misplaced, at least in the paperback version here reviewed. Nevertheless, would-be buyers should opt for the latter which costs much less than half the hardback, which at £65 is ridiculously expensive.

GF

ADDITIONS AND CORRECTIONS TO THE YORKSHIRE DIPTERA LIST (PART 2)

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The second and third parts of this series will deal principally with corrections to Yorkshire Brachycera (*sensu* Chandler, 1998a). The first part (Grayson, 2005) dealt exclusively with Nematocera, and should be consulted regarding the reasoning etc. for exclusions listed below.

As my research of the literature continues, the record of *Tipula* (*Lunatipula*) *alpina* Loew, 1873 in Grayson (2005) was found to have been previously published by Falk (1991), which is one of almost 1500 published titles so far discovered to contain references to Yorkshire Diptera. When taking into account all published and unpublished records collated by 25 December 2005, the provisional county list contained 4009 species, of which 1452 were in Nematocera; as research continues, this total is subject to continuous change. A disproportionate number of species are currently known from Yorkshire by a single published record; therefore, students of dipterology still have much scope for greatly advancing knowledge of the county fauna. The publication of a new county list will facilitate, and hopefully encourage, future monographs of dipterous groups.

At 25 December 2005, the number of species and names excluded from the provisional list amounted to 148, not including those lost to synonymy. In addition to errors of identification, a significant number of transcription or typographical errors have been discovered. This current report includes reasons for the exclusion of species and names within the best recorded family, i.e. Syrphidae, in which 10% of the reputed fauna was recorded in error. Families containing in excess of 100 species in the provisional list are as follows: Limoniidae (171), Mycetophilidae (298), Cecidomyiidae (217), Chironomidae (271), Hybotidae (125), Empididae (172), Dolichopodidae (215), Phoridae (176), Syrphidae (204), Agromyzidae (166), Chloropidae (112), Anthomyiidae (141), Muscidae (199) and Tachinidae (107).

Initials used below refer to the following: PJC = P. J. Chandler, CAC = C. A. Cheetham, JDC = J. D. Coldwell, RC = R. Crossley, RHLD = R. H. L. Disney, WAE = W. A. Ely, WJF = W. J. Fordham, AG = A. Grayson, PS = P. Skidmore, CSVY = C. S. V. Yeates.

Additions to Yorkshire Diptera List

KEROPLATIDAE

Neoplatyura nigricauda (Strobl, 1893). (63) Hoyland Bank, SE2710, 16.8.2000, JDC; Manvers, SE4501, 19.6.2001, JDC; Oughtibridge Signal Box, SK311937, 21-23.7.1976, A. Brackenbury, det. PJC; Tom Royd Wood, SE3003, 14.7.2001, JDC.

Orfelia nigricornis (Fabricius, 1805). (63) Bretton Lakes, SE2714, 17.6.2002, 13.7.2002, JDC; Pot Ridings Wood, 6.7.1986 (♂), PS.

O. pallida (Staeger, 1840). (63) Thorne Moors, 1987, per PS.

SCIARIDAE

Cratyna (*Peyerimhoffia*) *vagabunda* (Winnertz, 1867) [= *brachyptera* (Kieffer, 1903)]. (64) Kitchen Garden Wood, Malham Tarn, 2-3.6.1982, RHLD, det. P. Freeman [sub nom. *brachyptera*].

CECIDOMYIIDAE

Aprionus bispinosus Edwards, 1938. (63) Thurcroft Hall, SK5089, 11.10.1986, CSVY; east side of Bib Lane, SK513893, 16.8.1989, WAE.

A. halteratus (Zetterstedt, 1852) [= *flaviventris* (Winnertz, 1870)]. (64) East Shoreline Woods, Malham Tarn, 11.4.1974 (2♂ ex leaf litter), RHLD, det. K. M. Harris.

Polyardis monotheca (Edwards, 1938). (63) Church Lane, SK5587, 11.7.1989, CSVY;

Moses Seat, SK5482, 23.7.1983, WAE; Old Spring Wood, SK5381, 31.7.1986, D. P. Savage & WAE.

Heteropezula tenuis Wyatt, 1967. (63) Firbeck Hall, SK5688, 12.10.1986, WAE & CSVY; Old Meadow Wood, SK5281, 13.8.1989, CSVY; Roche Abbey, SK5489, 1985, J. A. Pearson; Wentworth Park, SK4196, 1.11.1987, WAE.

Rabdophaga cinerearum (Hardy, 1850). (63) Bitholmes Wood, SK2996, 1.9.2001, Margaret Redfern. A further (63) record from Levitt Hagg Wood, SE5301, 6.8.2003, should be provisionally disregarded, as the gall was possibly seen on willows other than *Salix caprea*, and hence may not have been *R. cinerearum* (I. Farmer, *pers. comm.*).

CULICIDAE

Ochlerotatus [= *Aedes*] (*Aedimorphus*) *vexans* (Meigen, 1830). (63) Birch Wood, Rawmarsh, SK437978, 17.8.2005 (♂), WAE. This species is rarely recorded in Britain; indeed, the Mosquito Recording Scheme data-base contains only two British records since the 1950s, *viz*. Brownsea Island, SZ08, 1968, and Cliffe, TQ729766, 5.9.1989.

SIMULIIDAE

Simulium (*Eusimulium*) *velutinum* (Santos-Abreu, 1922) [= *aureum* species 'I' Davies, 1968]. (62) outlet stream of pond circa 1 mile east of Oulston, SE565742, 15.8.1962, R. W. Dunbar.

S. (*Nevermannia*) *naturale* Davies, 1966. (65) near Blea Beck, Cronkley Fell, NY863284, 25.4.1961, L. Davies; small stream near High Force, Middleton-in-Teesdale, NY873280, 25.4.1961, L. Davies.

CHIRONOMIDAE

Stictochironomus maculipennis (Meigen, 1818). (64) Knaresborough Ringing Station, SE3656, 21.5.1983, WAE.

PLATYPEZIDAE

Agathomyia unicolor Oldenberg, 1928. (63) Anston Stones Wood, SK535829, 17.10.1989 (♀), WAE; Herringthorpe Wood, SK454923, 15.9.1991 (♀), WAE; King's Wood, Roche Abbey, SK5489, 27.9.1980, WAE.

Platypeza aterrima Walker, 1836. (63) Langold Holt, SK567857, 8.10.1988 (♀), WAE, det. PJC; Morley Plantation, SK4096, 25.10.1987, WAE, det. PJC; Ockley Bottom, SK392936, 20.10.1991 (♂), WAE.

Protoclythia rufa (Meigen, 1830). (63) Firbeck Hall, SK566885, 26.10.1991 (♀), WAE; Ockley Bottom, SK391933, 20.10.1991 (♂), WAE.

PHORIDAE

Borophaga carinifrons (Zetterstedt, 1848). (62) Castlebeck Wood, SE9496, 7.9.1986, WAE.

SYRPHIDAE

Sphegina (*Asiosphegina*) *sibirica* Stackelberg, 1953. (64) by side of upland course of River Nidd at Lofthouse, SE100736, 21.7.2005, RC.

PIPUNCULIDAE

Chalarus parmenteri Coe, 1966. (63) Cusworth Park, 2.7.1975 (♂ at light), PS.

CONOPIDAE

Myopa strandi Duda, 1940. (61) Bank Island, Wheldrake, SE6944, 24.5.1995 (ex *Crataegus* blossom), RC, det. J. H. Cole. A record of this species in Skidmore (1972) refers to *M. vicaria* Walker, 1849 (Skidmore, 1976).

M. tessellatipennis Motschulsky, 1859. (64) Adel, 11.5.1920, CAC, det. AG [see notes below]; East Keswick Fitts, SE3546, 26.4.1980 (ex *Prunus* blossom), 17.4.1982 (ex *Prunus* blossom), RC.

EXCLUSIONS FROM YORKSHIRE DIPTERA LIST

CECIDOMYIIDAE

Neurolyga truncata (Felt, 1912). Reputedly recorded from Yorkshire according to an annotation on an unpublished list; however, this was a transcription error (WAE, *pers. comm.*). *N. truncata* was provisionally included in circulated draft versions of the proposed Yorkshire Diptera list.

PSYCHODIDAE

Mormia satchelli (Jung, 1963). Recorded and circulated as per previous species. The Rotherham Biological Record Centre map for *M. satchelli* gives a 'hectad dot' for SK49, but apparently in error, as there is no record in the database, and no specimen (WAE, *pers. comm.*).

TABANIDAE

Chrysops (*Chrysops*) *viduatus* (Fabricius, 1794). First documented by Hincks (1953) [sub nom. *C.* (*C.*) *quadratus* Meigen]. All Yorkshire records are based on males, and are doubtfully authentic (Grayson, 1994). All material checked has proved to be *C.* (*C.*) *relictus* Meigen, 1820 (Grayson, 1995).
Haematopota grandis Meigen, 1820. Circulated records from Spurn, 1952 and 1953, based on material held at The Manchester Museum, are erroneous (Grayson, 1995).
Hybomitra muehlfeldi (Brauer in Brauer & von Bergenstamm, 1880). Circulated records from Buttercrambe, 1928 and 1929, based on material held at the National Museum on Merseyside, Liverpool, are erroneous (Grayson, 1995).
*H. solstitialis** (Meigen, 1820). Fordham's cards contain a record from Fylinghall, 26.6.1929, WJF: this was probably a misidentification, and is likely to refer to *H. distinguenda* (Verrall, 1909), which was also recorded by WJF at Fylinghall on the same day.
*Tabanus bovinus** Linnaeus, 1758. A record from Masham, in Ormerod (1888), with illustration and brief description of the species, doubtlessly refers to *T. sudeticus* Zeller, 1842 (Grayson, 2000).
T. miki Brauer in Brauer & von Bergenstamm, 1880. Drake (1991) referred to an unchecked record from South Yorkshire: this record from Maltby, 1974, plus a further record from Barden, 1918, proved to be erroneous (Grayson, 1995). Reports in Stubbs (1993, 1994) refer to the specimen from Maltby.

STRATIOMYIDAE

Sargus cuprarius (Linnaeus, 1758). First documented by Mosley (1878) [sub nom. *cupraeus* sic], and subsequently recorded from VCs 61-64; however, all material checked has proved to be *S. iridatus* (Scopoli, 1763), and remaining records are suspect.

ACROCERIDAE

Ogcodes pallipes Latreille in Olivier, 1812. Added from Ellerburn Bank by J. H. Flint in Skidmore (1969), but this and two subsequent records were misidentifications of *Acrocera orbiculus* (Fabricius, 1787) (Grayson, 2004).

THEREVIDAE

Thereva plebeja (Linnaeus, 1758). No authentic material is known. The following records were noted by Fordham (1931): Allerthorpe Common, 21.6.1925 (♀); Barmby Moor, 3.8.1924 (♀); Skipwith Common, 24.6.1918 (♀). Cheetham (1946) recorded it from Spurn, 1946. The Allerthorpe and Skipwith specimens are probably lost. The records from Barmby Moor and Spurn are erroneous, the specimens in Leeds Museum Resource Centre being

T. nobilitata (Fabricius, 1775) and *Acrosathe annulata* (Fabricius, 1805) respectively (det. AG, 2004).

HYBOTIDAE

Bicellaria sulcata (Zetterstedt, 1842). This species is only acceptably identifiable by reference to male genitalia. All Yorkshire records are suspect, and no material re-examined has proved to be this species (RC, *pers. comm.*). First documented by Laurence (1955), who was presumably referring to *B. vana* Collin, 1926, which he gave as a subspecies of *sulcata*.

Platypalpus aeneus (Macquart, 1823). Recorded from Maltby Low Common, 6.1979, in Coldwell (1996) and Falk and Crossley (2005), but in error, the specimen being *P. albifacies* (Collin, 1926) (WAE, *pers. comm.* to RC).

P. analis (Meigen, 1830). A record from Ashberry Pasture, attributed to RC (www.ryenats.org.uk), is a typographical error for another species (RC, *pers. comm.*).

P. latemi Grootaert (manuscript name). A circulated record exists for Hardcastle Crags, 1990; however, a description was not published as this may not be a distinct species (P. Grootaert, *pers. comm.* to RC).

P. niveiseta (Zetterstedt, 1842). Listed from Yorkshire by Falk and Crossley (2005); however, the only Yorkshire record, from Malham Tarn, was based on two females which are definitely not this species (P. Withers, *pers. comm.*).

*P. pictitarsis** (Becker, 1902). A species division has invalidated the Yorkshire records, and all material checked has proved to be *P. kirtlingensis* Grootaert, 1986 (RC, *pers. comm.*). Skidmore *et al.* (1987) appears to be the earliest of the few published records sub nom. *P. pictitarsis*.

P. pulicarius (Meigen, 1830). A record from Keld Head Springs, Pickering (www.ryenats.org.uk), and several other reputed VC 62 records, are transcription and typographical errors for *Atelestus pulicarius* (Fallén, 1816) (RC, *pers. comm.*).

P. unguiculatus (Zetterstedt, [1838]). Recorded [in *Tachydromia*] from Bradford, R. H. Meade, by Ashworth and Cheetham (1920); but presumably in error. *P. unguiculatus* occurs in Scandinavia, but is not known from Britain (PJC, *pers. comm.*).

*Tachydromia arrogans** (Linnaeus, 1761). Yorkshire records are suspect, and all material checked has proved to be *T. aemula* (Loew, 1864) (RC, *pers. comm.*). First documented by Ashworth (1909).

EMPIDIDAE

Empis (*Empis*) *decora* Meigen, 1822. According to Cheetham's record cards, this species was on the Bradford Naturalists' List, which does not appear to have been published, and was probably conceptual. The record from Ilkley is doubtfully authentic (RC, *pers. comm.*).

Hilara albitarsis von Roser, 1840. Recorded from Yorkshire in error by Falk and Crossley (2005). The specimen from Deffer Wood, 1993, was *H. litorea* (Fallén, 1816) (JDC, *pers. comm.* to RC).

H. lasiochira Strobl, 1892. Cheetham's card contains a tentative record from Crag Wood, 6.6.1921, which was probably unpublished. *H. lasiochira* is non-British (PJC, *pers. comm.*), and the record probably refers to either *H. cornicula* Loew, 1873, or *H. monedula* Collin, 1927 (PS).

H. pruinosa Megerle in Meigen, 1822. This species is not known from Britain; therefore, a record from Manningham, 3.5.1886, in Ashworth and Cheetham (1920), was presumably erroneous. J. E. Collin apparently informed CAC that he regarded *H. pruinosa* as non-British.

Rhamphomyia (*Pararhamphomyia*) *marginata* (Fabricius, 1787). Recorded [sub nom. *platyptera* Panzer] from Grass Woods by Cheetham (1927), but probably in error for a related species. Falk and Crossley (2005) noted the only known British localities, all of which are in Kent.

R. (*Rhamphomyia*) *vesiculosa* (Fallén, 1816). Recorded as new to both Durham and

Yorkshire by Fordham (1925), but the reputed specimens taken on 30.5.1925, from Middleton-in-Teesdale, were not this species (J. E. Collin).

DOLICHOPODIDAE

Dolichopus (*Dolichopus*) *andalusiacus* Strobl, 1899. A circulated record from Lower Fen, Malham Tarn, 6.6.1980, is unsupported by a voucher specimen and should be disregarded (D. J. de C. Henshaw, *pers. comm.* to RC). In Britain, *D.* (*D.*) *andalusiacus* appears to be restricted to southern England (RC, *pers. comm.*).

D. (*D.*) *laticola* Verrall, 1904. A record from the Sedbergh district in Cheetham (1927b) was stated to be erroneous by Cheetham (1928).

Medetera excellens Frey, 1909. Two female *Medetera* from Timble Ings, 15.7.1986, RC, thought possibly to be *M. excellens*, were another species (RC, *pers. comm.*).

Rhaphium fascipes (Meigen, 1824). A circulated record from Mulgrave, NZ8512, 15.9.1990 (♀), should be discounted (G. J. King, *pers comm.*).

*Sciapus maritimus** Becker, 1918. Added from Allerthorpe Common by Cheetham (1927a); however, all Yorkshire records are doubtfully authentic (Crossley, 1998), and all material re-identified has proved to be *S. zonatulus* (Zetterstedt, 1843) (RC, *pers. comm.*).

Syntormon filiger Verrall, 1912 [= *rufipes* sensu (Zetterstedt, 1849), nec (Meigen, 1824)]. Recorded from Bentley Common, near Doncaster, by d'Assis-Fonseca (1978); but the two Yorkshire records from Bentley Common (fishponds), 23.6.1976, PS, and Mickletown Ings (pond by colliery tip), 27.7.1976, PS, refer to *S. pumilum* (Meigen, 1824) [= *rufipes* sensu Parent, 1938, nec (Meigen, 1824)].

PHORIDAE

Phora velutina (Meigen, 1830). This species was deleted from the British list by Disney (1989). The Yorkshire records, *viz.* Pateley Bridge [in *Trineura*] (Cheetham, 1921), and subsequent records from Barden, Cautley and Middleham, were presumably misidentifications.

SYRPHIDAE

Anasimyia lunulata (Meigen, 1822). Added from Roecliffe Brickpits, 29.6.1974, by Skidmore (1976); but the specimen, in Leeds Museum Resource Centre, is a subsequently described species, *viz. A. contracta* Claussen & Torp, 1980 (det. AG, 2004).

Caliprobola speciosa (Rossi, 1790). Recorded from Yorkshire by Coe (1953), but curiously, no locality was given. If Coe's source was Cheetham's record cards, it is quite possible that he misinterpreted the card for *C. speciosa*, which has "Ex Gorhams Coll W.J.F." written at the bottom. The relevant specimen is held in the University of Leeds, but there is no indication that it was taken in Yorkshire.

Cheilosia barbata Loew, 1857. Several recent circulated records result from incorrect application of synonymy, and refer to *C. lasiopa* Kowarz, 1885.

C. chrysocoma (Meigen, 1822). Added by Cheetham (1938), but the specimen in the University of Leeds is a ♀ *C. fraterna* (Meigen, 1830) (det. AG, 2004).

C. semifasciata Becker, 1894. A circulated record from Houghton Woods, SE885365, 13.6.1957, was an error (D. H. Smith, *pers. comm.*).

C. zetterstedti Becker, 1894. Several Yorkshire records of *C. zetterstedti* have been circulated during recent years, one of which (Ely, 1983), has been published; these refer to *C. proxima* (Zetterstedt, 1843). British records of *C. zetterstedti* result from a former opinion that it was the valid name for *Cheilosia* species E of Stubbs and Falk (1983), which is now accepted as a seasonal form of *C. proxima* (S. J. Falk, *pers. comm.*).

Chrysotoxum verralli Collin, 1940. A circulated record from Slackcote, 6.8.1989, is a transcription error, and refers to *Cheilosia vernalis* (Fallén, 1817) (D. P. Sumner, *pers. comm.*).

Eumerus ornatus Meigen, 1822. Circulated records from Malton, by River Rye, 1987, are erroneous. The two specimens in the D. H. Smith collection were ♂ *E. strigatus* (Fallén, 1817) (det. AG).

Eupeodes (*Eupeodes*) *lundbecki* (Soot-Ryen, 1946). A circulated record from Malham Tarn, 1979, should be withdrawn. The relevant specimen was either subsequently identified as another species, or destroyed by a fungus (M. N. Pugh, *pers. comm.*).

E. (*E.*) *nielseni* (Dušek & Láska, 1976). A record from Thorne Moors, 1979, in Skidmore *et al.* (1987), was stated to be erroneous in the appendix to that work.

E. (*E.*) *nitens* (Zetterstedt, 1843). The purported specimen is not this species (WAE, *pers. comm.*). Recorded from Anston Stones Wood by Ely (1978), and Yorkshire by Falk (1991); Ball and Morris (2000) contained a hectad dot for SK58. A circulated record from Dinnington is a duplication of the Anston Stones Wood record under a locality name for the hectad.

E. (*Lapposyrphus*) *lapponicus* (Zetterstedt, [1838]). In application of synonymy; a record of "*Syrphus arcuatus*" in Mosley (1878) probably refers to this species, but Mosley's record is doubtfully authentic; indeed, Grimshaw (1907) stated it "requires confirmation".

Melangyna ericarum (Collin, 1946). First documented from Malham Tarn by Stubbs (1986), but in error, the specimens being *M. arctica* (Zetterstedt, [1838]) (S. J. Falk, *pers. comm.*).

Meligramma euchromum (Kowarz, 1885). A record [in *Epistrophella*] from Wentworth Park in Whiteley and Ely (1985) is erroneous (WAE, *pers. comm.*).

Paragus (*Pandasyopthalmus*) *tibialis** (Fallén, 1817). Yorkshire records are suspect, and all material examined, including all purported modern material, proved to be *P.* (*P.*) *haemorrhous*, Meigen, 1822. *P.* (*P.*) *tibialis* was added by Cheetham (1919).

Myolepta dubia (Fabricius, 1805). A circulated record exists from Owston Park, 9.6.1966, leg. C. J. Devlin; however, this is a transcription error (PS, *pers. comm.*).

Pelecocera tricincta Meigen, 1822. Listed from Seamer Moor, 1922, WJF, by Walsh (1956); however, this is a transcription error for *Dasysyrphus tricinctus* (Fallén, 1817), which was recorded from "Seamer Moor ♀ 9.20 small. (det CAC) WJF" according to Fordham's record cards. Walsh (1956) does not list *D. tricinctus*, nor is there a Fordham card for *P. tricincta*. In Britain, *P. tricincta* appears to be restricted to heathland in southern England.

*Pipiza lugubris** (Fabricius, 1775). Added from Pilmoor by Cheetham (1921), but all old Yorkshire records should refer to *P. austriaca* Meigen, 1822; indeed, Fordham's cards refer the Pilmoor record and others published in *The Naturalist*, *viz.* Allerthorpe, Buttercrambe and Robin Hood's Bay, to *P. austriaca*. A further record from Skipwith, 13.8.1927, CAC, is suspect.

P. signata Meigen, 1822. First tentatively documented by Fordham (1926) from Allerthorpe Common, with the comment "a specimen of which Mr. [J. E.] Collin says 'appears to run down to *signata*, though in some ways more like *notata*". *P. signata* is a good European species, but is undoubtedly misidentified in British literature; it was not recognised by Coe (1953) nor subsequent authors.

Pipizella maculipennis (Meigen, 1822). A circulated record exists from Austwick, 10.6.1922, leg. CAC; however, the specimen in Leeds Museum Resource Centre would appear to be a ♂ *Trichopsomyia flavitarsis* (Meigen, 1822) (det. AG, 2004).

*Rhingia rostrata** (Linnaeus, 1758). First documented by Grimshaw (1893), but this and all other older Yorkshire records refer to *R. campestris* Meigen, 1822. Recently circulated records from Ellers Wood and Sand Dale SSSI, 1993, and Kiplingcotes, 1952, are transcription and identification errors respectively.

Sphaerophoria virgata Goeldlin de Tiefenau, 1974. First documented by Whiteley (1988) from Wharncliffe Wood, 1.7.1987, JDC, but in error for *S. batava* Goeldlin de Tiefenau, 1974, which is listed instead by Coldwell (1999). A circulated record from Slackcote, 6.8.1989, is erroneous (D. P. Sumner, *pers. comm.*) and relates to the SD90 hectad dot in Ball and Morris (2000).

PIPUNCULIDAE

Cephalops (*Semicephalops*) *penultimus* Ackland, 1993. Listed in error on an unpublished list (WAE, *pers. comm.*), and hence provisionally included in circulated draft versions of the proposed Yorkshire Diptera list.

CONOPIDAE

Myopa polystigma Rondani, 1857. Added by Fordham (1919); however, true *M. polystigma* may be confined in Britain to East Anglia (Falk, 1991). Upon re-examination, most British material of *M. polystigma* (*sensu lato*) has proved to be *M. tessellatipennis* Motschulsky, 1850, including a specimen from Adel, 11.5.1920, CAC (det. AG, 2004) [see notes above]. The Fordham specimen from Breighton Ings, 8.6.1918, WJF is probably lost.

LONCHAEIDAE

Dasiops latifrons (Meigen, 1826). Recorded [sub nom. *Lonchaea parvicornis* Meigen] from Langton, 8.9.1956, Miss C. M. Rob (Gilmour, 1958), but presumably in error, because this is not a British species (PJC, *pers. comm.*).

ULIDIIDAE

Ulidia erythrophthalma Meigen, 1826. A circulated record from Barugh, 1988, is erroneous (JDC, *pers. comm.*).

TEPHRITIDAE

Campiglossa malaris (Séguy, 1934). The YNU Diptera cards contain the following tentative record [sub nom. *Paroxyna lhommei* Hering, with the comment "this sp?"]: Pocklington Canal, 1.7.1945 (2 ♂), W. D. Hincks. The only known British localities for *C. malaris* are in Kent (Clemons, 2004), which suggests that Hincks' specimens were probably another species.
Chetostoma curvinerve Rondani, 1856. Recorded from Sandbeck Park Upper Lake, 15.8.1982, by Coldwell *et al.* (1996), but in error (Chandler, 1998).
Urophora (*Urophora*) *cardui* (Linnaeus, 1758). A circulated record from Keld Head, Pickering, 1988, is unsupported by a specimen and should be discounted (G. J. King, *pers comm.*).
U. (*U.*) *mauritanica* Macquart, 1851. Added [sub nom. *macrura* (Loew)] by Fordham (1931), but this species is not known from Britain; moreover, Hincks (1946) stated that the specimens were lost, and indicated a probable error in Fordham's records.

LAUXANIIDAE

Sapromyza (*Sapromyza*) *obsoleta* Fallén, 1820. Recorded from Bishopdale, 1922, by Cheetham (1922), but in error for *Lyciella illota* (Loew, 1847) (Cheetham, 1922a).
S. (*Sapromyzosoma*) *quadricincta* Becker, 1895. Recorded [sub nom. *bipunctata* Meigen] from Wharncliffe Wood by Coldwell (1999); the basis was a spurious record from Oughtibridge Signal Box, SK311937, 5.11.1978, resulting from a computer input error (D. Whiteley, *pers. comm.*).

SCIOMYZIDAE

Euthycera chaerophylli (Fabricius, 1798). Documented [in *Lunigera*] from Redmire, 6.7.1940, by Cheetham (1940), but British records were misidentifications (Chandler, 1998a).
Psacadina zernyi (Mayer, 1953). Circulated 1990 records from Jeffry Bog, Wharram Quarry and Nettledale, Rievaulx are erroneous, and a suspect 1990 record by the same determiner from North Grimston Quarry is unable to be checked.

Further Notes

LIMONIIDAE

Further to Grayson (2005): Edwards (1926) stated that the British insect he formerly regarded as *Dicranomyia* (*Melanolimonia*) *pseudomorio* Alexander, 1920 was clearly the western representative of that species, yet it possessed distinct differences which made the description of a new species advisable; therefore, (*D.*) (*M.*) *occidua* Edwards (1926) = *D.* (*M.*) *pseudomorio* sensu Edwards, 1921, nec Alexander, 1920.

SCIARIDAE

The British list of Sciaridae has been greatly affected by a proliferation of recent taxonomic advances. The current Yorkshire list will require future revision after material has been re-identified following publication of Menzel *et al.* (in prep.), which will supersede Freeman (1983) as the standard work on British Sciaridae. Many species have been recently added, or confirmed, from Yorkshire by Menzel *et al.* (2006), which provides data from material examined in preparation for Menzel *et al.* (in prep.). Unpublished Yorkshire records exist under the following generic and specific names *sensu* Freeman (1983): these 'species' are provisionally excluded from the Yorkshire list, pending re-examination of material: *Bradysia albanensis* (Lengersdorf, 1926), *B. pullula* (Winnertz, 1867), *B. triseriata* (Winnertz, 1867), *Plastosciara* (*Plastosciara*) *pernitida* (Edwards, 1915), *Sciara nursei* Freeman, 1983, *Trichosia* (*Leptosciarella*) *basdeni* Freeman, 1983.

HYBOTIDAE

Euthyneura myricae Haliday in Walker, 1851 was added by Cheetham (1923) from the Helmsley area. RC has re-identified the specimen [labelled Ryedale, 21.5.1923, and held at the Leeds Museum Resource Centre] as *E. halidayi* Collin, 1926. Cheetham's record card reputes a second reference to his record in Cheetham (1925); however, this is a transcription error. McLean (1988) [sub nom. *myrica*] exhibited a ♀ *E. myricae* from Castle Wood, Helmsley, 21.6.1983, I. F. G. McLean.

DOLICHOPODIDAE

"*Dolichopus migulatus* P." (Hincks, 1936) and "*Dolichopus uliginosus*" (Morris, 1996) are apparently transcription errors for *D. ungulatus* (Linnaeus, 1758).

SYRPHIDAE

Cheilosia nigripes (Meigen, 1822) was stated to have been "recently confirmed from a site in Yorkshire" by Stubbs and Falk (2002). Walsh (1956) listed *C. nigripes* from Robin Hood's Bay, 1924 and Fylinghall, 1928, but these older records are doubtfully authentic; moreover, Walsh (1956) stated they were originally sub nom. *C. antiqua* (Meigen, 1822), a good species which is common in the North York Moors area.

All six *Pipiza* on the British list have been recorded from Yorkshire, but confusion surrounds the taxonomic status of several of these species; furthermore, it is likely that all old Yorkshire records of *P. lugubris* (Fabricius, 1775)* refer to *P. austriaca* Meigen, 1822.

PIPUNCULIDAE

Cheetham's cards contain an unpublished record of *Cephalosphaera furcata* (Egger, 1860) from the Ripon district, 1937, C. Morley, but this requires verification, as there have been many additions to British Pipunculidae over the last few decades, and *C. furcata* is not confirmed from Yorkshire.

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BOOK REVIEWS

Atlas of the water beetles (Coleoptera) and water bugs (Hemiptera) of Derbyshire, Nottinghamshire and South Yorkshire, 1993-2005 by **R. Merritt.** Pp. 160. Sorby Record Special Series, No. 14, 2006. £6.00 paperback, plus £1.50 postage/packaging, from Austin Brackenbury, 76 Crawford Road, Sheffield S8 9BU.

This book embodies an account of 13 years' exhaustive fieldwork by its author throughout the three administrative counties covered. For every species of aquatic beetle and bug encountered by the author and a couple of dozen minor collaborators in that period, there is a dot-map with a resolution of 1 km and a brief indication of the types of site in which it was found. The recognition that there are two species of *Chaetarthria* in Britain came too late to enable a re-survey of this genus to be undertaken; of the 40 records for *C. seminulum* sensu lato, only three could be checked, showing that both species occur in the area.

Twenty-four colour photographs, with descriptives notes, of collecting sites give a striking impression of the variety of habitats represented in the area. The general impression is of a rich fauna, totalling 174 species of beetles and 47 of bugs, about two-thirds of the British species, based on more than 28,000 and 8,000 records respectively. There is a note recording six species of beetle and one bug reliably reported in the period 1900-1992 but not encountered since. Four of the beetles were found at Thorne; one of them, *Laccobius poecilus*, last recorded in 1990, is discussed in detail because it is the subject of a UK Biodiversity Action Plan. Appendices include checklists in systematic sequence (useful for ease of reference as the genera of each Order are arranged alphabetically and there is no index); tables of the number of 1-km squares and the number of records for all the species, with an estimate of their British frequency derived from publicly available databases; and site names and 100-m grid references for noteworthy sites.

The work is attractively produced and very reasonably priced, being funded by English Nature, the Wildlife Trusts of Derbyshire and Nottinghamshire, the Environment Agency, the Peak District National Park Authority and Derbyshire County Council. It is a credit to its author and to its publisher, the Sorby Natural History Society.

WRD

Sir John Franklin and the Arctic Regions by **P. L. Simmonds.** Pp. 313, incl, 16 illus. 2005. £18.00 paperback; **Narrative of an Expedition to the Zambesi and its Tributaries** by **David** and **Charles Livingstone.** Pp. 477, incl. several illus. 2005). £16.00 paperback; **A Voyage to New Holland** by **William Dampier** (edited and with an introduction by **James Spencer**). Pp. 222, incl. numerous illus. 2006. £16.00 paperback. Nonsuch Publishing, Stroud.

Three further important titles from Nonsuch, the first two in the "Travellers, Explorers & Pioneers" series (see also *The Naturalist*, **130**: 153-154, 2005), will be of interest not only to historians but also to naturalists who follow the historical development of knowledge in their subject through the pioneering, mostly dangerous, exploration of our planet in the 18th and 19th centuries. Dampier, who beat Cook to Australia, anchoring in Shark Bay on 6 August 1699, has been shamefully neglected. As readers will find from his narrative, the time has come to accord him the recognition he so richly deserves: his inquiring mind, the record of his travels and observations of natural phenomena are plain to see. An important feature of the volume on Dampier, sadly lacking in the other works in this series, is the provision of more detailed introductory material and an index (albeit truncated). It would be useful to see such textual apparatus in future volumes. Nevertheless, the publishers are to be congratulated in reissuing these classics in such an attractive, reasonably priced, format.

MRDS

Tasmanian Devil: a unique and threatened animal by **David Owen** and **David Pemberton**. Pp. 240, plus 8-page colour section. The Natural History Museum, London. 2006. £12.99 hardback.

This volume traces both the fact and the fiction surrounding "Beelzebub's Pup" and its relationship with man, as well as with its closest marsupial relatives, the Tasmanian Wolf and its larger extinct precursors. Comparisons are also made with similar niche-filling predator scavengers such as wolverines or gluttons, ratels or honey badgers, and hyenas.

Condemned by ignorance and fear to be hunted to the verge of extinction, this predator scavenger is an important part of the ecosystem of Tasmania. Long extinct on the Australian mainland, the remaining populations, now confined to Tasmania, have to contend with DFSN (Devil Facial Tumour Disease), the origins of which are unknown. This disease is fatal and any unfortunate animal which contracts it dies within a few months. Many theories are being explored to try and trace the origins and causes of DFSN. One of these was the use of poisons to control Devils in the past, now illegal, but still thought to occur in some areas. If this proves to be the cause, and the Tasmanian Devil follows the Tasmanian Wolf into extinction, then all concerned will be condemned for allowing this to happen, particularly if lack of sufficient funding prevents a cure being found.

This book is written to the high standard expected of any volume associated with The Natural History Museum, London. First published in Australia, and written by two very authoritative and knowledgeable specialists in Australian mammals, it is a glimpse into the science, myth, history and politics of this fascinating animal.

AN

FURTHER RECORDS OF FEATHER MITES (ACARI: ASTIGMATA) IN YORKSHIRE

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Introduction

Since the records of feather mites in Yorkshire was published (Nattress, 1995), the author has continued to collect and record further specimens. In order to collect feather mites, a continuing supply of dead birds is required. Whilst some are obtained from friends and local ornithologists, this would not provide sufficient material. Therefore collaboration with a local museum proved to be an ideal situation, to where the public frequently take dead birds (and other animals), where they are catalogued and frozen. Some of these are made into mounts for display whilst others are totally unsuitable for this, but may be used for skeletal displays. From these birds it is possible to remove feathers and collect mites. In return, the museum is provided with micro-slides of named feather mites for their collection.

Materials and Methods

The mites are removed from feathers using a very fine brush, and with the aid of a stereo microscope. The mites are then mounted on micro-slides in a polyvinyl lactophenol medium and examined with phase contrast with a Zeiss Photomicroscope II with magnifications ranging from x200 to x500. Nomenclature is according to Peterson (2002).

Results

Family *Analgidae* Trouessart & Mégnin, 1884

***Analges beaucornui* Gaud, 1973**

First described from the wren *Troglodytes troglodytes* (L.) 1758, it has now been recorded from the same host from Low Bradley, near Keighley, SE0048 (Mironov, 1985).

***A. mucronatus* (Buchholtz, 1869)**

Previously recorded from great tit *Parus major* L., from Chapel Allerton, Leeds, it has now been recorded from the type host, the blue tit *Parus caeruleus* L. 1758, from Low Bradley, near Keighley, SE0048

***A. pollicipatus* Haller, 1882**

First described from the dunnock *Prunella modularis* (L) 1758, it has now been recorded from the same host from Sherburn in Elmet, SE4633.

***A.s passerinus* (L., 1758)**

First described from the chaffinch *Fringilla coelebs* L. 1758, it has now been recorded from the greenfinch *Carduelis chloris* (L.) 1758, from Keighley, SE0641.

***Megninia cubitalis* (Mégnin, 1877)**

First described from the domestic fowl *Gallus gallus domesticus* (L.) 1758, it has now been recorded from the grey partridge *Perdix perdix* (L.) 1758 and the red-legged partridge *Alectoris rufa* (L.) 1758 from Sherburn in Elmet, SE4633. (Gaud *et al*., 1985).

Family *Pteronyssidae* Oudemans, 1941

***Pteronyssoides parinus* (Koch, 1840)**

First described from the blue tit *Parus caeruleus* L. 1758, it has now been recorded from the same host, from Low Bradley, near Keighley, West Yorkshire, SE0048.

***P. striatus* (Robin, 1877)**

First described from the chaffinch *Fringilla coelebs* L. 1758, it has now been recorded from the same host, from Low Bradley, near Keighley, SE0048.

***Neopteronyssus pici* (Scopoli, 1763)**

First described from the middle spotted woodpecker *Dendrocopos medius* (L.) 1758, it has now been recorded from the greater spotted woodpecker *Dendrocopos major* (L.) 1758, from Askham Bryan, York, SE5448. (Faccini & Atyeo, 1981).

***Scutulanyssus obscurus* (Berlese, 1884)**

First described from the swallow *Hirundo rustica* L. 1758, it has now been recorded from the house martin *Delichicon urbica* (L) 1758, from Low Bradley, near Keighley, SE0048 (Gaud & Atyeo, 1985).

***S. ottuki* (Chirov & Mironov, 1983)**

First described from the swallow *Hirundo rustica* L. 1758, it has now been recorded from the same host, from Bilton in Ainsty, SE4749.

Family *Proctophyllodidae* Trouessart & Mégnin, 1884

***Joubertophyllodes modularis* (Berlese, 1894)**

First described from the dunnock *Prunella modularis* (L.) 1758, it has now been recorded from the same host, from Sherburn in Elmet, SE4633.

***Monojoubertia microphylla* (Robin, 1877)**

First described from the chaffinch *Fringilla coelebs* L. 1758, it has now been recorded from the same host, from Low Bradley, near Keighley, SE0048.

***Proctophyllodes doleophyes* Gaud, 1957**

First described from the spotted flycatcher *Muscicapa striata* (Pallas) 1764, it has now been recorded from pied flycatcher *Ficedula hypoleuca* (Pallas) 1764, from Roundhay, Leeds, SE3236. (Atyeo & Braasch, 1966).

***P. pinnatus* (Nitzsch, 1818)**

First described from the goldfinch *Carduelis carduelis* (L.) 1758, it has now been recorded from greenfinch *Carduelis chloris* (L.) 1758, from both Scarcroft, Leeds, SE3541 and Keighley, SE0641.

***P. rubeculinus* (Koch, 1841)**

First described from robin *Erithacus rubecula* (L.) 1758, it has now been recorded from the same host, from Low Bradley, near Keighley, SE0048 and from treecreeper *Certhia familiaris* L. 1758, from Brighouse, SE1422.

***P. reguli* Gaud, 1957**

First described from goldcrest *Regulus regulus* (L.) 1758, it has now been recorded from the same host, from Burley Woodhead, SE1544.

***P. stylifer* (Buchholz, 1869)**

Previously recorded from great tit *Parus major* L. 1758, from Chapel Allerton, Leeds, it has now been recorded from wren *Troglodytes troglodytes* (L.) 1758 and from the type host, the blue tit *Parus caeruleus* L. 1758 from Low Bradley, near Keighley, SE0048.

***P. troncatus* Robin, 1877**

Previously recorded from the type host, the house sparrow *Passer domesticus* (L.) 1758 in Bramham and Drighlington, it has now been recorded, again from house sparrow, from Low Bradley, near Keighley, SE0048.

***P. schoeniculi* Atyeo & Braasch, 1966**

First described from the reed bunting *Emberiza schoeniclus* (L.) 1758, it has now been recorded from the same host, from Low Bradley, near Keighley, SE0048.

Family *Psoropoididae* Gaud, 1983

***Mesalgoides oscinium* Koch, 1840**

First described from the greenfinch *Carduelis chloris* (L.) 1758, it has now been recorded from the same host, from Scarcroft, Leeds, SE3541 and Keighley, SE0641. (Gaud, & Atyeo, 1966).

***M. picimajoris* Cerny, 1974**

First described from the green woodpecker *Picus viridis* L. 1758, it has now been recorded from the great spotted woodpecker *Dendropos major* (L.) 1758, from Askham Bryan, York, SE5448.

Family *Trouessartiidae* Gaud, 1957
***Trouessartia inexpectata* Gaud, 1957**
First described from the Sardinian warbler *Sylvia melanocephala* (Gmelin) 1789, it has now been recorded from the goldcrest *Regulus regulus* (L.) 1758, from Burley Woodhead, SE1544. (Santana, 1976).
***T. rubecula* Jablonska, 1968**
First described from the robin *Erithacus rubecula* (L.) 1758, it has now been recorded from the same host, from Low Bradley, near Keighley, SE0048.

Family *Gabucinidae* Gaud and Atyeo, 1975
***Hieracolichus nisi* (Canestrini, 1878)**
First described from the sparrow hawk *Accipter nisi* (L.) 1758, it has now been recorded from the same host, from Sherburn in Elmet, SE4633.

Family *Kramerellidae* Gaud and Mouchet, 1961
***Kramerella aluconis* (Lönnfors, 1937)**
First described from the tawny owl *Strix aluco* L. 1758, it has now been recorded from the same host, from Burley in Wharfedale, SE1746.

Family *Pterolichidae* Trouessart and Mégnin, 1884
***Pterolichus obtusas* Robin 1877**
First described from the red-legged partridge *Alectoris rufa* (L. 1758), it has now been recorded from the grey partridge *Perdix perdix* (L.) 1758 and the red-legged partridge from Sherburn in Elmet, SE4633.

Erratum
In Nattress (1995), a mite removed from a mute swan *Cygnus olor* (Gmelin, 1789) was incorrectly identified as *Brephoceles anatina* Dubinin, 1951 – its correct name is *Brephoceles discidus* Peterson, 1971.

Discussion
British workers on the systematics of feather mites have included the Rev. John Hull (1863 – 1960), who worked mainly in Northumberland and Durham (Hull, 1934) and Harold (Harry) Britten (1870 – 1954) who worked mainly in Lancashire and Cheshire (Hancock & Pettitt, 1981). There is a collection of feather mites within the main acari collection in the Manchester University Museum (Ref. MANCH NW1125) made by Britten between 1930 and 1940. Charles Denys Radford (1903 – 1973) appears to have concentrated on collating published information. Published work on feather mites appeared over many years in a large number of journals from a number of countries. The paper by Radford (1952) was an attempt to bring all previous British and European data together "into one source". It must be noted that the nomenclature of all these workers is now out of date. Nattress (1995) recorded 15 feather mite species for Yorkshire and the present paper brings that total to 39.

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BOOK REVIEW

Climate Dependence and Food Production in Russia 1900-1990 by **Nikolai M. Dronin** and **Edward G. Bellinger**. Pp. xvii + 366, incl. numerous line drawings & tables. Central European Press, Budapest. 2005. £31.95 hardback.

Despite periods of dynamic economic development, Soviet Russia suffered from chronic food problems, including mass famine, not necessarily as a consequence of economic policy, but often due to vagaries of the climate. Bearing in mind the difficulties in tracking down such sensitive information, the authors are to be congratulated on their resourcefulness in detailing the impact, geographical extent and time scale of these problems. The extent to which policy and/or climate has conspired to affect agricultural yields is highly relevant to current interest in predicting the impacts of climatic change on natural ecosystems. This authoritative account is complemented by a glossary, an extensive list of references and an index, the whole contained within a very well produced volume.

MRDS

NEW AND IMPORTANT RECORDS OF FUNGI FROM COUNTY DURHAM (VC66), 2004-2005

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Unlike its much larger neighbour to the south, County Durham has had a very sketchy history of fungal recording. Efforts began well in the late 18th century with a fruitful correspondence between Edward Robson of Darlington and James Bolton of Halifax (Legg, 1997, 1998a). Many of Robson's collections were later to be documented by Winch (1831). Thereafter nothing appears in the literature until Potter's (1905) vague list. British Mycological Society Forays in 1907, 1933, 1971 and 1975 provided records for a few sites in the 20th century. In the 1920s and 1930s, the association between F. A. Mason of Leeds and J. B. Nicholson of Darlington echoed the earlier relationship between Bolton and Robson, with lists from jointly led forays still held by Darlington and Teesdale Naturalists' Field Club. Activity then again tended to languish until Mr J. Durkin of Derwentside made a determined effort to catalogue all earlier fungal records from VC66 in a database put together in the mid-1980s, but never published. The present writer was encouraged by Mr Durkin's lead to put his own records in order so that the total list of recorded fungi reached about 1300 taxa by the end of 1986. Ill health then prevented Mr Durkin from continuing and building upon his research, and lack of expertise and resources prevented me from doing more than listing my own significant finds in a card-index.

Finally, in 1990 the present author began to publish a series of record lists in *The Vasculum*, organ of the Northern Naturalists' Union, of County Durham fungi and slime moulds not previously featured in Mr Durkin's database. Later lists have appeared at roughly biennial intervals until 2003 (Legg, 1990, 1992, 1993a, 1993b, 1993c, 1994, 1996, 1998b, 2000, 2002, 2004a). Unfortunately, in January 2006, the Northern Naturalists' Union ceased to exist and *The Vasculum* is no longer to appear as a paper publication. Its website at http://www.thevasculum.com will still exist at least for the time being.

Meanwhile, the present paper continues the series begun in 1990. When last totalled in 2002, the number of non-lichenized fungi recorded for County Durham was 2,926; 73 species considered newly recorded for the county were added in 2004, and the addition here of a further 55 brings the raw total to 3,054. However, this figure is only approximate since a number of mitosporic fungi have been united with perfect states now recognised as their teleomorphs since early counts were made. Many species have been "lumped" with others and a few have been "split". There is, moreover, much on-going research in the fields of mating compatibility studies, cladistics and DNA sequencing. All this means that species counts are bound to remain mere approximations for some time to come. Despite these reservations, it is certain that the number of species known from VC66 has at least tripled in the last 20 years. The recently founded North Eastern Fungus Study Group is now working systematically to add county records to the British Mycological Society Fungus Record Database. In addition to the 55 new records mentioned above, the list which follows contains five species considered to be important since they have been recorded only once before, usually some time ago, or represent a new host-species association.

The list generally follows the systematic arrangement adopted by Kirk *et al.* (2001). More specifically, although the Myxomycetes are now considered to be Protozoa, the single slime mould given here is placed at the beginning rather than the end of the list; then follow the Oomycota, now considered to be part of the kingdom Chromista. As in the British checklist (Cannon *et al.*, 1985), Ascomycetes are dealt with alphabetically in genera. Lichenized Ascomycetes are excluded as these have been dealt with separately (McCutcheon, 2001). Treatment of basidiomycetes follows Legon and Henrici, (2005). Anamorphic fungi are treated under the traditional sub-headings of Hyphomycetes and Coelomycetes for ease of reference (cf. Ellis & Ellis 1997).

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NEW AND IMPORTANT RECORDS

MYXOMYCOTA
Enteridium splendens var. *juranum* (Meyl.) Harkonen. On fallen decorticate twig of *Quercus*. Darlington West Cemetery (NZ 274139), 3.8.2005.

OOMYCOTA: PERONOSPORALES
Albugo tragopogonis (DC.) S.F.Gray. On living leaves of *Tanacetum parthenium*, Nunnery Lane, Darlington (NZ267147), 2.6.2005, det. B. M. Spooner. **K**(M)132185. Very rare on this host.
Peronospora calotheca de Bary. On moribund leaves of *Galium odoratum*, Flatts Wood, Barnard Castle (NZ039177), 1.8.2005. Very few recent British records (Preece, 2002).

ASCOMYCOTA
Atopospora betulina (Fr.) Petrak. On fallen leaf of *Betula* suspended in vegetation, Darlington West Cemetery (NZ269141), 11.5.2005. Few modern British records. One previous VC66 record made at Raby Castle in 1911.
Carbonea vitellinaria (Nyl.) Hertel. On *Candelariella vitellina* on exposed acidic blocks of a cairn at Shorngate Cross (NY871450), 15.4.2004. Coll. D.E.McCutcheon, det. B.J.Coppins.
Chaetosphaeria callimorpha (Mont.) Sacc. On base of dead *Rubus* cane, Darlington West Cemetery (NZ269139), 21.3.2005. Recorded once previously in VC66 at Finchale Priory, Durham in May 1975.
Cryptosphaeria lignyota (Fr.) Auersw. On dead attached twig of *Populus nigra* var. *betulifolia*, Baydale, Darlington (NZ262154), 22.4.2005. Conf. B.M.Spooner, **K**(M)131360. Rarely recorded. This may be the most northerly British record.
Cucurbidothis pythiophila (Schm. & Kunze) Petrak. On old fallen twig of indet. conifer, Copley (NZ073248), 7.3.2004.
Microsphaera russellii G.P.Clinton. Conidia only on living leaves of *Oxalis*, Darlington West Cemetery (NZ273141), 26.9.2005.
Eutypella acericola (de Not.) Berl. On fallen twig of *Acer pseudoplatanus*, Low Coniscliffe riverbank (NZ238133), 7.3.2005.
Fenestella salicis (Rehm) Sacc. On dead attached twig of *Salix caprea,* Darlington West Cemetery (NZ273133), 4.3.2004.
Hymenoscyphus phyllogenus (Rehm) O.Kuntze. On old fallen leaf of *Quercus*, Rosa Shafto Reserve, Spennymoor (NZ247356), 12.11.2005. Coll. Mrs R.Richard.
Leptosphaeria typhyae (P.Karsten) Sacc. On dead standing culm of *Typha latifolia*, Low Barns Reserve, Witton-le-Wear (NZ166314), 1.5.2005.
Microglossum olivaceum (Pers.) Gill. From soil of upland rough pasture, Far Sandyford (NY966464), 14.11.2004. Coll. K. Cunningham, det. B.M.Spooner, **K.** Rare, but less so than recently thought.
Microsphaera euonymi (DC.) Sacc. Plentiful cleistothecia on attached living leaves of *Euonymus europaeus*, Darlington West Cemetery (NZ272140), 1.9.2005.
Microsphaera euonymi-japonici Viennet-Bourgin. Abundant conidia on living leaves of *Euonymus japonicus*, Billingham Bottoms Nature Reserve (NZ454228), 20.8.2005.
Mollisia aquosa (Berk. & Br.) Phill. On the underside of fallen branch of *Tilia,* Darlington West Cemetery (NZ271139), 19.9.2005.
Morenoina rhododendri J.P.Ellis. Near nodes on moribund attached twig of *Rhododendron ponticum*, Darlington West Cemetery (NZ272141), 26.5.2005.

Nectria cucurbitula (Tode) Fr. *Zythiostroma* state on fallen branch of *Cedrus deodara*, Darlington West Cemetery (NZ273139), 17.3.2004. Conf. A.Henrici, **K.**

Nectria cf. *pallidula* Cooke. On dead attached twig of *Fagus sylvatica*, Darlington West Cemetery (NZ272139), 4.3.2004. Examined A.Henrici, **K.** Possibly an albino form of another *Nectria* species, indet. on same twig.

Pezicula carpinea (Pers.) Tul. ex Fuckel. *Cryptosporiopsis* state on dead twig of *Carpinus*, Mallygill Wood Reserve, West Rainton (NZ309461), 13.3.2004.

Peziza ampliata Pers. On pile of rotting plant debris by entrance to Slit Wood, Westgate (NY906386), 24.7.2004. Surprisingly, only the second known VC66 record.

Pleospora vagans Niessl. On dead material of indet. ornamental grass, Darlington West Cemetery (NZ273141), 8.9.2005.

Pyrenophila typhicolor (Cooke) E.Muller. In leaf-sheath of *Typha latifolia*, Drinkfield Marsh, Darlington (NZ287175), 11.5.2004. Conf. B.M.Spooner, **K.**

Sowerbyella radiculata (Sow.) Nannf. Gregarious amongst litter of *Cupressus*, Darlington West Cemetery (NZ273141), 27.11.2004. Conf. B.M.Spooner, **K**.

Splanchnonema ampullaceum (Pers.) Shoemaker & Leclair. On fallen twig of *Tilia,* Darlington West Cemetery (NZ273131), 2.5.2004.

Valsa pruinosa (Fr.) Defago. On dead attached *Salix* twig, Low Barns Reserve, Witton-le-Wear (NZ165315), 15.2.2004.

Valsaria petrakii Spooner. On dead attached twig of *Crataegus*, Bushel Hill, Darlington (NZ267151), 3.3.2004. Sometimes known as *Pseudothyridaria insitiva*.

BASIDIOMYCOTA: BASIDIOMYCETES

Auriscalpium vulgare Gray. On cone of *Pinus,* Norman's Riding Wood, Winlaton (NZ165610), 6.11.2004. Coll. D.E.McCutcheon. The first known VC66 record of the well-known "ear-pick fungus" since Edward Robson's collection of the late 18th century, now in Sunderland Museum (Legg, 1997).

Bulbillomyces farinosus (Bres.) Jul. *Aegerita* state only on decorticate *Salix* wood, Slit Wood, Westgate (NY906388), 24.7.2004.

Camarophyllopsis foetens (W.Phillips) Arnolds. Amongst close-mown grass of a small chapel lawn, Woodland village (NZ068204), 30.10.2005. Coll. Mrs R.Richard, conf. B.M.Spooner, **K**(M)135534. Very rarely collected.

Entoloma bloxamii (Berk. & Br.) Sacc. In unimproved grassland, Red Burn, Rookhope (NY9243), 30.11.2005. Coll. K.Cunningham & A.McLay. Rarely collected.

Entoloma hispidulum (M.Lange) Noordel. Upland pasture, Slit Gill, Westgate (NY906388), 24.7.2004. Coll. K.Cunningham & A.McLay, det. A.W.L.

Entoloma longistriatum (Peck) Noordel. Upland pasture, Slit Gill, Westgate (NY906388), 24.7.2004. Coll. K. Cunningham & A.McLay, det. A.W.L.

Entoloma prunuloides (Fr.) Quel. Upland pasture, Far Sandyford, (NY966464), 29.8.2005. Coll. K.Cunningham, det. A.W.L.

Hebeloma leucosarx P.D.Orton. With *Salix*, Low Barns Reserve, Witton-le-Wear (NZ165314), 9.9.2004.

Hygrocybe flavipes (Britz.) Arnolds. Unimproved grassland, Red Burn, Rookhope, (NY9243), 30.11.2005. Coll. K. Cunningham & A.McLay.

Hygrocybe fornicata (Fr.) Singer. Unimproved grassland, Red Burn, Rookhope (NY9243), 30.11.2005. Coll. K. Cunningham & A.McClay.

Hygrocybe lacmus (Schumach.) P.D. Orton & Watling. From upland pasture, Langleydale Common, Woodland (NZ048245), 13.11.2005.

Leccinum pseudoscabrum (Kallenb.) Sutara. With *Corylus*, Slit Gill(NY906389), 24.7.2004.

Macrotyphula fistulosa var. *contorta* (Holmsk.) Nannf. & L.Holm. On *Corylus*, Norman's Riding Wood, Winlaton (NZ165610), 6.11.2004.

Mycena pearsoniana Singer. On fallen needles of *Picea abies*, Norman's Riding Wood, Winlaton (NZ165610), 1.8.2004. *et seq*. Coll. D.E.McCutcheon, conf. A.W.L.

Pholiota tuberculosa (Schaeff.) P.Kumm. On dead lying deciduous trunk, Durham Great High Wood (NZ279409), 16.10.2004.
Russula subfoetens W.G.Smith. With *Quercus cerris*, Mowden, Darlington (NZ265153), 25.8.2004.

BASIDIOMYCOTA: UREDINOMYCETES
Uromyces gageae Beck. On living leaves of *Gagea lutea*, Selaby (NZ158173), 21.3.2004. Conf. B.M.Spooner, **K**(M)122082. Very rare.
Melampsora lini (Ehrenb.) Desm. On *Linum catharticum*, Slit Gill, Westgate (NY906387), 24.7.2004. Coll. A.McLay.

BASIDIOMYCOTA: USTILAGINOMYCETES
Ustilago ornithogali (J.C. Schmidt & Kunze) Magnus. On living leaf of *Gagea lutea*, Low Coniscliffe (NZ242133), 14.4.2004. Conf. B.M.Spooner, **K**(M)122083. "Critically endangered" according to draft Red Data List (Legg, 2004b).

ANAMORPHIC FUNGI: HYPHOMYCETES
Arthrinium phaeospermum (Corda) M.B.Ellis. On dead stems of *Phragmites*, Drinkfield Marsh, Darlington (NZ287175), 11.5.2004.
Bactrodesmium cedricola M.B.Ellis. On fallen branch of *Cedrus deodara*, Darlington West Cemetery (NZ273141), 17.3.2004. Det. A.Henrici.
Cercosporidium depressum (Berk. & Br.) Deighton. On living leaves of *Angelica sylvestris*, Slit Wood, Westgate (NY906386), 24.7.2004. Coll. B. Walton.
Codinaea brittanica M.B.Ellis. On petiole of dead leaf of *Tilia*, Darlington West Cemetery (NZ269139), 26.5.2005.
Pseudospiropes simplex (Kunze) M.B.Ellis. On old wood of *Fraxinus*, Mallygill Wood, West Rainton (NZ311459), 13.3.2004.
Ramularia heraclei (Oudem.) Sacc. On living leaves of *Heracleum*, near Low Coniscliffe (NZ233136), 1.8.2004.
Ramularia lysimachiae Thum. On living leaves of *Lysimachia vulgaris*, Low Coniscliffe (NZ241133), 11.7.2004. Conf. B.M.Spooner, **K**(M)124708. First British record on this species (Legg, 2004c).
Rhinotrichum lanosum (Cooke) Cooke. Incubated on an owl pellet collected from Norman's Riding Wood, Winlaton (NZ165610), 6.11.2004.
Sporidesmium folliculatum (Corda) Mason & Hughes. On dead attached *Ilex* leaf, Darlington West Cemetery (NZ273139), 22.1.2004.

ANAMORPHIC FUNGI: COELOMYCETES
Aschochytula deformis (Karst.) Grove. A large group on old dead stem of *Sambucus*, Bushel Hill, Darlington (NZ22). 4.2004.
Camarosporium robiniae (West.) Sacc. On fallen twig of *Robinia*, Darlington West Cemetery (NZ272139), 16.2.2004.
Cytospora tamaricis Brun. On dead stem of *Tamarix,* Stodhoe Farm, Middleton St George (NZ336133), 24.3.2005. Coll. Mrs B.Walton.
Diplodia rubi Fr. Plentiful on dead stems of *Rubus fruticosus* agg. Darlington West Cemetery (NZ272139), 26.5.2005.

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BOOK REVIEWS

Principles of Conservation Biology by **M. J. Groom, G. K. Meffe** and **C. R. Carroll.** 3rd edition. Pp. xix + 793 with numerous illustrations (diagrams, photographs, maps) Sinauer Associates, Sunderland, Mass., USA. 2006. £36.99 hardback.

Principles of Conservation Biology is a large, lavishly illustrated book with three named authors, together with 19 major contributors listed, and around 100 others who contribute to around 50 essays and about the same number of case studies *en passant*.

There are 18 chapters classified within three 'units': 'Conceptual Foundations for Conservation Biology', 'Focus on Primary Threats to Biodiversity' and 'Approaches to solving Conservation Problems'. With such an abundance and diversity of expert contributions it would be difficult to fault the scope of this book. Landscapes, ecosystems, protected areas, restoration of damaged ecosystems, sustainable development, the integration of conservation and science and the biological impacts of climate change all receive attention. Well-known examples suggesting human failure to live within available resources (e.g. on Easter Island) are not cited, although the lessons are evident here under 'sustainable development'. Understandably, in an American book, where religion is touched upon, only sympathetic relationships with conservation are emphasised – wonder and awe at creation or evolution, the protection, by Buddhists of ginkgos, cranes and monkeys in the grounds of temples and the Great God of Israel who wanted the animals rescued from the flood. Yet I came across no mention of religious attitudes to population growth, which could be the most important conservation issue today, and I could find no direct mention of the original contribution of Malthus to population biology.

There is a useful Glossary, an Index and a comprehensive Bibliography, with perhaps a thousand references (unfortunately not referable in reverse to the text). At over 2kg and measuring 229 x 220 x 3.5 cm this is hardly a book to be carried around: it is as much a work for reference as an undergraduate text. Its dedication "To students of conservation biology in whose collective hands the future of biodiversity rests, and to the pioneers of the field, upon whose shoulders we stand." is appropriate.

The seven-point summary and five questions for discussion provide a brief and fittingly thoughtful ending occupying only one and a half pages. I recommend this book as a major source of reference for conservationists, and the last pages to anyone willing to discuss the future of life on earth.

DJH

Lichens. An illustrated guide to the British and Irish species by **Frank S. Dobson**. Fifth edition. Pp.480, with colour plates, line drawings and maps. Richmond Publishing, Slough. 2005. £45.00 hardback, £35 paperback.

Now into its 5th edition, there is clearly a demand for this work, since it bridges a gap between numerous lightweight works of little value to the field naturalist and the erudite *Lichen Flora of Great Britain and Ireland* (published in 1992, but currently under revision). Dobson's work packs a tremendous amount of detail within its covers by providing keys, coloured plates and distribution maps to most of the 850 species included (representing more than half of the British and Irish flora and, in general, only excluding the rare species). Although the maps are small, in most cases they do provide a reasonable picture of a species' current distribution useful to those unsure of its local status; however, the distribution patterns of those species which have significantly disappeared from major areas of Britain (particularly England) are difficult to interpret, since it is impossible, due to the printing process, to differentiate between older and newer records with the naked eye (e.g. *Lobaria* spp., *Ramalina fraxinea*). It is, however, possible with a hand-lens to differentiate between older and newer records (the former actually appearing darker!), but perhaps future editions of this important field guide should omit old records from the maps? This latest edition contains over 130 species additional to the previous edition and corrects the errors (many typographical) which marred earlier editions; the only major error noted in this edition is the incorrect map for *Ramalina cuspidata* (p.382) which repeats that provided for *R. calicaris* (p.381). Nevertheless, this work will be of great benefit not only to budding lichenologists but also to ecologists and field naturalists in general who require a more complete picture of the habitat or landscape they are investigating; unfortunately, the relatively high price for both the hardback and softback will discourage some from exploring this fascinating subject or tempt some of those possessing an earlier edition to hang on to it instead.

MRDS

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CURRENT STATUS OF THE DARK GREEN FRITILLARY (*ARGYNNIS AGLAJA* L.) IN YORKSHIRE

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The Dark Green Fritillary (*Argynnis aglaja* L.) is encountered in rough grassland with abundant violets, in a variety of situations from the early seral stages of woodland, to heathland, moorland and grasslands. Its populations have fluctuated during the past century, but it has declined consistently in most of the south and east of England since the early 1900s. It was widely distributed in Yorkshire until the 1850s but was probably more common in the uplands. Records in the last decade are concentrated in North York Moors National Park (NYMNP) and in the Yorkshire Dales National Park (YDNP). These are the only areas where it was known as resident. Records from outside the national parks are a scatter of reports and unconfirmed sightings in the eastern Pennines in west central Yorkshire, where the species has had a long history of solitary records and occasional colonisation (Clough 2005, Whitaker 2004). During the period 1995 to 2002, the Dark Green Fritillary and 'large fritillaries not identified' (presumed to be Dark Green) were only recorded from 14 Yorkshire 10 x 10km squares **VC65** SD78, **VC64** SD77 SD75 SE14 SE16 SE25 SE27, **VC63** SE03, **VC62** SE49 SE58 SE78 SE88 SE89 NZ90 (Whitaker 2004). In the definitive Yorkshire maps using better recording coverage up to 2003, the butterfly was still considered to be rare, being recorded from only 26 10 x 10 km squares and 50 out of 2377 tetrads (Frost 2005) (Table 1).

TABLE 1
Yorkshire records to Summer 2003 (10 x 10 km squares) (from Frost, 2005)

Vice-County	**Total 10km Squares**	**10km Squares**
VC 61	**0**	
VC 62	**10**	SE49 SE55 SE58 SE78 SE88 SE89 SE99 NZ51 NZ80 NZ90
VC 63	**1**	SE03.
VC 64	**13**	
	In YDNP (6)	SD65 SD75 SD77 SD86 SD96 SE05
	Not YDNP (7)	SD73 SE14 SE15 SE16 SE25 SE27 SE37
VC 65	**In YDNP (2)**	SD78 SE69
Yorks.	**Total 26**	

Since the publications of Whitaker (2004) and Frost (2005), increased observer effort in the summers of 2004 and 2005 has resulted in many more records and more has been discovered about its distribution, especially in western Yorkshire. Currently the species has been recorded from 40 10 x 10 km squares (Table 2).

Many of the other widely distributed records are of singletons. This is partly explained by most specimens not straying far from key habitats, the difficulties in identifying breeding sites and the inability of most naturalists to confidently recognise the species at a distance. The species is only common on Scar Close NNR, but during 2005 it was observed in 11 other 1 x 1 km squares around the Ingleborough Nature Reserves complex. It is surmised that these records may be the consequence of the large nuclear population on Scar Close NNR spreading into adjacent areas where the pasture is now being managed in a manner much more sympathetic to wildlife than previously. In 2003 there were only two

TABLE 2
Yorkshire records to Summer 2005 (10 x 10 km squares)

Vice-County	**Total 10km Squares**	**10km Squares**
VC 61	**0**	
VC 62	**10**	SE49 SE55 SE58 SE78 SE88 SE89 SE99 NZ51 NZ80 NZ90
VC 63	**4**	SE03 SE50 SE70 SE71
VC 64	(22)	
VC64 YDNP	**11**	SD65 SD67 SD75 SD76 SD77 SD86 SD87 SD96 SD97 SE05 SE06
VC 64 Ex YDNP	**11**	SE13 SE14 SE15 SE16 SE24 SE25 SE27 SE35 SE36 SE37 SE62
VC 65 YDNP	**4**	SD69 SD78 SD99 NZ06
Yorks.	**Total 40**	

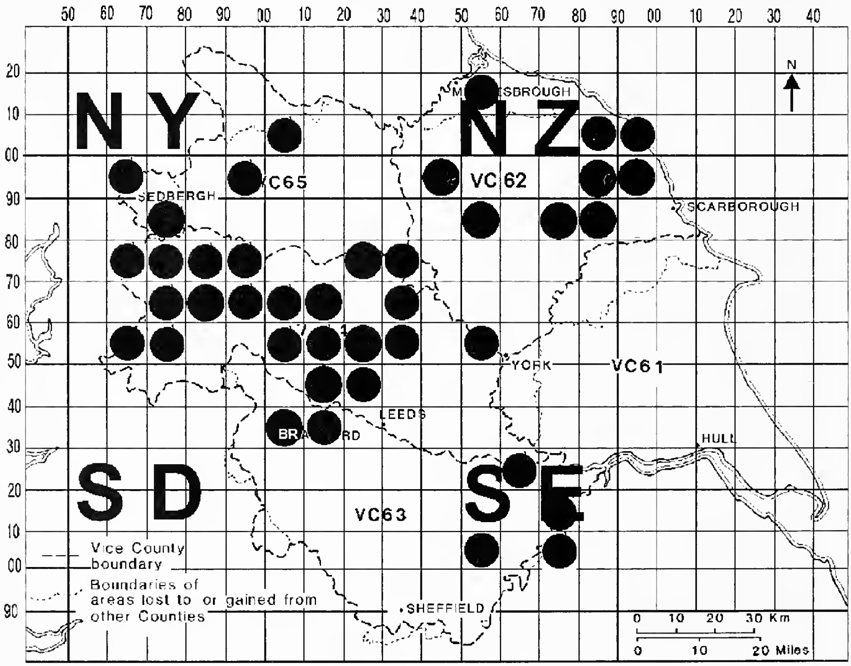

Figure 1. Dark Green Fritillary records for Yorkshire, 1995-2005

sites in western Yorkshire where the species was known to breed. Now five breeding sites are confirmed in the YDNP and others are suspected (Table 3). Most of those sites are associated with calcareous grassland (NVC CG9), characterised by frequent violets, usually *Viola riviniana* and V. *hirta*, scattered scrub and with areas of abundant nectar

TABLE 3
Argynnis aglaja breeding sites in the YDNP, 1995-2005

SITE	**Grid Ref**	**Total No 1995-2005**	**Max no. Seen**	**Alt. (m)**	**Site area (ha)**	**Comments**
Scar Close NNR	SD75 78 SD75 77 SD74 77	1097	100+	325-350	*ca* 30	Extremely Large Colony
Nr. Malham Tarn	SD88 67 SD89 67 SD8966	28	4	338	20+	Small Colony Nectar Site
Kettlewell, Park Gill	SD98 74	19	8	300-390	2	Small Colony
Swarth Moor SSSI	SD81 96	20	2	220	11	Small Colony
Rise Hill	SD76 88	7+	3	380	0.75	Small Colony
Southerscales NR	SD74 76	18	6	345	15?	Probable Colony
Austwick; Wharfe	SD77 70	7	3	240-250	<2	Probable Colony
Langstrothdale	SD9178	5+	2	270-295	–	Un-located Colony
Nr Cautley Spout	SD68 97	4	3	270-300	–	Un-located Colony
Giggleswick Scar	SD80 65 SD81 63	3	1	300	–	Un-located Colony
Grass & Bastow Woods	SD98 65 SD99 65	5	1	200-290	40?	Un-located Colony
Ribblehead Quarry N.R.	SD76 78	13	3	315	5?	Possible New Colony
Salt Lake Quarry NR	SD77 78	5	4	315	1	Possible Colony
Ingleborough NR South House / Sulber	SD77 73	4	2	350	?	Possible Colony
Duck Street Quarry NR	SE11 64	2+	2	385	4.0?	Extinct, Small Colony 1995-97

flowers in herb-rich grassland where purple Compositae are used as nectar plants. *Centauria nigra* is especially favoured, but *Cirsium* spp. and *Succisa pratensis* are also used. On a few sites (2) it is also associated with *V. palustris*, as near Rise Hill (a vegetational mosaic including NVC M23) and Swarth Moor SSSI, a mire with NVC M5, M23 & M25 vegetation (Rodwell 1991, 1992).

Ecological field work undertaken in 2005

Scar Close NNR supports what was estimated as by far the largest colony of the Dark Green fritillary in Yorkshire. Out of a total of 1272 individuals recorded during 1995-2005, from Mid-West Yorkshire (VC64), 1097 were from there. Part of this increase in numbers reported was due to the setting up of a transect on Scar Close by English Nature. This created a large enough dataset to enable a graph of the flight duration to be produced for the first time (Bell 2004).

A trial of field methodology was undertaken to make absolute estimates of population size of *Argynnis aglaja* prior to a more detailed study planned for 2006. The ultimate purpose is to incorporate calibrations of population estimates into the simpler procedure of transect monitoring (Thomas 1983). This can then be used on a wider range of fritillary sites than is possible using the time-consuming mark release recapture (MRR) methodology. Several different MRR and multiple mark and recapture methods were tried and it was confirmed that the most practical methodology was Craig's (1953) frequency of capture method. Details of the MRR calculations used in Table 5 can be found in Southwood 1966 (Chapter 3), Craig (1963 and Eberhardt (1969).

Every butterfly captured was examined and scored for wing-wear, using a subjective assessment scale to provide an index of aging by 'wear and tear' (Table 4).

TABLE 4
Wing-wear scoring criteria (Ellis 2000)

Wing-wear Score	**Description**	**Explanation**
4	Perfect	Near freshly emerged
3	Fine	No tears but colours faded
2	Poor	Scales rubbed off, wings with tears
1	Well Worn	Very ragged. Most scales absent. Veins protruding from wing margins

Population Estimates

During 2005 the first butterfly was observed on 7 July and the last on 2 September, a flight period of 57 days. In preceding years there are few observations available. The 2004 flight period was 46 days between 6 July and 21 August. During 1999-2003, only 35 casual records are available between 12 July and 1 September, giving 44 days. In 2004 the peak count was near 2 August (day 31) whereas in 2005 it was around 22 July (day 16 from first sighting) (Fig. 2).

Despite unfavourable weather and the inability to capture large numbers of individuals on a single day, it was possible to make absolute population estimates using frequency of capture data on four days and also MRR during four periods (Table 5). Because very few females (36) were encountered during the study, male and female population estimates are presented separately as well as estimates of the total population. This indicated a maximum male population of 707 (±768.4) or including females 742 (± 369.8 SE) for the period 3-5 August using Jolly's method of calculation. The transect counts probably missed the absolute population peak but indicate that it was at least 50% larger on 22 July. This places the population firmly in the 'large' (>1000) classification used by Butterfly Conservation; probably one of the largest populations in the county. Frequency of capture indicated a population of up to 742 on 2 August using the zero truncated geometric model and Eberhardt's (1969) calculation method, which assumes some individuals are more likely to be captured than others. If Craig's (1953) zero truncated Poisson model was used the estimates were about half. The only estimates of the female part of the population were 171 (±117.5 SE) on 2 August and 49 (±45.4 SE) on 12 August using frequency of capture. A single estimate by MRR, using a simple Lincoln Index, was 86 (± 42.7 SE) for the period 2-7 August (Table 5).

Wing-Wear

As can be seen in Tables 6 and 7, the wing-wear indices of the males captured showed progressive degeneration from predominately wing-wear 3 on 2 August to predominately wing-wear 2 and 1 on 12 August. In contrast, although the number seen was very low relative to the males observed, the females were first observed on 2 August as having

TABLE 5
Estimates of absolute population using MRR

Date	Comments	Sex	Population	± S.E.
2-Aug-05	Frequency of Capture (Craig 1953, Eberhardt 1969)	M	630	13.75
		F	171	117.5
		ALL	**742**	367.5
Period 3-5 Aug-05	Bailey's Triple Catch basic method. Inc. Bailey's small numbers correction.	M	480	358.3
		F	–	–
		ALL	–	–
	Simple Lincoln Index[1]	M	350	191.7
	Analysis by Jolly's method (1965)	M	707	768.4
5 Aug-05	Frequency of Capture (Craig 1953, Eberhardt 1969)	M	324	314.9
		F	–	–
		ALL	**625**	612.4
Period 2-7 Aug-05	Simple Lincoln Index[2]	F	86	42.7
Period 5-7 Aug-05	Bailey's Triple Catch basic method. Inc. Bailey's small numbers correction.	M	320	281.2
		F	–	–
		ALL	–	–
	Analysis by Jolly's method (1965)	M	117	31.6
	Simple Lincoln Index	M	300	56.0
7-Aug-05	Frequency of Capture (Craig 1953, Eberhardt 1969))	M	441	178.2
		F	–	–
		ALL	**412**	144.2
Period 7-12 Aug-05	Simple Lincoln Index	M	256	87.2
12-Aug-05	Frequency of Capture (Craig 1953, Eberhardt 1969))	M	86	29.8
		F	49	45.4
		ALL	**117**	36.4

Note[1] A Lincoln index calculated from the last marking date
Note[2] Only one female of 38 marked was re-captured subsequently (marked 2/8 recaptured 7/8

predominately wing-wear 3 with few well worn individuals. This appeared to be relatively unchanged until 12 August when proportionally more fresh females were seen.

Behaviour

The males tend to spend large proportions of their time patrolling (looking for females) and occasionally nectaring, especially early and late in the day. If the weather is relatively cool (16-17°C) and has intermittent periods of full sun, for the first few minutes of full sun, the males are highly active, not settling and patrolling widely at high speed. After a few minutes they settle down to periodically bask and or nectar. At higher air temperatures this behaviour is not so pronounced and basking is reduced. The females behave very differently from the males and initially they spend a considerable proportion of time lurking in the vegetation when not basking and nectaring. Most females were seen early and late in the day. When flying the females can be readily distinguished from the males by their flying low in the vegetation and settling more often, sometimes on vegetation and

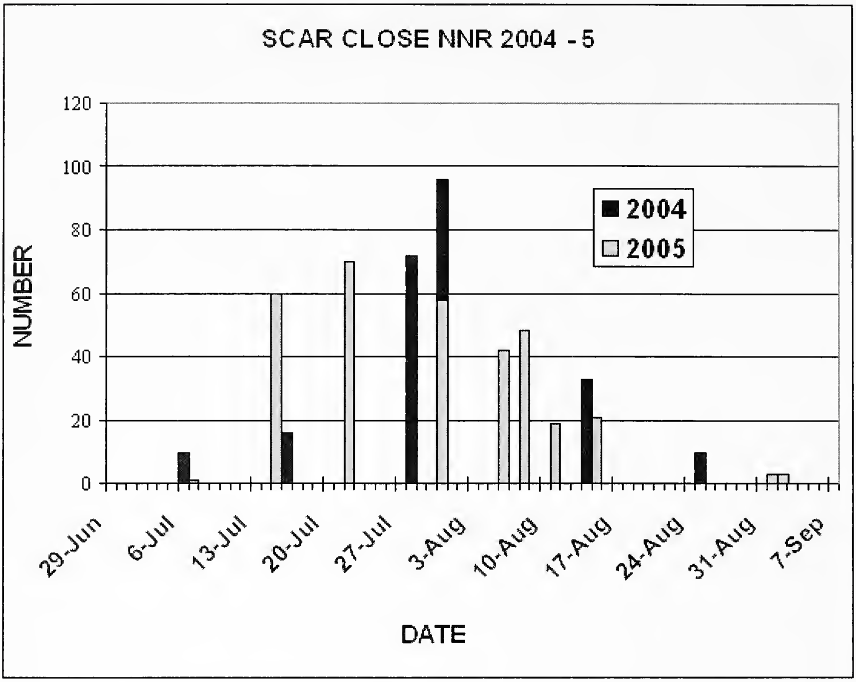

Figure 2. Totals of *Argynnis aglaja* on the transect 2005

TABLE 6
Male wing-wear (WW) score (n = 118).

	Total	Wing-wear 4		Wing-wear 3		Wing-wear 2		Wing-wear 1	
DATE	**Obs.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
2 August	35	2	5.71	22	62.86	11	31.43	0	0.00
5 August	18	2	11.11	8	44.44	8	44.44	0	0.00
7 August	38	4	10.53	17	44.74	14	36.84	3	7.89
12 August	23	1	4.35	6	26.09	12	52.17	4	17.39
2 September	4	0	0.00	0	0.00	2	50.00	2	50.00

TABLE 7
Female wing-wear score (n = 40).

	Total	Wing-wear 4		Wing-wear 3		Wing-wear 2		Wing-wear 1	
DATE	**Obs.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
2 August	17	2	11.76	13	76.47	2	11.76	0	0.00
5 August	7	2	28.57	4	57.14	1	14.29	0	0.00
7 August	7	2	28.57	4	57.14	1	14.29	0	0.00
12 August	7	5	71.43	1	14.29	1	14.29	0	0.00
2 September	2	0	0.00	1	50.00	1	50.00	0	0.00

rocks rather than on nectar flowers. Mating takes place soon after emergence and of the two matings observed one took place during late morning and the other during mid-afternoon. Later in their life cycle they fly to investigate suitable herbage patches. On several occasions egg laying was observed and in all cases this was close to *Viola riviniana* at the edge of small 'islands' of relatively short calcareous vegetation surrounded by bare limestone. The eggs were deposited singly on dead grass or plant detritus, 25-75mm above ground.

Sex Ratios

Many fewer females were encountered than males and even fewer were recaptured on the same day (n=2) or afterwards (n=1). On 2 and 12 August the proportion relative to the male population estimate, measured by frequency of capture, was 27.1 and 41.1 % respectively. Unfortunately it was not possible to elucidate the relationship between the observed and actual sex ratio. The proportions in the numbers captured are shown in Table 8.

TABLE 8.
Sex ratios in captured butterflies

DATE	M	F	% Female
2 August	35	18	51.43
5 August	18	7	38.89
7 August	49	5	10.20
12 August	23	7	30.43
2 September	8	4	50.00
Overall	112	40	35.71

Discussion

Recent records have enabled us to locate the main areas where the Dark Green Fritillary currently occurs in Yorkshire (Fig. 1). However, VCs 65 and 62 are under-recorded and the species is probably present in many more 10km squares in those areas. The sightings around the Humberhead levels also indicate a sparse and inadequately recorded population. The population of the butterfly on Scar Close NNR is confirmed as one of the largest populations of the butterfly in the county and there are indications that it is spreading to new sites in that area. Craig's frequency of capture methodology was successfully trialed for a project planned for 2006.

As suggested by previous workers (Thomas & Lewington 1991), female Dark Green Fritillaries behave in a very different manner from the males. These differences are supported by observed differences in wing-wear and by observed sex ratios always showing a dominance of males. It is probable that transect counts are mainly recording males.

The difference in the sex ratio may be explained by three factors:

1) The population inherently has a sex ratio different from unity. This is most unlikely, as virtually no *Lepidoptera* are known to have aberrant egg sex ratios although sex specific mortality factors occur resulting in sex imbalances in the adults. This has never been reported in *A. aglaja* although slight differences have been recorded in the Heath Fritillary (*Mellicta athalia* Fabricius) and the Marsh Fritillary (*Eurodryas. aurinia* Rottemburg) (Warren 1987)

2) It is most unlikely that they are active elsewhere on the site or they would certainly have been encountered. As Thomas and Lewington (1991) suggest, it is considered that the females are cryptic spending a much time concealed in the vegetation. If they were flying in equal numbers, females would probably be captured more readily than males, as they are easier to net, usually being pre-occupied by nectaring, basking or investigating vegetation for oviposition.

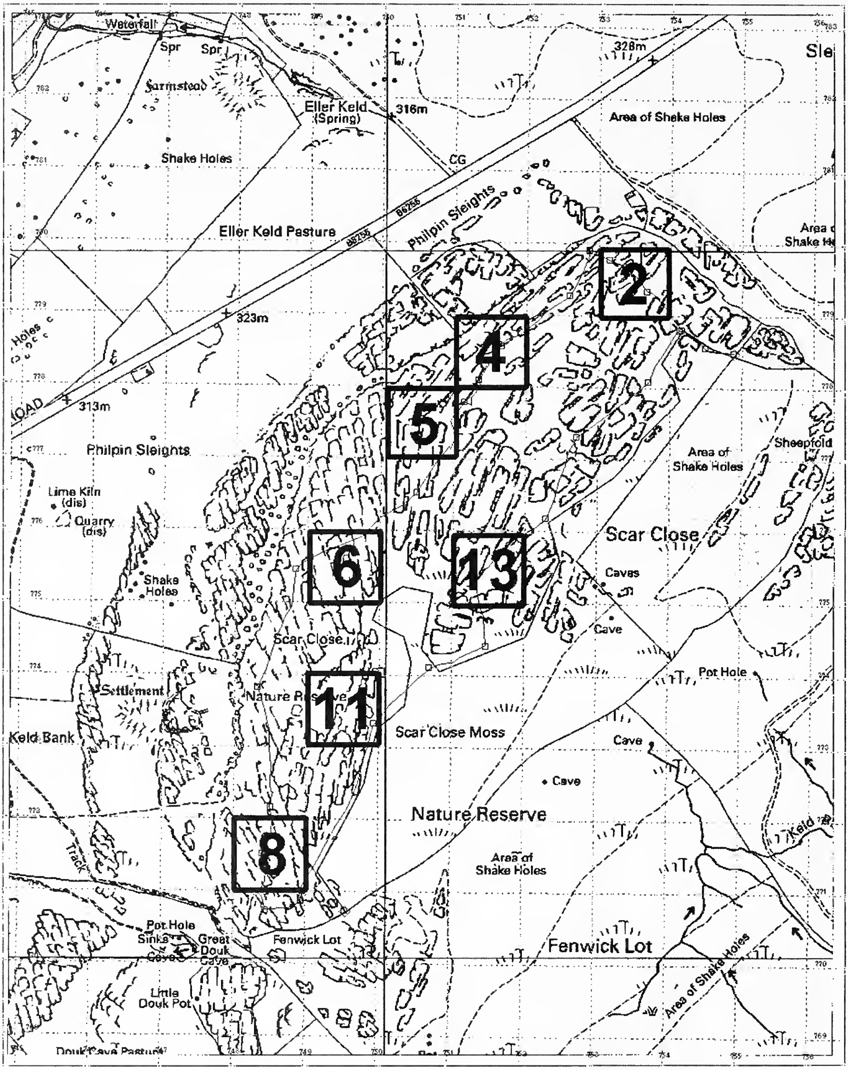

Figure 3. Positions of observers during the timed count experiment.
The numbers relate to the transect sections nearest that square (cf. Table 9).

3) It is likely that the males and females have different emergence patterns. It is normal for male butterflies to be the first to emerge as this is of selective advantage. The first emerging females will encounter proportionately more mates and there will be more competition for mates. It may have developed from the fact that females usually have a greater body mass as a consequence of the egg load and need a longer larval feeding period. If the females emerge over a longer period within the annual flight time than the

TABLE 9
Distribution of Dark Green Fritillaries on Scar Close NNR
(cf. Table 10 for key to the associated dominant and secondary vegetation).

NUMBER OF DARK GREEN FRITILLARIES IN EACH TRANSECT SECTION																
Section Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Total**
2004	9	28	40	28	11	16	22	28	9	7	0	3	13	8	15	237
2005	11	35	31	23	13	13	12	37	28	11	4	2	6	26	12	264
Timed Count	–	**48**	–	**69**	**43**	**11**	–	**39**	–	–	**15**	–	**19**	–	–	**244**
% OF DARK GREEN FRITILLARIES IN EACH TRANSECT SECTION																
2004	3.8	**11.8**	**16.9**	**11.8**	4.6	6.8	9.3	**11.8**	3.8	3.0	0	1.3	5.5	3.4	6.3	
2005	4.2	**13.2**	**11.7**	8.7	4.9	4.9	4.6	**14.0**	**10.6**	4.2	1.5	0.8	2.3	9.9	4.5	
Timed Count		**19.7**		**28.3**	**17.6**	4.5		**16.0**			6.2		7.8			
VEGETATION OF EACH TRANSECT SECTION																
1ry veg.	Ib	Ib	Ic	Ib	Ia	Ia	Ia	Ic	Ic	III	IIa	IIa	Ia	Ib	V	
% cover	40	95	55	60	60	65	65	45	65	40	95	40	45	65	65	
2ry veg.	V	IV	Ia	IV	IIA	IIa	IV	Ia	Ia	IIa	III	Ic	Ib	IIb	IIb	
% cover	35	5	35	40	20	25	15	40	15	40	5	25	35	25	20	

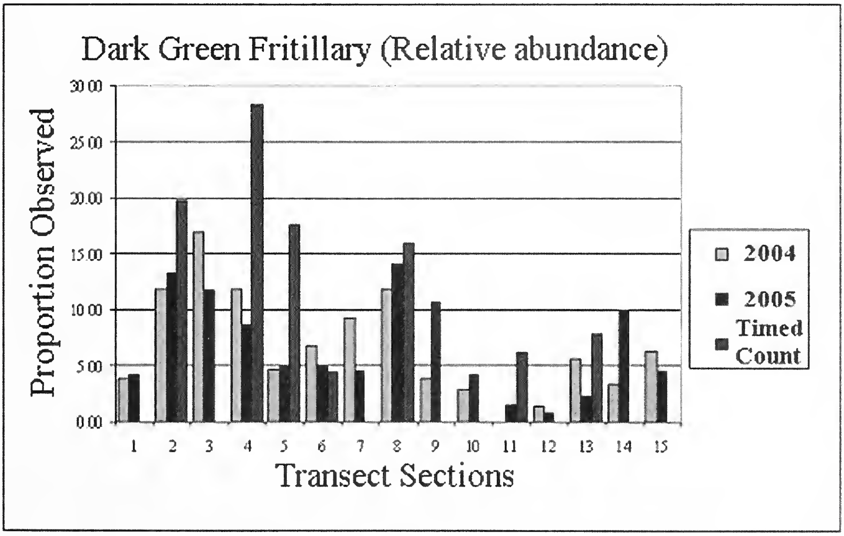

Figure 4. The abundance of Dark Green Fritillaries on various transect sections (2004 & 2005 totals) and during the timed count experiment).

TABLE 10
Key to habitats on Scar Close NNR.

NCC/RSNC General Biotope	Code	Description
Calcareous Habitats B3.1.1 Mainly CG9 Sub-divided according to the amount of vegetation cover	**Ia**	Rocky/Limestone Pavement (mainly bare of vegetation) Small patches of NVC CG9 vegetation
	Ib	Vegetated Pavement (more vegetation than bare rock)
		NVC CG9. Nectar flowers include *Centaurea nigra* and *Succisa pratensis*.
	Ic	Calcareous Grassland (little exposed limestone) NVC CG9 Nectar flowers include *Centaurea nigra* and *Succisa pratensis*.
Acid Habitats Dry heath **D1.1.1** & Dry grassland **B1.1.1**	**IIa**	Dry Heathy (H12?) (mainly *Caluna vulgaris* some *Vaccinium vitis-idea*e and V. *myrtillus* usually on peat above limestone.
	IIb	Dry Acid Grassland (U2) *Deschampsia flexuosa, Arenatherum elatius, Nardus strictus*
Mire Habitats E1.1.1 &D6.1.1 Mainly small patches of a large variety of vegetational types adjacent to Scar Close Moss	**III**	Wet acid grassland (NVC M23a) (Total of 200m^2) *Juncus acutiflorus/ Galium palustre* rush pasture + *Viola riviniana*. Small patches with *Molinea caerulea, Potentilla erecta* (NVC M25) & *Narthecium ossifragaria* (NVC M21) Small patches with *Molinea caerulea-Potentilla erecta* (NVC M25) & *Narthecium ossifragaria* (NVC M21) Wet heath/Blanket Bog (NVCs M15, M17, M18) *Scirpus cespitosus, Erica tetralix, Eriphorum vaginatum* and *Sphagnum* spp.
Woodland A2.1.1 IV	**IV**	Scrub < 6m Developing *Fraxinus excelsior-Sorbus aucuparia-Mercurialis perennis* woodland (NVC W9)
Other C.1.1 & C.1.2 Invasive bracken	**V**	Bracken dominated (*Pteridium aquilinum*) (U20)

males but do not survive any longer the population would show different shaped population curves for each sex dependent on emergence rates and survivorship of each sex. Equality of numbers would occur only once in the season but similar numbers of each sex would emerge during the flight season. Later emergence of the females is partly supported by the wing-wear observations. During the whole period, freshly emerged females were periodically seen and proportionally more fresh females were observed between 7 and 12 August than earlier in the study period which may explain the higher male : female sex ratio observed on the 12th August (Table 8) and the anomaly of the higher overall wing-wear scores of that period. Freshly emerged males were extremely rare late in the season, but they were occasionally seen up to 12 August. The proportion of females encountered varied from 10.2 to 51.4% but they were never observed to out-numbered the males which was expected later in the season, given their later emergence. This is inexplicable unless they have a shorter survival period than the males. No discernable seasonal trend was observed in the sex ratios of the captured butterflies (Table 8). This may be due to the small numbers involved and delayed successive emergences during the cool and changeable weather of the 2005 season.

Microdistribution of Butterflies on Scar Close NNR

A trial timed count experiment was undertaken simultaneously within 7 different 100m grid squares located around the 33.25ha (compartment 28) of Scar Close NNR to observe densities of the butterfly. These 1ha squares were representative of ca 25% of the habitat area (Fig. 3). The observers were instructed to ensure that they could clearly observe most of a 10 x 10m square within the 100 x 100m grid square they were allocated to and note the limits of observation (10m in front, 5m to each side of them). They recorded any fritillaries entering the square, during time blocks of 10 minutes, over a 1-hour period when the sun was at its zenith (13.00 GMT). The results are given in Figure 4 and Table 9.

The results of the counts were similar to differences in butterfly densities observed in both 2004 and 2005 in those sections of the transect route that crossed those squares. The observed differences in butterfly density are probably related to vegetation differences and the preferences of the species. The majority of butterflies were recorded in areas where NVC CG9 vegetation was dominant.

Little is known about how butterfly species move through the landscape and this is a critical factor in influencing the population dynamics of organisms with fragmented distributions. Thomas and Lewington (1991) recognised that although the butterfly is a powerful flier it usually stays close to its well-defined breeding grounds and rarely moves even a few kilometres to other sites. Warren (1994 unpubl. data) made a mark and recapture study on the slopes of Dartmoor where three distinct populations of *A. aglaja* were separated by 1-2.5 km. Although the butterflies moved freely within their habitat patch most seemed to stay within their own colony. Although *A. aglaja* is popularly considered to be wide ranging e.g. Clough (2005), and undoubtedly a few individuals will move long distances, this is a partial interpretation of its behaviour; where powerful flight is equated with mobility. Ries and Debinski (2001) have demonstrated that the Regal Fritillary (*Speyeria idalia* Drury) can show strong responses to subtle differences in vegetation and was less likely to cross such boundaries than the migrant generalist butterfly the Milkweed (*Danaus plexippus* L.). It seems probable that *A. aglaja* is behaving in a similar manner to *Speyeria idalia* and this may tend to restrict it to a currently favourable habitat patch but render it vulnerable to stochastic processes, which can cause local extinction. If this is the situation, an urgent re-assessment of its behaviour is needed to establish landscape scale conservation policies aimed at re-establishing meta-populations (networks) of this habitat specialist species.

Acknowledgements

The financial assistance provided by the Yorkshire Dales National Park Authority who part funded the study and the help provided by English Nature in the form of information and scientific data are acknowledged, as are the many individuals who assisted in this study; especially Ian Court (Species Officer of the YDNP) who gave field assistance, well beyond any possible remit of his official duties; also Judith Allinson, Chris Bell, Claudia Carter-Pike, Peter Martin, and Helen Sergeant for other field assistance. I am also grateful to Butterfly Conservation: Yorkshire Branch for access to local and regional butterfly records and to their staff, including B.C. Conservation Officer Sam Ellis for helpful advice and for checking some of the population calculations, and Martin Warren for information about the Dartmoor study (Warren, 1994) and for his helpful comments on an early draft of this paper, and to the staff members of English Nature, Simon Bullough, Emma Coombes, John Osborne and especially to Paul Evans, who were involved in routine transect walks.

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BOOK REVIEW

Birds and Climate Change edited by **Anders P. Møller**, **Wolfgang Fiedler** and **Peter Berthold**. Pp. 259, incl. figures and tables. Advances in Ecological Research, Academic Press, London. 2006. £28.99 soft cover.

The eleven chapters in this book are based on contributions to a workshop on "Bird Migration in Relation to Climate Change" in March 2003 organized by the Laboratoire de Parasitologie Evolutive, CNRS, Paris and the Max Planck Institute for Ornithologie, Vogelwarte Radolfzell, and hosted by the University of Constance.

Twenty-one authors have contributed to the very detailed chapters, the subjects being: Arrival and departure dates; Migratory fuelling and global climate change; Using large-scale data from ringed birds for the investigation of the effects of climate change on migrating birds; Breeding dates and reproductive performance; Global climate change leads to mistimed avian reproduction; Analysis and interpretation of long-term studies investigating response to climate change; Photoperiodic response and adaptability of avian life cycles to environmental change; Microevolutionary response to climate change; Climate influences on avian population dynamics; Importance of climate change for the ranges, communities and conservation of birds; The challenge of future research on climate change and avian biology.

The reference lists at the end of each chapter are an important part of the publication and vary from one to four pages, with no fewer than seven pages for the chapter on 'Microevolutionary response to climate change'. The researches and convincing conclusions make this a must for students of climate change and ornithologists in general should find much of interest in its perceived effects on birds at this early stage of what will, undoubtedly, be an ongoing trend.

JRM

COMPARISON OF TAWNY OWL DIET THROUGH PELLET ANALYSIS AT FOUR SITES IN YORKSHIRE

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SUMMARY

The Tawny Owl predates upon a more diverse range of prey than most British owls, enabling it to utilise a greater variety of habitats; this study examined variation in diet relating to habitat types at four sites in West Yorkshire. The Tawny Owl is the commonest and possibly the most widespread owl of Europe. The sedentary and territorial nature of these birds, along with their method of pellet regurgitation to discard undigested food remains, make them a suitable bird for long term studies on diet. A total of 2497 pellets collected on a monthly basis over a 7-year period contained 6144 prey items, an estimated total live weight of 89,800g. The estimated average weight of live prey taken per pellet was 36.48 g, a mean daily intake of 46.7 g. The breakdown of the different groups of prey taken was: small mammals 47.65%, larger mammals 15.64%, amphibians 6.84%, birds 20.97% and invertebrates 8.90%. Seasonal variation was evident in several of the prey species taken, notably the small mammals with significantly more by number taken in spring than in summer. Seasonal variation could be attributed to the life cycles of each prey species and the presence of ground cover. Variation was observed in the prey types taken at the four different sites, reflecting differences in habitat type found within each territory, indicating that Tawny Owls take prey in proportion to its availability within their territory.

INTRODUCTION

The Tawny Owl *Strix aluco*, is the commonest and possibly most widespread owl of Europe (Voous 1988, Marchant *et al.* 1990), ranging through the western Palearctic region and extending into SW Asia (Cramp 1985, Gibbons *et al.* 1993). The British population was estimated to be stable at *ca* 20,000 pairs in 1993 (Gibbons *et al.* 1993), although a slight downward trend, which may be accelerating, has been reported (Baillie *et al.* 2005). The amount of woodland available in a study area is important in determining the numbers of Tawny Owls (Gibbons *et al.* 1993).

The overall size of a Tawny Owl territory appears to be dependant upon the abundance of prey (Mikkola 1983, Hardy 1992), which in turn relates to the quality and different habitat types within it (Nilsson 1978, Hardy 1992). Territory size varies considerably in the UK, ranging from 18.2 ha in deciduous woodlands (Southern & Lowe 1968) to 70 ha in spruce forests (Petty & Pearce 1992). There may be a threshold for the area of woodland required within a territory; Tawny Owls were absent from 90% of woods less than 100 ha in size, but only absent from 18% of woods larger than that size (Marchant *et al.* 1990). Tawny Owls are primarily nocturnal (Southern 1954, Voous 1988), seldom emerging before dusk, and have two activity peaks at dusk and dawn. They have good vision, hearing and memory, which aid hunting within a known territory (Mikkola 1983). Hunting strategies are adapted according to prey type the main method being 'Perch and Pounce' (Southern & Lowe 1968, Mikkola 1983). 'Active Searching' (Nilsson 1978) flying back and forth over open areas and other hunting techniques have been described for specific types of prey, e.g. standing motionless on the ground to detect earthworms (MacDonald 1976), active digging for beetles (Burton 1950), and flushing birds from bushes (Bevan 1965). Birds and bats may be snatched from roosting perches (Mikkola 1983), or taken in flight (Schmidt & Topal 1972). The Tawny Owl's build, of short tail with broad wings and a high wing loading provide for manoeuvrability within dense woodlands (Southern 1954, Mikkola 1983, Voous 1988). Although physically it appears to be adapted for a woodland lifestyle (Voous 1988), studies have shown the Tawny Owl lives in a variety of habitats, dependant upon suitable nest sites and food sources (Mikkola 1983).

Several studies have been undertaken in various habitat types within Britain, including: deciduous woodland (Southern 1954, Bevan 1965, 1982), conifer woodlands (Petty & Pearce 1992), farmland (Hardy 1992), moorland and pasture (Yalden 1985) and suburban and urban habitats (Harrison 1960, Bevan 1965, Yalden & Jones 1971, Bevan 1982, Kirk 1992). These studies have shown that the degree to which Tawny Owls were dependant upon different proportions of prey varies considerably both seasonally and with habitat type.

Tawny Owls are generally monogamous and, once established, territories are strictly adhered to and may be held for life, all prey being caught within its boundaries (Southern & Lowe 1968, Southern 1970, Hirons 1985). Restriction to a territory may be one factor behind the Tawny Owl's wide variety of prey. When its staple diet is not available it can increase the proportion of invertebrates, larger mammals, and/or birds in its diet (Voous 1988).

Prey items are generally swallowed whole (Bevan 1965, Yalden & Morris 1993); once the flesh has been digested the indigestible fur and bones are regurgitated in a condensed pellet. Pellets are scattered throughout the home range (Kirk 1992, Yalden & Morris 1993) prior to returning to the roost site (Southern 1954). The territorial nature of Tawny Owls, combined with their use of pellet regurgitation, provides a method through which their diet can be evaluated in respect to the available habitat. This study analyses the importance and variation of prey across different habitat types within Tawny Owl diets at four sites in Yorkshire over a period of seven years.

Methods

Territory characteristics

The four study sites are situated in West Yorkshire: (1) Bramhopegate (GR: 44/228.443), a coniferous plantation with a dense canopy and little undergrowth, inter-planted with a few beech and oak trees, and open rides with surrounding grazing land. Several bat boxes were in use within this territory and pellets were dropped at a variety of sites within the territory. (2) Buckwood (GR: 44/175.395), situated near a canal, of mainly deciduous woodland, with an area of ungrazed grassland and a belt of pines with relatively open canopy. The majority of pellets had been found in the pines except during the breeding season when most were found in the deciduous woodland. (3) Esholt (GR: 44/188.399), a small conifer wood situated adjacent to a large pond, with nearby mature oak and beech trees, meadow and scrubland. (4) Filter Beds (GR: 44/195.392), a large belt of pine trees, where the majority of pellets were found, adjacent to a river and bacteriological filter beds; mature oak and beech trees and cropped grazing land occurred nearby.

Pellet collection

The data set examined comprised of a set of long-term records of pellets collected from the four territories. The pellets had been collected on a regular basis, at the end of each month, over a 7-year period. Each site was extensively searched in an attempt to remove all the pellets produced that month. Compared to most owls, Tawny Owl pellets are generally difficult to find and this was true of the owls at the four study sites in this study. Throughout the collection period the trees under which regurgitated pellets were found changed frequently and irregularly, with usually no more than a single pellet found under any one tree, as has been observed previously for Tawny Owls (Southern 1954, Bevan 1965). The owl pellets were dried and dissected. Each pellet was individually characterised, measured by length and diameter and the minimum number of prey items taken in each pellet recorded. Tawny Owl pellets break down within a period of about 8 weeks (Bevan 1966), therefore, if any are missed in one month and subsequently found there should be minimal discrepancy in the data with regard to the season of analysis and findings. Despite these potential issues pellet analysis remains the optimal method to accumulate data on prey taken by owls.

Data collection and analysis

Data were analysed by species and also as prey groups: small mammals, large mammals, amphibians, birds and invertebrates, by site, month, year and season, and as a whole. Seasons were designated: winter: December - February; spring: March - May; summer: June – August, and autumn: September - November. The total number of each prey item was converted into its 'prey unit' biomass and expressed as a proportion of a single pellet by month. This provides a more precise measure of the actual diet and removes variation resulting from different quantities of pellets collected in each time period. The number of individual prey items was also calculated to provide information on targeting prey species by Tawny Owls and to enable comparison with other studies. Lowe (1980) calculated that captive Tawny Owls produce a mean of 1.03 pellets/day between April and September and 1.27 pellets/day between October and March. These figures were used to calculate the average pellet weight and determine the average daily and yearly biomass of prey consumed. Weather data, temperature, rainfall and number of days of snow, were obtained from the Bingley weather station (Meteorological Office, Leeds). Analysis of Variance (ANOVA) was used to compare the data to assess if there was a significant variation between different factors. Pearson's correlation was used to determine if seasonal variation correlated to the weather.

The analysis made two assumptions. Firstly, the live biomass figures assumed smaller species were swallowed whole, that each prey item was fully consumed. However, for larger prey items, that may need to be eaten in pieces, the biomass figures represented young or partially eaten prey. Secondly, that digestion between prey species and season was the same. However, previous studies of captive Tawny Owls observed that the bones of some prey items may be completely digested and not appear in the pellets. This was more likely for species with lighter skeletons or during the summer months (Lowe 1980). Losses of 16% (Raczynski & Ruprect 1974), 19% (Lowe 1980) and 20.4% (Hirons 1985) have been observed in some, but not all studies examining this (Clarke 1975, Mikkola 1983).

In allocating prey biomass units, figures were taken where possible from previous studies (Table 1). Small mammals were biased towards younger members of the species, which are generally more numerous in the population (Bevan 1982, Corbet & Harris 1991, Yalden & Morris 1993). The biomass used for rats and rabbits reflect younger or partially eaten animals which have most frequently been found at nests (Southern 1954). Previous studies also provided reference weights for other species: squirrel (Corbet & Southern 1977), frogs and toads (Yalden & Morris 1993) and birds (Cramp 1985). Unidentified birds were designated the average weight of birds taken in that territory. Weights for invertebrates were taken from Altringham *et al.* (1994) and earthworms were identified by the presence of chaetae (Yalden & Morris 1993). Owls may concentrate on catching earthworms for short periods of time (MacDonald 1976), and it is likely that more than one earthworm is taken at any one time and contribute to the pellet biomass. However, no reliable method has been produced to accurately quantify the number within individual pellets. Rather than ignore this important item of prey, a figure of 5g was used to quantify the presence of earthworms in the pellet, although this was probably an underestimate of the actual biomass present. Beetles were quantified by numbers of heads and legs. Noctuid moths and caterpillars were identified by the presence of jaws and heads. At two sites a single house-fly (Buckwood) and a grasshopper (Esholt) were found in separate pellets, these were the only prey items not included in the biomass analysis.

Results

A total of 6144 prey items was identified from 2497 Tawny Owl pellets collected from the

TABLE 1
Tawny Owl pellet characteristics by site.

	Site:		BRAMHOPEGATE			BUCKWOOD			ESHOLT			FILTER		
	Period of Collection:		Nov. 1988 - Oct. 1993			March 1988 - Sept. 1993			Oct. 1986 - Sept.1993			Sept. 1986 - Nov. 1993		
	Average weight/pellet:		40.3g			34.9g			35.4g			32.4g		
	Total number of Pellets		n = 773			n = 402			n = 581			n = 741		
	Pellet dimensions:		Mean length 47mm Mean diameter 19mm			Mean length 39.2 mm Mean diameter 18.5 mm			Mean length 41.2mm Mean diameter 19.2mm			Mean length 41.6 mm Mean diameter 18.9mm		
		Prey weight g	Number of prey	Percentage by number	Percentage by weight	Number of prey	Percentage by number	Percentage by weight	Number of prey	Percentage by number	Percentage by weight	Number of prey	Percentage by number	Percentage by weight
SMALL MAMMALS														
Microtus agrestris	**Field vole**	21	445	23.78	29.99	88	8.49	13.19	186	13.19	18.97	144	7.89	12.58
Apodemus sylvaticus	**Wood mouse**	18	173	9.25	9.99	102	9.85	13.10	160	11.35	13.99	240	13.15	17.98
Cleithrionomys glareolus	**Bank vole**	16	56	2.99	2.88	83	8.01	9.48	100	7.09	7.77	151	8.27	10.05
Sorex araneus	**Common shrew**	8	106	5.67	2.72	93	8.98	5.31	80	5.67	3.11	74	4.05	2.46
Talpa europaea	**Mole**	70	2	0.11	0.45	6	0.58	3.00	8	0.57	2.72	9	0.49	2.62
Mus musculus	**House mouse**	12	1	0.05	0.04				3	0.21	0.17	1	0.05	0.05
Sorex minutus	**Pygmy shrew**	4	67	3.58	0.86	24	2.32	0.68	19	1.35	0.37	32	1.75	0.53
Neomys fodiens	**Water shrew**	12	4	0.21	0.15	4	0.39	0.34	7	0.50	0.41	14	0.77	0.70
	Totals for small mammals		*854*	*45.64*	*47.08*	*400*	*38.61*	*45.10*	*563*	*39.93*	*47.51*	*665*	*36.44*	*46.98*
BATS														
Pipistrellus pipistrellus	**Pipistrelle bat**	6.5							1	0.07	0.03	72	3.95	1.95
Nyctalus noctula	**Noctule bat**	31.7										8	0.44	1.06
	Totals for bats								*1*	*0.07*	*0.03*	*80*	*4.38*	*3.00*
LARGE MAMMALS														
Oryctolagus cuniculus	**Rabbit**	200	23	1.23	14.76	2	0.19	2.85	10	0.71	9.71	9	0.49	7.49
Rattus norvegicus	**Rat**	100	12	0.64	3.85	9	0.87	6.42	13	0.92	6.31	3	0.16	1.25
Sciurus carrlinensis	**Squirrel**	515	1	0.05	1.65				1	0.07	2.50	1	0.05	2.14
	Totals for large mammals		*36*	*1.92*	*20.26*	*11*	*1.06*	*9.28*	*24*	*1.70*	*18.53*	*13*	*0.71*	*10.88*
AMPHIBIANS														
Rana species	**Frog**	20	30	1.60	1.93	67	6.47	9.56	101	7.16	9.81	72	3.95	5.99
Bufo species	**Toad**	20				9	0.87	1.28	14	0.99	1.36	14	0.77	1.17
	Totals for amphibians		*30*	*1.60*	*1.93*	*76*	*7.34*	*10.85*	*115*	*8.16*	*11.17*	*86*	*4.71*	*7.16*

		Prey weight g	Number of prey	Percentage by number	Percentage by weight	Number of prey	Percentage by number	Percentage by weight	Number of prey	Percentage by number	Percentage by weight	Number of prey	Percentage by number	Percentage by weight
BIRDS														
Sturnus vulgaris	**Common Starling**	82	20	1.07	5.26	11	1.06	6.44	4	0.28	1.59	13	0.71	4.44
Pica pica	**Magpie**	237	7	0.37	5.32	3	0.29	5.07				4	0.22	3.94
Turdus merula	**Blackbird**	95	11	0.59	3.35	3	0.29	2.03	6	0.43	2.77	8	0.44	3.16
Turdus philomelos	**Song thrush**	76	13	0.69	3.17	5	0.48	2.71	7	0.50	2.58	7	0.38	2.21
Regulus regulus	**Goldcrest**	5.7	41	2.19	0.75	8	0.77	0.33	16	1.13	0.44	124	6.79	2.94
Fringilla caelebs	**Chaffinch**	20	18	0.96	1.16	4	0.39	0.57	8	0.57	0.78	22	1.21	1.83
Parus Caeruleus	**Blue tit**	13.3	21	1.12	0.90	9	0.87	0.85	12	0.85	0.78	26	1.42	1.44
Turdus viscivorus	**Mistle Thrush**	130	2	0.11	0.83	2	0.19	1.86						
Columba palumbus	**Wood Pigeon**	524							1	0.07	2.54			
Garrulus glanarius	**Jay**	161	3	0.16	1.55									
Parus major	**Great tit**	19	1	0.05	0.06	4	0.39	0.54	6	0.43	0.55	13	0.71	1.03
Parus ater	**Coal tit**	9.1	8	0.43	0.23	4	0.39	0.26	5	0.35	0.22	9	0.49	0.34
Streptopelia turtur	**Collared Dove**	196	1	0.05	0.63									
Erithacus rubecula	**Robin**	19.3	1	0.05	0.06				2	0.14	0.19	5	0.27	0.40
Cardvelis carduelis	**Goldfinch**	15.6	2	0.11	0.10				2	0.14	0.15	3	0.16	0.19
Prunella modularis	**Dunnock**	21.7	1	0.05	0.07	2	0.19	0.31	2	0.14	0.21			
Chloris chloris	**Greenfinch**	27.8							1	0.07	0.14	3	0.16	0.35
Turdus iliacus	**Redwing**	68.1				1	0.10	0.49						
Acanthis cabaret	**Lesser Redpoll**	11	3	0.16	0.11	2	0.19	0.16						
Troglodytes trolodytes	**Wren**	9.9	1	0.05	0.03	1	0.10	0.07						
Pyrrhula pyrrhula	**Bullfinch**	22	1	0.05	0.07									
Sylvia atricapilla	**Blackcap**	18.5										1	0.05	0.08
Certhia familiaris	**Treecreeper**	9							2	0.14	0.09			
Phylloscopus trochlius	**Blackcap**	8.7	1	0.05	0.03									
Unknown birds (Buckwood only)		50.6				7	0.68	2.53						
	Totals for birds		*156*	*8.34*	*23.69*	*66*	*6.37*	*24.21*	*74*	*5.25*	*13.03*	*238*	*13.04*	*22.36*
INVERTEBRATES														
Annelida	**Earthworm**	5	372	19.88	5.97	271	26.16	9.67	369	26.17	8.96	430	23.56	8.95
Lepidoptera	**Caterpiller**	1	300	16.03	0.96	61	5.89	0.44	121	8.58	0.59	102	5.59	0.42
Coleoptera	**Beetles**	0.25	116	6.20	0.09	114	11.00	0.20	141	10.00	0.17	201	11.01	0.21
Lepidoptera	**Moth**	1	7	0.37	0.02	37	3.57	0.26	2	0.14	0.01	10	0.55	0.04
Diptera	**Housefly ***					1	0.10							
Orthoptera	**Grasshopper***								1	0.07				
	Totals for invertebrates		*795*	*42.49*	*7.05*	*483*	*46.62*	*10.57*	*633*	*44.89*	*9.73*	*743*	*40.71*	*9.62*
Totals			**1871**			**1036**			**1410**			**1825**		

* Not quantified in the biomass analysis

four sites. Prey included 13 species of mammal, over 24 species of birds, in addition to amphibians and invertebrates which were not identified to species level. The total number of prey items and biomass were determined and the representative percentage of the diet was calculated for each species and as prey groups (Table1). Across the four sites, small mammals, including bats, made up the greatest proportion, 47.65%, of the diet by the estimated live weight. Birds accounted for the second largest proportion of the diet by weight, 20.97%, ranging in size from Goldcrests (5.7g) to Wood Pigeons (524.0g). The remaining prey groups contributing to the diet were large mammals (15.64%), invertebrates (8.90%) and amphibians (6.84%). The proportions varied by season and site with more birds and fewer mammals taken during the summer months (Figure 1). The average pellet length was 42.2 mm and diameter 18.9 mm, similar to other studies (Cramp 1985) and average estimated pellet biomass was 35.96g. Extrapolating from Lowe's (1980) figures on daily pellet production the average biomass of live prey consumed each day by a single Tawny Owl was estimated at 46.7g, a total prey biomass of 17.06 kg/year (Table 2).

TABLE 2
Estimated total weight of prey taken by day and year

	Weight (g) of Prey taken Day			Yearly
	April to Sept.	Oct. to March	All Year	Total weight (g)
Bramhopegate	46.8	48.6	47.4	17410.7
Buckwood	58.1	42.7	50.4	18398.6
Esholt	46.4	46.9	46.7	17030.2
Filter Beds	46.0	38.3	42.1	15385.2
All Sites	49.3	44.1	46.7	17056.2

TABLE 3
The percentage of Tawny Owl diet of the six major prey species by biomass

	Field Vole	Woodmouse	Rabbit	Earthworm	Bank Vole	Amphibian	Total % of the diet
Bramhopegate	30	10	14.8	6	2.9	1.9	65.5
Buckwood	13.2	13.1	2.9	9.7	9.5	10.9	59.1
Esholt	19	14	9.7	9	7.8	11.2	70.6
Filter Beds	12.6	18	7.5	9	10.1	7.2	64.2
All sites	20.2	13.5	9.8	8	7	6.8	65.3

Major prey items

Although some species were more important at specific sites, six prey species were responsible for the major proportion (59.1 - 70.6%) of the diet (Table 3). Field Voles and Woodmice accounted for the greatest proportion of the total diet by weight. Reliance on these major food sources varied by month and appeared most important in March and April accounting for ca 80% of prey taken (Figure 2). When prey is considered in terms of the number of individual items consumed, Field Mice and Woodmice fall to second and third in importance. When considered numerically earthworms represent the largest proportion of prey taken (note: numerically earthworms were quantified as a single earthworm per pellet when chaetae were observed in a pellet, therefore, this is a minimum figure and most likely an underestimate of their numbers). By number, these three species combined with caterpillars and beetles account for over 67% of individual prey items consumed (Table 4). The average number varied over a year from 58.3% of prey items caught in July to 72.6% in December (Figure 3).

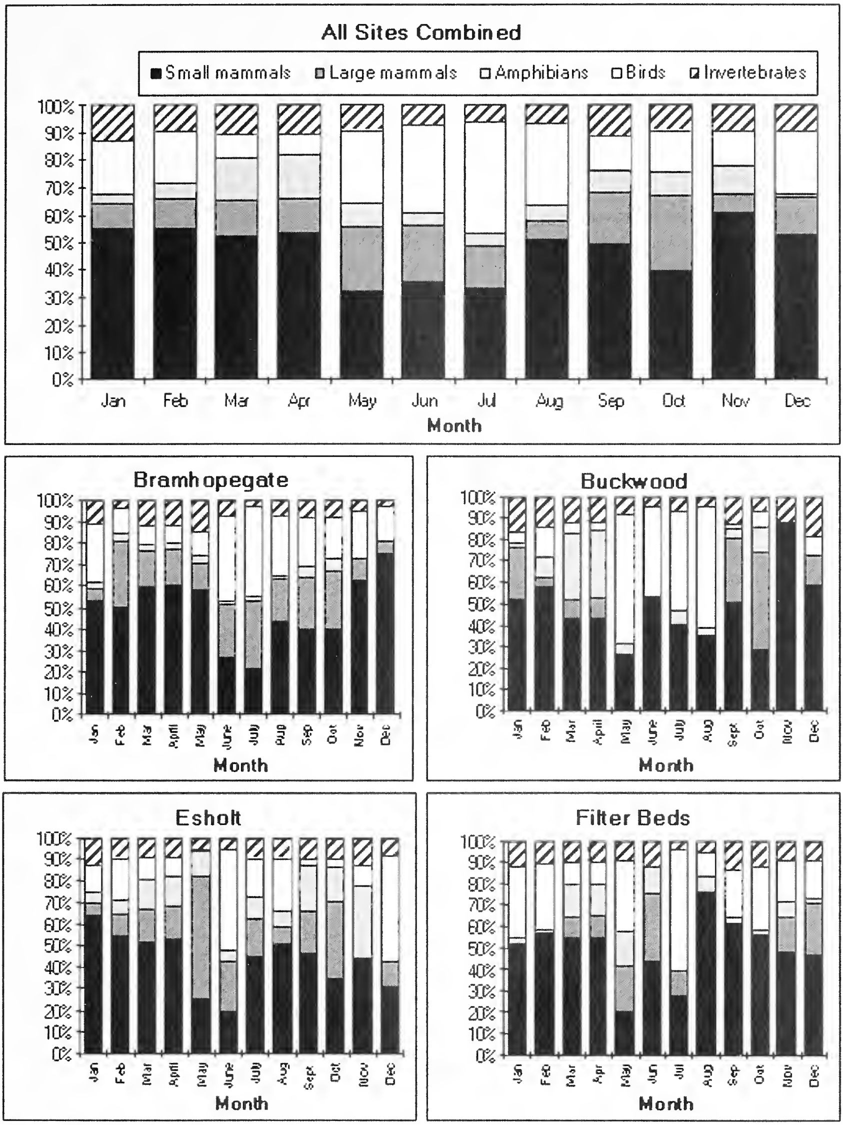

FIGURE 1
Seasonal variation in the diet, by weight, of each prey group

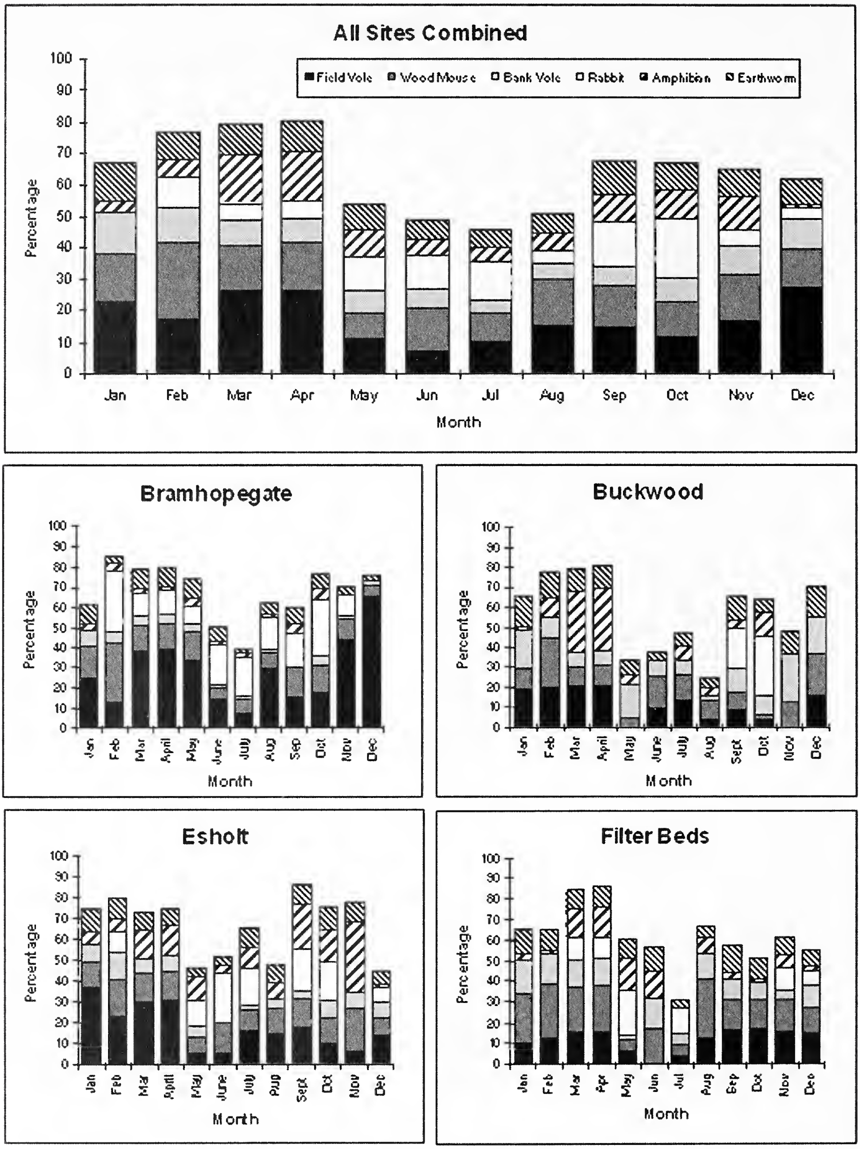

FIGURE 2
Percentage of the diet, by biomass, composed of the six major prey items by month

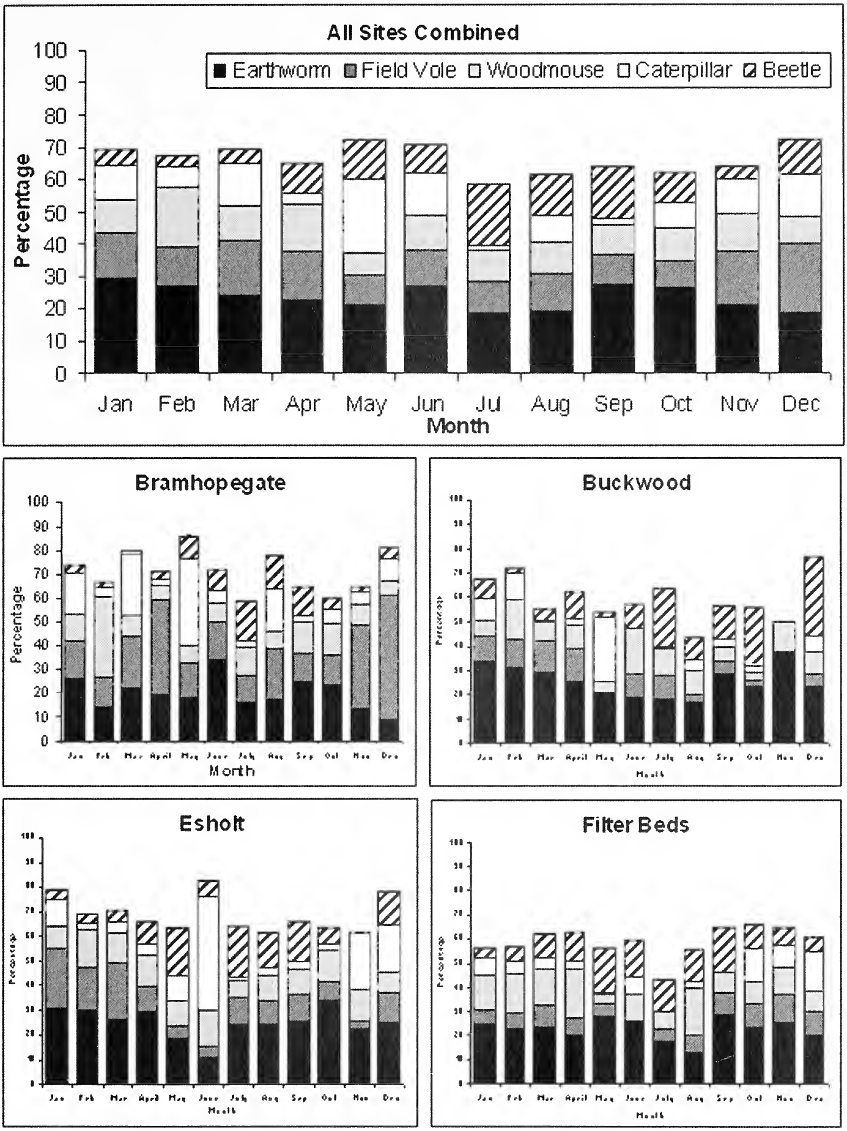

FIGURE 3
The change in proportion, by number, of the major prey items taken by month

TABLE 4

Percentage of the most important prey species in the diet of the Tawny Owl by number.
* Note that the number of earthworms represents the minimum figure of one per pellet where presence (chaetae) was observed, and is likely to be an under-estimate.

	Earthworm*	Field Vole	Woodmouse	Caterpillar	Beetle	Total % of the diet
Bramhopegate	19.9	23.8	9.2	16	6.2	75.1
Buckwood	26.1	8.5	9.8	5.9	11	61.3
Esholt	26.2	13.2	11.3	8.6	10	69.3
Filter Beds	23.6	7.9	13.2	5.6	11	61.2
All sites	23.5	14.1	11	9.5	9.3	67.3

Seasonal variation

Correlations were observed between the number of days of snowfall in a month and small mammals (Woodmice, Bank Voles, Field Voles) and invertebrates (earthworms). Significantly less small mammals were taken in summer compared to winter and spring ($p<0.01$). Within the small mammals, this was significant for the Field Voles ($p<0.01$) and Woodmice ($p<0.05$), whereas significantly more Moles ($p<0.05$) and Common Shrews ($p<0.05$) were taken in autumn than in spring and more Common Shrews were caught in winter than autumn ($p<0.001$). With regard to birds, significantly fewer Goldcrests were taken in summer than spring ($p<0.01$) or winter ($p<0.05$). Conversely more Common Starlings were taken in summer than spring or winter ($p<0.01$). Significantly more amphibians were taken in spring than winter ($p<0.03$). Fewer beetles were taken in spring than autumn ($p<0.05$).

Yearly variation

Between-year variation at the individual sites, over the collection period was significant for the following species: Bramhopegate and Esholt had yearly variation in the proportions of Woodmouse, Common Shrew, beetle and earthworms taken in the diet; Buckwood variation was seen with Bank Vole, Mole, frog and toad quantities; Esholt had yearly variation in Field Voles; and the Filter Beds showed yearly variation in the Goldcrest.

Between-site variation

Over the collection period there was a significant difference in the quantities of some species that were taken at the different sites. Owls at Bramhopegate took more Field Voles, but less Bank Voles than at Buckwood and the Filter Beds ($p<0.05$). Significantly more bats were taken at the Filter Beds than at any other site ($p<0.0001$). Fewer rabbits were taken at Buckwood than Bramhopegate ($p<0.05$). Esholt owls took more amphibians than Bramhopegate ($p<0.01$). Fewer Goldcrests were taken at Buckwood than at the Filter Beds ($p<0.001$). Buckwood owls took significantly more moths than were seen at Bramhopegate and the Filter Beds.

Discussion

Several previous studies (Southern 1954, Bevan 1965, Yalden 1985, Petty 1989) have examined the diet of Tawny Owls in Britain using pellet prey analysis, both numerical and biomass quantification are provided here to enable comparisons to these and future studies. However, differences in quantification of biomass and the inclusion/exclusion of some species in the analysis, e.g. invertebrates, may result in discrepancies which will bias the importance of prey items in some cross study comparisons. The assumptions made in the analysis, must be born in mind when considering the results, the data represent the minimum number of prey items or biomass/pellet. Accurate quantification of earthworms, which make up an important proportion of the diet, was not possible and is most likely an underestimation of the quantities consumed.

Within the four territories, the Tawny Owls targeted a wide variety of prey (45 species). The estimated daily intake of prey, 46.7g, was slightly less than observed in captive owls 64.2g prey/day (Hardy 1977) and 44.9-57.6g/day (Lowe 1980). A lower figure might be expected in pellets collected from wild birds as data represent the minimum number of prey items observed, whereas captive studies are able to weigh and itemise food items prior to feeding. Lowe (1980) suggested a greater biomass was taken in the winter (Oct.-March), this was not observed at Buckwood or the Filter Beds (Table 2).

Comparison with other Tawny Owl studies

The four territories examined here consist of rural, deciduous and partly coniferous woodland. Previous studies in deciduous woodlands found Tawny Owl diet comprised of *ca* 95% mammals and 4% birds (Southern 1954, Bevan 1965), whereas in an inner-city environment, London, prey consisted of mainly birds, 93-96% (Harrison 1960, Bevan 1965). In a suburb, habitat between these two types, mixed proportions (55% mammals, 45% birds) were recorded (Bevan 1965), suggesting that a reversal in the proportions of mammals and birds taken may take place between woodland and urban habitats. In the Yorkshire habitats of this study, the greatest proportion of the diet, 47.65%, was made up of small mammals, with small and larger mammals combined forming 63.29% of the diet within the four sites. This is similar to the Peak District, 59.3% (Yalden 1985), but less than deciduous woodland, 95% (Southern 1954, Bevan 1965). The proportion of amphibians seen in the diet, average 6.84%, was relatively high and may be a reflection of the presence of water the three of the territories where high numbers were taken.

By biomass, birds averaged 20.97% of the diet consumed. This was greater than seen in some other studies 4% (Southern 1954, Bevan 1965) and 5.4% (Petty 1989), but similar to the proportion of birds (25.9%) seen by Yalden (1985). It appears that by weight birds were a relatively important part of the diet at these four sites. Without a more reliable method of quantifying diet it is difficult to compare the proportion of the diet made up by invertebrates.

Prey species

Tawny Owl ecology restricts prey availability to those species that occur within its territory and are active during its hunting period (peak: dusk and dawn). The species available also depend upon the habitat type, and population density which may vary by season. Many of the birds that Tawny Owls target roost communally (Southern 1954, Glue 1972) and may be taken at roosts which may be the case for; Goldcrests, Common Starlings, finches, thrushes and Magpies.

Six species made up the major component of the Tawny Owl diet at the four sites: Field Voles, Woodmice, Rabbits, Bank Voles, earthworms and amphibians. Combined these species made up an average of over 45% of the diet throughout the year. They were most important in spring and autumn, least in summer, accounting for >80% of the diet biomass in some months. The greatest proportion of the Tawny Owl diet by weight consisted of Field Voles and Woodmice, 20.18% and 13.53%, respectively. Field Voles, Woodmice and also Bank Voles appear to be the major component of diets in other studies (Southern 1954, Bevan 1965, Yalden 1985, Petty 1987). Bank Voles accounted for 2.88-10.05%, with low numbers taken at Bramhopegate.

Although perhaps not as important with regard to biomass, invertebrates are important in the number of individual prey items consumed. When considered by numerical importance invertebrates accounted for 43% (earthworms >23.5%) of individual prey items caught and consumed, compared to 8.84% (7.97% earthworms) of the prey by weight. This suggests Tawny Owls spend a considerable amount of time hunting for invertebrates. MacDonald (1976) has suggested that an owl may concentrate on catching worms for periods of between two and fifteen minutes at a time. This suggests that each pellet is likely to contain a number of worms rather than a single worm as was assumed in this study. If so the figures presented here would be an underestimate of the number and biomass that they actually represent in the Tawny Owl diet.

Between-site variation

Variation observed in the proportions of a species taken at the different sites appears to relate to the habitat found within the territory. The Field Vole accounted for a large proportion of the diet at Bramhopegate (29.99%) and Esholt (18.97%), whereas at the Filter Beds site the Woodmouse accounted for a larger proportion of the diet (17.98%). At Buckwood the proportions were about equal. Interestingly, at Bramhopegate, an area of dense woodland, the major prey item was the Field Vole, a grassland species, and not the Woodmouse. This may be explained by the conifer woodland at this site being dense, reducing the owls ability to fly within it, whereas long stretches of lush grass rides divided the plantation. The presence of greater numbers of Bank Voles at three sites can be explained by their proximity to water, plus its preferred habitat being deciduous woods of which there was little at Bramhopegate (Southern & Lowe 1982, Corbet & Harris 1991).

Rabbits played an important part of the diet, the large numbers seen at Bramhopegate again suggest much of the hunting at this site may take place over the grassy rides. In comparison, only a small number were taken at Buckwood where little close cropped grass occurred.

Bats, an uncommon prey item for Tawny Owls, were taken in large numbers at the Filter Beds making up 3% by weight of the prey taken at this site. By number this accounts for 4.38% of prey items taken, higher than observed in previous studies: 0.05% (Britian: Speakman 1991), 0.2% (Poland: Ruprect 1979) and 0.15% (Germany, Uttendorfer 1943). There were no known bat roosts within this territory, suggesting bats were taken in flight, possibly whilst feeding on insects over the river or bacteriological filter beds. At the other three sites only a single bat was detected throughout the collection period. Interestingly, Buckwood contained a number of bat roosts, but no trace of bats were found within the pellets. This may suggest bats are a specialist prey.

Overall, the most frequently taken bird was the Goldcrest (3.08% of prey items taken by number, 1.19% of the diet by weight). They represented over 50% of individual birds caught at the Filter beds. Goldcrests prefer conifer woods rather than deciduous, which would account for the smaller numbers taken at Buckwood which was a more deciduous type habitat.

Seasonal variation

Monthly variation was observed in the number of pellets collected, less pellets being found as the amount of undergrowth or leaf litter present increased, as noted in other studies (Southern 1954, Kirk 1992); for example, at Buckwood two periods of low pellet collections were seen, April to June which related to deeper ground cover, and also autumn due to the shedding of leaves from deciduous trees. At the Filter Beds, increased ground cover in summer coincided with lower collection figures.

The number of days of snow correlated with monthly variation in some species and prey groups, small mammals, invertebrates, Woodmice, Bank Voles, Field Voles and earthworms. More small mammals, especially Field Voles and Woodmice, were taken in spring than summer. No significant variation was seen in the proportions of larger mammals, birds or invertebrates taken by season, however, this may be a result of yearly variation. A more varied diet was seen during the summer months, notably an increase in the number of birds taken (Figure 2). This trend has been noted in other studies (Southern 1954, Kirk 1992).

The variation in small mammal prey by season relates to two factors. Firstly the density of prey species and secondly the presence of ground cover. Small mammals are more vulnerable in winter due to the lack of dense ground cover, plus population densities are generally higher at these times. The population density of Woodmice peaks in autumn and winter (Southern 1970, Flowerdew 1985, Corbet & Harris 1991), as does Bank Voles (Southern 1970, Southern & Lowe 1982, Corbet & Harris 1991), coinciding with the period they were highest in the Tawny Owl diet. Seasonal variation was also seen for the Mole and Common Shrew, significantly less were taken in spring than autumn as seen in other studies (Southern 1954, Petty 1987). Common Shrews are less active on the ground surface in winter than summer when peak densities are seen (Southern 1954, Corbet & Harris 1991). Bats, at the Filter beds, were mainly taken in summer where they accounted for approximately 19% of small mammal prey taken in the months of May and June. Both Pipistrelle and Noctule Bats are active throughout the year, although to a lesser extent in winter (Corbet & Harris 1991). More amphibians were taken in spring, March and April especially, than winter, during the breeding season when they were more active in the open, similar to previous findings (Bevan 1982, Petty 1987).

Higher proportions of birds were seen in the diet in summer, than at other times of the year. This was seen in some other studies (Southern 1954, Petty 1987) but not in Yalden's (1985) where more birds were taken in winter. Bird numbers were at a high point at this time, having reared one or two broods. The exception to this was Goldcrests, where fewer were taken in summer than spring or winter.

There was no significant variation seen in the numbers of earthworms taken over the year, similar to previous findings (Southern 1954, Yalden 1985). There may be several reasons for this. There was no significant variation in rainfall throughout the years which might have influenced earthworm presence at or near the surface. Rainfall did correlate with the seasonal variation seen elsewhere (Voous 1988). Another reason could be that a more quantitative measurement of earthworms is required to reflect any variation in quantities taken within a single pellet.

Conclusions

This study shows that at the four sites investigated, small mammals were the most important factor of the Tawny Owls diet, especially during winter and spring, confirming the findings of other studies. The percentage of small mammals in the diet reduced in summer when a more diverse range of prey was taken. Variation between the sites can be attributed to their habitat types, presence or absence of water accounting for a number of important prey observed. Other factors may also influence the diet, such as weather, habitat quality within the territory and a birds experience. The ability to utilise such a diverse diet, is not seen in the other British owls and may be influenced by the Tawny Owls territorial nature. This generalist ability, to switch between prey types, is likely to be an important factor that has enabled the Tawny Owl to move into a greater variety of suitable habitats and to maintain a stable population over recent years, where many of the other species of owls in Britain have suffered due to habitat loss or degradation.

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ADDITIONS AND CORRECTIONS TO THE YORKSHIRE DIPTERA LIST (PART 3)

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The main purpose of the first three parts of this series has been to exclude and delete taxa from the conceptual list of Yorkshire Diptera. A new tangible full county Diptera list (Grayson, in prep.) is planned for publication during 2007, which would seem to be an appropriate year, given that it marks the publication centenary of the previous comparable list compiled by Percy Hall Grimshaw (1869-1939). Unlike Grimshaw (1907), which was an annotated list, the revised list is a basic summarised inventory of Yorkshire Diptera, coupled with a substantial bibliography. The aim of the work is not only to publicise our current knowledge, but also to stimulate studies in neglected areas, and ultimately facilitate the publication of a more detailed monograph or series of works in the future.

During the first six years of this century, over 600 species have been conceptually added to the Yorkshire Diptera list as a result of the combined contents of many published papers. Of the 102 dipterous families recognised from Britain by Chandler (1998), 100 are now known to be represented in Yorkshire. The two outstanding families, *viz*. Tanypezidae and Strongylophthalmyiidae, are mono-specific in Britain, and may not occur in Yorkshire.

As with parts 1 and 2 of this series, 'Further Notes' includes solutions to some less obvious typographical and transcription errors. An asterisk is again used to indicate British species whose names were incorrectly applied to another British species by earlier authors. Initials used below refer to the following: PJC = P. J. Chandler, CAC = C. A. Cheetham, JHC = J. H. Cole, WAE = W. A. Ely, ARG = A. R. Godfrey, GJK = G. J. King, RHM = R. H. Meade, PS = P. Skidmore, CJW = C. J. Wainwright.

Additions to Yorkshire Diptera List

PSEUDOPOMYZIDAE

Pseudopomyza atrimana (Meigen, 1830). (62) Hollins Wood, (on log stack), SE5783, 9.7.2005, ARG.

LONCHAEIDAE

Earomyia viridana (Meigen, 1826). (62) Chafer Wood, SE8983, 28.5.1988, WAE.
E. virilis Collin, 1953. (63) near Hawkehouse Green, SE608139, 11.6.1974 (♀), PS.
Lonchaea britteni Collin, 1953. (63) Blacktoft Sands, SE8423, 8.1976, A. Grieve, det. PS.
L. laticornis Meigen, 1826. (63) Canklow Wood, SK4290, 7.6.1985 (♂), WAE; Kings Wood, Bawtry, 3.1978 (♂), "and other sites in the Doncaster area", PS; Slackcotes, pupa under ash bark 4.1962, adult emerged 1.5.1962, PS; Treeton Dyke, SK4386, 29.7.1981, WAE; (64) Ha Mire Wood, Malham Tarn, pupae collected under bark of ash logs on 15.5.1989, many adults hatched out, R. H. L. Disney; Temple Newsam, 7.1977, PS.
L. laxa Collin, 1953. (63) 111, Hill Top Lane, SK3992, 1980, Mrs E. Dransfield, det. WAE; Langold Lake, (south shore, along field), SK58, 23.5.1981, WAE.

TEPHRITIDAE

Terellia (*Cerajocera*) *ceratocera* (Hendel, 1913). (61) Hessle, TA0126, 6.1948, B. H. Cogan; (63) Station Wood, Barnby Dun, 16.7.1978 (♀), 6.8.1978 (♂), PS; Northcliffe, Conisbrough, 15.7.1986, PS; Pot Hill, Sandall Beat, 12.7.1983, PS.

Urophora (*Urophora*) *cardui* (Linnaeus, 1758). (63) Fishlake, SE648162, 5.7.2006 (gall on stem of Creeping Thistle *Cirsium arvense*), T. Higginbottom. This unmistakeable gall is common in southern England. It has been recently reported from Nottinghamshire (56) and North Lincolnshire (54) (T. Higginbottom, *pers. comm.*). Grayson (2006a) provisionally discounted a record from (62) Keld Head, Pickering, 1.8.1988 (♀).

LAUXANIIDAE

Minettia (*Minettia*) *desmometopa* (de Meijere, 1907). (61) Spurn Head, TA4112, 19.7.1996, JHC; Welwick Saltmarsh, TA343190, 19.7.1996, JHC.

M. (*M.*) *flaviventris* (Costa, 1844). (63) Rother Valley Country Park, (wet field), SK4682, 13.7.1989, WAE.

Sapromyza (*Sapromyza*) *zetterstedti* Hendel, 1908. (64) Timble Ings, Otley, SE1552, 19.8.1984, WAE.

S. (*Sapromyzosoma*) *quadripunctata* (Linnaeus, 1767). (63) Woodhouse Washlands, Rotherham, SK436854, 2.7.2001, ARG.

CLUSIIDAE

Paraclusia tigrina (Fallén, 1820). (63) Norwood, SK538904, 10.8.2001, WAE.

OPOMYZIDAE

Geomyza subnigra Drake, 1992. (63) Thrybergh Country Park, SK4795, 6.9.1980 (♀), WAE; open area north of Centenary Way, SK426931, 7.8.1991 (♀), WAE.

G. venusta (Meigen, 1830). (64) Malham Tarn, 28.8.-1.9.1981 (ex lawn), D. M. Unwin.

ANTHOMYZIDAE

Anthomyza socculata (Zetterstedt, 1847). (63) Treeton Dyke Marsh, (upstream of bridge), SK436869, 14.6.1989 (♂), WAE.

TETHINIDAE

Tethina (*Tethina*) *albosetulosa* (Strobl, 1900). (61) Spurn Head, TA4112, 19.7.1996, JHC.

RHINOPHORIDAE

Phyto discrepans Pandellé, 1896. (63) 169, Carr House Road, Doncaster, 30.7.1974 (♀ ex garden), PS; (64) Temple Newsam, 17-18.7.1977 (♂ ex light-trap), R. Brooke, det. PS.

SARCOPHAGIDAE

Oebalia cylindrica (Fallén, 1810). (63) Rossington Bridge, 15.7.1965, PS.

Nyctia halterata (Panzer, [1798]). (61) Hessle, TA013528, 17.6.1951, C. D. Day.

Sarcophaga (*Discachaeta*) *arcipes* Pandellé, 1896. (61) Wharram Quarry, SE8565, 18.7.1996 (♂), ARG.

S. (*D.*) *pumila* Meigen, 1826. (61) Wharram Quarry, SE8565, 18.7.1996 (♂), ARG; (63) Norwood, SK5390, 21.8.1976, WAE.

S. (*Krameromyia*) *anaces* Walker, 1849. (61) Bishop Wilton, (old chalk quarry), SE805560, 14.7.1996, JHC.

S. (*Liopygia*) *argyrostoma* (Robineau-Desvoidy, 1830). (63) Barnburgh Cliff, 26.5.1975, PS.

S. (*Sarcotachinella*) *sinuata* Meigen, 1826. (61) Welwick Saltmarsh, TA343190, 19.7.1996, JHC.

EXCLUSIONS FROM YORKSHIRE DIPTERA LIST

CHIRONOMIDAE

Orthocladius (Eudactylocladius) fuscimanus (Kieffer in Kieffer & Thienemann, 1908) [= *O. (E.) hygropetricus* Kieffer, 1911]. This species was erroneously included in circulated draft versions of the proposed Yorkshire Diptera list, instead of *Metriocnemus eurynotus* (Holmgren, 1883) [= *M. hygropetricus* Kieffer, 1912].

Parachironomus biannulatus (Staeger, 1839) [= *viridanus* (Ruthe, 1831)]. Recorded on a YNU card [sub nom. *viridanus*] from Keighley, 1925, and hence included in circulated drafts of the proposed Yorkshire Diptera list. The determiner may have been George Grace, and this questionably authentic record does not appear to have been published.

HYBOTIDAE

Platypalpus albocapillatus (Fallén, 1815). Collin (1961) stated this "appears to be a sea-coast species". The Sorby Natural History Society database contains a record from an inland site, *viz.* Agden Bog, SK2593, 15.9.1995. Provisional exclusion from the Yorkshire list would seem appropriate pending verification of the record.

DOLICHOPODIDAE

Dolichopus (Dolichopus) caligatus Wahlberg, 1850. A circulated record from Drax Abbey Farm, 21.7.1987, was a transcription error for another species (WAE, *pers. comm.*).

TEPHRITIDAE

Oxyna flavipennis (Loew, 1844). Added by Skidmore (1976) from Denaby Ings and Wilthorpe, 1967; Norton Common, 11.6.1974; and Bentley Common, 19.6.1974. These records, and several others from the Rotherham area, refer to *O. parietina* (Linnaeus, 1758) (PS). Further records from Thorne Moors, 1966, (Skidmore *et al.*, 1987), and Sandall Beat, 1966, are suspect.

CLUSIIDAE

Clusiodes (Clusiaria) nubila (Meigen, 1830). This central European species was presumably recorded in error from Rawdon, 1924, in Cheetham (1926).

AGROMYZIDAE

Phytomyza ranunculicola Hering, 1949. A circulated record from Highscree Wood, Malham Tarn, 1980, was presumably an error. This species is not known from Britain.

P. taraxaci Hendel, 1927. This is a *nomen dubium* (PJC, *pers comm.*). Leeds area records were published in Russell (1958), and repeated in Russell (1959).

OPOMYZIDAE

Geomyza hackmani Nartshuk, 1984. Recorded from VC 62 in circulated draft versions of the proposed Yorkshire Diptera list; but this was possibly as a result of a transcription error, or error in application of synonymy involving *Geomyza combinata* (Linnaeus, 1767).

CHLOROPIDAE

Platycephala umbraculata (Fabricius, 1794). Reference to an exhibit from "The Spittals, Yorks." in Chandler (1989), was an error for The Spittals, Lyme Regis, Dorset (A. E. Stubbs, *pers. comm.*).

HELEOMYZIDAE

Morpholeria (Spanoparea) variabilis (Loew, 1862). Recorded [in *Blepharoptera*] by Ashworth (1907) and Ashworth (1908), but presumably in error. *M. (S.) variabilis* is a non-British species which occurs in central and southern Europe (PJC, *pers. comm.*).

Neoleria ruficauda (Zetterstedt, 1847). Records from High Force, Teesdale, 20.9.1965 (3♀ ex Fly Agaric *Amanita muscaria*), (Skidmore, 1968), and Roche Abbey, 1967, were more likely to refer to *N. ruficeps* (Zetterstedt, [1838]) (PS, *pers. comm.*).

SPHAEROCERIDAE
Rachispoda breviceps (Stenhammar, 1855). Added [in *Collinellula*] from Kilnsea Warren, 19.9.1971, by Skidmore (1972). According to Chandler (2002), this species has not been confirmed as British.

DROSOPHILIDAE
Stegana (*Stegana*) *furta* (Linnaeus, 1758) [= *curvipennis* (Fallén, 1823)]. Added by Cheetham (1949) [sub nom. *Prostegana curvipennis*] from Cawthorne, 1.8.1948, leg. E. W. Aubrook. This species was deleted from the British list by Chandler (1987), with the comment "no British material has been examined".

SCATHOPHAGIDAE
Cordilura (*Cordilura*) *picipes* Meigen, 1826 [= *biseta* Loew, 1864]. Recorded on a YNU card [sub nom. *biseta*] from Adel Dam with the subsequent annotation "why not *pubera* with scutellum bristles broken?" Identification sub nom. *biseta* was presumably erroneous, and the record was apparently never published.
Norellia armipes (Meigen, 1826) [= *flavicauda* (Meigen, 1826)]. Listed as new to Yorkshire [sub nom. *flavicauda*] from Apperley, 4.6.1884, RHM, by Ashworth and Cheetham (1920); but previously also published in Ashworth (1909) and Ashworth (1910). Chandler (1998) excluded *N. armipes* from the British list.

ANTHOMYIIDAE
Pegomya (*Pegomya*) *exilis** (Meigen, 1826). A record from Bingley, RHM, in Ashworth and Cheetham (1920), was stated on Cheetham's record card to refer to *P.* (*P.*) *nigritarsis* (Zetterstedt, [1838]), which is synonymous with *P.* (*P.*) *solennis* (Meigen, 1826).
P. (*P.*) *hyoscyami** (Panzer, [1809]). Yorkshire records refer to *P.* (*P.*) *betae* (Curtis, 1847), which was first documented from the county by Brady (1881).
P. (*Phoraea*) *deprimata* (Zetterstedt, 1845). Yorkshire records require verification. PS found no material in Doncaster Museum to support a tentative record from Goole Moor, 12.6.1966; hence *P.* (*P.*) *deprimata* was listed within brackets in Skidmore *et al.*, (1987). Other records are from Oughtibridge, 17.11.1976 (♀) and 29.11.1976 (♀).

FANNIIDAE
Fannia leucosticta (Meigen, 1830) [= *brevis* (Rondani, 1866)]. Ashworth (1909) remarked upon a specimen from Pool which "appears to be *Homalomyia brevis*, a continental insect not included in the British list"; however, Ashworth (1910) stated "The capture which it was thought might be *Homalomyia brevis* is undoubtably abnormal and may be an *Azelia*".

MUSCIDAE
Coenosia campestris (Robineau-Desvoidy, 1830). Rotherham Biological Records Centre holds a circulated record from Wentworth, 7.7.1921, CAC, which is presumably a transcription error for another species. The report of the Wentworth meeting (Cheetham, 1921) does not mention *C. campestris*.
C. genualis Rondani, 1866. This non-British European species was presumably recorded in error from Manningham, 1886, RHM, in Ashworth and Cheetham (1920).
C. nigridigita Rondani, 1866. This non-British species was recorded from Kilnsea Warren, during a YNU excursion to Easington and Spurn held 26-28.5.1928 (Cheetham, 1928). According to Collin (1953), *C. nigridigita* of British authors is *C. infantula* Rondani, 1866.
C. octopunctata (Zetterstedt, [1838]). This non-British European species was presumably recorded in error from Goole, 4.8.1934, by Cheetham (1934).
Helina intermedia (Villeneuve, 1899). A record from Duncombe Park, on the Ryedale Natural History Society's web-site (www.ryenats.org.uk), is a typographical error for *Coenosia intermedia* (Fallén, 1825).
H. pubescens (Stein, 1893). A record from Low Farm, Armthorpe, 31.7.1965, (synonymous with "Ox Carr Wood, SE6203, 1965" in a well-circulated internal report), refers to an

abnormal specimen of *H. impuncta* (Fallén, 1825) (PS).
Phaonia consobrina (Zetterstedt, [1838]). Recorded in '*The Naturalist* 1920-1929' according to a circulated list; however, there appears to be no such record.
P. latipalpis Schnabl in Schnabl & Dziedzicki, 1911 [= *umbraticola* d'Assis-Fonseca, 1957]. Grayson (2006) listed this species from Malham Tarn; but PS is of the opinion that the records held at Malham Tarn Field Centre, *viz.* West Fen, 14.9.1980, and Ha Mire Wood, 8.6.1982, are probably erroneous, and may refer to *P. zugmayeriae* (Schnabl, 1888).
*P. mystica** (Meigen, 1826). Yorkshire records refer to *P. villana* Robineau-Desvoidy, 1830. First documented from Yorkshire by d'Assis-Fonseca (1968).
P. scutellata (Zetterstedt, 1845). A record from Deffer Wood, 1928, in Coldwell (1999), was based on Cheetham (1928a), and is therefore a transcription error for *P. scutellaris* (Fallén, 1825), which is a junior synonym of *P. rufiventris* (Scopoli, 1763).
Polietes steinii (Ringdahl, 1913). A circulated record from Malham Tarn, 2.7.1983, is an error, and almost certainly refers to *P. hirticrus* Meade, 1887 (S. J. Falk, *pers. comm.*).

CALLIPHORIDAE

Onesia sepulcralis (Meigen, 1826). This is a non-British insect. The Yorkshire records refer to *Bellardia* species. It was first documented from Yorkshire [sub nom. *Calliphora sepulchralis*] by Willis and Burkill (1895).

SARCOPHAGIDAE

Sarcophaga lasiostyla Macquart, 1843. This is a *nomen dubium* according to the World catalogue of Sarcophagidae (PJC, *pers. comm.*). A circulated record exists from Cowcliff Plantation, SE6566, 28.4.1990.
S. (*Helicophagella*) *hirticrus* Pandellé, 1896 [= *agricola* sensu Meade, 1876, nec Robineau-Desvoidy, 1830]. This species was erroneously included in circulated draft versions of the proposed Yorkshire Diptera list. This inclusion was based on Ashworth and Cheetham (1920), which documented *Sarcophaga agricola* Meigen [error: the author was Robineau-Desvoidy] from Rawdon, 1874, RHM. The relevant YNU record card is headed "*Sarcophaga agricola* Mg.? ([C. J.] Wainwright says this is *carnaria* L.)". Both *S. agricola* Robineau-Desvoidy, 1830 and *S. carnaria* sensu auctt., nec (Linnaeus, 1758) are synonymous with *S. variegata* Scopoli, 1763.
S. (*Pandelleisca*) *similis* Meade, 1876. Recorded from Apperley, 1878, RHM, by Ashworth and Cheetham (1920); but Wainwright (1938) stated the specimen was *S.* (*Sarcophaga*) *subvicina* Rohdendorf, 1937, and gave the date on the label as 13.9.1875.

TACHINIDAE

Allophorocera pachystyla (Macquart, 1850) [= *Dexodes auripilus* Brauer & von Bergenstamm, 1891]. This species is only known from Switzerland (PJC, *pers. comm.*). Recorded [sub nom. *Ceromasia auripila*] from Castle Howard, 4.7.1926, by Cheetham (1927); but CJW re-identified the material as *Lydella stabulans* (Meigen, 1824) (Cheetham, 1927a).
Cyzenis juncunda (Meigen, 1838). This name was evidently misapplied by British authors (Chandler, 1998). The Yorkshire records [in *Exorista*] were from Bingley, 1874, RHM, (Meade, 1892: p. 20), and Austwick, 26.5.1926.
Loewia brevifrons (Rondani, 1856) and *L. setibarba* Egger, 1856. Meade (1892: p. 261) stated he had taken both sexes of *L. brevifrons* near Bradford in 1877. Grimshaw (1907) placed Meade's record sub nom. *L. setibarba*, and gave *brevifrons* as a synonym. Wainwright (1938) re-identified Meade's specimens as *L. foeda* (Meigen, 1824). Chandler (1998) excluded *L. brevifrons* and *L. setibarba* from the British list, stating that *setibarba* had not been seen by Wainwright (1928) or van Emden (1954), and that the same two authors had stated that *brevifrons* was a good species, but not British.
Nowickia (*Fabriciella*) *ferox* (Panzer, [1809]). A circulated record from Maiden Greve Balk, Malton, 1990, was in error for *Tachina* (*Eudoromyia*) *fera* (Linnaeus, 1761).

Phebellia nigripalpis (Robineau-Desvoidy, 1847) [= *Exorista agnata* Rondani, 1859] Excluded from the British list by Chandler (1998). Recorded [sub nom. *agnata*] from Huddersfield in Cheetham (1921a); but the material was re-identified by J. E. Collin as *Phryxe nemea* (Meigen, 1824) (Cheetham, 1923).

Tachina morosa Meigen, 1824. Recorded from "Apperley, 1875, Heaton, 1876, RHM" by Ashworth and Cheetham (1920). The relevant Cheetham card attributes these records to "*Blepharipoda atropivora* Rnd. (*Tachina morosa*)". A pencil note on an accompanying YNU card states "CJW thinks these records refer to *Exorista rustica* Fallén". Chandler (1998) excluded *Drino atropivora* (Robineau-Desvoidy, 1830) [formerly in *Blepharipoda* Rondani] from the British list, and regarded *T. morosa* as a *nomen dubium*.

Further Notes

LIMONIIDAE

According to Cheetham's record cards, the following species are synonymous with provisional manuscript names of F. W. Edwards: *Gonomyia* (*Gonomyia*) *simplex* Tonnoir in Goetghebuer & Tonnoir, 1920 = *collina* Edwards (m.s.); *Molophilus* (*Molophilus*) *bifidus* Goetghebuer in Goetghebuer & Tonnoir, 1920 = *bidens* Edwards (m.s.); *Molophilus* (*Molophilus*) *flavus* Goetghebuer in Goetghebuer & Tonnoir, 1920 = *undulatus* Edwards (m.s.); *Dicranomyia* (*Dicranomyia*) *mitis* (Meigen, 1830) = *diffinis* Edwards (m.s.).

Further to the notes on *Rhabdomastix* (*Sacandaga*) *schistacea* (Schummel, 1829) in Grayson (2005); the YNU records state that the specimen in The Natural History Museum, London, is a paratype of *R.* (*S.*) *edwardsi* Tjeder, 1967.

AGROMYZIDAE

Some of the YNU records of *Cerodontha* (*Icteromyza*) *capitata* (Zetterstedt, 1848) require further investigation, as another distinct species, *C.* (*I.*) *geniculata* (Fallén, 1823) is given in synonymy on the relevant card. Cheetham (1921) recorded *geniculata* [in *Agromyza*] from Wentworth, 7.7.1921, and gave *capitata* in synonymy. Cheetham (1927) divulged records sub nom. *Agromyza capitata* from Castle Howard and Gormire. It is likely that all YNU records refer to *capitata*, except for a Thorne Moors, 1995, PS, record of *geniculata*.

SPHAEROCERIDAE

A circulated record of "*Borborus nigriventris* Haliday" from Hole of Horcum, 1937, sourced from Britten (1937), is a transcription error for *Bibio nigriventris* Haliday, 1833.

"*Leptocera tarsella*" was included in a circulated list of Diptera compiled from record cards held at Malham Tarn Field Centre; but there is no such species, and no such record card. This transcription error possibly refers to *Megaselia tarsella* (Lundbeck, 1921).

EPHYDRIDAE

"*Pelma aenea* (Hal.)" in Hincks (1942), is a typographical error for *Pelina aenea* (Fallén, 1813), which was added to the Yorkshire list from Roche Abbey, 17.5.1941, by Cheetham (1941), which also incorrectly cited the author as "Hal." [= Haliday].

ANTHOMYIIDAE

Delia "*brunneistigma* Schnabl" from Cusworth Park, 1975, in Skidmore (1977), is a typographical error for *Paradelia brunneonigra* (Schnabl in Schnabl & Dziedzicki, 1911).

Inchbald (1886) alluded to the name *Phorbia floricola* Zetterstedt, but gave no details of localities. PJC (*pers. comm.*) writes that there does not appear to be such a Zetterstedt name; perhaps it was *sensu* Zetterstedt and refers to *floricola* Robineau-Desvoidy, 1830 = *Delia cardui* (Meigen, 1826); but regardless, the determination was probably incorrect.

TACHINIDAE

Records from Keld Head, Pickering, 28.7.1984, GJK, and Malham Tarn, are contained on a YNU record card for "*Siphona crocata*"; however, there is no such species (PJC, *pers.*

comm.). The name "*crocata*" is probably an error for the suppressed generic name *Crocuta* Meigen, 1800, which is synonymous with *Siphona* Meigen, 1803. According to GJK's records, *S. cristata* (Fabricius, 1805) was the species taken at Keld Head on 28.7.1984.

The YNU record card for *Phorocera gracilis* (Egger, 1861) [= *Staurochaeta albocingulata* (Fallén, 1810)] gives "VH [Victoria History, i.e. Grimshaw (1907)] Ilkley?" in ink, followed by "PHG [Grimshaw] says 'no'" in pencil. This is a puzzling transcription error, as there is no reference to this species in Grimshaw (1907). Chandler (1998) excluded *S. albocingulata* from the British list.

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YORKSHIRE NATURALISTS' UNION EXCURSIONS IN 2005

Compiled by
A. HENDERSON and A. NORRIS

FILEY (VC61) 21 May 2005

INTRODUCTION (A. Norris)

14 members from 12 societies attended this coastal survey meeting with some members turning up well in advance of the main party to take advantage of the low tide prior to the meeting. The weather conditions were ideal with plenty of sun and only light winds off the sea. The incoming tide restricted the time available for visiting the rocks of the Brigg, but it encouraged members to examine the soft cliffs north and south of Filey, some visiting Filey Dams, the Yorkshire Wildlife Trust Nature Reserve. The information gathered on the soft cliffs will be included in the National Buglife project. The tea and meeting, held in the Evron Centre, which proved ideal for our purposes, completed a very successful day.

ORNITHOLOGY (C. W. Curtis)

The state of the tide dictated a morning visit to the shore and the rocks of the Brigg. In the vicinity of the car park and path to the beach, Swallows, House Martins, Swifts, Blackbirds and Magpies were observed. The bushes along the path to the beach revealed Robin, Willow Warbler, Song Thrush, Chaffinch and Wood Pigeon, and Chiffchaff was heard singing. Small numbers of Black-headed Gulls were on the sea near the town whilst a single Lesser Black-backed Gull flew along the cliffs. Other species noted in this area were Carrion Crown, Rook, Pied Wagtail and Rock Pipit. A small party of dark ducks were on the sea where the long range and strong light hindered identification though it was considered they were Common Scoter. From the rocks at the seaward end of the Brigg Gannets, Kittiwakes and auks were observed passing to and from the large breeding colonies of nearby Flamborough Head. On returning to the car park for lunch, Collared Dove, Jackdaw, Skylark and House Sparrow were all seen.

The early part of the afternoon was taken up with a walk northwards along the sea-cliffs which provided an excellent vista of the rocks revealing Sanderling, usually associated with sandy beaches, Turnstones, Oystercatchers, Dunlins, Knots, Redshanks, three Cormorants and a small party of Common Eiders. Both Herring and Common Gulls were quite plentiful in this area, whilst the cliffs held breeding Fulmars, Kittiwakes, Common Guillemots and Razorbills. Puffins also were seen and considered to be breeding. Offshore, Gannets were again seen passing along with all three species of auks, Fulmars, Sandwich Terns and Shags. The highlights of this walk were an adult Peregrine Falcon which flew along the cliffs and a Turtle Dove in the Totem Pole field.

Prior to the meeting, a short visit was made to Filey Dams NR where the freshwater lagoons produced a different range of species, including Whimbrel, Mute Swan, Little Grebe, Ruddy Duck and Common Sandpiper. A thriving colony of Tree Sparrows near the car park was a welcome sight.

In all, 59 species were reported.

CONCHOLOGY (A. Norris)

38 species of land and freshwater and 33 marine species of molluscs were recorded, with 34 of the land and freshwater species occurring on the soft cliffs. The highlights of the land and freshwater include *Arion flagellus* recorded from three 1 km squares, *Leiostyla anglica* which occurred in numbers in a marshy area on the cliffs to the south of the town and *Helicella itala*, which was reconfirmed as occurring on the cliffs above the Brigg.

Of the marine species, by far the most interesting was *Skeneopsis planorbis* (two specimens) which David Lindley recorded from amongst seaweed on the north side of

Spittal Rocks, Filey Brigg. The last record of this minute gastropod from Filey Brigg by F. H. Woods was in May 1913.

COLEOPTERA (M. L. Denton & R. J. Marsh)
Searching the tide line along the cliff bottom revealed a small number of common grassland species, presumably blown down from the cliff above, and four specimens of the Staphylinid *Myrmecopora sulcata*, a species associated with sandy shores, often below the high water line, and previously known from only three Yorkshire localities, the last record being from Spurn in the mid-20th century.

The damp edges of the ponds above the Brigg provided a far more varied selection. Despite their small size and isolation, a good number of wetland species were present, including two Nationally Scarce species, the ground beetle *Bembidion clarkii* and the Hydrophilid *Cercyon tristis*. The former is most frequently found in wet habitats by the coast, but in Yorkshire it has a wide distribution and appears to be centred on the Lower Derwent Valley, and the latter, which is commoner in northern England than in the south, is widely distributed in the county.

By sweeping the grassy areas of the soft cliff faces overlooking Filey Bay, Bill Dolling found the weevil *Calosirus terminatus*, a predominantly coastal and Nationally Scarce insect associated with the umbellifer *Daucus carota*, which would appear to be new to the county.

The cow dung in the North Cliff Nature Reserve held good quantities of expected species; those with a more local distribution included the Staphylinids *Philonthus albipes* and *Datomicra sordidula*. A brief visit to Filey Dams also produced a list of expected species. A decomposing pile of grass cuttings, thrown over the fence of an adjacent house, contained the locally distributed Staphylinids *Philonthus tenuicornis* and *Datomicra celata*.

MARINE FLORA AND FAUNA (A. Norris)
Records for marine groups other than Mollusca included the Beadlet Anemone, very common in some areas of the Brigg, the Sea-slater *Ligia oceanica*, and a number of crustaceans, including Shore, Fiddler, Edible and Hermit Crabs, as well as the Aesop Prawn. The Bryozoan *Flustra foliacea* and the Sand-mason *Lanice conchilega* were very common in the wet sands south of Old Quay Rocks, and twelve of the commoner seaweeds were recorded. A Grey Seal was reported as basking on the rocks at the head of Spittal rocks, Filey Brigg. In general, the area was of very good ecological quality with clean beaches and little general pollution, but the south side of the Brigg showed evidence of deterioration in the blackening of the sand under deep-set stones.

FLOWERING PLANTS (J. Lambert & S. Priest)
From the car park, a small steep-sided valley known as Arndale leads down to the shore. Introduced species such as *Rosa rugosa* and *Populus* x *canescens* were amongst the mainly *Acer pseudoplatanus* woodland. *Veronica beccabunga* was in the small stream on the valley floor, and on the south side, *Juncus inflexus, Pulicaria dysenterica* and *Carex hirta* were found in a wet flush; new growth of a *Hypericum* species, possibly *H. tetrapterum*, was found close by. *Primula veris* was flowering under trees, and *Hippophaë rhamnoides* occurred with *Alnus glutinosa* and *Salix* sp. Along the shore on boulder clay cliffs, *Rhinanthus minor, Lotus corniculatus* and *Cochlearia officinalis* were in flower, and *Ononis repens, Daucus carota, Carolina vulgaris, Helictotrichon pratense* and *Koeleria macrantha* were also seen. A bramble, collected for identification later, proved to be an as yet undescribed species. Bill Dolling also found *Triglochin palustris, Glaux maritima* and *Armeria maritima* from cliffs nearer to Filey Brigg

SANDSEND NEAR WHITBY (VC62) 18 June 2005
INTRODUCTION (J. M. Blackburn)
A party of 31 members and guests set off from the car park at the north end of Sandsend on

an overcast but humid day which became less cloudy as the day progressed. A large group spent the day along the old railway line, venturing off the track in several places into the vegetated disused marl quarries. The first path worked its way up beside a cliff towards Lythe village. The cliff itself was of sandstone, but had base-rich water running down it to provide an added interest in an otherwise acidic environment.

A Roe Deer was spotted in one of the quarries, where a Green Woodpecker was heard calling. A short-tailed field vole was seen and there was evidence of moles and rabbits, whilst many lizards were lazing in the warmth. Tadpoles and toadlets were frequent, and a smooth newt was recorded. Several members spent some time in Mulgrave Woods.

The indoor meeting held in the village hall was attended by 21 members representing 16 affiliated societies. The President, Mike Denton, chaired the meeting at which reports were given, enlivened in particular by Ian Lawrence giving details of the plant hybrids seen during the day.

ORNITHOLOGY (C. W. Curtis)

The car park at the northern end of the town afforded an excellent platform for viewing the sea as it uncovered part of the shore. Owing to the state of the tide, little beach was available for birds, so that only a small party of Mallards and a few Herring Gulls were present. Further out in the bay, both Razorbills and Common Guillemots were noted, in small numbers, either at rest on the water or in flight, as were both Fulmars and Kittiwakes.

Four Cormorants flew south. A small party of Sandwich Terns was feeding well to the south, whilst 16 Common Gulls were seen sitting on the sea in a small, compact party. Blue and Great Tits were present in a nearby garden, whilst both House Martins and Swallows were seen over the former railway station. The dismantled railway line, now forming part of the Cleveland Way, provided an easy walk during which most of the passerines to be expected in the area were noted. The time of the year would indicate that all species seen should have been breeding, although very little evidence of this was noted. Goldfinch, Chaffinch, Yellowhammer, Meadow Pipit, Dunnock, House Sparrow, Blackbird, Song Thrush, Linnet, Jackdaw, Carrion Crow, Wren, Willow Warbler and Whitethroat were recorded along the old railway north to the first tunnel. Grey Wagtail, the only species confirmed as breeding, was seen carrying food to an area of boulders along the stream immediately to the south of the railway tunnel. The sea cliffs held breeding Fulmars and "Rock" Doves, whilst six Oystercatchers were seen on the rocks at the base of these same cliffs. Great Black-backed and Black-headed Gulls were also noted, with a single Arctic Tern seen flying north offshore. On returning to the car park, a single Sparrowhawk flew over the party. Although the sea and shore were under almost constant observation whilst eating lunch, no further species were noted.

During the afternoon period, Mulgrave Woods was explored, but it proved a little disappointing since few additions to the daily list were made, the highlight being the number of Nuthatches which were very vocal and occasionally afforded excellent sightings. Green Woodpecker was heard, as was Pheasant, whilst a bird-feeder, in a garden adjacent to the woods, gave us Coal Tit. Chiffchaff was heard singing at several locations in the woods, and Robin, Magpie and Wood Pigeon were also noted.

A total of 45 species was recorded during the day.

CONCHOLOGY (D. Lindley & A. A. Wardhaugh)

It was hoped that some marine recording could be carried out at the meeting but due to the tide it was only possible to find three species on the upper rocky shore. Under stones at the top of the shore were large numbers of the woodlouse *Ligia oceanica*, including some very large specimens. 36 land and freshwater species were found throughout the day in the following 1 km squares: NZ8512 (14 species), NZ8513 (21 species) and NZ8514 (31 species). There was one new 10 km record, namely *Monacha cantiana* found in and around the car park area. A large, fine specimen of *Limax maximus* was found on the railway banking. The area of the alum workings was unsurprisingly unproductive; however, once the area of the old railway tunnel was reached this changed. A short distance into Overdale proved to be fairly rich, and *Acanthinula aculeata* and *Ashfordia granulata* were found near the stream, and the stream itself provided specimens of *Potamopyrgus antipodarum* in some numbers. It was interesting to note that this was the only area in which *Arianta arbustorum* was found. A juvenile *Limax* found by Tony Wardhaugh may add another species once reared to adulthood.

ENTOMOLOGY: LEPIDOPTERA (J. Payne)
Nine butterfly species were recorded, comprising four species of Pieridae, two Lycaenidae, two Nymphalidae (one of them Satyrinae) and one Hesperiidae. It was very pleasing to see Dingy Skipper flying in the morning sun on the cliff edge and to have the Speckled Wood reported from Mulgrave Woods. Five "macro" moths were recorded. The Geometridae were represented by the Common Wave, the Lymantriidae by the black, red and white larva of the Yellow-tail, the Arctidae by the red and black Cinnabar and the Ruby Tiger. The only member of the Noctuidae seen was the Large Yellow Underwing. It was remarkable that no Burnet moths, or evidence of them, were seen especially as they were noticeable on the cliffs at Filey as larvae and pupae a month earlier.

COLEOPTERA (M. L. Denton)
The number of Coleoptera species recorded along the Cleveland Way was rather poor, not due to a problem with the locality, but because of the year in general since May and the early part of June had been cold and, in some areas, very wet. As a consequence many invertebrate groups appear not to have proliferated. Sieving copious amounts of *Sphagnum* which surrounded a number of flushes and ponds revealed very little with the exception of a single male *Dryops luridus*; although common nationally, Yorkshire records are confined to lowland areas and show a south-easterly bias. It is unusual not to find a wealth of Staphylinids (rove beetles) in such a situation, but none were located. Indeed, the only Staphylinid found along the Cleveland Way was a single example of the common *Philorinum sordidum*.

The weevil *Cionus scrophulariae* was found on its food plant *Scrophularia nodosa*; it is normally found on this species, but recently it has been recorded from Cape Figwort *Phygelius capensis* growing in gardens; although in different genera, they are both members of the Scrophulariaceae. Since *P. capensis* is obviously to the liking of this weevil, the species may be destined to become another garden pest.

PLANT GALLS (J. Payne & K. G. Payne)
Most of the time was spent on the old railway track on the cliffs to the north of the village. Accessible plant hosts were not numerous and galls of only four galling species were noted. The most interesting were the "mop heads" formed on Lady Fern by the Anthomyiid fly *Chirosia betuleti*. Bert Brand collected Alder leaves covered with pustules of the mite *Eriophyes laevis*. Goosegrass was twisted and distorted by the mite *Cecidiophyes galii*, and almost everywhere sycamore leaves were scattered with little red pustules of the mite *Aceria cephaloneus*. On the banks of the stream flowing through the village, *Salix fragilis* carried the "bean galls" of the sawfly *Pontania proxima*, and the flowering stems of Greater Periwinkle were deformed by the rust fungus *Puccinia vincae*.

Taking the wrong path near the entrance to Mulgrave Wood Peter Cook recorded the following: pale hard globular swellings on *Tilia platyphyllos* leaves which contained the yellow larvae of the fly *Contarinia tiliarum*; leaves of *Salix aurita* galled by the mite *Aculus laevis* and the leaves of *Salix caprea* galled by the fly *Rabdophaga salicis*. He also found some leaves and petioles of *Urtica dioica* at the top of the flight of steps to the old railway line galled by the fly *Dasyneura urticae* and, although not technically a gall, stems of *Holcus lanatus* were found to be 'choked' by an *Epichloe* sp.

LEAF MINERS (P. Cook)

The area seemed particularly rich in leaf miners with examples found on Hogweed, Smooth Sow-thistle, Creeping Buttercup and Goat Willow, none of which is easy to identify in the field, or without 'breeding out' the culprit. Spiral galleries within distinct purple blotches on *Rumex acetosella* were probably those of the lepidopteran *Enteucha acetosae*.

OTHER ARTHROPODS (P. Cook)

The five common woodlice, *Armadillidium vulgare, Oniscus asellus, Philoscia muscorum, Porcellio scaber* and *Trichoniscus pusillus* were recorded in their expected haunts. Some time was spent poking into the nests of ants *Lasius flavus*, which resulted in a single specimen of the troglodyte woodlouse *Platyarthus hoffmannseggi* and yellow forms of *Philoscia muscorum* among the roots of *Vulpia bromoides* capping several nests. Overturned stones failed to reveal any common centipedes and millipedes. Rotting wood in Mulgrave Wood yielded a single specimen of *Cylindroiulus punctatus*, and Bill Dolling reported finding the pill millipede *Glomeris marginata* in leaf litter.

FLOWERING PLANTS (I. C. Lawrence)

The old railway track has been well-documented in past years, so it was interesting to update it. It is a well-known site for *Vicia sylvatica* which is spreading along the trackside, profusely in places. Along with all the plants already documented, some strange-looking *Senecio vulgaris* occurred in one area, growing close to a colony of *S. sylvaticus*, possibly hybrids between the two and therefore worthy of expert attention.

Along a wet area of the trackside, *Epilobium parviflorum* (in quantity), *E. ciliatum* and *E. obscurum* were identified, with hybrids between *E. parviflorum* and *E. ciliatum* and *E. ciliatum* x *E. obscurum*. The ubiquitous *E. hirsutum* was present in some abundance, but no hybrid. Another hybrid species of interest was *Potentilla* x *mixta* which occurred in some quantity at the Sandsend end of the track. Even more interesting was the presence of one of its parents, *P. anglica*, further along the track in a short grassy area and in some quantity; a subsequent visit in late August confirmed this, and also confirmed the hawkweeds as *Hieracium sabaudum*.

Erica cinerea was in good bloom on open spaces, as was *Pulicaria dysenterica* which with *Eupatorium cannabinum* made a colourful display. In wet areas further in from the track, large areas of *Equisetum palustre* and *E. telmateia* were seen, plus hybrids. It was interesting to note that *Potentilla reptans* was not present but, unusually, the rarer parent of *P.* x *mixta* was! The weather was dry and warm and many plants had prematurely dried.

BRYOLOGY (J. M. Blackburn)

The first point of interest was a track on the left hand side a short way along the old railway track. This led to a vertical cliff, which had base-rich water dripping from it and provided a habitat for *Palustriella commutata* and the tufa-forming *Eucladium verticillatum*. The small stream which formed lower down, had *Aneura pinguis* and *Leiocolea turbinata*. The marshy areas in and around the quarries produced three common *Sphagnum* species, much *Calliergonella cuspidata* and several heathland mosses, with *Campylopus introflexus* particularly frequent. The stream at the end of the railway track was profitable, with three thalloid liverworts, *Conocephalum conicum, Lunularia cruciata* and *Pellia epiphylla*, accompanied by *Scapania undulata* and *Dichodontium pellucidum*. Epiphytes were infrequent but *Dicranoweisia cirrata* and *Orthotrichum diaphanum* were seen and also *Ulota phyllantha*, growing on an elder tree on the slope above the railway track. An interesting day resulted in a total of 59 species being recorded.

LICHENS (P. Cook)

Despite the coastal location and maritime recording intention, a combination of hydrophobia and vertigo prevented any examination of lichens on the rock cliffs. Attention to lichens was merely in passing and only five species were recorded. Exposed rocks with patchy heather near the alum workings presented occasional *Parmelia saxatilis*. *Hypogymnia physodes* was found on prostrate heather stems in damp locations, and *Cladonia chlorophaea* and *C. coniocraea* on damp peat. *Enterographa crassa* was noted on bark and, incidentally, the myxomycete *Lycogalla epidendrum* (det. Chris Yeates) on the rotting parts of a fallen tree in Mulgrave Wood.

LOWER HOLME HOUSE FARM, NEW MILL, HUDDERSFIELD (VC63)
2 July 2005

INTRODUCTION (M. L. Denton)

19 members, representing 11 affiliated societies, attended the meeting on what had begun as a dull and overcast day, but by the start of the meeting, the sky had cleared and a very warm and enjoyable day was experienced. Members met at Lower Holme House Farm where Mr Harry Ellis, the owner, spoke about his association with the land; he remained with the group throughout the day and members benefited from his knowledge of the local history and land use. Part of the site is a SSI on account of its floristic content and the botanists paid particular attention to this small area, recording a total of 88 species.

The five ponds, some of which were created within the last few years, had breeding Common Frog, Common Toad and Smooth Newt. Although a number of mammal species have been recorded in the past, few were in evidence. Members commented on the lack of rabbit activity; Mr Ellis, who had owned the land for many years, said it had always been rare, but Brown Hare was regularly recorded.

The indoor meeting held at the Crossroads Inn was attended by 14 members, at which reports were given, and votes of thanks were expressed to Brian and Jill Lucas for suggesting the meeting place and to Mr Ellis for allowing access to his land.

CONCHOLOGY (A. Norris)

29 species of land and freshwater molluscs were recorded from within the confines of Lower Holme House Farm. The very hot and dry conditions made it very difficult to locate many of the commoner species, but it was felt that the total for the farm area should exceed 35 species, and might even reach 40 under correct recording conditions.

Seven species were located in what proved to be a very dry flush within the SSI, including the freshwater snails *Potamopyrgus antipodarum, Galba truncatula* and *Lymnaea peregra*, as well as the small marsh snail *Vertigo pygmaea*. The streams produced the river limpet *Ancylus fluviatilis*, whilst the series of ponds produced a further 4 species including the freshwater orb shell *Musculium lacustre*. Most of the land species occurred in a dark damp area of woodland on the northern edge of the farm, bordering the stream; *Lauria cylindracea, Clausilia bidentata* and *Zonitoides excavatus,* an acid woodland species, were also recorded here.

COLEOPTERA (R. J. Marsh)

Several areas around the farm were investigated in the fine weather, including the environs of the farmhouse, a series of ponds constructed on the nearby wooded slopes and a grassland site. 95 species of Coleoptera were recorded for the day, all generally common and widespread. Of note was the large number of the chrysomelid *Cryptocephalus labiatus* on *Betula* and *Salix* around the top pond and in the surrounding woodland. *Cis boleti* and *C. bilamellatus* were found in large numbers in a bracket fungus near the farmhouse. Of the water beetles, only the common and widespread *Agabus bipustulatus, Hydroporus palustris* and *Gyrinus substriatus* were noted from a pond near the grassland near the SSI site. The perception that 2005 has so far been a poor beetle year was borne out by these results.

BOTANY (D. R. Grant)

The area visited is a steep valley with fields and woodland situated on the western edge of the Coal Measures Series of rocks, giving rise to mildly acidic soils. A stream flows down the valley towards New Mill and a series of ponds has been excavated in one area. An area of pasture, now a SSI, has much *Stachys officinalis*, growing with *Pimpinella saxifraga*, *Briza media* and *Rhinanthus minor*. In the shorter turf, *Ophioglossum vulgatum* can be found. In the centre of the field, a colony of *Carex caryophyllea* was discovered; this is very rare on acid soils and there is probably a marine band of fossil shells occurring in the shale. Water seeping out of the shale will be alkaline, as was further suggested by the conchologists finding two snails, *Clausilia bidentata* and *Lauria cylindracea*, both of which favour calcareous habitats. The field margins had four rose species, *Rosa canina, R. caesia, R. arvensis* and *R. sherardii*.

The woodland is fairly dense with much *Ilex aquifolium*. Brambles noted here were *Rubus dasyphyllus* and, at the eastern end, a little *R. hylocharis*. The woodland margins had *R. newbouldii* and the common *R. vestitus*. The four ponds had a mixture of native and introduced plants, with *Glyceria maxima, Iris pseudacorus* and *Juncus effusus* on their margins, whilst *Potamogeton natans* and *Elodea canadensis* were true aquatics; *Ranunculus lingua*, *Calla aquatica, Houttuynia cordata* and a white water lily were garden introductions. Two more unusual brambles growing around the second pond were *Rubus scissus* and *R. echinatoides*. Ferns were represented by four common species, together with a few plants of *Thelypteris oreopteris*. *Danthonia decumbens* and *Aira praecox* were the rarer grasses growing in the valley. Two sedges, very similar in appearance, were found, namely *Carex laevigata* in a wet runnel in the SSI and *C. binervis* on dry ground on the wooded side of the valley. In one damp, shady spot a colony of *Stellaria pallida* was discovered; superficially like *Moehringia trinervia*, but having only one main leaf vein and very tiny white petals, this is overlooked but not common.

BRYOLOGY (J. M. Blackburn)

The fields around the farm, though rich in flowering plants, were unrewarding for bryophytes, and only *Rhytidiadelphus squarrosus* was able to compete, with *Scleropodium purum* in the higher, more heathy, grassland.

The stream below the lower pond was visited early in the day and was very profitable. The rocks in the stream had *Rhynchostegium riparioides* and *Brachythecium plumosum*, with *B. rivulare* on the marshy bankside, accompanied by *Rhizomnium punctatum*. *Fissidens crassipes* was also on the rocks and large mats of *Chiloscyphus polyanthos* were frequent. *Pellia epiphylla* was abundant on the banksides and a large patch of *Conocephalum conicum* was also seen. Higher up, the shady banks were covered with *Cephalozia bicuspidata* and *Diplophyllum albicans*. Several of the sandy banks had the tiny moss *Dicranella rufescens*.

The birch and oak woodland floor had much *Atrichum undulatum, Dicranella heteromalla, Dicranum scoparium, Hypnum jutlandicum, Mnium hornum, Plagiothecium undulatum* and *Pseudotaxiphyllum elegans*. A wet gully to the west of the higher ground produced *Cratoneuron filicinum* and *Scapania undulata*. Epiphytes were not abundant, but some of bases of birch and oak trees and some tree stumps were covered with *Orthodontium lineare* and *Lepidozia reptans*. *Orthotrichum affine* and the attractive *O. pulchellum* were also seen. The main pond areas produced several additional records, such as *Calliergonella cuspidata* and *Dicranella varia*, whilst a wet shaded bank towards the top of the site had patches of *Pogonatum aloides* and *Calypogeia arguta*. Despite the acidic nature of the ground, a satisfying total of 50 species was recorded.

MALHAM (VC64) 22-24 July 2005

INTRODUCTION (A. Norris)

The residential weekend at the Malham Tarn Field Centre proved to be very successful, with 17 members and friends staying two or more nights at the centre and other non-residential members attending the event, representing 20 affiliated societies. The weather for the weekend proved to be almost ideal, warm with little or no wind. The long hot spell prior to our visit had however, affected the springs supplying water to the Field Centre and water was thus in short supply. A large number of areas normally very wet proved to be dry, or almost so, including Malham Fen.

MAMMALS AND LOWER VERTEBRATES (A. Norris)
The mammals were represented by a number of Roe Deer (seen by most of the residential members), Grey Squirrel and Rabbit; plenty of mole activity was evident, 122 moles occurring on a gibbet just south of Darnbrook Farm, and a number of bats were seen, including reported sightings of Pipistrelle and Noctule. Reptiles and amphibians were represented by frogs and two Palmate Newts which were recorded from under stones below Great Close Scar.

ORNITHOLOGY (M. L. Denton)
56 species was observed between Friday morning and Monday morning. Although a large number of the species were common and expected, some were of interest. Three species of diurnal birds of prey were seen, namely a family group of Kestrels, a number of Sparrow Hawks and a single Buzzard. Both Little and Tawny Owl were seen, the latter's presence (in Tarn House Wood) only being realised due to the alarm calls of a Blackbird. The woodlands held breeding Great Spotted Woodpecker and Nuthatch (in at least three locations).

The only waders were a handful of Lapwing and Curlew, a single Redshank (all three presumably breeding on the estate) and a single Whimbrel which flew west on Saturday. As a breeding species, the Whimbrel is generally boreal, although up to 250 pairs breed in northern Scotland; south of the breeding area, they are recorded only as a spring and autumn migrant in variable numbers.

The Tarn held at least 20 Great Crested Grebe, 10 Little Grebe, 100 Coot, 200 Tufted Duck and eight Pochard. Three broods (4 + 4 + 9) of Tufted Duck were present on the Tarn.

The most pleasing sight was the four Yellow Wagtails seen a few miles from the Tarn on Friday. This species suffered a national decline in breeding numbers of 67% between 1977 and 2002 (BTO data), mostly attributed to extensive drainage of wet grassland in lowland Britain during the 1950s and 1970s.

CONCHOLOGY (A. Norris)
The number of molluscs now recorded for the Malham Estate and its close environs is 91 species, plus three species known only as fossils recorded from marl deposits bringing the combined total to 94. Over the weekend meeting, 65 species were recorded, 19 of the 27 freshwater molluscs and 46 of the 64 land species known from the area. Highlights included the rare freshwater gastropod, *Gyraulus laevis*, and two local speciality species, the semi-subterranean *Vitrea subrimata* and the slug *Deroceras agreste*. *Azeca goodalli* and *Helicigona lapicida* were both recorded from Janet's Foss, the latter being the first record for this species from there, although it has been recorded in the past from Gordale Scar. *Pisidium amnicum*, last recorded for the Malham area in 1955, was refound by David Lindley in the stream crossing Great Close Mire within SD9066. The most important record was, without any doubt, the tiny marsh snail *Vertigo genesii*, an internationally rare Red Data Book species, listed as Vulnerable; the only other known English sites are in upper Teesdale.

ENTOMOLOGY – LEPIDOPTERA (T. M. Whitaker & J. A. Newbould)
About 80 species of moth were recorded during the three days of the meeting, and a further four nights of trapping undertaken by TMW yielded another 15 species. JAN, who returned to operate three traps on two nights (27-28 August), added a further 12 species. Generally, these were recorded after dusk using a mixture of blended, actinic and mercury vapour lights. In addition, 12 species of butterfly were recorded during the weekend, with no new species added in August. The 119 species of Lepidoptera recorded during 2005 compares

favourably with the 150 species recorded during the mid-1950s series of field meetings; however, in 2005, the recorders did not spend time during the day beating vegetation or looking for evidence of leaf-miners.

Moth traps were operated at nine sites. The grass bank to the west of Tarn House was trapped on seven nights, an actinic Heath trap was operated on Tarn House meadow, and a modified actinic Heath trap was operated in Tarn House Wood for six nights. Traps were operated at five other sites on one or two nights, making a total of 26 trap nights. The following weather reports were posted in Tarn House at 9.00 a.m. on subsequent days of the meeting:

2005	22 July	23 July	24 July
Air Temp. (Dry bulb) (°C)	13.5	11.8	11.4
Air Temp. (Wet bulb) (°C)	12.9	11.2	10.2
Maximum Temp. (°C)	15.9	18.4	16.9
Minimum Temp. (°C)	10.3	8.1	8.5
Minimum Grass Temp. (°C)	12.1	8.4	10.5
Rain (mm)	0.35	0.15	Trace
Hours of sunshine (hours)	2.1	3.4	1.48

The weather during the August weekend was poor with strong winds and heavy rain soaking the equipment on the evening of 27 August.

Tarn House Plantation, located to the north of the Field Centre (SD893673), is principally *Acer pseudoplatanoides* and *Fagus sylvatica*, with *Fraxinus excelsior* and a little *Larix decidua*. *Mercuralis perennis* dominated the ground flora, equating to NVC W9 woodland. Roe Deer were seen most days resulting in little to no understorey. *Rubus ideaus*, the occasional *Viburnum opulus*, small *Ilex aquifolia* and *Ulmus procera* were the principal components. A mercury vapour bulb was operated with a sheet for two hours on 22 July, whilst an actinic light was run all night on from 24 to 28 July.

A blended bulb 160W Robinson trap was operated on 22 and 23 July in a meadow heavily grazed by sheep to the east of High Stables (SD892674) surrounded by drystone walls; the grass was short and few herbs had survived the grazing pressure. However, the trap was located just 100m north of Tarn House Plantation, whilst to the east herb-rich limestone pasture was found rising to limestone pavement.

A 125W mercury vapour Robinson trap was operated on 22 and 23 July in a meadow to the north of Keeper's Cottage (SD888673). The meadow contained a limestone outcrop leading down to calcareous grassland with a southeast-facing slope of NVC types CG9 *Sesleria albicans-Galium sterneri* and CG10 *Festuca ovina-Agrostis capillaris-Thymus praecox*. Nearer Keeper's Cottage, the grassland is mesotrophic and fits the NVC type MG9 *Holcus lanatus-Deschampsia cespitosa*. Nearby is a line of Sycamore and Ash and in the valley bottom, there is a large bed of *Urtica dioica* associated with *Mercurialis perennis* and *Geranium robertianum*.

A single actinic trap was operated on the board-walk of Tarn Fen (SD883671) on 22 July. The trap was operated in one of the more species diverse parts of the fen, where Judith Allinson drew attention to the increased size of the Reed-bed *Phragmites australis* and to the rare *Carex appropinquata*, whose stronghold is the fens of East Anglia, but here is found at 380 m together with *C. lepidocarpa* and *Calamagrostis stricta*. This Red-Data Book grass is now only known in eleven 10 km squares in Britain and is a plant of neutral marshes. Other specialities included a wet pool with *Menanthes trifoliata*, *Parnassia palustris* and *Crepis paludosa*.

A single actinic trap was operated on two evenings on the eastern end of the board-walk of Tarn Fen (SD888673) on 27 and 28 August. Here, *Betula pubescens* is associated with willow carr before opening out into fenland with both acidic and calcareous flushes. Near the trees were large areas of both *Polytrichium* and *Sphagnum* species.

On a grass bank to the west of Tarn House (SD 894672), a blended bulb Robinson Trap was operated on the nights of 22 to 24 July and a 125W M/V Robinson trap from 25 to 28 July. The small grass bank lies between the house and an area of shrubs including Hawthorn and Beech. The small list of herbs included *Cruciata laevipes*, *Lotus corniculatus* and *Centaurea nigra*.

An actinic trap was operated from 23 to 28 July at Tarn House Meadow (Weather Station) (SD897671), an exposed, rich calcareous grassland area on the northern shore of the Tarn.. JAN also operated a Robinson trap here on 28 August.

An actinic trap was operated on Ha Mire (SD899666) on 23 July next to the track in a cool easterly breeze. This calcareous mire is adjacent to improved grassland typical NVC type MG6 – an improved ley. Four species of sedge were recorded including *Carex viridula* sub. *brachyrrhyncha*, as well as *Narthecium ossifragum*, *Erica tetralix*, *Pedicularis palustris*, *Pinguicula vulgaris* and *Sagina nodosa*.

A similar species list was recorded from Great Close Mire (west) (SD904662), a site similar to Ha Mire, but with an area of open water.

Without doubt, the largest lists of moths were obtained from the lights operated in the meadow to the east of the High Stables and at the rear of Keeper's Cottage. On the morning of 23 July, the catch was the largest in terms of number of insects in the trap, with 177 Dark Arches in the Stables Trap and 110 in the Keeper's Cottage Trap since the light drizzle from low cloud made ideal conditions for moth trapping. Actinic lights operate on a different wavelength, rarely catching large numbers of moths. Interestingly, Northern Rustic *Standfussiana lucernea,* a moth with an essentially western coastal distribution, was only caught in the actinic traps. Two micro-moths recorded were interesting, namely a single *Crambus pratella*, the first Yorkshire record since 1882, but since no voucher specimen has been preserved for the 2005 sighting, it cannot be accepted as a record, and *Dipleurina lacustrata* (det. H.E.B.) was taken in the woods in both July and August.

Amongst the macro-moths, Gold Spot *Plusia festucae* and Lempke's Gold Spot *P. putnami* reflect the nearby fen vegetation. Five specimens of Square-spotted Clay *Xestia rhomboidea* were recorded; this species is a UK BAP priority species, but in the newly proposed BAP priority list, in consultation with JNCC, it is recommended for downgrading. From the August list, Crinan Ear *Amphipoea crinanensis* (det. H.E.B.) was very satisfying, being only the third VC64 record. It is a species of marshy stream-sides and is attracted to the flowers of scabious; it has a northern and western distribution. A total of five individuals were observed at Tarn Fen and from the west lawn of the Field Centre.

The value of intensive trapping was demonstrated from 32 possible trapping nights:

No of occasions	Frequency
Caught once	28
Caught 2-5 times	51
Caught 6-10 times	17
Caught 11-15 times	5
Caught 16 times or more	8

COLEOPTERA (M. L. Denton)

The time of year, coupled with the very dry conditions, made the finding of beetles extremely difficult and the coleopterists present struggled to achieve the total of 140 species. The copious amounts of sheep and cow dung found in the areas of pasture produced a suite of Aleocharinae (rove beetles) and Scarabaeidae (dung beetles); most of these were common and to be expected, but a number of examples of the locally distributed rove beetle *Badura macrocera* were present. The newly acquired land at Street Gate produced another locally distributed rove beetle *Acidota crenata*.

Tarn Moss was extremely dry, so much so that it was possible to walk across it with little difficulty. It had been hoped that the RDB3 chrysomelid (leaf beetle), *Hydrothassa hannoveriana,* would have been in evidence, but since its food plant, *Caltha palustris,* was not located, no beetles were found. Two locally distributed rove beetles, *Tachyporus tersus* and *Philonthus nigrita,* were sieved from moss. The presence here of *Oedemera lurida* was somewhat surprising; this species has been spreading northwards in recent years and there are now 60 Yorkshire records, most of which stem from lowland localities.

Searching for saproxylic species in Tarn House Wood produced a varied selection of species, including the locally distributed rove beetle *Quedius plagiatus* and the scolitid *Dryocoetes autographus*. Both species are associated with conifers, the former being fairly common in parts of Scotland but much rarer in northern England, whilst the latter is also native to Scotland but rather local in northern England. In the light traps employed by the lepidopterists were single examples of the locally distributed chafer *Serica brunnea* and the Nationally Scarce rove beetle *Deleaster dichrous*.

Andy Godfrey, by suction sampling both the grassland area at Highfolds and the limestone pavement at Highfolds Scar, revealed the presence of the Nationally Scarce weevil *Brachysomus echinatus*. This species is found at the roots of grass tussocks and has been recorded in Yorkshire on 29 occasions, but only two of these are post-1980. The locally distributed ground beetle *Notiophilus germinyi* and the Orchid Beetle *Dascillus cervinus* were also present on the limestone pavement, the larvae of the latter feeding on plant roots, including orchids.

A full species list, along with localities and annotations, has been housed with the Malham Field Study Council Centre.

HYMENOPTERA

The following insects were taken whilst moth trapping and determined by Bill Ely: the sawfly *Tenthredo acerima* was common and the ichneumons *Enicospilus inflexus* (fifth Yorkshire record, with one from Thorne Moors in 1837 and the remainder from VC64) and *Ophion ptendis*, described as common but this was only the fifth VC64 record; both were new to the 10km square.

FLOWERING PLANTS (P. P. Abbott)

The Malham Tarn area is extremely species-rich botanically; the Moss and the Fen are well documented and were not visited on this occasion. The botanists spent Saturday morning on Ha Mire and found the vegetation a mosaic of calcifuge and calcicole plants due to glacial drift overlying the limestone. There were drifts of *Narthecium ossifragum* and even a few tufts of *Calluna vulgaris* among the marsh orchids *Dactylorhiza fuchsii* and *D. purpurella*. *Primula farinosa* and *Pinguicula vulgaris* were mostly over, *Parnassia palustris* was still in bud, but *Sagina nodosa* was at its best and frequent. It was reassuring to see strands of *Potamogeton lucens* strewn along the shore of the Tarn and to know that this largely southern species still survives in its only site in VC64.

After lunch a move was made eastwards through the pastures to the flushed areas west of Gordale Beck, with a few *Coeloglossum viride* found on the way and later the nationally rare *Alchemilla glaucescens* in its British stronghold. Many of the plants seen on Ha Mire were here, but most striking were the frequent groups of *Selaginella selaginoides*, a northern species near its southern limit in England. The area deserved more time and was therefore returned to on Sunday morning, when several more species were added to the list, the most pleasing being several plants of the nationally scarce *Equisetum variegatum* in the middle of a rivulet. In the outflow stream from the Tarn, there were three further pondweeds *P. crispus, P. berchtoldii* and the hybrid *P.* x *nitens* = *P. gramineus* x *P. perfoliatus*, as well as *Myriophyllum spicatum*. In the adjacent flood zone was a patch of *Blysmus compressus*.

BOTANICAL SURVEYS (J. A. Newbould)
Just one area of limestone pavement (High Folds, SD89466761), located NE of the stables, was surveyed during the visit. Mr A. Godfrey commented particularly on the number of invertebrate species collected which he would normally associate with marsh conditions. This was not surprising, since the National Vegetation Survey methodology is hard to apply in limestone pavement surveys. Amongst the NVC types associated with the shallower grikes is the M27 *Filipendula-Angelica* tall herb fen and in the deeper grikes, especially to the west, there was a field layer of the W9 *Fraxinus-Sorbus-Mercurialis* woodland and the OV40 *Asplenium viride-Cystoperis fragilis* community. Herbs present in the grikes of a fenced-off area, c. 12 x 8 m, containing 60% bare rock, included *Oxalis acetosella* and *Mercurialis perennis* and the ferns *Asplenium ruta-muraria* and *A. trichomanes* forming an NVC OV39 community. Away from this area, much of the grassland community formed an NVC CG8 *Sesleria albicans-Scabiosa columbaria* grassland with *Lotus corniculatus*, *Campanula rotundifolia,* 14 spikes of *Listeria ovata* and a marsh orchid *Dactylorhiza* species. Hollows were characterised by *Deschampsia cespitosa*, *Cirsium palustre,* one large patch of *Agrostis gigantea* and *A. canina*. *Galium boreale* and *Dryopteris submontana* were amongst the specialist plants found, and *Galium sterneri* and *Potentilla erecta* were rare here. Ellenburg Indicator Values for the plants found here show how complex the micro-habitats are.

Highfold Scar (SD894674), located to the NE of Tarn House, is above the tree-line protected from rabbits. *Epipactis atrorubens*, which has not been seen since 1999, was searched for without success; it generally prefers a well-lit habitat with partial shade, mostly on skeletal soils over well-drained rock. The grass within the compound was c. 40 cm and the encroaching woodland trees cast shade. In addition, leaf litter could raise nitrogen levels to an unacceptable level. *Helianthemum nummularium* was only found in the crags below High Fold Scar. A number of limestone indicator plants were observed, including *Draba incana*, *Galium sterneri*, *Carlina vulgaris*, *Scabiosa columbaria* and *Sesleria caerulea*. The lower slopes to the east had become dominated by *Arrhenatherum elatius*, and Sycamore seedlings were common.

On the south shore of Malham Water (Tarn Foot, SD893661), the west bank of the outflow from the Tarn was surveyed. The shore is composed of water-worn stones leading to a grass mound c. 1 m higher than the land to the south. Here the grassland resembles a typical MG10 *Holcus lanatus-Juncus effusus* meadow, including wet meadow species such as *Caltha palustris*, *Pedicularis palustris* and *Mentha aquatica*. Dry ground had neutral grassland herbs (MG5), including *Rhinanthus minor*, *Potentilla erecta*, *Campanula rotundifolia* and *Lotus corniculatus*, and the wetter areas supported plants associated with mire communities, such as *Sagina nodosa*. The field 200 m to the west is an M27 *Filipendula ulmaria-Angelica sylvestris* mire community; herbs observed included *Lychnis flos-cuculi, Campanula rotundifolia*, *Succisa pratensis* and *Myosotis scorpioides*. To the west, the area becomes dominated by *Holcus lanata*.

The two vegetation plots recorded at Great Close Pool poorly reflected the species diversity recorded by E. J. Hewens *et al*. in their *Nature Conservation Evaluation Malham Tarn Estate* in 2001. At the western end (SD904663), adjacent to a public footpath, only a few species common to the area were recorded, including *Rorippa nasturtium-aquaticum* and *Pinguicula vulgaris*. Great Close Pool and Mire flows east running under a wall at SD909663, forming a ford across a track. *Chara vulgaris* var. *longibracteata* (det. A. Henderson) formed extensive colonies in pools with a pH of 9.6. At the eastern end, only a small area was surveyed, the principal items of interest being the hybrid sedge *Carex* x *fulva* (det. Judith Allinson) and *Alopecurus geniculatus*. Further analysis of relevés of open habitats at Great Close Mire (SD 909663 – 905656) will probably characterise a new sub-community of the M25 *Molinia caerulea-Potentilla erecta* mire (see *YNU Bulletin* 43: 62-63); included here were *Viola lutea, Sanguisorba officinalis*, *Nardus stricta*, *Dactylorhiza maculata*, *Sagina nodosa* and *Succisa pratensis*.

A wet flush to the east of Street Gate (SD90911.65702) supported a MG10b *Briza* *media-Primula farinosa* subcommunity of a *Carex dioica-Pinguicula vulgaris* mire. Following the very dry summer, the little water present in this flush had an unusually high pH reading of 10.8. Amongst the sedges, was *Eriophorum angustifolium*, a rhizomatous perennial herb of open sites, growing in base-rich wet mires and calcareous flushes in the uplands, which requires high light and water levels and thrives in a pH of 7; also found here were *Selaginella selaginoides, Equisetum variegatum, Chara longibracteata, Primula farinosa, Potentilla erecta, Lotus corniculatus* and *Pinguicula vulgaris*.

LICHENOLOGY (A. Henderson)
Most attention was directed towards a survey of the walls running from Thoragill down to Cowside Beck, which has recently been the subject of an intensive survey conducted under the auspices of the Field Studies Council. The marsh-side wall, a mixture of siliceous and calcareous stone typical of the area, supported 58 species, most interestingly *Diploschistes scruposus, D. muscorum, Micarea lignaria, Protoblastenia calva, P. incrustans, Petractis clausa, Rhizocarpon concentricum, R. umbilicatum* and *Solenospora candicans*, and *Strangospora pinicola* on lignum. On the second day, examination of the roadside walls from Thoragill down to Malham added another 26 species, notably *Dermatocarpon miniatum* var. *complicatum, Gyalecta jenensis, Solorina saccata* and *Toninia sedifolia*. Low on the wall of Thoragill Bridge *Belonia nidarosiensis* was in fruit with ample pink-mauve pyrenocarps. The presence of both siliceous and calcareous substrata makes the walls of this area a most fascinating exploration for any lichenologist. In all, 93 taxa were listed during the two days of the meeting.

MARSKE (VC65) 6 August 2005
INTRODUCTION (D. Millward)
On a fine dry day, 13 members representing 13 societies gathered by the main bridge in Marske to walk through the woods via the tiny woodland settlement of Clints to Orgate Farm. This remote farm in now only used for temporary grazing, and indeed some parts appeared not to be grazed at all. The beck was surprisingly full in spite of the drought, and one member was rewarded with a kingfisher; everyone saw the three buzzards working the area all day. The drought had, however, reduced much of the vegetation to a rather unrewarding brown, and even the slugs were reported to be dry and wrinkled. One highlight of the day was a slow-worm, found under a stone by the side of the road, close to Clints.

In the village, members marvelled at the quality of the superb Victorian stable block, complete with clock tower, which housed the village hall. Marske is fortunate in owning the whole site but, climbing the stone steps in the entrance arch to access the rather run-down upper room, one could appreciate why a more user-friendly facility was sought. We are grateful to Mrs Rutter, the owner of Orgate Farm, for allowing us to wander wherever the whim took us, and to Mr Villiers, owner of the woodland and presumably also owner of the refound feral guinea fowl.

ORNITHOLOGY (J. E. Dale)
Within minutes of our reaching the parking place in Marske village, the call of a Curlew flying east over Marske Beck valley drew attention to a Common Buzzard flying west pursued by three Carrion Crows. A Song Thrush singing, a Nuthatch calling from the shrubbery near the entrance to Marske Hall; several House Martins feeding overhead and a party of Chaffinches were all recorded before we left the village to follow the beck northwards.

Near Pillmire Bridge a Bullfinch was calling, and two others were heard later further up the valley. Near Clints, Pheasant and Blackbird were seen, and a few Swallows were flying overhead. Kestrels were seen by various members of the party over Clints Wood and Limekiln Wood, a total of at least four being in the area. At the northern end of a clearing in Clints Wood we disturbed what we thought might have been a family group of

Sparrowhawks; from the calls and sightings at least three birds were present, only one of which (a female) was seen clearly as it flew into woodland on our right just as another, probably a male, flew to the left. None were relocated. Jackdaws in small parties of four to eight birds were seen on several occasions over Clints Wood. A juvenile Stonechat was seen briefly about 200 yards from Orgate Farm. Several species were added to the list near Orgate Bridge, namely Willow Warbler, Wren, Jay, Magpie, Meadow Pipit, Robin, Great Tit and about ten more Chaffinches.

Three Common Buzzards, seen by most members of the party during the early afternoon, circled over the valley south of Orgate Farm, eventually dropping into Clints Wood. A lesser Black-backed Gull flew south down the valley, a Wheatear was noted by our botanists; and both Green Woodpecker and Great Spotted Woodpecker were heard calling. Additional species seen as we returned down the west side of the valley to Marske village included Blue Tit, Coal Tit and Dunnock. Shortly after crossing Pilmire Bridge, two Grey Wagtails flew into the beck. A female Mallard with young added another species to the list, but for some members the sighting of the day was probably that of a Kingfisher sitting on a rock in Marske Beck immediately below the bridge in the village.

A modest total of 33 species, but nonetheless an enjoyable excursion, particularly for those of us making our first visit to this delightful area.

CONCHOLOGY (A. Norris)

27 species of mollusc were found in four different 1 km squares surrounding the village of Marske. The prevailing hot and dry weather conditions made it very difficult to locate slugs and only eight individuals of four species were seen. The highlights of the day proved to be *Balea perversa* which was found in numbers on the limestone walls and a single specimen of *Ashfordia granulata* which was found close to the stream.

COLEOPTERA (M. L. Denton)

The most productive method of collecting in the local terrain was searching for saproxylic species and inspection of the copious amounts of cow dung. The dung only produced the expected species, namely *Sphaeridium lunatum, Dimetrota atramentaria* and *Aleochara lanuginosa*, and a number of yet unidentified species of *Philonthus* and *Cercyon*. Searching the small amounts of fungus on the dead trees was more productive and revealed the locally distributed *Dacne bipustulata, Pseudotriphyllus suturalis* and *Mycetophagus quadripustulatus*. Of the rove beetles present, *Dimetrota ischnocera* and *Atheta nigricornis* proved to be new to VC65. The finding of a single *Cis punctulatus* in a fungus on a pine tree added another species to the Yorkshire list; although its national status is given as 'local', it is mainly northern in distribution with only a few southern records.

A large specimen (c. 25mm long) of the orange and black burying beetle *Nicrophorus investigator* was located under a freshly dead Rabbit, and a long dead Rook produced the common rove beetle *Gabrius piliger* and the locally distributed leiodid *Catops coracinus*. Although most *Nicrophorus* species are common, they are of interest because of the way they bury carrion, and feed their offspring. Upon finding a corpse, they excavate the ground underneath by pushing it to one side. In this way a dead mammal or bird slowly sinks into the ground until it is completely covered. Egg-laying then takes place and the resulting larvae are fed by the female; the male, although capable of participating, is usually driven away by the female. Even though the larvae begin to feed on their own after a few hours, they are again dependant on the female for a brief period following their first and second moults. Parental care in the insect world is extremely unusual, being limited to a small number of species.

Good numbers of *Chrysomela aenea*, a metallic green leaf beetle, were found on Alder by the beck; it is found widely in Yorkshire, but restricted to areas where this food plant grows.

In total, only 44 species were located; a full, annotated list of these has been lodged with the owner, Mrs Rutter.

FLOWERING PLANTS (D. Millward)

While members gathered at Marske Bridge, recording commenced on the bridge itself which supported a variety of tree species including Yew and Norway Maple. The woodland beside the stream held fine veteran trees, mostly aliens, but noteworthy for their size. A few of the spring flowers were still evident and it is clearly an attractive spot earlier in the year.

The scrubby open pasture on the way to Clints was unimproved and *Stachys officinalis* and *Sanguisorba major* were flowering here along with the pink form of *Rubus echinatoides*, an unusual bramble surprisingly quite frequent in the area given the calcareous soil which is not conducive to the *R. fruticosa* group. Only two other Rubi were recorded *R. dasyphyllus* and *R. newbouldii*. Walls in Clints supported *Mycelis muralis*, *Cymbalaria muralis* and *Asplenium trichomanes*, and in the woodland beyond the settlement *Campanula latifolia* and *Scrophularia nodosa* were just opening.

Once out in the open field, the steep land below the scar had a typical calcicolous suite of species including abundant *Origanum vulgare*, *Helianthemum nummularium*, *Linum catharcticum* and *Carduus nutans*. Some of the limestone here is atypically dark brown and members would have benefited from some geological information. The limestone scar itself is the more normal pale grey, and being south-facing is not well colonized. *Taxus baccata* grew in the scree talus and *Scabiosa columbaria* was occasional on the ledges.

Cutting down to the lead mining area, no species associated with lead were recorded but *Cystopteris fragilis* was found at the base of the spoil heap and *Phyllitis scolopendrium* grew in the adit. A wet area beside the stream supported *Carex disticha* and *Crepis paludosa*, and *Carpinus betulus* grew in a narrow belt of woodland.

LICHENOLOGY (A. Henderson)

On the stone monument in the village centre 22 species were noted, including *Caloplaca crenulatella* which, since its recognition some years ago as a species distinct from *C. holocarpa* (also present), is proving to be of frequent occurrence. The large *Aesculus hippocastanum* by the memorial, worth the pose of any village blacksmith, was productive of delightfully pinhead-fruiting *Calicium viride*, plentiful *Physconia grisea* and several thalli of *Parmelia tiliacea*. The only fruticose species was *Evernia prunastri* on a background community dominated by *Amandinea punctata, Lecanora expallens, Pertusaria pertusa* and *Phlyctis argena*. On the bridge over Marske Beck and adjacent walls 38 species were recorded, including well developed *Agonimia tristicula* and three *Collema* species in deep shade.

Further afield, Downholme Bridge (SE44/113991) had pavement-like coping stones c. 2 foot square, upon which were some extremely large thalli of *Aspicilia calcarea* and *Ochrolechia parella*, no doubt formed in most instances by conjunction of growing thalli and on occasion covering almost the entire surface of a capstone. Except for very little *Cladonia fimbriata*, this bridge capstone community was entirely crustose; among its more notable species were *Pertusaria lactea* and *Porpidia cinereoatra*. 74 species (4 fruticose, 16 foliose and 54 crustose) were recorded during the day.

BOOK REVIEWS

Shetland Lichens by **Kery Dalby** and **Claire Dalby**. Pp. vi + 120, incl. numerous b/w & colour illus. Shetland Amenity Trust. 2005. £15.00 hardback (incl. postage) from: Shetland Amenity Trust, Garthspool, Lerwick, Shetland ZE1 0NY.

The authors of this delightfully produced volume have combined the results of their extensive survey of these remote islands over 25 years (52pp) with an informative introduction to lichenology (61pp). The whole is generously complemented by excellent photographs, as well as line drawings and paintings by Claire Dalby, and supplemented by a useful reference list (which unfortunately omits Seaward & Hawksworth, the major source for tracking down published British records). This work will be of great value not only to naturalists visiting the Shetlands, but also to those interested in the ecology and biogeography of British lichens.

British Fungus Flora. Agarics and Boleti. 9 Russulaceae: *Lactarius* by **R. W. Rayner,** assisted by **R. Watling** and **R. Turnbull.** Pp.iii + 203, incl. numerous line drawings. Royal Botanic Garden, Edinburgh. 2005. £12.50 paperback.

This latest part to this invaluable guide to the British fungus flora maintains the high standards of former parts, each species taxonomically treated in considerable detail, complemented by a key to species, line drawings of habit, cystidia, spores, cap sections, etc. and supported by important textual apparatus. Obviously, a must for mycologists.

An Illustrated Introduction to the Larger Fungi of North Cyprus by **D. E. Viney**. Pp. 302, incl. numerous colour plates & line drawings. Richmond Publishing. 2005. £14.99 paperback; £17.99 incl. postage from: Richmond Publishing Co. Ltd., P.O. Box 963, Slough SL2 3RS.

This guide to over 200 species of fungi to be found in northern Cyprus with be of value not only to local naturalists, but also to those taking holidays and field trips to the eastern Mediterranean. Each species entry is supported by useful photographs and line drawings. Helpful introductory matter includes a key to genera and a map to the study area (with a gazetteer of Turkish and Greek place name equivalents).

Plant Atlas of Mid-west Yorkshire by **P.P. Abbott**. Pp. 254, with colour plates, line drawings, geological, soil and plant distribution maps. Yorkshire Naturalists' Union. 2005. £21.00 hardback.

Vice-county 64 (Mid-west Yorkshire) is a botanically very rich and diverse area and, until the publication of the present volume, no detailed account of its flora had appeared since F.A. Lees' *Flora of West Yorkshire* published in 1888, of which this area constituted only a part. This keenly felt omission has at last been superbly remedied by Phyl Abbott's comprehensive and well-presented book, which gives caption details of 1794 species, sub-species, hybrids and varieties of different plants, of which 992 have distribution maps at a tetrad scale. The most common and widespread species is common nettle (*Urtica dioica*), which occurs in 909 of the 949 tetrads in VC 64; the rarest native species is, predictably, the famous lady's slipper orchid (*Cypripedium calceolus*), in its sole location in Great Britain. The critical genera *Rubus, Hieracium, Taraxacum, Alchemilla* and *Euphrasia* are well represented with, collectively, numerous 'microspecies'; these are all fully covered and care has been taken by the respective referees or local experts to ensure correct determination. Some of the scarcer or more notable species, such as thistle broomrape (*Orobanche reticulata*), have more detailed caption descriptions, including information on habitat requirements, population size and seed dispersal.

In addition to the main section dealing with plant species accounts and distribution maps, the book contains excellent and detailed descriptions of the geology and soils of the region, written by specialist guest authors. I particularly liked Phyl's own Botanical Tour of Mid-west Yorkshire, which cleverly combines a short piece on climate and topography with a very readable peregrination around the vice-county, picking out and highlighting the major botanical 'hot-spots', habitats and species in a variety of geographical areas from the Vale of York in the east to the Ingleborough massif and the Forest of Bowland in the west. The colour photographs are stunning, cleverly depicting a mix of habitat shots and plant portraits (including small sedges with pin-sharp clarity) from the various sub-regions of the vice-county. The book contains a comprehensive bibliography, a full index with Latin and English names and a list of recorders, referees and other important contributors who are all acknowledged in the Introduction.

If I have to criticise the book (and there is precious little to find fault with) one minor gripe would be that there is no analysis of the various vegetation types using the National Vegetation Classification (NVC) system. The NVC is now a very useful analytical tool, and since this book will be of much assistance to professional ecologists and land managers, as well as to the amateur botanist and, indeed, the general public *per se*, I would have thought that some inclusion of NVC habitat categorisation would be useful in terms of its application in environmental management.

This publication has been eagerly awaited for some time. The wait has been fully worthwhile – the book has filled a huge gap in our knowledge of one of the prime botanical regions of the British Isles, and has drawn together the various strands, from the underlying geology and soils, to the habitats and the plants themselves, into a unified whole. The author is to be congratulated on its production; it contains a wealth of information, and I recommend it to all who are interested in the study and exploration of a very special region.

GTDW

CONTRIBUTORS

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