



An Audit of Performance in the Analysis of Biological Samples. WBB Devon Clays Ltd

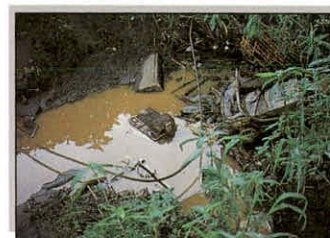
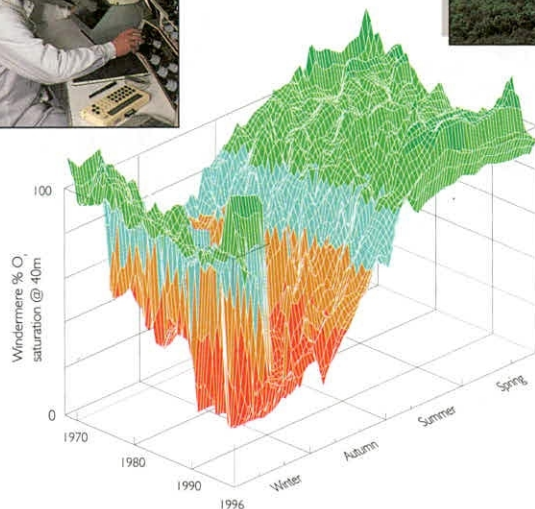
R J M Gunn, BA

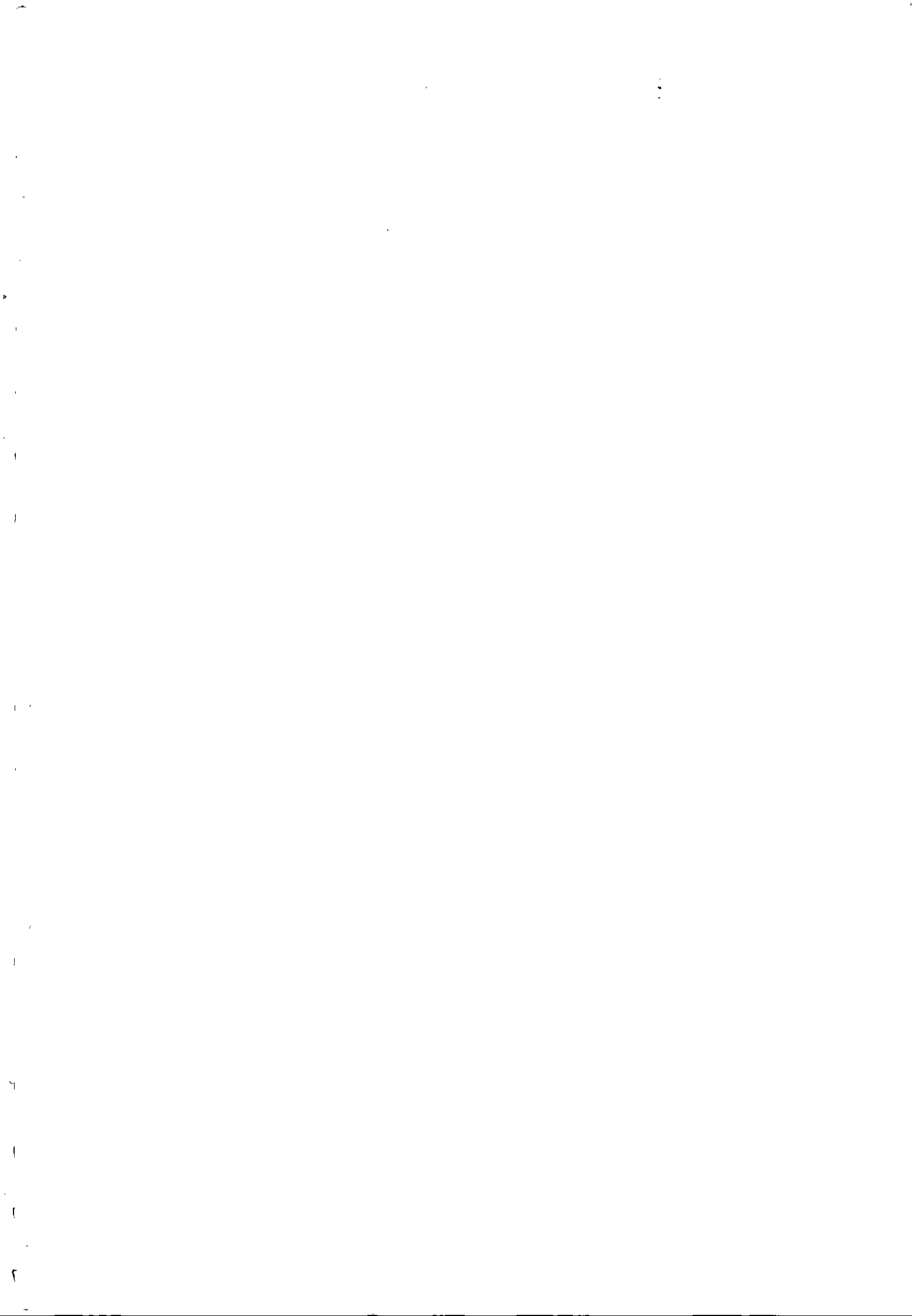
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Report To:
CEH Project No:
IFE Report Ref. No:

WBB Devon Clays Ltd
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An Audit of Performance in the Analysis of Biological Samples. WBB Devon Clays Ltd

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Project Leader:	R.J.M. Gunn
Report Date:	March 1999
Report To:	WBB Devon Clays Ltd
IFE Report Ref. No:	RL/T04071R7/15

**Centre for
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1. INTRODUCTION

The use of aquatic macro-invertebrate communities for the biological assessment of river quality is now a well-established technique that is employed by many environmental consultancies throughout the United Kingdom. In much of the biological monitoring undertaken, specimens are identified to family level and the level of pollution measured by use of the Biological Monitoring Working Party (BMWP) score system. This provides a reliable measure of organic pollution but has limited value as an indicator of other stresses on a particular site. Furthermore, family level data is of limited use when assessing the conservation value of a particular site. For this purpose, species-level data is required.

The analysis of biological samples and subsequent identification of macro-invertebrates to species level is a highly specialised task. Biologists, especially those working alone, often make consistent errors when using taxonomic keys. This can result in important decisions being made on the basis of inaccurate lists of the invertebrate fauna present at a site. For this reason, the Environment Agency (EA) commissioned the Institute of Freshwater Ecology (IFE) to set up a system to audit the performance of their biologists, and contractors working under their guidance, in the analysis of biological samples. This report summarises the findings of an audit of work undertaken for WBB Devon Clays Ltd by G.J. Robinson. The audit comprised a qualitative re-analysis at species level of one sample (T9) from the River Teign and the verification of voucher specimens from all samples included in the project.

2. SAMPLE PROCESSING

The protocol employed G.J. Robinson was to place the invertebrates removed from the sample in a separate bottle of preservative before reconstituting the sample. The specimens in the bottle and the remainder of the sample were preserved in 70% industrial alcohol. The taxa found in the sample were listed on a data sheet. For the verification of each taxon found in the whole project, an individual specimen of each taxon was placed in a labelled vial. This was accompanied by a data sheet listing, in alphabetical order, the taxa found.

The protocol employed by IFE for the sample audit was to sort the remainder of the sample in a gridded tray, a small aliquot at a time, without reference to the data sheet or to the vial of animals. The invertebrates picked out were identified. Then the species contained within the vial were identified. Comparisons were then made with the data sheet.

3. REPORTING

For the sample audit, three listings were entered, in full, into the IFE database: a) taxa found in the vial, b) taxa found in the sample and c) taxa entered on the data sheet. Comparisons were made automatically between the listing of taxa and the specimens identified by IFE from vial and sample. "Losses" or "gains" from the original listing of taxa were noted. In the case of "losses", an interpretation of the possible cause of error was offered. The results of the sample audit were recorded on a standard report form (Appendix 1). The results of the verification of identifications are tabulated in Appendix 2.

4. ACKNOWLEDGEMENTS

Grateful thanks to John Murray-Bligh of the Environment Agency's Thames Region, who provided an invaluable service in the development and implementation of improved methodology.

APPENDIX

Results of the sample audit



RESULTS OF QUALITATIVE AUDIT

These results are produced for: **WBB Devon Clays Ltd -**
Report printed on: **12-Mar-99**

River and site: **Teign at SX 8621 7296**

Original Sample Code: **T9**

Sample date: **27/05/98**

Analyst: **GJR**

IFE Sample Code: **16**

	<u>In Vial</u>	<u>In Sample</u>	<u>Data sheet</u>	<u>Losses/Gains</u>
Potamopyrgus antipodarum (Gray)	*	*	*	
Lymnaea peregra (Muller)	*		*	
Ancylus fluviatilis Muller	*		*	
Sphaeriidae	*		*	
Oligochaeta	*	*	*	
Piscicola geometra (L.)	*		*	
Theromyzon tessulatum (Muller)	Mis-id		*	LOSS
Hemiclepsis marginata (Muller)	*			GAIN
Glossiphonia complanata (L.)	*		*	
Helobdella stagnalis (L.)	*		*	
Erpobdella octoculata (L.)	*		*	
Hydracarina	*	*	*	
Asellus aquaticus (L.)	*	*	*	
Crangonyx pseudogracilis Bousfield	*		*	
Gammarus pulex (L.)	*	*	*	
Siphonurus lacustris Eaton	*		*	
Baetis muticus (L.)	*		*	
Baetis rhodani (Pictet)	*	*	*	
Baetis scambus group	*	*	*	
Heptagenia sulphurea (Muller)	*		*	
Habrophlebia fusca (Curtis)	*		*	
Ephemera danica Muller	*		*	
Ephemerella ignita (Poda)	*	*	*	
Caenis rivulorum Eaton	*	*	*	
Brachyptera risi (Morton)	*		*	
Amphinemura sulcicollis (Stephens)	*		*	
Leuctra sp.	*		*	
Leuctra geniculata (Stephens)	*		*	
Isoperla grammatica (Poda)	*		*	
Chloroperla torrentium (Pictet)	*		*	
Calopteryx sp.	*		*	
Calopteryx virgo (L.)	*		*	
Cordulegaster boltonii (Donovan)	*		*	
Hydrometra stagnorum (L.)	*		*	
Velia sp.	*		*	

River and site: **Teign at SX 8621 7296**

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Micronecta sp.	*		*	
Hyphydrus ovatus (L.)	*		*	
Potamonectes depressus elegans (Panzer)	*		*	
Oreodytes septentrionalis (Sahlberg)	*		*	
Platambus maculatus (L.)	*		*	
Gyrinus urinator Illiger	*		*	
Helophorus (Meghelophorus) grandis Illiger	*		*	
Hydraena gracilis Germar	*	*	*	
Pomatinus substriatus (Muller)	*		*	
Elmis aenea (Muller)	*	*	*	
Esolus parallelepipedus (Muller)	*	*	*	
Limnius volckmari (Panzer)	*	*	*	
Oulimnius sp.	*		*	
Oulimnius tuberculatus (Muller)	*		*	
Sialis lutaria (L.)	*		*	
Sialis nigripes Pictet	*		*	
Rhyacophila sp.		Further id poss	*	LOSS
Rhyacophila dorsalis (Curtis)	*			GAIN
Glossosoma boltoni Curtis	*		*	
Hydroptila sp.	*		*	
Lype phaeopa (Stephens)		*		GAIN
Psychomyia pusilla (Fabricius)	*		*	
Plectrocnemia conspersa (Curtis)	*		*	
Hydropsyche instabilis Curtis	*			GAIN
Hydropsyche pellucidula (Curtis)	*		*	
Hydropsyche siltalai Dohler	*		*	
Brachycentrus subnubilus Curtis	*	*	*	
Lasiocephala basalis (Kolenati)	*		*	
Lepidostoma hirtum (Fabricius)	*	*	*	
Halesus radiatus (Curtis)	*		*	
Potamophylax cingulatus (Stephens)	*		*	
Goera pilosa (Fabricius)	*		*	
Silo pallipes (Fabricius)	*		*	
Beracodes minutus (L.)	*		*	
Sericostoma personatum (Spence)	*		*	
Odontocerum albicorne (Scopoli)	*		*	
Athripsodes sp.	*		*	
Athripsodes albifrons (L.)	*	*	*	
Athripsodes cinereus (Curtis)	*	*	*	
Ceraclea sp.		Further id poss	*	LOSS
Ceraclea dissimilis (Stephens)	*	*		GAIN
Mystacides sp.		Not new taxon	*	LOSS

River and site: **Teign at SX 8621 7296**

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Mystacides azurea (L.)	*	*	*	
Mystacides longicornis (L.)	*		*	
Adicella reducta (Mclachlan)	*		*	
Oecetis sp.	Not new taxon		*	LOSS
Oecetis testacea (Curtis)	*	*	*	
Antocha vitripennis (Meigen)	*		*	
Ceratopogonidae	*	*	*	
Simulium sp.	Further id poss		*	LOSS
Simulium (Nevermannia) vernum group	Mis-id		*	LOSS
Simulium (Wilhelmia) sp.	*		*	
Simulium (Boophthora) erythrocephalum (de Geer)	*			GAIN
Simulium (Simulium) reptans (L.)	*		*	
Simulium (Simulium) ornatum group	*	*		GAIN
Chironomidae	*	*	*	
Atherix ibis (Fabricius)	*		*	
Atherix marginata (Fabricius)	*		*	
Atrichops crassipes (Meigen)	*	*	*	
Hemerodromia group	*	*	*	

Score summary based on BMWP families found in sample or in vial

BMWP score: 320

ASPT score: 6.667

No. of scoring taxa: 48

Score summary based on BMWP families on data sheet

BMWP score: 320

ASPT score: 6.667

No. of scoring taxa: 48

APPENDIX 2

Verification of identifications from whole project

Taxon	Status of identification	Occurrence in audit sample (T9)
<i>Acroloxus lacustris</i> (L.)	Identification confirmed	
<i>Adicella reducta</i> (McLachlan)	Identification confirmed	Present
<i>Aeshna</i> sp.	Identification confirmed	
<i>Agabus bipustulatus</i> (L.)	Identification confirmed	
<i>Agabus sturmii</i> (Gyllenhal)	Identification confirmed	
<i>Agapetus</i> sp.	No specimen provided	
<i>Agapetus delicatulus</i> McLachlan	Identification confirmed	
<i>Agapetus fuscipes</i>	No specimen provided	
<i>Amphinemura sulcicollis</i> (Stephens)	Identification confirmed	Present
<i>Anabolia nervosa</i> (Curtis)	Identification confirmed	
<i>Anacaena bipustulata</i> (Marsham)	Identification confirmed	
<i>Anacaena globulus</i> (Paykull)	Identification confirmed	
<i>Ancylus fluviatilis</i> Muller	Identification confirmed	Present
<i>Anisus vortex</i> (L.)	= <i>Anisus leucostoma</i> (Millet)	
<i>Antocha vitripennis</i> Meigen	Identification confirmed	Present
<i>Aphelocheirus aestivalis</i> (Fabricius)	Identification confirmed	
<i>Armiger crista</i> (L.)	Identification confirmed	
<i>Asellus aquaticus</i> (L.)	Identification confirmed	Present
<i>Atherix ibis</i> (Fabricius)	Identification confirmed	Present
<i>Atherix marginata</i> (Fabricius)	Identification confirmed	Present
<i>Athripsodes albifrons</i> (L.)	Identification confirmed	Present
<i>Athripsodes bilineatus</i> (L.)	= <i>Athripsodes cinereus</i> (Curtis)	
<i>Athripsodes cinereus</i> (Curtis)	Identification confirmed	Present
<i>Athripsodes</i> sp.	Identification confirmed	Present
<i>Atrichops crassipes</i> Meigen	Identification confirmed	Present
<i>Baetis muticus</i> (L.)	Identification confirmed	Present
<i>Baetis rhodani</i> (Pictet)	Identification confirmed	Present
<i>Baetis scambus</i> group	Identification confirmed	Present
<i>Baetis vernus</i> Curtis	Identification confirmed	
<i>Bathyomphalus contortus</i> (L.)	Identification confirmed	
<i>Beraeodes minutus</i> (L.)	Identification confirmed	Present
<i>Brachycentrus subnubilus</i> Curtis	Identification confirmed	Present
<i>Brachyptera risi</i> (Morton)	Identification confirmed	Present
<i>Brychius elevatus</i> (Panzer)	Identification confirmed	
<i>Caenis luctuosa</i> group	Identification confirmed	
<i>Caenis rivulorum</i> Eaton	Identification confirmed	Present
<i>Calopteryx</i> sp.	Identification confirmed	Present
<i>Calopteryx virgo</i> (L.)	Identification confirmed	Present
<i>Ceraclea dissimilis</i> (Stephens)	Identification confirmed	
<i>Ceraclea fulva</i> (Rambur)	No specimen provided	
<i>Ceraclea nigronervosa</i> (Retzius)	No specimen provided	
<i>Ceraclea senilis</i> (Burmeister)	No specimen provided	

Ceraclea sp.	= Ceraclea dissimilis (Stephens)	Present
Ceratopogonidae	Not on listing of taxa	Present
Chelifera group	Identification confirmed	
Chironomidae	Not on listing of taxa	Present
Chloroperla torrentium (Pictet)	Identification confirmed	Present
Chloroperla tripunctata (Scopoli)	Identification confirmed	
Cloeon dipterum (L.)	Identification confirmed	
Coenagriidae indet	Identification confirmed	
Colymbetes fuscus (L.)	Identification confirmed	
Cordulegaster boltonii (Donovan)	Identification confirmed	Present
Corixidae (nymphs)	Identification confirmed	
Corixa punctata (Illiger)	Identification confirmed	
Crangonyx pseudogracilis Bousfield	Identification confirmed	Present
Dendrocoelum lacteum (Muller)	Identification confirmed	
Dicranota sp.	Identification confirmed	
Dixa maculata Meigen	= Dixa maculata complex	
Dixa puberula Loew	Identification confirmed	
Dolichopodidae	= Rhagionidae	
Drusus annulatus Stephens	Identification confirmed	
Dugesia polychroa group	= Polycelis nigra group	
Dugesia tigrina (Girard)	Identification confirmed	
Dytiscus sp. (larva)	Identification confirmed	
Ecdyonurus sp.	Identification confirmed	
Elmis aenea (Muller)	Identification confirmed	Present
Ephemera danica Muller	Identification confirmed	Present
Ephemerella ignita (Poda)	Identification confirmed	Present
Ephydriidae	Identification confirmed	
Erpobdella octoculata (L.)	Identification confirmed	Present
Esolus parallelepipedus (Muller)	Identification confirmed	Present
Gammarus pulex (L.)	Identification confirmed	Present
Gerridae (nymph)	Identification confirmed	
Gerris lacustris (L.)	Identification confirmed	
Gerris najas (Degeer)	Identification confirmed	
Glossiphonia complanata (L.)	Identification confirmed	Present
Glossosoma boltoni	Identification confirmed	Present
Glyptotaelius pellucidus (Retzius)	Identification confirmed	
Goera pilosa (Fabricius)	Identification confirmed	Present
Gyraulus albus (Muller)	Identification confirmed	
Gyrinus substriatus Stephens	Identification confirmed	
Gyrinus urinator Illiger	Identification confirmed	Present
Habrophlebia fusca (Curtis)	Identification confirmed	Present
Haemopis sanguisuga (L.)	Identification confirmed	
Halesus digitatus (Schrank)	Identification confirmed	
Halesus radiatus (Curtis)	Identification confirmed	
Haliphus flavicollis Sturm	Identification confirmed	
Haliphus lineatocollis (Marshall)	Identification confirmed	
Helobdella stagnalis (L.)	Identification confirmed	Present
Helochares lividus (Forster)	Identification confirmed	
Helodes sp. (larva) (=Elodes sp.)	Identification confirmed	

<i>Helophorus brevipalpis</i> Bedel	Identification confirmed	
<i>Helophorus grandis</i> Illiger	Identification confirmed	Present
<i>Hemerodromia</i> group	Identification confirmed	Present
<i>Heptagenia sulphurea</i> (Muller)	Identification confirmed	Present
<i>Hesperocorixa sahlbergi</i> (Fieber)	No specimen provided	
<i>Hilaria</i> sp.	Empididae (adult) - No key available	
<i>Hydatophylax infumatus</i> (McLachlan)	Identification confirmed	
<i>Hydracarina</i>	Identification confirmed	Present
<i>Hydraena gracilis</i> Germar	Identification confirmed	Present
<i>Hydraena riparia</i> Kugelann	No specimen provided	
<i>Hydrochus nitidicollis</i> Mulsant	Identification confirmed	
<i>Hydrometra stagnorum</i> (L.)	Identification confirmed	Present
<i>Hydroporus memnonius</i> Nicolai	Identification confirmed	
<i>Hydroporus palustris</i> (L.)	Identification confirmed	
<i>Hydroporus planus</i> (Fabricius)	No specimen provided	
<i>Hydroporus pubescens</i> (Gyllenhal)	Identification confirmed	
<i>Hydroporus tessellatus</i> Drapiez	Identification confirmed	
<i>Hydropsyche angustipennis</i> (Curtis)	Identification confirmed	
<i>Hydropsyche instabilis</i> Curtis		Additional taxon
<i>Hydropsyche pellucidula</i> (Curtis)	Identification confirmed	Present
<i>Hydropsyche sitalai</i> Dohler	Identification confirmed	Present
<i>Hydroptila</i> sp.	Identification confirmed	Present
<i>Hygrobia hermanni</i> (Fabricius)	Identification confirmed	
<i>Hygrotus inaequalis</i> (Fabricius)	Identification confirmed	
<i>Hyphydrus ovatus</i> (L.)	Identification confirmed	Present
<i>Ilybius fuliginosus</i> (Fabricius)	Identification confirmed	
<i>Isoperla grammatica</i> (Poda)	Identification confirmed	Present
<i>Laccobius</i> sp.	= <i>Laccobius striatulus</i> (Fabricius)	
<i>Laccophilus minutus</i> (L.)	Identification confirmed	
<i>Lasiocephala basalis</i> (Kolenati)	Identification confirmed	Present
<i>Lepidostoma hirtum</i> (Fabricius)	Identification confirmed	Present
<i>Leuctra geniculata</i> (Stephens)	Identification confirmed	Present
<i>Leuctra hippopus</i> (Kempny)	Identification confirmed	
<i>Leuctra inermis</i> Kempny	Identification confirmed	
<i>Leuctra</i> sp.	Identification confirmed	Present
Limnephilidae indet (pupa)	Identification confirmed	
<i>Limnophilus lunatus</i> Curtis	Identification confirmed	
<i>Limnius volckmari</i> (Panzer)	Identification confirmed	Present
<i>Limnophora riparia</i> (Fallen)	Identification confirmed	
<i>Limonia</i> sp.	Identification confirmed	
Lonchopteridae	Identification confirmed	
<i>Lymnaea peregra</i> (Muller)	Identification confirmed	Present
<i>Lymnaea truncatula</i> (Muller)	Identification confirmed	
<i>Lype phaeopa</i> (Stephens)	Identification confirmed	Additional taxon
<i>Micronecta poweri</i> (Douglas & Scott)	Identification confirmed	
<i>Micronecta</i> sp. (nymph)	Identification confirmed	Present
<i>Mystacides</i> sp.	Not a new taxon (= <i>M. azurea</i> + <i>M. longicornis</i>)	Present
<i>Mystacides azurea</i> (L.)	Identification confirmed	Present
<i>Mystacides longicornis</i> (L.)	Identification confirmed	Present

<i>Nemurella picteti</i> Klapalek	Identification confirmed	
<i>Nepa cinerea</i> L.	Identification confirmed	
<i>Nephrotoma</i> sp.	Identification confirmed	
<i>Notonecta</i> sp. (nymph)	Identification confirmed	
<i>Notonecta glauca</i> L.	Identification confirmed	
<i>Ochthebius dilatatus</i> Stephens	Identification confirmed	
<i>Ochthebius minimus</i> (Fabricius)	Identification confirmed	
<i>Odontocerum albicorne</i> (Scopoli)	Identification confirmed	Present
<i>Oecetis</i> sp.	Not a new taxon (= <i>O. testacea</i>)	Present
<i>Oecetis furva</i> (Rambur)	= <i>Oecetis testacea</i> (Curtis)	
<i>Oecetis testacea</i> (Curtis)	Identification confirmed	Present
<i>Oligochaeta</i>	Identification confirmed	Present
<i>Orectochilus villosus</i> (Muller)	Identification confirmed	
<i>Oreodytes sanmarkii</i> (Sahlberg)	Identification confirmed	
<i>Oreodytes septentrionalis</i> (Sahlberg)	Identification confirmed	Present
Ostracoda	No specimen provided	
<i>Oulimnius</i> sp. (larva)	Identification confirmed	Present
<i>Oulimnius tuberculatus</i> (Muller)	Identification confirmed	Present
<i>Paraleptophlebia</i> sp.	No specimen provided	
<i>Paraleptophlebia submarginata</i> (Stephens)	Identification confirmed	
<i>Pericoma</i> sp.	Identification confirmed	
<i>Perlodes microcephala</i> (Pictet)	Identification confirmed	
Phoridae	No specimen provided	
<i>Physa acuta</i> group	Identification confirmed	
<i>Pilaria filata</i> grp (= <i>Pilaria</i> (<i>Neolimnomyia</i>) sp.)	Identification confirmed	
<i>Piscicola geometra</i> (L.)	Identification confirmed	Present
<i>Platambus maculatus</i> (L.)	Identification confirmed	Present
<i>Plectrocnemia conspersa</i> (Curtis)	Identification confirmed	Present
<i>Polycelis felina</i> (Dalyell)	Identification confirmed	
<i>Pomatinus substriatus</i> (Muller)	Identification confirmed	Present
Porifera	No specimen provided	
<i>Potamonectes depressus elegans</i> (Panzer)	Identification confirmed	Present
<i>Potamophylax cingulatus</i> (Stephens)	Identification confirmed	Present
<i>Potamophylax latipennis</i> (Curtis)	Identification confirmed	
<i>Potamopyrgus antipodarum</i> (Gray)	Identification confirmed	Present
<i>Procloeon bifidum</i> Bengtsson	= <i>Centroptilum luteolum</i> (Muller)	
<i>Psychomyia pusilla</i> (Fabricius)	Identification confirmed	Present
<i>Pyrrhosoma nymphula</i> (Sulzer)	Identification confirmed	
<i>Rhantus suturalis</i> (Macleay)	Identification confirmed	
<i>Rhithrogena semicolorata</i> group	Identification confirmed	
<i>Rhyacophila</i> sp.	Not a new taxon (= <i>R. dorsalis</i>)	Present
<i>Rhyacophila dorsalis</i> (Curtis)	Identification confirmed	Present
<i>Rhyacophila munda</i> Mclachlan	Identification confirmed	
<i>Sericostoma personatum</i> (Spence)	Identification confirmed	Present
<i>Sialis lutaria</i> (L.)	Identification confirmed	Present
<i>Sialis nigripes</i> Pictet	Identification confirmed	Present
<i>Sigara dorsalis</i> (= <i>Sigara</i> (<i>Sigara</i>) sp.)	Identification confirmed	
<i>Sigara falleni</i> (Fieber)	No specimen provided	

Sigara limitata (Fieber)	No specimen provided	
Sigara nigrolineata (Fieber)	No specimen provided	
Sigara venusta (Douglas & Scott)	Identification confirmed	
Silo pallipes (Fabricius)	Identification confirmed	Present
Simulium sp.	= Simulium ornatum group	Further identification
Simulium vernum group	= Simulium erythrocephalum (de Geer)	Mis-identification
Simulium equinum L.	Identification confirmed	Present
Simulium reptans (L.)	Identification confirmed	Present
Simulium tuberosum Lundstrom	No specimen provided	
Simulium variegatum Meigen	Identification confirmed	
Siphonurus lacustris Eaton	Identification confirmed	Present
Sisyra sp.	Identification confirmed	
Sisyra fuscata (Fabricius)	No specimen provided	
Sisyra terminalis Curtis	No specimen provided	
Sphaeriidae	Identification confirmed	Present
Stictotarsus duodecimpustulatus (Fabricius)	Identification confirmed	
Sympetrum sp.	No specimen provided	
Tabanidae	Identification confirmed	
Theromyzon tessulatum (Muller)	= Hemicleipsis marginata (Muller)	Mis-identification
Tinodes waeneri (L.)	No specimen provided	
Tipula sp.	Identification confirmed	
Trocheta subviridis Dutrochet	Identification confirmed	
Valvata piscinalis (Muller)	Identification confirmed	
Velia sp. (nymph)	Identification confirmed	Present
Velia caprai Tamanini	Identification confirmed	
Wiedemannia group	No specimen provided	

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