HABITAT CREATION FAVOURING INVERTEBRATES: AN EXAMPLE FROM ALLERTON BYWATER, URBAN WEST YORKSHIRE

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Abstract. The terrestrial and aquatic invertebrates on an old colliery site at Allerton Bywater, West Yorkshire were surveyed in 1998, 1999 and 2001. A total of 19 nationally scarce species were recorded as well as a considerable number of other species at the edge of their range. Some of the mainly spoil site was covered in clayey soil and this provided a number of different invertebrate habitats delineated by substrate type and water and the differences in vegetation. The results of the surveys indicate that post-industrial sites with considerable amounts of bare ground are likely to have considerable invertebrate interest.

INTRODUCTION

Post-industrial land and urban sites have been known to be interesting as invertebrate habitats for some time (Davis & Jones, 1978; Hutson & Luff, 1978; Davis, 1982). There have been investigations into a number of invertebrate groups in urban areas; ground beetles (Kegel, 1990), butterflies (Hardy & Dennis, 1999), hoverflies (Wright, 1998), grasshoppers and crickets (Nagy, 1997), leafhoppers (Chudzicka, 1987) and bees, wasps and ants (Jacob-Remacle, 1984; Richter *et al.*, 1986). Some invertebrate groups have been studied on urban demolition and derelict sites, especially leafhoppers and bugs (Kirby, 1984; Sanderson, 1992; Schmitz, 1996) and beetles (Lott & Daws, 1995), whilst Wahlbrink & Zucchi (1994) concentrated on ground beetles on an urban railway embankment. Spoil heaps and reclaimed land from large-scale extractive industry have also been surveyed for ground beetles (Durka *et al.*, 1997), rove beetles (Good, 1999), butterflies (Holl, 1996), spiders (Krajca & Krumpalova, 1998) and for a number of invertebrate groups (Spalding & Haes, 1995).

The invertebrate fauna of urban water bodies, especially dragonflies (Kury & Durrer, 1991; Oly, 1996; Samways & Steyler, 1996) have also been investigated. Wichtowska & Sobczak (1994) surveyed urban ponds for water beetles whilst the effects of man and industry on the distribution of water beetles and bugs has been studied (Eyre, 1985; Carr, 1986; Williams, 1993).

An area of post-industrial land, in this case a colliery, at Allerton Bywater, West Yorkshire, was converted into an area for nature conservation and for use in education in 1998 by Leeds Metropolitan Borough Council. This paper reports on the results of invertebrate survey work, including noting interesting records and assessing habitats for different invertebrate groups.

SURVEY AREA

The old Allerton Bywater colliery, in the valley of the River Aire, was finally cleared in the late 1990s and some of the area was set aside for nature conservation and education purposes in 1998. The area is in a rectangle between the national

grid references SE420272 to SE420275, south to north, and SE420272 to SE425272, west to east, approximately 500 × 300 m. In the west of the area there is a triangular patch of marshy grassland, which appeared to have developed since the demise of the colliery. The northern edge of the area is a strip approximately 100 m wide, which has been cleared of buildings, capped with a heavy clay soil and seeded with a grass/clover mix. Most of the area, about 400 × 200 m, is where the old coal storage area had been and where the substrate is a mixture of colliery spoil and small coal. About a half of this area was capped with a heavy clay soil but the rest is mainly open spoil. These clay and spoil areas have been left to develop naturally. A number of ponds was constructed in 1998, mostly on the spoil.

Sampling

Sampling for both terrestrial and aquatic invertebrates was carried out in three 6-week periods; in autumn 1998 and 2001 and in late spring–early summer 1999. Terrestrial site sampling, for Coleoptera, Hemiptera, Orthoptera and Araneae, was carried out using ten pitfall traps (8.5 cm diameter, 10 cm deep, part-filled with ethylene glycol), set in a line, 1 m apart, at 10 different sites. Collections from the traps were after three weeks, with two collections per 6-week period. At the same time as the pitfall traps were installed, suction sampling was carried out around the pitfall sites in 1998. A modified leaf-blower, now standard equipment for suction sampling (Stewart & Wright, 1995), was used for one minute at each site. Sweep net samples, in the same areas as the suction sampling, were taken in 1999 and 2001, with two samples per year.

The pond sampling was carried out using a D-shaped net (1 mm mesh), with two samples taken in 1998 and 1999 and three in 2001. The rationale was to generate a representative sample from each site.

Sites

Ten terrestrial and eight pond sites were sampled and these are shown on a site map (Fig. 1). The terrestrial sites were:

Site 1. An area of sparse grass cover on wet spoil, next to pond 1. There was a slight increase in vegetation cover in the three years but it was still mostly bare.

Site 2. By Pond 2, an area of damp, densely vegetation, mainly grasses with some moss, on clay.

Site 3. The base of a south-facing spoil bank with a little ruderal vegetation, but mainly bare.

Site 4. A site with fairly dense grassy vegetation, on clay.

Site 5. A west-facing spoil bank with about a 5% covering of ruderal vegetation.

Site 6. An area of short, dense, mainly grass vegetation on clay, mowed in the autumn.

Sites 7 and 8. Two sites in the northern strip of heavy clay capping with dense, unmowed vegetation, mainly grass and clover.

Sites 9 and 10. In the marshy area with tussocks of *Juncus* and grass and patches of *Ranunculus*.

The eight pond sites were:

Pond A. Approximately 30 m by 20 m and 50 cm deep when full, this pond had a mainly spoil substrate with considerable amounts of *Carex* tussocks, some *Typha* and a little grass in the edge.

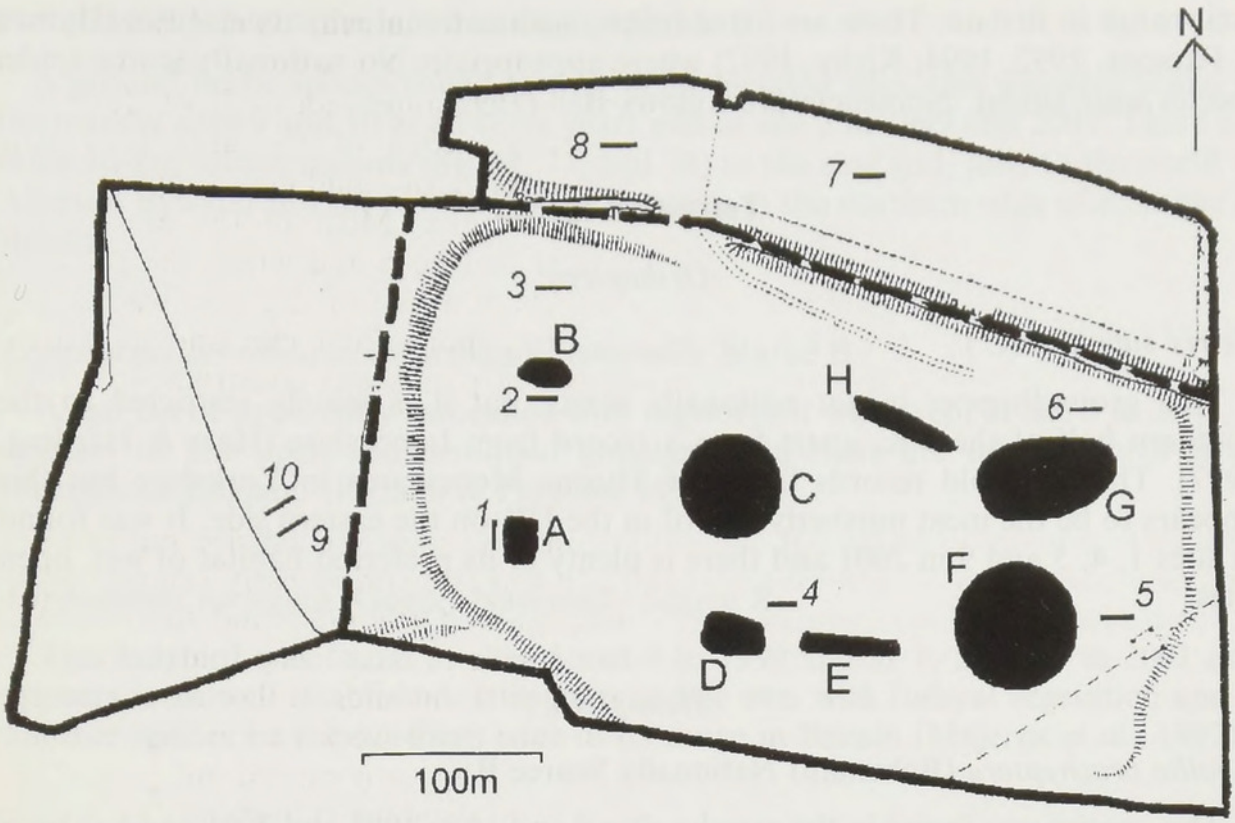

Fig. 1. Map showing the distribution of pitfall trap lines (1–10) and ponds (A–H) on the survey area at Allerton Bywater, West Yorkshire.

Pond B. A round pond, about 25 m in diameter when full, with a clay substrate and considerable amounts of *Carex*, *Glyceria*, *Potamogeton* and moss in the edge, giving high habitat diversity for invertebrates.

Pond C. A round pond, excavated out of spoil, about 30 m in diameter when full. There was a small patch of *Carex* in 1998 and 1999 and this had increased considerably in size by 2001.

Pond D. This was a rectangular pond, about 40 m by 15 m. This pond appeared to be more well established than the other ponds as there was well developed emergent vegetation, especially *Typha*, with *Potamogeton* and a dense moss edge.

Pond E. A thin, rectangular pool, 30 m by 5 m, with a steep edge with some *Carex* and grass, on spoil.

Pond F. A large pond excavated from spoil, about 50 m in diameter when full. There was an area with sparse *Carex* which had changed little in the three years. Most of the pond had a bare, spoil substrate.

Pond G. Another rectangular pond, about 30 m by 20 m, with a small patch of *Carex* in 1998 which had expanded considerably by 2001. There were still considerable areas of open substrate, which appeared to be a mixture of clay and spoil.

Pond H. On clay, this was a small, narrow pond, about 20 m by 5 m, with a little emergent *Carex* and some grass in the edge and a lot of bare substrate.

All these ponds were subject to considerable water level fluctuation but only pond H appeared to be subject to drying out, but there was water in 1999 and 2001.

Noteworthy records

There were a number of nationally scarce beetle and bug species recorded from both the terrestrial and pond sites, as well as a number of other species at the edge of

their range in Britain. These are listed below, with national scarcity statuses (Hyman & Parsons, 1992, 1994; Kirby, 1992) where appropriate. No nationally scarce spider species were found. Nomenclature follows Ball (1997).

Terrestrial species

Orthoptera

Tetrix subulata (L.)

This groundhopper is not nationally scarce but it is mainly restricted to the southern half of the UK, apart from a record from Lancashire (Haes & Harding, 1997). There are old records from the Thorne Moors area in Yorkshire but this appears to be the most northerly record in the UK on the eastern side. It was found at sites 1, 4, 5 and 9 in 2001 and there is plenty of its preferred habitat of wet, open sites.

Hemiptera

Agallia brachyptera (Boheman) Nationally Scarce B

This species was found in the marshy sites 9 and 10 in 1998 and 2001 and has been recorded before in Yorkshire (Kirby, 1992). It has been found regularly in north-east England, especially on post-industrial sites and it is probably under recorded and not as rare as previously thought.

Psammotettix frigidus (Boheman) Nationally Scarce A

Said by Kirby (1992) to have been only recorded from Scotland, from upland sites. It was recorded from site 3 in 1998. We have it from a number of post-industrial sites and coastal dunes in northern England (Eyre *et al.*, 2001) but this appears to be the most southern record in Britain.

Coleoptera

Acupalpus consputus (Duftschmid) Nationally Scarce B

This is a wetland ground beetle liking sites where the standing water dries up in the summer, as at site 9 in 1999. There is only one post-1970 record north of this record, from SE74 (Luff, 1998), and one other Yorkshire record.

Bembidion clarki Dawson Nationally Scarce B

A ground beetle species of well established wetlands, this was found in the marshy sites 9 and 10 in 1998 and at pitfall site 2 in 2001. There are a few records to the north of Allerton Bywater but most are in southern and eastern England (Luff, 1998).

Blethisa multipunctata (L.) Nationally Scarce B

Another ground beetle species of well vegetated wetlands, it was found at site 2 in 2001. There are a few recent and several old records for Yorkshire (Luff, 1998).

Pterostichus gracilis (Dejean) Nationally Scarce B

A ground beetle species found in wet, well-vegetated sites, this was also found in the marshy sites 9 and 10 in all three years and at site 2 in 1999 and 2001. There are three 10-km square records (SE 64, 73, and 74) to the east and, just, to the north of Allerton Bywater in Luff (1998). This is a species at the northern edge of its range in Britain.

Longitarsus ochroleucus (Marsham) Nationally Scarce B

A leaf beetle apparently associated with ragworts, it was swept at site 3 in 2001. It appears to like open and disturbed grassland and there are other records from throughout England (Hyman & Parsons, 1992).

Hippodamia variegata (Goeze) Nationally Scarce B

This ladybird was found at sites 5 and 8 in 1999 and at 1, 5 and 7 in 2001 and appears to be well established. It appears to like sites with ruderal vegetation and is another species on the northern edge of its range in Britain (Majerus *et al.*, 1997).

Notaris scirpi (F.) Nationally Scarce B

This weevil associated with *Typha* was found in 1998 at site 1. There are other northern England records for this species, especially by rivers (Eyre *et al.*, 2000).

Cercyon tristis (Illiger) Nationally Scarce B

A wetland species, found in sites 9 and 10 in 1999 and 2001, we have a number of recent records from pitfall trapping (Eyre *et al.*, 1998, 2000). It is probably not as rare as its conservation status implies.

Ocypus fuscatus (Gravenhorst) Nationally Scarce B

A rove beetle of grassland habitats, found at site 6 in 2001, this is a widespread but scarce species in England (Hyman & Parsons, 1994).

Aquatic species

Odonata

No nationally rare or scarce species were recorded but a number of the ponds, especially A and B, provided good habitat for the total of twelve species (*Aeshna cyanea* (Müller), *A. grandis* (L.), *A. juncea* (L.), *Anax imperator* Leach, *Coenagrion puella* (L.), *Enallagma cyathigerum* (Charpentier), *Ischnura elegans* (Vander Linden), *Lestes sponsa* (Hansemann), *Libellula quadrimaculata* L., *Pyrrhosoma nymphula* (Sulzer), *Sympetrum danae* (Sulzer), *S. striolatum* (Charpentier)) recorded as larvae. *Aeshna grandis* and *Anax imperator* are near the northern limit of their range in England (Merritt *et al.*, 1996) but are common in the south. The ponds provide a mixture of open and vegetated sites with contrasting water productivity leading to a number of suitable habitats for dragonflies.

Hemiptera

Ilyocoris cimicoides (L.)

This is not a nationally rare or scarce species but the recording of it in pond B in 1998 and from ponds C, D and G in 2001 is interesting because it is not recorded from northern England in Savage (1989). We have another record from Thorpe Marsh near Doncaster to the east, and these records are at the northern edge of its distribution in Britain.

Notonecta maculata F.

Another species which is not nationally rare or scarce, it is usually found in ponds and pools with little vegetation, conditions found at ponds C and F from which it was recorded in 2001. It is regarded as a species of southern Britain (Ball, 1997) and is not recorded from northern Britain in Savage (1989).

Notonecta marmorea F.

Also not nationally rare or scarce, *N. marmorea* is not recorded from northern England in Savage (1989) and this and *N. maculata* are likely to be at the northern extremes of their range in the UK. It is a species preferring brackish water and it was recorded from pond F in 1998 and from ponds C, D and G in 2001.

Coleoptera

Dytiscus circumcinctus Ahrens Nationally Scarce A

This species was found in the pitfall traps at site 2 in 1999, indicating that it was breeding in the adjacent pond B and had fallen into the trap after emerging from pupation. The distribution of this species is centred on Cheshire and this record is near its northern limit in Britain (Ball, 1997).

Dytiscus circumflexus F. Nationally Scarce B

This species, recorded from the grassy edge of pond B in 1998, tends to be found near the coast but it also occurs inland (Ball, 1997).

Hygrotus nigrolineatus (von Steven) Nationally Scarce A

A pioneer species, found in the bare pond F in 1998. It was first recorded in the UK in Kent in 1984 but has now been found north to County Durham (Eyre & Foster, 1998). It was not found in either 1999 or 2001.

Enochrus melanocephalus (Olivier) Nationally Scarce B

A species of weedy, dense vegetation that was found in the mossy edge of pond D in 1998. It occurs sporadically throughout northern England.

Helochares lividus (Forster) Nationally Scarce B

Found in the grassy pond B in 1998, this species is approaching the northern edge of its range in Britain (Ball, 1997). It was found in ponds A, D and H in 2001 and is obviously resident.

Helochares punctatus Sharp Nationally Scarce B

This is a species usually found in ponds with base-poor water. It was recorded from ponds A, B, D and E in 2001 and also appears to be well established.

Laccobius sinuatus Motschulsky Nationally Scarce B

This was found in ponds D and H in 1998, the most shallow, and possibly most temporary, of the ponds. It is a species of land slips with trickles but in northern England all records are from either colliery spoil sites or sand workings.

Rhantus grapii (Gyllenhal) Nationally Scarce B

A species of sites with dense vegetation, this species was found in pond D in 1999 and B in 2001. This is another species on the northern edge of its distribution in Britain (Ball, 1997).

Scarodytes halensis (F.) Nationally Scarce B

A species liking open water sites with little vegetation and high conductivity, this was found in pond 6 in 1998. It has been expanding northwards recently but this is a record for the species at the north of its range in Britain. As with the other colonist species *Hygrotus nigrolineatus*, it was not found in 1999 and 2001.

Habitat distribution

The species lists of leafhoppers, ground, rove and phytophagous beetles and spiders from the terrestrial sites and of the invertebrate lists from the ponds were ordinated using DECORANA (Hill, 1979) to identify which sites were similar and which were different and to identify habitat types by subjectively grouping similar sites. DECORANA is a standard method for identifying trends in species assemblage distribution and is used as a basis for habitat classification (e.g. Eyre *et al.*, 2001). The number of habitat types for the five terrestrial groups and for the aquatic invertebrates, the sites in each group and a description of the habitat are given in Table 1.

Three habitat types were identified for leafhoppers, ground, rove and phytophagous beetles but only two for spiders. The marshy area with sites 9 and 10 produced a separate habitat for leafhoppers, rove and phytophagous beetles but two other wet sites, 1 and 2, had similar ground beetles to the marshy sites. The other habitats for leafhoppers were open spoil sites and more densely vegetated clay sites and a similar pattern was seen with ground and phytophagous beetles. The rove beetle habitats were not as clear, with one group on open spoil and the other on a mixture of spoil and clay with varying vegetation. The two spider habitats differed in site water and vegetation but habitat definition was less clear than with the other groups.

Table 1. The habitat groups of leafhoppers, ground, phytophagous and rove beetles and spiders on the terrestrial sites and of the aquatic invertebrates in the pond sites at Allerton Bywater

Group	Sites	Description
Leafhoppers		
1	1, 2, 3	A mixture of open spoil with sparse vegetation and more densely vegetated spoil, damp or wet.
2	4, 5, 6, 7, 8	Mainly densely vegetated, grassy sites on clay and one open spoil site, with the driest soils.
3	9, 10	Dense grass and *Juncus* and marshy.
Ground beetles		
1	3, 5	Damp spoil sites with sparse vegetation.
2	4, 6, 7, 8	Densely vegetated, grassy sites on clay, with the driest soils.
3	1, 2, 9, 10	A mixture of open sparsely vegetated and dense grass and *Juncus* sites, either wet or marshy.
Phytophagous beetles		
1	1, 2, 3, 4, 5	A mixture of both open and well-vegetated sites, mainly on spoil and either damp or wet.
2	6, 7, 8	Densely vegetated sites on clay, with the driest soils.
3	9, 10	Dense grass, *Juncus* and marshy.
Rove beetles		
1	3, 5	Damp spoil sites with sparse vegetation.
2	1, 2, 4, 6, 7, 8	A mixture of spoil and clay sites, mostly densely vegetated, and with wet, damp and the driest soils.
3	9, 10	Dense grass, *Juncus* and marshy.
Spiders		
1	3, 4, 5, 6, 7, 8	A mixture of spoil and clay sites, both open and well-vegetated, and with both damp and the driest soils.
2	1, 2, 9, 10	Mostly densely vegetated sites, with one open site, and either wet or marshy.
Aquatic invertebrates		
1	A, E, G, H	Ponds on spoil, with areas of both bare and emergent vegetation.
2	B, C, D	Ponds on both clay and spoil with dense aquatic submerged and emergent vegetation.
3	F	Open pond on spoil with little vegetation.

The invertebrate habitats in the pond sites differed in the amount of vegetation and the type of substrate. Pond F was obviously less productive than the other ponds and had fewer species whilst the other spoil-based ponds were more vegetated with more species. The most species were in the densely vegetated ponds B, C and D.

Discussion

The presence of a number of nationally scarce and other interesting terrestrial and aquatic invertebrate species indicate that this particular post-industrial area has considerable conservation interest. The conservation potential for these types of site for invertebrates has been assessed by Gibson (1998) and there have been a number of reports of uncommon species from sites such as colliery spoil and metalliferous

mine sites (Coldwell, 1993; Eyre & Luff, 1995; Lott & Daws, 1995; Spalding & Haes, 1995), whilst roadsides have been shown to be good habitat for heathland ground beetles (Eversham & Telfer, 1994). Another positive aspect on the old Allerton Bywater site was the provision of clayey soil capping of some of the area when the area was assigned for conservation and educational purposes. These clayey areas complimented the base-poor spoil areas to produce different invertebrate habitats. Most of the terrestrial groups studied had three obvious assemblages, generally delineated by the type of substrate, the amount of substrate water and the amount of vegetation.

A number of the interesting terrestrial species were those preferring open sites and ruderal vegetation on the spoil areas with a number of the important aquatic species in the bare substrate spoil ponds. As Haes & Spalding (1996) pointed out, conservation bodies do not tend to be excited by bare ground although Kirby (1994) estimated that up to 15% of nationally rare and scarce invertebrate species are likely to occur on artificial ruderal habitats. Jones (1999) recorded a number of interesting and nationally scarce invertebrate species from distinctly unpromising urban habitats along two tributaries of the River Thames in London and there is an increasing number of reports of rare and scarce species from urban and post-industrial sites (Eyre *et al.*, 2002a,b). It is likely that the open nature of these sites is the main reason for the occurrence of interesting invertebrate species because they are relatively scarce in a highly managed landscape but even if, as at Allerton Bywater, an area is not aesthetically pleasing, it may have considerable conservation interest.

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SHORT COMMUNICATION

***Lasius brunneus* (Latr.) (Hymenoptera: Formicidae) found indoors.** – In May 2003, a naturalist colleague Mr Mike Paice gave me four ants; he had found them in a house in the village of Jacob's Well, near Guildford, Surrey, where they had been infesting a tin of biscuits. To my surprise, they were *Lasius brunneus*. In virtually all of the literature, this species is described as being 'fugitive', alluding to its evasive, secretive and non-aggressive habits. To find it invading a house is very unusual. From my own experience the normal ant found indoors is the ubiquitous black pavement ant, *Lasius niger* (L.), which commonly invades kitchens. Busy ant trails often lead to small amounts of spilled food in larders and cupboards or spoiled fruit at the bottom of the fruit bowl. In Norway and Sweden, *L. brunneus* is recorded from timbers in old houses and farm buildings (Collingwood, C. A. 1979. The Formicidae (Hymenoptera) of Fennoscandia and Denmark. *Fauna Ent. Scand.* **8**: 98–99). The house in Jacob's Well is old, part of it, and the adjoining barn having been built around 1640, so the ant may well have been nesting in some of the ancient building timber. – RICHARD A. JONES, 135 Friern Road, East Dulwich, London SE22 0AZ. bugmanjones@hotmail.com