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July 2015

In the UK and Ireland 27 species of earthworm have been recorded living in natural environments. Earthworms are under-recorded and as a result we know very little about the true distribution of many of our species. In fact, distribution maps have only been published for a handful of species. The Earthworm Society of Britain (ESB) was set up to tackle this issue and now manages the National Earthworm Recording Scheme. The aims of this scheme are to train new earthworm recorders and produce new earthworm records.

On 4<sup>th</sup> and 5<sup>th</sup> July Kerry Calloway and Dan Carpenter led a team of experienced and trainee earthworm recorders to undertake earthworm sampling in York. Seven habitats were sampled across four locations in York: St Nicks Nature Reserve, Fulford Ings, Walmgate Stray and University of York Campus. This report outlines some background information on earthworm ecology and the results of the sampling.

## Earthworm Ecology

### *Compost earthworms*

As their name would suggest, these are most likely to be found in a compost bin, but can also be found in manure heaps, sewage treatments works and other places with large amounts of organic matter. They prefer warm and moist environments with a ready supply of fresh organic material. They can very rapidly consume this material and also reproduce very quickly. Compost earthworms tend to be bright red in colour and stripy. Compost earthworm species include *Eisenia fetida* and *Dendrobaena veneta*

### *Epigeic earthworms*

Epigeic earthworms live on the surface of the soil in leaf litter. These species tend not to make burrows but live in and feed on the leaf litter. Epigeic earthworms are also often bright red or reddy-brown, but they are not stripy. Epigeic earthworm species include *Dendrobaena octaedra*, *Dendrobaena attemsi*, *Dendrodrilus rubidus*, *Eiseniella tetraedra*, *Heliodrilus oculatus*, *Lumbricus rubellus*, *Lumbricus castaneus*, *Lumbricus festivus*, *Lumbricus friendi*, and *Satchellius mammalis*

### *Endogeic earthworms*

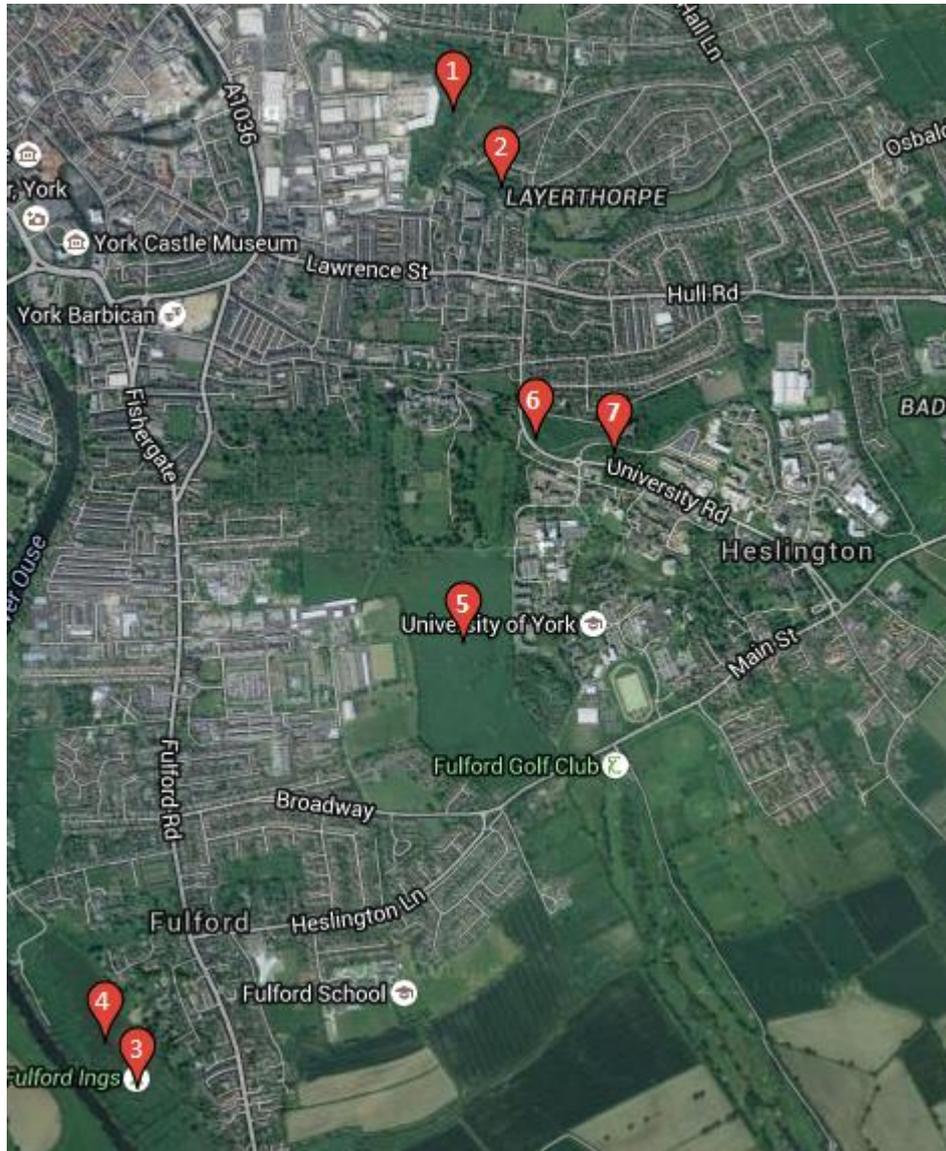
Endogeic earthworms live in and feed on the soil. They make horizontal burrows through the soil to move around and to feed and they will reuse these burrows to a certain extent. Endogeic earthworms are often pale colours, grey, pale pink, green or blue. Some can burrow very deeply in the soil. Endogeic earthworm species include *Allolobophora chlorotica*, *Aporrectodea caliginosa*, *Aporrectodea icterica*, *Aporrectodea rosea*, *Murchieona muldali*, *Octolasion cyaneum* and *Octolasion lacteum*

### *Anecic earthworms*

Anecic earthworms make permanent vertical burrows in soil. They feed on leaves on the soil surface that they drag into their burrows. They also cast on the surface, and these casts can quite often be seen in grasslands. They also make middens (piles of casts) around the entrance to their burrows. Anecic species are the largest species of earthworms in the UK. They are darkly coloured at the head end (red or brown) and have paler tails. Anecic earthworm species include *Lumbricus terrestris* and *Aporrectodea longa*

## Study Sites

Seven sites (see figure 1) were sampled across York that represented a range of habitats, including (woodlands, stream bank, ditch and grasslands). Environmental variables such as grid reference, altitude and habitat were recorded at each site (see table 1)



Map data ©2015 Google Imagery ©2015 DigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky, Landsat

Figure 1 (above): Satellite map of York area showing the location of sampling sites. The numbered pins show the location of the sampling sites.

**Table 1: Details of sampling locations in York**

Site No.	Grid Reference	Altitude (m)	Habitat	Sampling Method and Comments
1	SE61645180	10	woodland	ESB standard + deadwood microhabitat Alder, oak and hawthorn growing
2	SE61735158	10	stream bank	ESB standard + extra soil pit on island in stream with very wet soil. Hawthorn, elder, nettles and cow parsley growing Surprisingly dry soil considering low down on stream bank and close to water.
3	SE60544928	10	grassland	ESB standard Greater Burnet growing Flood plain meadow
4	SE60544929	10	woodland	3 soil pits Small copse of field maple, hawthorn and nettle in middle of flood plain meadow
5	SE61735046	10	grassland	ESB standard + dung microhabitat search
6	SE61895084	20	ditch	1 soil pit
7	SE62095083	20	woodland	1 soil pit, deadwood and leaf litter search

## Sampling Method

The ESB's standard sampling protocol for earthworm sampling was followed in accordance with the National Earthworm Recording Scheme.

**Soil Pit Sampling:** 5 soil pits were excavated at each site measuring approximately 25 x 25 x 10cm. The contents of each pit were hand sorted and any earthworms were removed and preserved in 80% alcohol on site. In addition to the sampling, an eight figure grid reference of the location and habitat details were recorded.

**Microhabitat Searches:** To improve the probability of finding epigeic and compost species of earthworm, microhabitats were also searched at several sites (microhabitats included dead wood, leaf litter and random turn over).

For further details please see the ESB's 'Sampling Earthworms' webpage:

<http://www.earthwormsoc.org.uk/earthworm-identification/sampling-earthworms>

## Identification

Earthworms were identified at the University of York using binocular microscopes and the Field Studies Council *Key to the earthworms of Britain and Ireland* (Sherlock, 2012). All identifications were verified by experienced ESB recorders (Kerry Calloway and Dan Carpenter).

## Yorkshire ESB Weekend Species List

In total 18 earthworm records were created during this sampling initiative. The species list below lists the 11 different species that were recorded in the 7 sites:

### St Nicks Nature Reserve - woodland

*Allolobophora chlorotica* (Number of records = 1, Number of individuals = 8)  
*Dendrodrilus rubidus* (Number of records = 1, Number of individuals = 2)  
*Murchieona muldali* (Number of records = 1, Number of individuals = 1)

### St Nicks Nature Reserve – stream bank

*Eiseniella tetraedra* (Number of records = 1, Number of individuals = 1)

### Fulford Ings - grassland

*Allolobophora chlorotica* (Number of records = 1, Number of individuals = 1)  
*Aporectodea caliginosa* (Number of records = 1, Number of individuals = 1)

### Fulford Ings - woodland

*Allolobophora chlorotica* (Number of records = 1, Number of individuals = 11)  
*Aporrectodea rosea* (Number of records = 1, Number of individuals = 2)

### Walmgate Stray

*Allolobophora chlorotica* (Number of records = 1, Number of individuals = 4)  
*Aporrectodea longa* (Number of records = 1, Number of individuals = 1)  
*Aporrectodea rosea* (Number of records = 1, Number of individuals = 1)  
*Lumbricus rubellus* (Number of records = 1, Number of individuals = 1)  
*Lumbricus terrestris* (Number of records = 1, Number of individuals = 1)

### University of York Campus - ditch

*Aporrectodea rosea* (Number of records = 1, Number of individuals = 2)

### University of York Campus - woodland

*Allolobophora chlorotica* (Number of records = 1, Number of individuals = 2)  
*Allolobophoridella eiseni* (Number of records = 1, Number of individuals = 1)  
*Lumbricus castaneus* (Number of records = 1, Number of individuals = 4)  
*Lumbricus terrestris* (Number of records = 1, Number of individuals = 1)

Most of the species recorded are thought to be common species with broad distributions. Of the 11 different species found on this trip two (*Allolobophoridella eiseni* and *Murchieona muldali*) are classified as rare. However, with such a small amount of data on available earthworm distributions and species abundances it is actually very difficult to tell with any certainty the distributions of British earthworm species. It seems that several of the species which are currently classified as rare or very rare may actually just be extremely under recorded. As more

records are gathered across a range of habitats a more accurate picture of the state of our earthworm species will be produced.

We have produced and submitted four county first records from this trip to the National Earthworm Recording Scheme. *Allolobophorida eiseni*, *Murchieona muldali*, *Lumbricus rubellus* and *Lumbricus terrestris* had never been recorded (and submitted to the National Earthworm Recording Scheme) in North Yorkshire until now.

## National Earthworm Recording Scheme

All of the records have been submitted to the National Earthworm Recording Scheme and will be shared responsibly with external organisations, such as Local Biological Records Centres and the National Biodiversity Network. Earthworm records will be made freely available, alongside other wildlife records, to the general public.

The ESB website ([www.earthwormsoc.org.uk](http://www.earthwormsoc.org.uk)) contains guidance on sampling, identifying and recording earthworms and includes PDF copies of our:

Creating & Submitting Earthworm Records – A guide to the essential and desired earthworm record fields for the National Earthworm Recording Scheme. This also includes instruction for using the iRecord Earthworm Survey form

ESB Sampling Standard Protocol – A guide to sampling earthworms using the National Earthworm Recording Scheme sampling standard protocol. This includes guidance on how to undertake soil pit sampling and organise your soil pits, as well as guidance on undertaking microhabitat searches.

Earthworm Field Sampling Form – A form for recording site data when undertaking earthworm sampling.

Earthworm Records Submission Sheet – An excel spreadsheet that can be used to submit earthworm records to the National Earthworm Recording Scheme.

The ESB is always grateful to receive any new, or old, records. Please note that even single records of a species with no habitat information are still useful as geographic distribution data is still very limited with regards to earthworms. Please feel free to contact us if you are interested in organising any earthworm identification training for your staff.

## Further Information

Carpenter D, Sherlock E, Jones DT, Chiminoides J, Writer T, Neilson R, Boag B, Keith AM, Eggleton P (2012) Mapping of earthworm distributions for the British Isles and Eire highlights the under-recording of an ecologically important group. *Biodiversity Conservation* 21:475-485

[Natural England \(2014\) Earthworms in England: distribution, abundance and habitats](#)

[Sims RW, Gerrard BM \(1999\) Earthworms. Synopses of the British Fauna \(New Series\). 39. London: Linnean Society of London](#)

[Sherlock E \(2012\) Key to the earthworms of the UK and Ireland. Field Studies Council](#)

Please contact the author of this report, Kerry Calloway, at [info@earthwormsoc.org.uk](mailto:info@earthwormsoc.org.uk) if you have any queries regarding this report.

**Table 2: Records collected through soil pit and microhabitat sampling of 7 sites across York by Kerry Calloway and Dan Carpenter on 4<sup>th</sup> and 5<sup>th</sup> July 2015.**

Species	Grid Reference	Date (dd/mm/yyyy)	Habitat	Substrate
<i>Allolobophora chlorotica</i>	SE61645180	04/07/2015	woodland	soil
<i>Murchieona muldali</i>	SE61645180	04/07/2015	woodland	soil
<i>Dendrodrilus rubidus</i>	SE61645180	04/07/2015	woodland	dead wood
<i>Eiseniella tetraedra</i>	SE61735158	04/07/2015	stream bank	soil
<i>Allolobophora chlorotica</i>	SE60544928	04/07/2015	grassland	soil
<i>Aporrectodea caliginosa</i>	SE60544928	04/07/2015	grassland	soil
<i>Allolobophora chlorotica</i>	SE60544929	04/07/2015	woodland	soil
<i>Aporrectodea rosea</i>	SE60544929	04/07/2015	woodland	soil
<i>Allolobophora chlorotica</i>	SE61735046	05/07/2015	grassland	soil
<i>Aporrectodea longa</i>	SE61735046	05/07/2015	grassland	soil
<i>Aporrectodea rosea</i>	SE61735046	05/07/2015	grassland	soil
<i>Lumbricus rubellus</i>	SE61735046	05/07/2015	grassland	soil
<i>Lumbricus terrestris</i>	SE61735046	05/07/2015	grassland	soil
<i>Aporrectodea rosea</i>	SE61895084	05/07/2015	ditch	soil
<i>Allolobophoridella eiseni</i>	SE62095083	05/07/2015	woodland	leaf litter
<i>Lumbricus castaneus</i>	SE62095083	05/07/2015	woodland	leaf litter
<i>Lumbricus terrestris</i>	SE62095083	05/07/2015	woodland	leaf litter
<i>Allolobophora chlorotica</i>	SE62095083	05/07/2015	woodland	soil

## Acknowledgements

We would like to thank Ivana Jakubkova and Jonathon Dent at St Nicks Nature Reserve, Nadine Rolls and Daniel Calvert (City of York Council), Natural England and the University of York for kindly allowing us to sample on their land and Prof. Mark Hodson at the University of York for allowing us to use his lab to run an identification course and identify these specimens.

We would also like to thank all of the participants (see table 3 below) for all their contribution to the Yorkshire sampling initiative.

**Table 3: The volunteers that were involved in the earthworm sampling of Yorkshire and the identification of specimens.**

<b>Individuals involved in specimen collection and identification</b>
Kerry Calloway
Dan Carpenter
Christina Chalkia
Kirsty Godsman
Keith Lugg
Yusef Samari
Emma Sheard