

Survey of ponds at Waterhouse Plantation, STANTA, Norfolk



A report for the Freshwater Habitats Trust

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1. Introduction

This survey was commissioned by the Freshwater Habitats Trust to provide information on the ecological value of selected ponds in the vicinity of Waterhouse Plantation at Tottington in the Norfolk Breckland. This forms part of the STANTA military training area and lies within the Stanford Training Area Site of Special Scientific Interest (SSSI).

Waterhouse Plantation and adjoining grasslands contain a large number of ponds, some of which are natural, groundwater-fed water bodies formed by the freezing and thawing of ground-ice during the late glacial and variously referred to as pingos, palsa-scars and lithopalsas. Although not referred to as such in the SSSI citation, certain ponds have well-defined ramparts which identify them as 'pingos'. Such water bodies can support exceptional assemblages of wetland invertebrates, often dominated by rare or scarce species and including highly sedentary 'relict fen' species.

Although entomological surveys of have been undertaken in several wetland habitats on STANTA, these ponds have not previously been studied as far as is known.

2. Survey methods

The area around Waterhouse Plantation was visited on 16th May 2018 by Martin Hammond, Martin Collier (Norfolk Coleoptera recorder) and Garth and Susan Foster to conduct a general survey of wetland beetles. This involved sampling a range of aquatic habitats by hand-netting and using small sieves. In addition, six permanent ponds was assessed by MH using PSYM (**P**redictive **S**ystem for **M**ultimetrics), the standard technique for monitoring the ecological quality of still waters developed by the Environment Agency and Pond Conservation (now the Freshwater Habitats Trust) (Environment Agency, 2002).

PSYM uses six 'metrics' (measurements) representing important indicators of ecological quality. The botanical survey involves a careful examination of each pond to record wetland plants listed on the PSYM pro-forma. The three botanical metrics are:

- diversity of emergent and submerged plant species
- the number of uncommon wetland plant species
- Trophic Ranking Score (TRS, an indication of nutrient status based on selected plant species)

The three invertebrate metrics are based on a timed sample which involves netting each of the 'meso-habitats' present in a pond (e.g. emergent vegetation, open water, floating vegetation). Although PSYM requires identification of aquatic macro-invertebrates to family level only, during this survey most material was identified to species level to add value to the data. Because pingos are known to support important populations of rare species, samples were sorted in a white polythene tray on the bankside, to avoid removing large numbers of individuals (normally PSYM samples are preserved in bulk and sorted in the

laboratory). Material was either identified in the field or preserved for identification at a later date. The three invertebrate metrics are:

- Average Score Per Taxon (ASPT, an estimation of biological water quality based on the sensitivity of different invertebrate families to organic enrichment)
- diversity of dragonfly, damselfly and alderfly families
- diversity of water beetle families

Environmental data obtained for each pond include surface area, altitude, grid reference, water pH, presence/absence of inflows, substrate composition, degree of shade, accessibility to livestock and cover of emergent vegetation.

The results are analysed using software which compares the observed data with values predicted from a large reference dataset of undegraded ponds. PSYM predicts how a high quality pond with similar attributes *should* score for each metric, and compares the predictions with the survey results. The scores for each metric are combined to produce an Index of Biotic Integrity (IBI) which provides an overall indication of the ecological quality of the pond. This can be categorised as Very Poor, Poor, Medium and Good. Good quality ponds are those which have an Index of over 75%.

PSYM data and outputs are provided in Appendix 1. Plant and invertebrate records have been provided separately in spreadsheet format.

3. The ponds surveyed

Pond 279

TL 9058 9500

This lozenge-shaped pond in the north of Waterhouse Plantation was dredged in 2013 and has an abrupt edge with only a very narrow marginal zone. Water Violet *Hottonia palustris* is locally-abundant in the open water. A water sample produced a pH reading of 7.09 with electrical conductivity of 310 $\mu\text{S}/\text{cm}$.

Pond 279 produced 18 wetland plant species, notably including Water Violet and Orange Foxtail. A total of 34 aquatic macro-invertebrate taxa were recorded (22 in the PSYM sample). These included the Near Threatened diving beetle *Agabus undulatus* and the Vulnerable long-toed water beetle *Dryops griseus*, both of which are considered to be relict-fen indicator species.

PSYM analysis for Pond 279 produced an Index of Biotic Integrity (IBI) of 83%, placing it in the top (**Good**) category for ecological quality. It scored well for all three botanical metrics and for biological water quality (ASPT). Scores for representation of water beetle families and dragonfly, damselfly and alderfly families were moderate and poor respectively.

Waterhouse Plantation long pond

TL 9060 9507



This elongate, L-shaped pond is around 250 metres in length and is prominent on Ordnance Survey maps. Its shape has not changed since the first edition Ordnance Survey maps were published. Most of it is in the shade of overhanging Alders and willows but the section adjoining the northern boundary of the plantation was opened-up in 2011-12, with sediment removed from the centre (photograph above). At this end of the pond there are stands of Greater Pond Sedge *Carex riparia* swamp, which yielded the vast majority of the invertebrate records. Shaded areas support little vegetation other than occasional tussocks of Tufted Sedge *Carex elata*; only a handful of invertebrates were found in this habitat, though a single specimen of the Near Threatened diving beetle *Agabus undulatus* was netted.

Twenty-four aquatic invertebrate taxa were recorded in the PSYM sample. In addition to *Agabus undulatus* these included four other Near Threatened water beetles: *Hydrochus brevis*, *H. crenatus*, *H. elongatus* and *Limnebius aluta*. Other species of conservation concern were the Pond Mud Snail *Omphiscola glabra* and the Nationally Scarce water beetles *Noterus crassicornis*, *Clemnius decoratus* and *Helophorus nanus*.

PSYM analysis for this pond produced an Index of Biotic Integrity (IBI) of 50%, placing it on the borderline between Poor and Moderate ecological quality. Diversity of submerged and emergent plants was low and representation of uncommon wetland plants was moderate,

as was Trophic Ranking Score. Biological water quality was below the predicted value, giving a moderate score. Diversity of water beetle families was moderate but there was a zero score for dragonfly, damselfly and alderfly families. This relatively low scoring reflects the fact that most of the pond is in deep shade and the open area has limited diversity of vegetation. Nonetheless, the proportion of rare species in the invertebrate sample demonstrates the high conservation value of this water body.

Pond 414

TL 9054 9512



This circular pond is situated alongside a tree line extending north from Waterhouse Plantation. Its shape has not changed since the first edition Ordnance Survey maps were published. It is fringed by a mosaic of Greater Pond Sedge swamp and mixed fen vegetation which includes Water Mint *Mentha aquatica*, Gipsywort *Lycopus europaeus*, Meadowsweet *Filipendula ulmaria*, Amphibious Bistort *Persicaria amphibia*, Hard Rush *Juncus inflexus* and Blunt-flowered Rush *J. subnodulosus*. There are patches of Flote-grass *Glyceria fluitans* in shallow water and floating duckweed vegetation with Common Duckweed *Lemna minor*, Ivy-leaved Duckweed *L. trisulca* and the liverwort *Riccia fluitans*.

The PSYM sample included 34 aquatic invertebrate taxa. Amongst these were three Near Threatened species: the diving beetle *Agabus labiatus*, the small water beetle *Limnebius aluta* and the long-toed water beetle *Dryops auriculatus*. Nationally Scarce water beetles included *Noterus crassicornis*, *Hydaticus seminiger*, *Clemnius decoratus*, *Helophorus nanus* and *Enochrus quadripunctatus*.

PSYM analysis for Pond 414 produced an Index of Biotic Integrity (IBI) of 78%, placing it in the top (**Good**) category for ecological quality. It scored moderately for diversity of submerged and emergent plants and representation of uncommon wetland plants but well for trophic status. Scores for biological water quality (ASPT) and diversity of water beetle families were good but representation of dragonfly, damselfly and alderfly families was poor.

Pond 281

TL 9064 9525

This is a mid-sized, circular pingo surrounded by a well-defined rampart, located in open pasture (cover photo). Its shape has not changed since the first edition Ordnance Survey maps were published, though an engineered channel connects to pools to the south, suggesting that it has been modified for some purpose in the past.

Pond 281 supports diverse vegetation including marginal grass mats and low emergents, Common Club-rush *Schoenoplectus lacustris* swamp, submerged aquatics including an extensive stand of Fen Pondweed *Potamogeton coloratus* and modest amounts of floating duckweed vegetation including the liverwort *Ricciacarpus natans*.

A total of 25 wetland plant species were recorded, notably including Fen Pondweed, Tubular Water-dropwort *Oenanthe fistulosa*, Fan-leaved Water-Crowfoot *Ranunculus circinatus* and *Ricciacarpus*.

This was a particularly rich pond for aquatic invertebrates with 53 taxa recorded (34 in the PSYM sample). Amongst these were the Endangered Miry Sloth Weevil *Bagous lutosus*, the Vulnerable long-toed water beetle *Dryops griseus* and the Near Threatened water beetles *Agabus labiatus*, *Hydrochus brevis*, *H. elongatus*, *Enochrus nigrinus*, *Limnebius aluta* and *Dryops auriculatus*. Nationally Scarce water beetles included *Noterus crassicornis*, *Rhantus frontalis*, *Clemnius decoratus*, *Helochaeres punctatus* and *Notaris scirpi*.

PSYM analysis for Pond 281 produced an Index of Biotic Integrity (IBI) of 94%, placing it in the top (**Good**) category for ecological quality. It scored highly for all three botanical metrics, with representation of uncommon wetland plant species being much higher than predicted. Scores for biological water quality (ASPT) and diversity of water beetle families were good with moderate representation of dragonfly, damselfly and alderfly families.

Waterhouse Lodge Pond (Pond 338???)

TL 9087 9490

There is some uncertainty as to the numbering of this water body as nothing this size or shape is shown on modern maps, though an area of swamp is indicated on the first edition 25" map surveyed in the 1880s. It extends for around 300 metres to the east of the site of

Waterhouse Lodge, on the south side of the access track. Trees were felled to open-up a 'halo' around this large pond in winter 2017-18.

As most of the pond margin has only recently been opened-up, vegetation remains patchy but includes grass mats, Tufted Sedge tussocks and small stands of Common Reed *Phragmites australis*. The uncommon Soft Hornwort *Ceratophyllum submersum* is present in open water.

Fifty-one aquatic macro-invertebrate taxa were recorded (31 in the PSYM sample). Near Threatened species included the diving beetle *Agabus labiatus*, the scavenger water beetles *Hydrochus crenatus* and *Enochrus nigrinus*, the small water beetle *Limnebius aluta* and larvae of the Great Silver Water Beetle *Hydrophilus piceus*. There were large populations of Pond Mud Snail and Shining Ram's-horn snail *Segmentina nitida* amongst grass mats on the northern bank; both of these are Species of Principal Importance as well as Nationally Scarce. Other Nationally Scarce species were the water beetles *Hydaticus seminiger*, *Hydroporus neglectus* and *Helochares punctatus*.

PSYM analysis for Waterhouse Lodge Pond produced an Index of Biotic Integrity (IBI) of 94%, placing it in the top (**Good**) category for ecological quality. It scored highly for diversity of submerged and emergent plants and representation of uncommon wetland plant species, and moderately for trophic status. Scores for all three invertebrate metrics were good.

Field pond south-west of Waterhouse Plantation

TL 9014 9475

Located in sheep-grazed pasture, this pond is not a pingo and is likely to have originated as a stock-watering pond or some type of mineral pit. It is steep-sided and contains limited vegetation though there are floating grass mats. Scrub was removed from the south side of this pond in 2011 to improve habitat for Great Crested Newts and surrounding nettle beds suggested that sediment had been dredged in the past.

Twenty-seven aquatic invertebrate taxa were identified in the PSYM sample. In contrast to the other ponds, none of these were species of conservation concern.

PSYM analysis for this pond produced an Index of Biotic Integrity (IBI) of 56%, placing it in the **Moderate** category for ecological quality. It scored poorly for all three botanical metrics as well as for representation of dragonfly, damselfly and alderfly families. Scores for biological water quality (ASPT) and diversity of water beetle families were good.



Other habitats

A seasonal pool near Waterhouse Lodge (TL 9087 9494) had tussocks of Soft Rush *Juncus effusus* and Purple Moor-grass *Molinia caerulea*. This was productive for water beetles characteristic of seasonally-flooded fen litter such as the Near Threatened diving beetle *Agabus uliginosus* and the Nationally Scarce *Hydroporus neglectus*. Both adults and larvae of *Hydaticus seminiger* were present as well as a range of hydrophilids,

Agabus uliginosus was also present in a grassy ditch or linear depression at TL 9054 9504, along with the Nationally Scarce scavenger water beetle *Helophorus strigifrons*.

An un-numbered seasonal pond north of Waterhouse Plantation is situated between Ponds 414 and 218, in open grassland at TL9062 9514. This produced 24 water beetle species including the Vulnerable *Dryops griseus*; the Near Threatened *Agabus labiatus*, *A. uliginosus*, *Hydrochus ignicollis*, *Enochrus nigrinus*, *Hydraena palustris* and *Dryops auriculatus*; and the Nationally Scarce *Clemnius decoratus*, *Helophorus nanus*, *Helochares punctatus* and *Enochrus quadripunctatus*. This exceptional concentration of rarities underlines the value of seasonal pools in pingo systems.

4. Results

4.1 Environmental variables

Water samples were tested for pH and electrical conductivity (a measure of solute concentration) (Table 1).

Location	water pH	conductivity ($\mu\text{S}/\text{cm}^{-1}$)
Pond 279	7.09	310
Pond 414	7.54	460
Pond 281	7.68	420
Waterhouse Lodge Pond	6.41	350
Long Pond	6.83	190
Field pond	7.99	560

Table 1: physico-chemical data

A mean pH of 7.26 is similar to typical values on Thompson Common (mean = 7.15, $n = 41$), indicating that conditions in the permanent ponds around Waterhouse Plantation are comparably base-rich. The mean conductivity reading of 382 is considerably lower than the average for Thompson (mean = 574, $n = 41$). This suggests that the STANTA ponds have relatively natural water quality since eutrophication is usually accompanied by a rise in conductivity.

It should be noted that Professor Foster obtained lower pH and conductivity readings from several more seasonal water bodies at Waterhouse Plantation, down to pH 4.3 / 53 $\mu\text{S}/\text{cm}$ in the temporary pool near Waterhouse Lodge - an indication of markedly acidic and oligotrophic conditions. This range of variation contributes to the diversity of habitats for wetland invertebrates.

4.2 Invertebrates

A total of 116 aquatic macro-invertebrate taxa were recorded during the survey (Appendix 2). Of those identified to species level, water beetles (including wetland weevils) made up 62% with water bugs comprising 11% and molluscs 9.4% (Figure 1). The high proportion of water beetle species is consistent with other pingo sites, though the participation of specialists in the survey undoubtedly helped! Flatworms (Tricladida) were not identified beyond Order level because they have to be collected separately and identified alive. Fly larvae (Diptera) were identified only to family. No effort was made to identify Limnephilid caddis pupae, which were numerous in some ponds, and it is likely that several species of *Limnephilus* are present.

In addition to the high level of taxonomic diversity overall, no less than 24 species of conservation concern were identified, indicating the exceptional biodiversity value of these

ponds (Table 2)¹. Equally striking was the frequency of rare water beetles in most ponds and the absence or scarcity of many widespread and common species.

Two molluscs - Pond Mud Snail and Shining Ram’s-horn - are listed as Species of Principal Importance for the conservation of biodiversity under Section 41 of the Natural Environment & Rural Communities Act 2006. These were formerly referred to as UK Biodiversity Action Plan priority species.

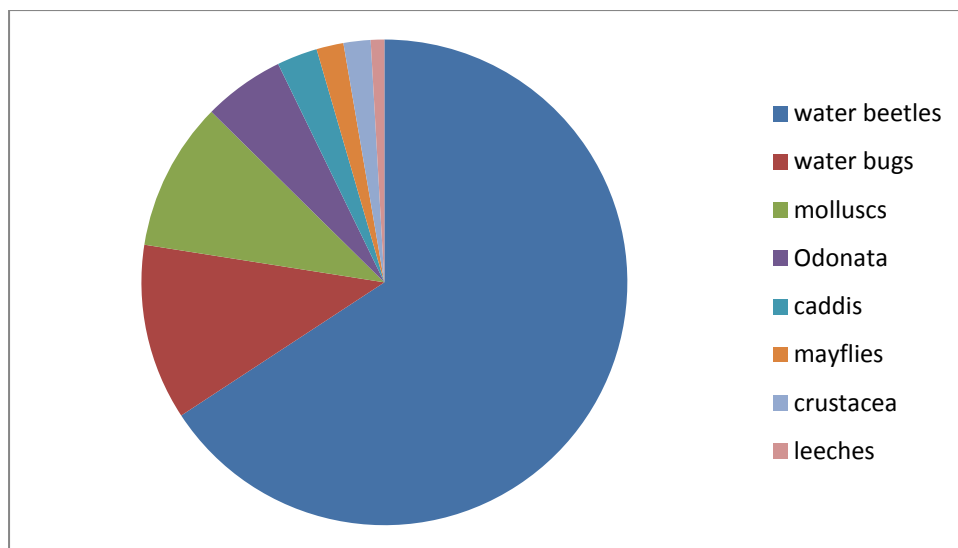


Figure 1: taxonomic composition of the aquatic macro-invertebrate fauna (excluding fly larvae)

Status	Species	English name
Endangered	<i>Bagous lutosus</i>	Miry Sloth Weevil
Vulnerable	<i>Dryops griseus</i>	a long-toed water beetle
Near Threatened	<i>Agabus labiatus</i>	a diving beetle
	<i>Agabus uliginosus</i>	a diving beetle
	<i>Agabus undulatus</i>	a diving beetle
	<i>Hydrochus brevis</i>	a scavenger water beetle
	<i>Hydrochus crenatus</i>	a scavenger water beetle
	<i>Hydrochus elongatus</i>	a scavenger water beetle
	<i>Enochrus nigrinus</i>	a scavenger water beetle
	<i>Hydrophilus piceus</i>	Great Silver Water Beetle
	<i>Hydraena palustris</i>	a small water beetle
	<i>Limnebius aluta</i>	a small water beetle
	<i>Dryops auriculatus</i>	a long-toed water beetle
Nationally Scarce	<i>Omphiscola glabra</i>	Pond Mud Snail
	<i>Segmentina nitida</i>	Shining Ram’s-horn snail

¹ Conservation status designations are explained in the relevant reviews: Foster (2010) for water beetles and Seddon *et al* (2014) for molluscs. Weevils were last reviewed by Hyman & Parsons (1992) using categories which have now been superceded; equivalent current categories have been used here. In brief, Endangered species are under threat of extinction in Great Britain; Vulnerable species have small and declining populations and very restricted ranges (Endangered and Vulnerable species are referred to as ‘Red Listed’). Near Threatened species are not currently in danger but are close to qualifying for Red List status. Nationally Scarce species have very localised distributions in Great Britain and are believed to occur in 100 or fewer hectads (10 km grid squares).

	<i>Noterus crassicornis</i>	a burrowing water beetle
	<i>Rhantus frontalis</i>	a diving beetle
	<i>Hydroporus neglectus</i>	a diving beetle
	<i>Clemnius decoratus</i>	a diving beetle
	<i>Helophorus nanus</i>	a scavenger water beetle
	<i>Helophorus strigifrons</i>	a scavenger water beetle
	<i>Enochrus quadripunctatus</i>	a scavenger water beetle
	<i>Helochares punctatus</i>	a scavenger water beetle
	<i>Notaris scirpi</i>	a weevil

Table 2: invertebrate species of conservation concern recorded during the survey

4.3 National significance

It is beyond the scope of this report to assess the wider significance of the Waterhouse Plantation ponds, though the combination of pingos, fluctuating meres and other water bodies certainly makes STANTA a nationally-important pondscape. By way of comparison, when species rarity scores are calculated for Waterhouse Lodge Pond and Pond 281, these are on a par with the best 33% and 25% of Thompson Common ponds respectively. Given that Thompson Common is often considered one of the UK's highest quality pond sites, this gives some indication of the conservation value of the Waterhouse Plantation pingos.

5. Species of conservation concern

5.1 Invertebrates

MOLLUSCA

Omphiscola glabra (Lymnaeidae), Pond Mud Snail

GB status: Nationally Scarce; NERC Act Section 41 Species of Principal Importance; Pond Mud Snail is also categorised as Near Threatened in the IUCN global Red List (Prié *et al*, 2011).

A distinctively elongate pond snail, closely associated with pools and pond margins in agriculturally-unimproved habitats. Its remnant distribution implies that Mud Snail is much more sedentary than most of the Lymnaeidae. It avoids water bodies supporting a rich variety of aquatic molluscs, preferring those which dry out in summer or are poor in nutrients (e.g. Kerney, 1999), though the oft-repeated claim that this is a calcifuge species is misleading.

Pond Mud Snail has declined massively, though significant populations persist in a few regions such as the New Forest and Humberhead Levels/Vale of York. There are post-1999 records from 47 hectads in Great Britain (Seddon *et al*, 2014). Kerney (1999) mapped TL99 as the only modern (post-1964) East Anglian hectad record; this grid square includes STANTA. There are known populations in several pingos on Stow Bedon Fuel Allotment and a single pond on Thompson Common.

Segmentina nitida (Planorbidae), Shining Ramshorn Snail

GB status: Nationally Scarce; NERC Act Section 41 Species of Principal Importance

This beautiful, translucent ram's-horn snail is a rare and seriously declining species which has disappeared from much of its British range. Most of its surviving stations are grazing marsh drains in the coastal levels of south-east England but it has long been known from some of the larger, more persistent pingos on Thompson Common (Kerney, 1999). A large population was found in grass mats along the northern shore of Waterhouse Lodge Pond. This represents a 'new' site for this rare species, albeit only around 3 km west of the populations at Thompson Common.



Quite extraordinarily (and perhaps uniquely), Shining Ram's-horn was found alongside Pond Mud Snail; the two species would normally be considered to occupy opposite habitats with Mud Snail favouring seasonal pools with soft water and *Segmentina* requiring permanent, calcareous water.

COLEOPTERA

Noterus crassicornis (Noteridae), a burrowing water beetle

GB status: Nationally Scarce

This small, brown, bullet-shaped beetle has a very patchy, 'semi-relict' distribution associated with lowland fenland areas. Its principal centres are the coastal grazing levels of south-east England; East Anglia; the Trent Valley and Humberhead Levels; the Cheshire Plain and Anglesey. *Noterus crassicornis* is flightless, having markedly reduced wings, and is probably a good indicator of historic (though sometimes highly modified) wetland landscapes. This species occurs both in primary wetlands (such as natural meres and pingos) and in secondary habitats such as ditches, ponds and borrow-pits on drained fenland. It was recorded from Ponds 281 and 414 during the survey.

Agabus labiatus (Dytiscidae), a diving beetle

GB status: Near Threatened

A very local dytiscid of richly-vegetated pools which has declined over much of its British range with numerous local or regional extinctions (Foster, 2010). *Agabus labiatus* was found in Pond 414, Pond 218 and the seasonal pond between the two.

Agabus uliginosus (Dytiscidae), a diving beetle

GB status: Near Threatened

A very local beetle of seasonal pools in unimproved grassland, fens and old woodland. *Agabus uliginosus* has its main population centres in the Brecks and the Vale of York/Humberhead Levels. It is classified as Near Threatened due to the vulnerability of its habitats and evidence of localised contractions in range (Foster, 2010). During this survey it was found in large numbers in the seasonal pool near Waterhouse Lodge and in a grassy woodland ditch. Females were of the matt *dispar* form.

Agabus undulatus (Dytiscidae), a diving beetle

GB status: Near Threatened



A mid-sized diving beetle with distinct gold zigzag marks on the 'shoulders' of its wing-cases. Like *Noterus crassicornis*, it is found in lowland fenland areas but persists in agricultural drains as well as more natural habitats. British populations are now centred on the Fens and Breckland (Foster & Friday, 2011); it has disappeared from outlying sites in southern and western England and survives precariously at a single northern station. *Agabus*

undulatus was found in Ponds 279, 281 and the 'long pond'.

Rhantus frontalis (Dytiscidae), a diving beetle

GB status: Nationally Scarce

Rhantus frontalis is a mid-sized diving beetle with a very patchy British distribution centred on eastern Scotland, East Anglia, the Thames and North Kent Marshes, the Somerset Levels and Anglesey (Foster & Friday, 2011). A single female was found in Pond 218.

Hydaticus seminiger (Dytiscidae), a diving beetle

GB status: Nationally Scarce

This large diving beetle occurs in richly-vegetated, often shaded ponds, mainly in East Anglia, the Home Counties, Dorset and the Cheshire Plain. *Hydaticus seminiger* was found in Waterhouse Lodge Pond, the nearby seasonal pool and Pond 414.

Hydroporus neglectus (Dytiscidae), a diving beetle

GB status: Nationally Scarce

A tiny diving beetle associated with seasonal or very shallow waters containing tussocks or leaf litter, recorded from Waterhouse Lodge Pond and a nearby seasonal pool.

Clemnius decoratus (Dytiscidae), a diving beetle

GB status: Nationally Scarce

This tiny but attractively-marked diving beetle occurs very locally in fen pools and pond margins from North Yorkshire southwards. During this survey it was recorded from Ponds 281, 414 and a seasonal pond in between as well as the long pond.

Helophorus nanus (Helophoridae), a scavenger water beetle

GB status: Nationally Scarce

A small *Helophorus* found in seasonal habitats such as fen pools, floodplain swamps and depressions in wet grassland. It was found in large numbers in Ponds 218 and 414 with a single specimen collected from the 'long pond'.

Helophorus strigifrons (Helophoridae), a scavenger water beetle

GB status: Nationally Scarce

A widespread but very local *Helophorus* of seasonal pools in fens and floodplain swamps, often with *H. nanus*. This species is known to retreat into Tufted Sedge *Carex elata* tussocks during dry periods. It was found in the grassy ditch but might be detected more widely in early spring, including in depressions which dry up in early summer.

Hydrochus brevis (Hydrochidae), a scavenger water beetle

GB status: Near Threatened

This species has a wide but extremely fragmented distribution in old fens, with strong populations largely confined to Broadland and Breckland (Foster, 2010). *Hydrochus brevis* was recorded from the 'long pond' and Pond 218.

Hydrochus crenatus (Hydrochidae), a scavenger water beetle

GB status: Near Threatened

A small, slender hydrophilid, virtually confined to fenland habitats in East Anglia and the counties around the Wash. Despite its very restricted distribution, *Hydrochus crenatus* can occur in secondary habitats including clay pits and the reedy margins of arable ditches. It is frequent in the Breckland pingo systems and was recorded from the long pond and Waterhouse Lodge Pond.

Hydrochus elongatus (Hydrochidae), a scavenger water beetle

GB status: Near Threatened

A scarce beetle of richly-vegetated water margins, *H. elongatus* has disappeared from several parts of its former British range with modern records restricted to southern and central England north to the Humber (Foster, 2010). Specimens of *H. elongatus* was collected from Pond 218 and the 'long pond'.

Hydrochus ignicollis (Hydrochidae), a scavenger water beetle

GB status: Near Threatened

This species is more restricted to ancient fens than *H. elongatus*. A specimen was collected by Professor Foster from a seasonal pond between Ponds 414 and 281.

Hydrophilus piceus (Hydrophilidae), Great Silver Water Beetle

GB status: Near Threatened

One of Britain's largest beetles, up to 48 mm in length, the Great Silver Water Beetle is associated with richly-vegetated ponds and drains, mostly on grazing levels. It is presently confined to Somerset, south-east England and East Anglia but formerly occurred more widely. This spectacular species appears to be a recent colonist of Breckland and was first recorded on nearby Thompson Common only in 2016. A few early instar larvae were found along the northern shore of Waterhouse Lodge Pond.

Helochares punctatus (Hydrophilidae), a scavenger water beetle

GB status: Nationally Scarce

Although listed as Nationally Scarce (Foster, 2010), *H. punctatus* is a localised rather than rare beetle, mostly associated with acidic bog-pools at low to moderate elevations but sometimes occurring in base-rich ponds. It was recorded from Waterhouse Lodge Pond and Pond 281.

Enochrus nigrinus (Hydrophilidae), a scavenger water beetle

GB status: Near Threatened

Occurring in "mesotrophic and base-rich fen, most often in relict sites", *E. nigrinus* is known in England from scattered sites between Hampshire and Cheshire, and also on Anglesey (Foster *et al*, 2014). It is frequent in the Breckland pingo systems. During this survey it was collected from Waterhouse Lodge Pond and a nearby seasonal pool, Pond 281 and a seasonal pond north of Waterhouse Plantation.

Enochrus quadripunctatus (Hydrophilidae), a scavenger water beetle

GB status: Nationally Scarce

A mid-sized scavenger water beetle associated with clayey or silty water margins. Although older records are confused by taxonomic changes, the true *E. quadripunctatus* has a restricted British distribution strongly centred on eastern England; it appears to have extended its range in recent years (Foster *et al*, 2014). It was collected from Pond 414 and a nearby seasonal pond.

Hydraena palustris (Hydraenidae), a small water beetle

GB status: Near Threatened

A very small beetle restricted to ancient fens in Cambridgeshire and East Anglia with an outlying site in East Yorkshire, though subfossil records indicate that *H. palustris* was once much more widespread. A single specimen was collected by Professor Foster from the un-numbered seasonal pond north of Waterhouse Plantation.

Limnebius aluta (Hydraenidae), a small water beetle

GB status: Near Threatened

Britain's smallest Hydraenid, *L. aluta* occurs in silty water margins or among plant litter in old fen habitats. It was recorded from the long pond, Waterhouse Lodge Pond and Ponds 281 and 414.

Dryops auriculatus (Dryopidae), a long-toed water beetle

GB status: Near Threatened

A rare species of heath and fen pools found from Yorkshire southwards. It is, according to Foster (2010), "largely confined to natural habitats" though its distribution is more widely scattered than *D. griseus*. It was recorded from Ponds 414 and 218, being plentiful in grass mats in the second location.

Dryops griseus (Dryopidae), a long-toed water beetle

GB status: Vulnerable

This is the rarest British *Dryops*, confined to a handful of relict fens in Cambridgeshire and East Anglia with an isolated outlying station in the Vale of York. It was recorded from Ponds 279 and 281.

Miry Sloth Weevil, *Bagous lutosus* (Curculionidae)

GB status: Endangered

Collected by Martin Collier from Pond 281, this aquatic weevil is the most important species recorded during the survey. Although Hyman & Parsons (1992) list bur-reeds *Sparganium* as

its foodplant, the Miry Sloth Weevil is actually associated with pondweeds, including Various-leaved Pondweed *Potamogeton gramineus* (Hansen *et al*, 1991) and Fen Pondweed *P. coloratus* (Nelson, 2007). In Pond 281, the latter is almost certainly the foodplant.

Miry Sloth Weevil is a Norfolk speciality, first recorded in Britain from Wreatham Heath in 1900 and 1903 (Anon, 1904). One of the few recent records is from the Devil's Punchbowl, a fluctuating mere on STANTA (Martin Collier, pers com). It appears to be rare throughout Europe, being categorised as Rare in Germany, Vulnerable in Finland, Near Threatened in Norway and Endangered in the Czech Republic. It is listed in the Irish Red Data Book as 'Data Deficient' as it was only discovered there in 2005.

Notaris scripi (Eirrhinidae), a weevil

A widespread but very local weevil found on sedges, recorded from Pond 281 and the nearby seasonal pond.

5.2 Plants

Species listed here include vascular plants meriting Red List² or Near Threatened status in England (Stroh *et al*, 2014³); vascular plants listed as Nationally Scarce in Great Britain (Leach & Rusbridge, 2006); and bryophytes listed as Nationally Scarce in Great Britain (Preston, 2006).

***Carex elata*, Tufted Sedge**

English status: Near Threatened

This tussock-forming sedge is associated with fluctuating water margins in base-rich fens. Its British distribution is centred on the belt of former fenland extending from East Anglia to the Vale of York with outlying centres in the Lake District, the Cheshire Plain and Anglesey. Its range (Extent of Occupancy) in England contracted by 29% during the second half of the 20th century.

Tufted Sedge is one of the most characteristic plants of the Breckland palaeo-ponds, in both shaded and open habitats and forms an important structural component of their vegetation. During this survey it was recorded from Waterhouse Lodge Pond and the 'long' pond.

² **Red List** species are those categorised as Regionally Extinct, Critically Endangered, Endangered or Vulnerable in relevant inventories. **Near Threatened** plants are mainly those undergoing significant declines in distribution which are not yet at risk but liable to become so if present trends continue.

³ The recently-published vascular plant Red List for England provides a more relevant basis for conservation assessment than previous inventories covering the whole of Great Britain as many species which have stable populations in Scotland are threatened in lowland England.

***Hottonia palustris*, Water Violet**

English status: Vulnerable

A locally-abundant plant in semi-permanent palsa-scar ponds, Water Violet was less common than expected at Waterhouse Plantation, being found only in Pond 279 and the 'long' pond. Its status of Vulnerable in England reflects a sustained decline in distribution.

***Oenanthe fistulosa*, Tubular Water-dropwort**

English status: Vulnerable; NERC Act Section 41 Species of Principal Importance

A seriously declining umbellifer of pond and ditch margins, fens and wet grassland, Tubular Water-dropwort is locally-abundant in Pond 281.

***Potamogeton coloratus*, Fen Pondweed**

GB status: Nationally Scarce

This translucent pondweed is restricted to calcareous but oligotrophic still-waters. Its main centres are in East Anglia and Cambridgeshire, the Somerset Levels, Anglesey and the Hebrides. Fen Pondweed forms a large submerged stand in Pond 281.

***Ricciocarpus natans*, Fringed Heartwort**

GB status: Nationally Scarce

This distinctive floating liverwort has a restricted distribution in base-rich, lowland waters, mainly in eastern England. It is plentiful in Pond 281.

6. References

- Anon** (1904). Societies and academies: London, Entomological Society, November 2. *Nature*, **71**: 117–120.
- Foster, G.N.** (2010). *A review of the scarce and threatened Coleoptera of Great Britain, Part 3: water beetles of Great Britain*. Joint Nature Conservation Committee: Peterborough.
- Foster, G.N., Bilton, D.T. & Friday, L.E.** (2014). *Keys to adults of the water beetles of Britain and Ireland (Part 2)*. Handbooks for the Identification of British Insects, **4** (5b). Royal Entomological Society: London.
- Foster, G.N. & Friday, L.E.** (2011). *Keys to adults of the water beetles of Britain and Ireland (Part 1)*. Handbooks for the Identification of British Insects, **4** (5). Royal Entomological Society: London.
- Kerney, M.** (1999). *Atlas of the land and freshwater molluscs of Britain and Ireland*. Harley Books: Colchester.
- Leach, S. J., & Rusbridge, D. J.** (2006). *A tool for assessing the current conservation status of vascular plants on SSSIs in England*. English Nature Research Reports, No 690. English Nature: Peterborough.
- Nelson, B. (2007). *Bagous lutosus* and *Stenopelmus rufinasus* new to Ireland and recent records of two other rare Irish weevils (Curculionidae and Eirrhinidae) *The Coleopterist*, **16**: 141-145.
- Preston, C.D.** (2006). A revised list of nationally scarce bryophytes. *Field Bryology* **90**, 22–30.
- Prié, V., Seddon, M.B. & Vavrova, L.** (2011). *Omphiscola glabra*. The IUCN Red List of threatened species 2011. Accessed at: <http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T156100A4894924.en>.
- Seddon, M.B., Killeen, I.J. & Fowles, A.P.** (2014). *A review of the non-marine Mollusca of Great Britain*. Species Status No. 17. NRW Evidence Report 14. Natural Resources Wales: Bangor.
- Stroh, P.A., Leach, S.J., August, T.A., Walker, K.J., Pearman, D.A., Rumsey, F.J., Harrower, C.A., Fay, M.F., Martin, J.P., Pankhurst, T., Preston, C.D. & Taylor, I.** (2014). *A vascular plant Red List for England*. Botanical Society of Britain and Ireland: Bristol.

Appendix 1: PSYM data and outputs

SITE DATA						
Site name	STANTA Pond 279	STANTA Pond 281	STANTA Pond 414	STANTA field pond	STANTA Long Pond	STANTA Waterhouse Lodge Pond
Survey date	17-May-18	17-May-18	16-May-18	17-May-18	17-May-18	16-May-18
Grid reference (e.g. SP123456 or higher precision)	TL905950	TL906952	TL905951	TL901947	TL906949	TL908949
<i>Plant metrics</i>						
No. of submerged + marginal plant species (not including floating leaved)	15	22	13	6	9	28
Number of uncommon plant species	4	8	2	1	3	7
Trophic Ranking Score (TRS)	8.9428571	8.3888889	8.9666667	9.75	9.26	9.38
<i>Invertebrates metrics</i>						
ASPT	4.6363636	5	4.4615385	4.7647059	4	5
Odonata + Megaloptera (OM) families	1	2	1	1	0	3
Coleoptera families	2	4	3	4	2	3
<i>Environmental variables</i>						
Altitude (m)	30	30	30	31	29	30
Shade (%)	35	0	40	8	80	20
Inflow (0/1)	0	0	0	0	0	1
Grazing (%)	0	100	0	100	0	0
pH	7.09	7.68	7.54	7.99	6.83	6.41
Emergent plant cover (%)	5	55	35	7	5	5
Base clay (1-3)	3	3	3	3	3	3
Area (m²)	475	1305	470	260	5650	10000

Results	STANTA Pond 279	STANTA Pond 281	STANTA Pond 414	STANTA field pond	STANTA Long Pond	STANTA Waterhouse Lodge Pond
Submerged + marginal plant species						
Predicted (SM)	18.7	21.9	18.7	16.4	31.2	33.5
Actual (SM)	15	22	13	6	9	28
EQI (SM)	0.80	1.00	0.69	0.37	0.29	0.83
IBI (SM)	3	3	2	1	1	3
Uncommon plant species						
Predicted (U)	3.3	3.6	3.3	2.7	5.6	5.9
Actual (U)	4	8	2	1	3	7
EQI (U)	1.22	2.21	0.61	0.37	0.54	1.19
IBI (U)	3	3	2	1	2	3
Trophic Ranking Score (TRS)						
Predicted (TRS)	8.74	8.75	8.74	8.74	8.79	8.72
Actual (TRS)	8.94	8.39	8.97	9.75	9.26	9.38
EQI (TRS)	1.02	0.96	1.03	1.12	1.05	1.08
IBI (TRS)	3	3	3	1	2	2
ASPT						
Predicted (ASPT)	5.11	5.09	5.11	5.10	5.11	5.19
Actual (ASPT)	4.64	5.00	4.46	4.76	4.00	5.00
EQI (ASPT)	0.91	0.98	0.87	0.93	0.78	0.96
IBI (ASPT)	3	3	3	3	2	3
Odonata + Megaloptera (OM) families						
Predicted (OM)	3.33	3.25	3.41	3.31	3.41	3.34
Actual (OM)	1	2	1	1	0	3
EQI (OM)	0.30	0.62	0.29	0.30	0.00	0.90
IBI (OM)	1	2	1	1	0	3
Coleoptera families						

Predicted (CO)	3.75	3.74	3.75	3.73	3.78	3.85
Actual (CO)	2	4	3	4	2	3
EQI (CO)	0.53	1.07	0.80	1.07	0.53	0.78
IBI (CO)	2	3	3	3	2	3
Sum of Individual Metrics	15	17	14	10	9	17
Index of Biotic Integrity (%)	83%	94%	78%	56%	50%	94%
PSYM quality category (IBI >75%=Good, 51-75%=Moderate, 25-50%=Poor, <25%=V Poor)	Good	Good	Good	Moderate	Poor	Good
Is this a Priority Pond? (Good quality category)	Yes	Yes	Yes	No	No	Yes

Appendix 2: aquatic macro-invertebrate taxa recorded during the survey

TAXON	ENGLISH NAME	FAMILY	ORDER	GB STATUS ⁴
Tricladida	flatworms	Tricladida	Tricladida	
<i>Erpobdella testacea</i>	a leech	Erpobdellidae	Hirudinea	
<i>Aplexa hypnorum</i>	Moss Bladder Snail	Physidae	Gastropoda	
<i>Lymnaea stagnalis</i>	Great Pond Snail	Lymnaeidae	Gastropoda	
<i>Omphiscola glabra</i>	Pond Mud Snail	Lymnaeidae	Gastropoda	NS, SPI
<i>Radix balthica</i>	Wandering Snail	Lymnaeidae	Gastropoda	
<i>Stagnicola palustris</i> agg.	Marsh Pond Snail	Lymnaeidae	Gastropoda	
<i>Anisus leucostoma</i>	White-lipped Ram's-horn snail	Planorbidae	Gastropoda	
<i>Bathymphalus contortus</i>	Twisted Ram's-horn snail	Planorbidae	Gastropoda	
<i>Planorbis carinatus</i>	Keeled Ram's-horn snail	Planorbidae	Gastropoda	
<i>Planorbis planorbis</i>	Margined Ram's-horn	Planorbidae	Gastropoda	
<i>Segmentina nitida</i>	Shining Ram's-horn snail	Planorbidae	Gastropoda	NS, SPI
<i>Pisidium</i> sp.	a pea-mussel	Sphaeriidae	Bivalvia	
<i>Crangonyx pseudogracilis</i>	an amphipod shrimp	Crangonyctidae	Amphipoda	
<i>Asellus aquaticus</i>	Water Hoglouse	Asellidae	Isopoda	
<i>Cloeon dipterum</i>	Pond Olive mayfly	Baetidae	Ephemeroptera	
<i>Caenis</i> sp.	a mayfly	Caenidae	Ephemeroptera	
<i>Coenagrion puella</i>	Azure Damselfly	Coenagrionidae	Odonata	
<i>Libellula quadrimaculata</i>	Four-spotted Chaser	Libellulidae	Odonata	
<i>Orthetrum cancellatum</i>	Black-tailed Skimmer	Libellulidae	Odonata	
<i>Sympetrum sanguineum</i>	Ruddy Darter	Libellulidae	Odonata	
<i>Aeshna cyanea</i>	Southern Hawker	Aeshnidae	Odonata	
<i>Anax imperator</i>	Emperor Dragonfly	Aeshnidae	Odonata	
<i>Nepa cinerea</i>	Water Scorpion	Nepidae	Hemiptera	

⁴ NS = Nationally Scarce; NT = Near Threatened; VU = Vulnerable; EN - Endangered; SPI = Species of Principal Importance for the conservation of biodiversity

<i>Corixa punctata</i>	a lesser water-boatman	Corixidae	Hemiptera	
<i>Hesperocorixa linnaei</i>	a lesser water-boatman	Corixidae	Hemiptera	
<i>Hesperocorixa moesta</i>	a lesser water-boatman	Corixidae	Hemiptera	
<i>Hesperocorixa sahlbergi</i>	a lesser water-boatman	Corixidae	Hemiptera	
<i>Sigara distincta</i>	a lesser water-boatman	Corixidae	Hemiptera	
<i>Notonecta glauca</i>	Common Backswimmer	Notonectidae	Hemiptera	
<i>Plea minutissima</i>	Pygmy Backswimmer	Pleidae	Hemiptera	
<i>Ilyocoris cimicoides</i>	Saucer Bug	Naucoridae	Hemiptera	
<i>Hydrometra stagnorum</i>	Water-measurer	Hydrometridae	Hemiptera	
<i>Gerris lacustris</i>	Common Pond-skater	Gerridae	Hemiptera	
<i>Gerris odontogaster</i>	Toothed Pond-skater	Gerridae	Hemiptera	
<i>Microvelia reticulata</i>	a pygmy water-cricket	Veliidae	Hemiptera	
<i>Gyrinus substriatus</i>	Common Whirligig	Gyrinidae	Coleoptera	
<i>Haliphus ruficollis</i>	an algivorous water beetle	Haliplidae	Coleoptera	
<i>Noterus clavicornis</i>	a burrowing water beetle	Noteridae	Coleoptera	
<i>Noterus crassicornis</i>	a burrowing water beetle	Noteridae	Coleoptera	NS
<i>Agabus bipustulatus</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Agabus labiatus</i>	a diving beetle	Dytiscidae	Coleoptera	NT
<i>Agabus sturmii</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Agabus uliginosus</i>	a diving beetle	Dytiscidae	Coleoptera	NT
<i>Agabus undulatus</i>	a diving beetle	Dytiscidae	Coleoptera	NT
<i>Ilybius ater</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Ilybius chalconatus</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Ilybius fuliginosus</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Ilybius montanus</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Colymbetes fuscus</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Nartus grapii</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Rhantus exsoletus</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Rhantus frontalis</i>	a diving beetle	Dytiscidae	Coleoptera	NS

<i>Rhantus suturalis</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Liopterus haemorrhoidalis</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Acilius sulcatus</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Dytiscus semisulcatus</i>	a great diving beetle	Dytiscidae	Coleoptera	
<i>Dytiscus</i> sp. (not <i>semisulcatus</i>)	a great diving beetle	Dytiscidae	Coleoptera	
<i>Hydaticus seminiger</i>	a diving beetle	Dytiscidae	Coleoptera	NS
<i>Graptodytes granularis</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Hydroporus angustatus</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Hydroporus gyllenhalii</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Hydroporus neglectus</i>	a diving beetle	Dytiscidae	Coleoptera	NS
<i>Hydroporus palustris</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Hydroporus planus</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Hydroporus pubescens</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Hydroporus striola</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Porhydrus lineatus</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Clemnius decoratus</i>	a diving beetle	Dytiscidae	Coleoptera	NS
<i>Hygrotus inaequalis</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Hyphydrus ovatus</i>	a diving beetle	Dytiscidae	Coleoptera	
<i>Helophorus nanus</i>	a scavenger water beetle	Helophoridae	Coleoptera	NS
<i>Helophorus strigifrons</i>	a scavenger water beetle	Helophoridae	Coleoptera	NS
<i>Hydrochus brevis</i>	a scavenger water beetle	Hydrochidae	Coleoptera	NT
<i>Hydrochus crenatus</i>	a scavenger water beetle	Hydrochidae	Coleoptera	NT
<i>Hydrochus elongatus</i>	a scavenger water beetle	Hydrochidae	Coleoptera	NT
<i>Hydrochus ignicollis</i>	a scavenger water beetle	Hydrochidae	Coleoptera	NT
<i>Anacaena globulus</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	
<i>Anacaena limbata</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	
<i>Anacaena lutescens</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	
<i>Cymbiodyta marginellus</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	
<i>Enochrus coarctatus</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	

<i>Enochrus nigritus</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	NT
<i>Enochrus quadripunctatus</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	NS
<i>Enochrus testaceus</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	
<i>Helochares punctatus</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	NS
<i>Hydrobius fuscipes</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	
<i>Hydrobius rottenbergii</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	
<i>Hydrobius subrotundus</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	
<i>Hydrophilus piceus</i>	Great Silver Water Beetle	Hydrophilidae	Coleoptera	NT
<i>Coelostoma orbiculare</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	
<i>Cercyon convexiusculus</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	
<i>Cercyon sternalis</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	
<i>Hydraena britteni</i>	a small water beetle	Hydraenidae	Coleoptera	
<i>Hydraena palustris</i>	a small water beetle	Hydraenidae	Coleoptera	NT
<i>Hydraena riparia</i>	a small water beetle	Hydraenidae	Coleoptera	
<i>Limnebius aluta</i>	a small water beetle	Hydraenidae	Coleoptera	NT
<i>Limnebius truncatellus</i>	a small water beetle	Hydraenidae	Coleoptera	
<i>Ochthebius minimus</i>	a small water beetle	Hydraenidae	Coleoptera	
<i>Dryops auriculatus</i>	a long-toed water beetle	Dryopidae	Coleoptera	NT
<i>Dryops griseus</i>	a long-toed water beetle	Dryopidae	Coleoptera	VU
<i>Tanysphyrus lemnae</i>	Duckweed Weevil	Eirrhinidae	Coleoptera	
<i>Notaris acridulus</i>	a weevil	Eirrhinidae	Coleoptera	
<i>Notaris scirpi</i>	a weevil	Eirrhinidae	Coleoptera	NS
<i>Bagous lutosus</i>	Miry Sloth Weevil	Curculionidae	Coleoptera	EN
<i>Limnobaris t-album</i>	a weevil	Curculionidae	Coleoptera	
<i>Contacyphon padi</i>	a scavenger water beetle	Hydrophilidae	Coleoptera	
<i>Contacyphon variabilis</i>	a marsh beetle	Scirtidae	Coleoptera	
<i>Limnephilus flavicornis</i>	a caddis fly	Limnephilidae	Trichoptera	
<i>Limnephilus vittatus</i>	a caddis fly	Limnephilidae	Trichoptera	
<i>Limnephilus</i> sp. (indet, others)	a caddis fly	Limnephilidae	Trichoptera	

Chaoboridae	phantom midge larvae	Chaoboridae	Diptera	
Chironomidae	non-biting midge larvae	Chironomidae	Diptera	
Culicidae	mosquito larvae	Culicidae	Diptera	
Dixidae	meniscus midge larvae	Dixidae	Diptera	
Stratiomyidae indet	soldier-fly larvae	Stratiomyidae	Diptera	