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Invertebrate Survey

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1 INTRODUCTION

1.1 Background and Scope

URS Infrastructure & Environment UK Ltd (URS) was commissioned by Low Level Waste Repository (LLWR) to undertake a survey of Odonata (damselflies and dragonflies) at the LLWR operational site in Cumbria. The survey was undertaken in part to address comments made by Natural England on the Final Capping and Closure Environmental Statement (URS, 2013). Specifically, Natural England wanted further information to understand how Odonata would be affected by the proposed re-routing of the Drigg stream, which would be necessary to accommodate the Final Capping project. Dragonflies are listed as features of importance for the adjoining Drigg Coast Site of Special Scientific Interest (SSSI) with at least ten species recorded.

In addition to the Odonata survey, Natural England also sought further information regarding the value of the Trench Cap area itself for invertebrates. The Final Capping project would require the re-grading and recapping of the existing trench cap area.

1.2 Study Site

The LLWR site (hereafter referred to as the 'Site') is situated adjacent to the village of Drigg, Cumbria (Ordnance Survey reference SD 055 992). The Site is approximately 100ha in size and includes mixed secondary woodland, grassland, open water, operational buildings and a series of underground storage tanks (the toluene tanks).

The length of the Drigg stream included within the Site boundaries (hereafter referred to as the Drigg stream) runs from northwest to southeast, bisecting the Site. During the summer months, several sections of the stream are effectively dry whilst others contain relatively deep water (>30cm) and dense aquatic vegetation (refer to URS (2011) for more details). The majority of the stream banks support dense marginal vegetation along with gorse (*Ulex europaeus*) scrub and willow (*Salix spp.*) saplings.

The existing trench cap is dominated currently by rough grassland with scattered scrub and tree saplings, which occur sporadically throughout the area (URS, 2013). An active programme of vegetation management ensures that deep-rooting vegetation (such as large shrubs and trees over 1m in height) is selectively removed to prevent damage to the Trench Cap membrane. The construction of new drainage channels has resulted in a number of small areas of disturbed ground.

1.3 Planning and Legislation

A number of species of invertebrate receive strict legal protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). A considerable number of invertebrates are listed under Section 41 of the Natural Environment and Rural Communities Act 2006 as 'Species of Principal Concern for Conservation in England'. Others are listed as being of conservation concern in various Red Data Books and under Local Biodiversity Action Plans (LBAP).

Given the extremely large number of invertebrates that occur in the UK, a summary of the Conservation Status of only those species recorded that are assessed as 'of importance for conservation' is provided in Appendix A. It is important to note that to record a species of conservation importance is not unusual. As such, assemblages as a whole are assessed to establish value.

2 METHODS

2.1 Field Survey

The two main sampling techniques employed were sweep netting and direct searching; more detail of each technique is provided below.

Sweep netting on the Drigg stream principally targeted damselflies (Zygoptera) but other insects were recorded incidentally. On the Trench Cap, sweep netting involved brushing over bare ground, within low vegetation and in overhanging willow branches. The collected material was preferentially removed using an aspirator. The sweep net comprised a 16 inch diameter net mounted on a metre long angling pole.

The direct searching targeted Odonata in flight and also general invertebrates occupying flowers, vegetation and in flight over the Trench Cap. A limited amount of pond netting was undertaken for Odonata larvae.

Two survey visits were undertaken to reduce the risk that species were missed and to pick up those found later in the season (e.g. Odonata), particularly those that emerged later in the season. Details of each of the surveys are presented in Table 1 below.

Table 1: Survey Dates and Environmental Conditions

Survey Date	Weather Conditions
30.05.2014	Sunny with 20% cloud cover and cool offshore breeze.
05.08.2014	100% cloud with cool breeze.

The survey and assessment was undertaken by Andy Godfrey, an independent entomological consultant of 20+ years' experience.

2.2 Assessment Methods

To evaluate the value of the Trench Cap's invertebrate assemblage, target groups were selected that were considered to be good indicators of habitat quality. These included Orthoptera (grasshoppers and allies), Odonata, Hemiptera (particularly shieldbugs and grassbugs), selected Coleoptera (beetles), selected Lepidoptera (butterflies, day-flying moths), selected Diptera (true flies) and selected aculeate Hymenoptera (ants, bees and wasps).

3 RESULTS

3.1 Drigg Stream

3.1.1 *Odonata*

Seven species of Odonata were recorded along with one darter species only identified to genus. Four of these species were recorded from the Drigg Stream in May and August 2014, namely the azure damselfly (*Coenagrion puella*), ruddy darter (*Sympetrum sanguineum*), keeled skimmer (*Orthetrum coerulescens*) and the golden-ringed dragonfly (*Cordulegaster boltonii*). An unidentified darter (probably either the common darter *Sympetrum striolatum* or the ruddy darter *S. sanguineum*) was also fleetingly seen by the Drigg Stream in May 2014. Four species were also recorded from photographs taken by a member of staff at LLWR in summer 2012, namely the common blue damselfly (*Enallagma cyathigerum*), large red damselfly (*Pyrrhosoma nymphula*), ruddy darter and emperor dragonfly (*Anax imperator*). Odonata were assessed to be rather scarce along the Drigg stream. One reason for this may be that the upper parts of the stream within the Site are completely dry (and are scrub-invaded).

3.1.2 *Other Invertebrates*

The focus of the Drigg Stream survey was to record Odonata; however, given the depauperate state of this group the opportunity was taken to record other invertebrates. One Red Data Book and two Nationally Scarce species of fly were recorded from active sampling of the vegetation.

The Red Data Book robberfly (*Dioctria cothurnata*) was recorded on the Drigg Stream in early August. This species has a disjunct distribution with most of the records from the Central Highlands of Scotland or from the south of England. It has been recorded from heathy woodlands, the margins of wet meadows besides woods and was recorded as common in the past in cornfields in Speyside. The early stages are unknown but the larvae may live in soil (they are certainly not aquatic).

Two Nationally Scarce relatives of the house-fly were also recorded from the Drigg Stream, namely, *Coenosia bilineella* and *Spanochaeta dorsalis*. The former is mainly a Scottish species, becoming scarce southwards, whilst the latter is associated with reed beds (in the surveyor's experience). The ecology of both these species is poorly known but the larvae will be terrestrial (i.e. in damp soils or common reed stems). Caterpillars of the cinnabar moth (*Tyria jacobaeae*) were recorded feeding on ragwort by the side of the Drigg Stream.

3.2 Trench Cap Survey

Two moth species listed on Section 41 were recorded here, namely the shaded broad-bar (*Scotopteryx chenopodiata*) and the cinnabar along with the Nationally Scarce snail-killing fly (*Tetanocera punctifrons*). Although the two moths are still abundant and widespread, they are listed on S41 because Butterfly Conservation has data which suggests that they are declining. The snail-killing fly is associated with wetlands, such as ditches or ponds, where the larvae are parasitoids on aquatic snails. This species is unlikely to be breeding on the Trench Cap and presumably originated from the Drigg Stream.

Overall, the Trench Cap appeared to be depauperate in plants and invertebrates and is unlikely to support important invertebrate assemblages.

3.3 Summary

A combined total of 146 species of invertebrates were recorded during the survey visits and through photographic identification; this is a typical number for the size and nature of the area surveyed. Of these 146 species, fourteen (9.5%) were assessed to be of some conservation importance based on the criteria described in Section 1.3); again, this is considered to be typical for an area of this quality and size.

4 DISCUSSION

4.1 Odonata

Odonata were assessed to be rather scarce on the Drigg stream. One reason for this may be that the upper parts of the stream within the Site were completely dry at the time of the surveys (and were completely scrub-invaded). Dry stream sections will be of no use for breeding dragonflies and of limited use for foraging adults. Some of the lower sections of the stream were also narrow and shallow and, as such, may dry out during the summer. These could support breeding damselflies (Zygoptera) but would be unlikely to support breeding dragonflies, which often have a longer larval stage. There was also evidence of eutrophication (sewage fungus was noted for example) in the stream although it is difficult to explain where nutrients enter the water.

All the Odonata species recorded are widespread and common. The most interesting species recorded is the keeled skimmer. This species occurs in small rivers and streams, ditches and swampy pools in acid-peat areas, usually where there is *Sphagnum* moss. This is mainly a western and northern species in Britain but is also found on heathlands in southern England. The adults were common on one section the Drigg stream (SD 05068, 99236), which (uniquely for the Drigg stream) included boggy pools and a lower pH.

4.2 Trench Cap

Two S41 moths and a Nationally Scarce snail-killing fly were recorded from the Trench Cap; however, most of the invertebrates recorded here were common and widespread. The Trench Cap appeared to be relatively species-poor in plants and invertebrates and did not appear to represent special habitat for invertebrates.

4.3 Summary

The overall assessment is that the site supports a reasonable but not exceptional invertebrate fauna. It is suggested that the entire site might be regarded as of District or Borough value for its invertebrates.

4.4 Recommendations

To minimise the adverse effects associated with the re-routing of the Drigg Stream the following broad steps are recommended:

- Excavate the new sections prior to modifying the existing ditch;
- Plant up the new areas using native species set into coir matting;
- Dredge and transport sediment from the existing to the newly excavated ditch (this will include a plant seed bank and invertebrate larvae); and
- Connect the old and new sections of the stream before removing or modifying the existing section.

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