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ICP Waters Report 109/2011

Biological intercalibration: Invertebrates 1511

Sample processing at ICP Waters subcentre in Bergen. Photo: Tore Wiers.

International Cooperative Programme on Assessment and Monitoring Effects of Air Pollution on Rivers and Lakes

Convention on Long-Range Transboundary Air Pollution

LRTAP
Long-range Transboundary Air Pollution

Norwegian Institute for Water Research
– an institute in the Environmental Research Alliance of Norway

REPORT

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Abstract
The 15th intercalibration of invertebrates in the ICP Waters programme had contribution from four laboratories. The laboratories identified a high portion of the individuals in the test samples, usually > 90% of the total number of species. Few faults were recorded on genus level. The mean Quality assurance index was > 90% for all participating laboratories, indicating excellent taxonomic work.

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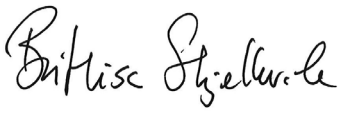

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CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

INTERNATIONAL COOPERATIVE PROGRAMME ON ASSESSMENT AND MONITORING OF ACIDIFICATION OF RIVERS AND LAKES

Biological intercalibration: Invertebrates 1511

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Preface

The international cooperative programme on assessment and monitoring of air pollution on rivers and lakes (ICP Waters) was established under the Executive Body of the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP) in July 1985. Since then ICP Waters has been an important contributor to document the effects of implementing the Protocols under the Convention. Numerous assessments, workshops, reports and publications covering the effects of long-range transported air pollution have been published over the years.

The ICP Waters Programme Centre is hosted by the Norwegian Institute for Water Research (NIVA), while the Norwegian Climate and Pollution Agency (Klif) leads the programme. A programme subcentre is established at Uni Research, University of Bergen. The Programme Centre's work is supported financially by Klif and from the UNECE LRTAP Trust Fund.

The main aim of the ICP Waters Programme is to assess, on a regional basis, the degree and geographical extent of the impact of atmospheric pollution, in particular acidification, on surface waters. More than 20 countries in Europe and North America participate in the programme on a regular basis.

The Programme objective is to establish and maintain an international network of surface water monitoring sites and promote international harmonisation of monitoring practices. A tool in this work is the inter-laboratory quality assurance tests. The bias between analyses carried out by the individual participants of the Programme has to be identified and controlled. The tests will also be a valuable tool in improving the taxonomic skill of the participating laboratories.

We here report the results from the 15th intercalibration on invertebrate fauna.

Bergen, November 2011

Arne Fjellheim
ICP Waters Programme Subcentre

Contents

Summary

The 15th intercalibration of invertebrates in the ICP Waters programme had contribution from four laboratories. The biological intercalibration is important for harmonising biological material/databases and will be of high value in programmes where community analyses is in focus or where the ecological status should be stated, like EU Water Framework Directive. The biological intercalibration under the ICP Waters programme is a unique test, as it operates on a species level.

The laboratories generally identified a high portion of the total number of species in the test samples, usually > 90% of the total number of species. Few faults were recorded on genus level. The mean Quality assurance index was > 90% for all participating laboratories, indicating excellent taxonomic work. None of the participants did misidentifications that could result in a wrong acidity index, based on the Raddum score (Raddum et al., 1988).

1. Introduction

The purpose of the biological intercalibration is to evaluate the quality of the taxonomic work on the biological material delivered to the Programme centre. The quality can influence on the evaluation of the samples, which is based on the species and their tolerance (Raddum *et al.* 1988, Fjellheim and Raddum 1990, Raddum 1999). The control is therefore important for evaluation of the significance of trends in biotic indexes both for a specific site/watershed, as well as for comparisons of trends between different regions and countries. The material is also used for multivariate statistical analysis (Larsen *et al.* 1996, Skjelkvåle *et al.* 2000, Halvorsen *et al.* 2002). The results of this type of data treatment are especially sensitive to the quality of the species identification. The biological intercalibration focuses on the taxonomic skills of the participants and is a tool for improving the quality of work at the different laboratories as well as harmonisation of the biological database.

The methods for intercalibration of biological material were outlined in 1991 at the 7th ICP Waters Task Force meeting in Galway, Ireland. The different countries/laboratories have to know, first of all, their home fauna. Since the fauna in different geographical regions vary, it is necessary to prepare specific samples for each participating laboratory, based on their home fauna. It is a problem for the exercise of the intercalibration that it is not possible to use standardised samples for all participants. To solve this problem, each laboratory send identified samples of invertebrates from their own monitoring sites to the Programme centre. The Programme centre will additionally add species known to be present in the region of the specific laboratory. Based on this, each laboratory receives individual test samples composed of species representing their own monitoring region.

In this report we have calculated the quality assurance index for the participants, see Raddum (2005). This index evaluates the skill of identifying the species as well as the genus. It also takes into account the effort of identifying all specimens in the sample. The highest index score is 100, while a value of 80 is set as the limit of good taxonomic work.

2. Methods

Preparation of test-samples

Samples of identified invertebrates were received from all participating laboratories. These samples were used to compose test samples, with the addition of specimens from earlier exercises and from own stocks. The geographical distribution of species is checked by the use of the Fauna Europaea Web Service (2004). This is a database of the scientific names and distribution of multicellular European land and fresh-water animals (see example in Figure 1).

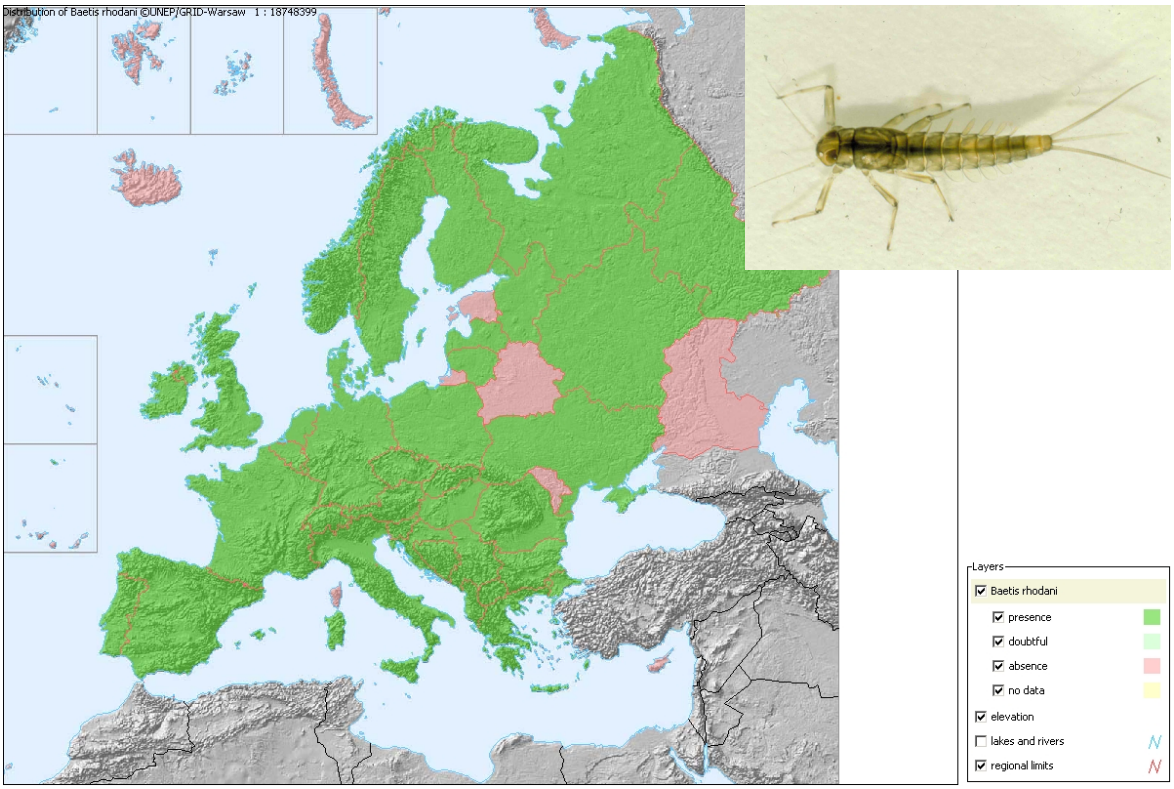

Figure 1. *Geographical distribution of the mayfly* Baetis rhodani *in Europe. This is an example of a widely distributed freshwater species. The species is recorded in all countries participating in the ICP Waters intercalibration with the exeption of Estonia. Map after Fauna Europaea version 1.1, http://www.faunaeur.org, Photo: Arne Fjellheim*

Identification

To minimise possible faults the following procedure have been used in preparing the test samples:

- The participating country has first identified the source material for the test samples. Two of us have verified the identification of the species/taxa as far as possible without damaging the individuals.
- The content of the two test samples for each laboratory, with respect to species and numbers, is listed in a table. Two persons control that the correct number and species is placed in the test samples according to the list.

Damages of the material

The quality of the test material may be reduced during handling and shipping. Taxonomically important parts of the body, as gills, legs, cerci, mouthparts etc., can be lost or destroyed in actions connected with identification, sample composition and transportation. Contamination of larvae can also occur during these processes as well as during the identification work at the participating laboratories. All mentioned possibilities for faults could influence on the results of the identifications and disturb the results in a negative way.

Evaluation

The results of the tests are sent to the laboratories for eventual comments before publishing the report. In this way we can remove taxonomical biases, for example misidentified or destroyed test material. In cases of disagreement, material may be sent back to the programme subcentre for control. This procedure may act educational for both parts.

For calculation of faults (in percent), we must take into account possible destructions of the material as mentioned above. Further, a wrong identification of a species is one fault even if the sample contains many individuals of the species. We encourage the participants to give comments on matters that may impede the identification. For example may misidentification of species, in cases where important taxonomic characters have been destroyed, be neglected if this is pointed out by the participant.

We have discriminated between "short coming" identification, probably due to damaged material, and virtual fault (wrong species – or genus name). Due to this, some subjective evaluations of the results have to be made. The percent of faults is therefore not always the exact calculated percent of faults, but can be a modified value where some "expert judgement" is taken into account.

It is also of interest to know how many individuals that have been identified of the total number in the sample. This is named *% identified*. A low percent means that many individuals are not identified and will consequently reduce the value of the taxonomic work.

Available material for making test samples varies. The number of individuals and number of species delivered will therefore differ. Normally each laboratory gets between 50 and 80 individual species in the two samples. Samples with low diversity will be easier to handle than samples with high diversity, see Appendix tables. This should also be kept in mind when the results are evaluated. On the other hand, small samples should be avoided as only a few misidentifications could result in a low score.

We have calculated the quality assurance index, Qi, for important groups of invertebrates as well as the mean index for each participant. The Qi integrates the separate levels of the identifications as follows:

Qi = % correct species/10 * % correct genus/10 * % identified individuals/100

Qi will be a number between 0 and 100. 100 are the highest score that can be obtained. A score $\geq$80 is regarded as good taxonomical work.

Test of the subcentre

The ICP waters subcentre in Bergen is tested each second year with the help from Sweden. The Swedish University of Agricultural Sciences in Uppsala prepares and evaluates the test of the subcentre. Methodology and implementation is otherwise identical to the other tests.

3. Results and discussion

Four laboratories participated in the intercalibration of invertebrates in 2011 (Appendix A). The content of species in the test samples delivered – and the results of the identification by the different laboratories are shown in Appendix Tables 1 – 4.

Mayflies

The identification of mayflies (Ephemeroptera) was generally very good (Figure 12, Appendix Table 1-4). Laboratory 2 and 4 identified the mayflies without faults. The results from the other laboratories were very good, with only minor faults. The Qi was calculated to 95, 100, 95 and 100 for laboratories 1, 2, 3, and 4 respectively. This indicates high quality of work for all laboratories.

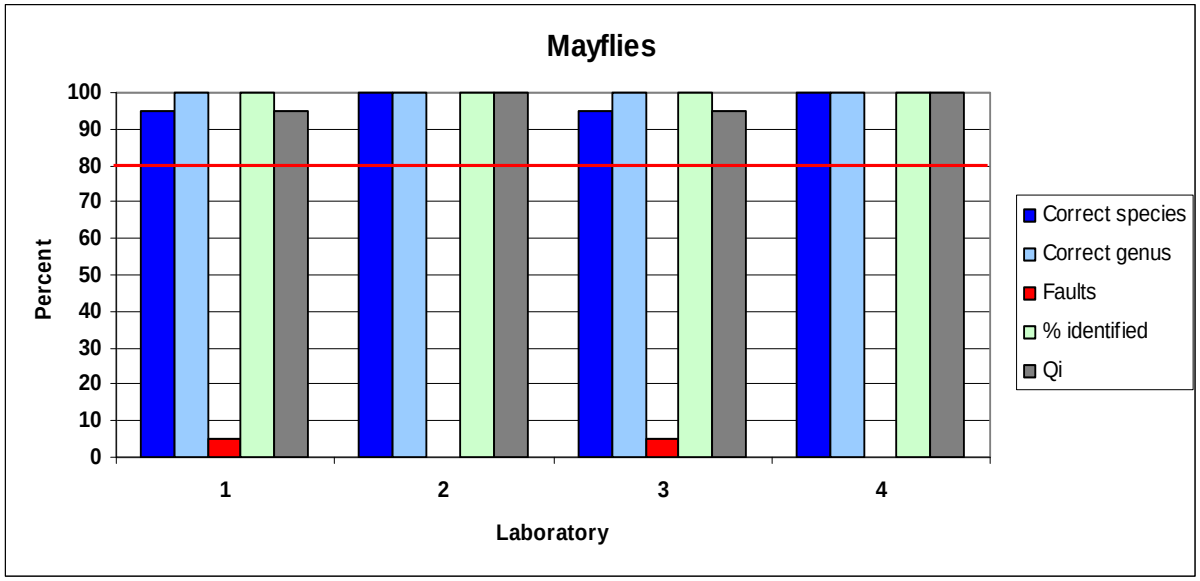

Figure 2. *Results of the identification of mayflies.*

Stoneflies

Laboratory 1 and 4 identified the stoneflies (Plecoptera) without faults, while the results from the rest of the participants were very good (Figure 3, Appendix tables 1 – 4). The Qi was calculated to 100, 91, 92 and 100 for laboratories 1, 2, 3 and 4, respectively.

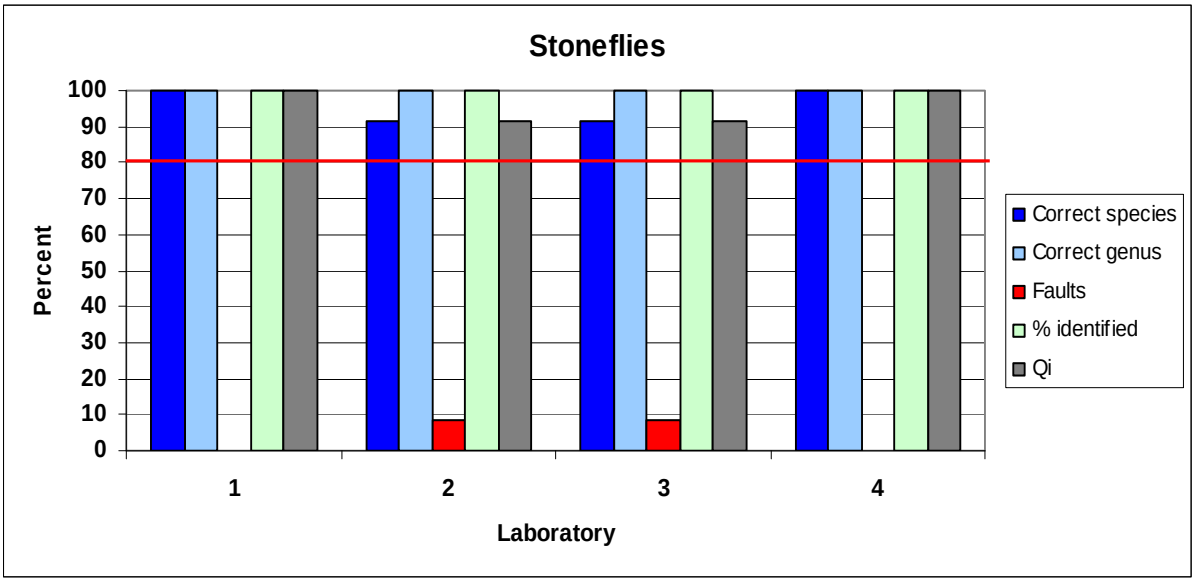

Figure 3. *Results of the identification of stoneflies.*

Caddisflies

The identification of caddisflies (Trichoptera) is presented in Figure 4 and Appendix tables 1 – 4. Laboratory 1 identified all specimens correctly. The taxonomic work on caddisflies was overall regarded as acceptable with Qi values of 100, 89, 85 and 97, for participants 1, 2, 3, and 4, respectively.

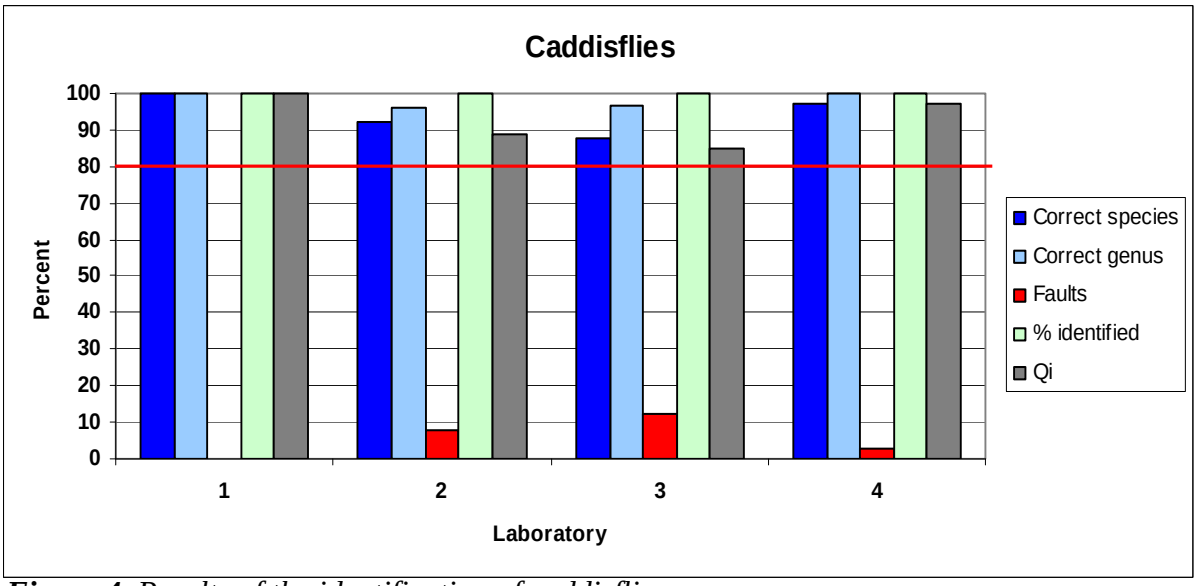

Figure 4. *Results of the identification of caddisflies.*

Other groups

In this intercalibration we have included water beetles (Coleoptera), larger crustaceans (Malacostraca), leeches (Hirudinea), molluscs (Gastropoda), alder-flies (Megaloptera), Diptera etc. Both larvae and imagines have been included for some of the groups. Leeches,

molluscs and larger crustaceans are sensitive to acid water and important for the evaluation of acidification. The tolerance of the invertebrates among Coleoptera, Megaloptera, Diptera etc. is little known, but generally they are regarded as tolerant to acidic water and consequently have low importance for evaluation of acidity indices. However, all species will be important for invertebrate community analysis. Figure 5 and Appendix tables 1 – 4 shows the results of the identification of these groups. The identifications made by laboratory 1 and 4 were perfect with no faults. The quality of laboratory 2 and 3 was also very good. The Qi score was 100, 92, 91 and 100, for participants 1, 2, 3 and 4, respectively.

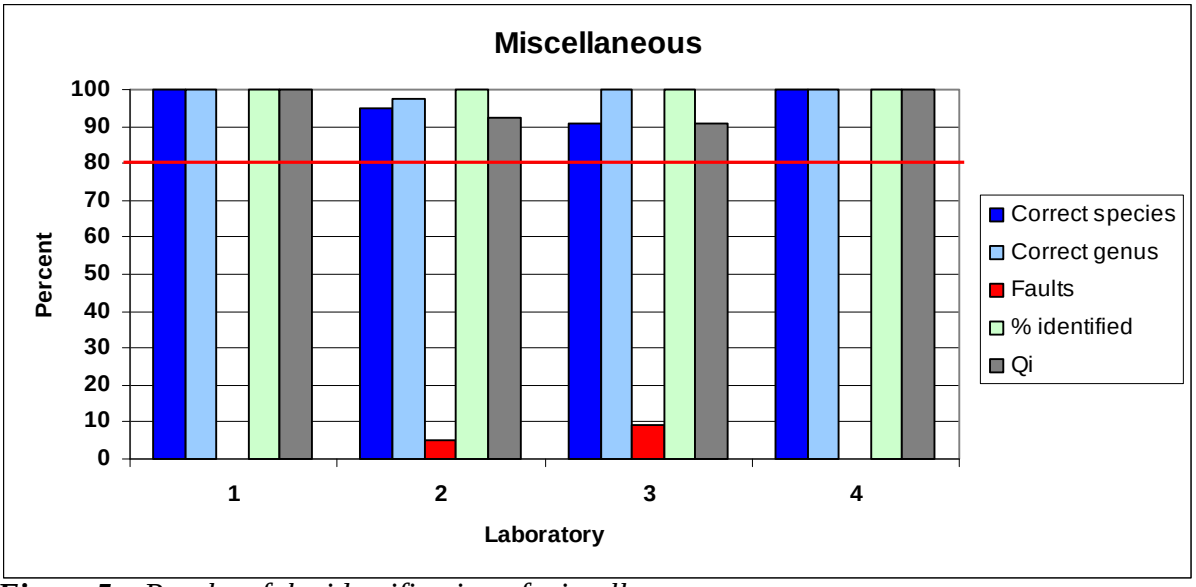

Figure 5. *Results of the identification of miscellaneous groups*

Total number of species in the sample

There were generally low discrepancy between the number of individuals put into the samples and the reported number of larvae. A total of 384 individual specimens were sent to the different laboratories. Of these 99.7 percent were reported back to the programme sub-centre.

4. Evaluation/conclusion

The laboratories generally identified a high portion of the total number of species in the test samples. Shortcoming identification was low and indicated good taxonomic skills by the participants. The mean skill of identifying species, genus and Qi score per laboratory is shown in Figure 6. Laboratory 1 to 4 got a mean Qi score of 99, 93, 91 and 99 respectively. All tests were characterized as excellent taxonomic work. The biological intercalibration is important for harmonising biological material/databases and will be of high value in programmes where community analyses is in focus or where the ecological status should be stated, like EU Water Framework Directive.

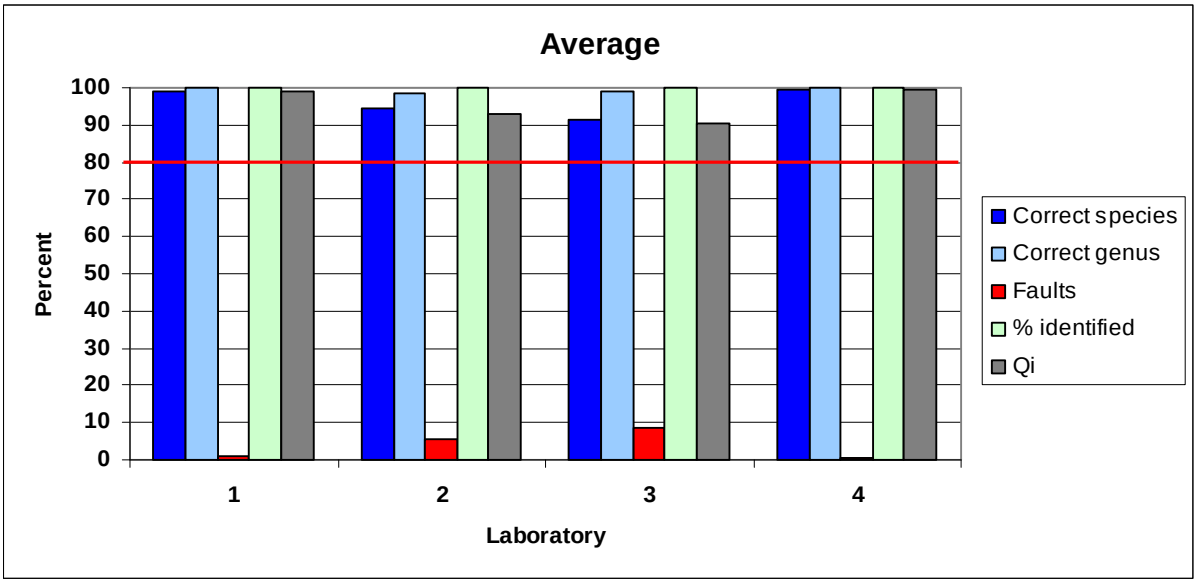

Figure 6. *Mean skill in percent of identifying species and genus and mean Qi for each laboratory.*

None of the participants did misidentifications that could result in a wrong acidity index, based on the Raddum score (Raddum et al., 1988).

The biological intercalibration under the ICP Waters programme is a unique test, as it operates on a species level. A similar test is run by the Natural History museum, London, aiming to test skills in identifying British freshwater macroinvertebrates to species level or to higher groups, mostly to family level (Identification Qualifications – IdQ test). The invertebrate groups covered in this test are those used in the BMWP water quality score system (Armitage et al., 1983) and include groups used for monitoring freshwater environments under the EU water framework directive (Schartau et al. 2008).

5. References

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Appendix A. Identified species/genus

Each participating laboratory is identified by a number, which is identical with table number. Laboratories participating in the intercalibration of invertebrates in 2011 and their code numbers are:

1. Estonian Environmental Research Centre, Tartu branch, Vaksali 17a 50410 Tartu, **Estonia**. Responsible taxonomist: Dr. Urmas Kruus.
2. Swedish University of Agricultural Sciences, Dept. of Environmental Assessment, P.O. Box 7050, S-75007 Uppsala, **Sweden.** Responsible taxonomist: Dr. Lars Erikson
3. EcoRing Gewässerökologie, Umweltdokumentation & Datenmanagement, Lange Str. 9, D-37181 Hardegsen, **Germany.** Responsible taxonomist: Dr. Eckhard Coring
4. School of Biological Sciences Queen Mary, University of London London E1 4NS, **UK.** Responsible taxonomist: Dr. Julie Winterbottom

Appendix table 1. Identified species/genus in sample 1 and 2 by Laboratory 1

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Ephemeroptera				
Procloeon bifidum	1	1		
Cloeon dipterum			1	1
Centroptilum luteolum			1	1
Leptophlebia marginata	1	1		
Leptophlebia vespertina				
Siphlonurus alternatus	1	1	1	
Siphlonurus armatus				1
Habrophlebia lauta	1	1	1	1
Habrophlebia fusca			1	1
Paraleptophlebia submarginata	1	1		
Serratella ignita	1	1	1	1
Heptagenia sulphurea			1	1
Baetis rhodani	1	1	1	1
Baetis niger			1	1
Baetis liebenauae			1	1
Caenis horaria	1	1	1	1
Ephemera danica			1	1
Ephemera vulgata	1	1		
Plecoptera				
Nemurella pictetii	1	1	1	1
Leuctra fusca	1	1	1	1
Leuctra hoppopus			1	1
Taeniopteryx nebulosa	1	1	1	1
Nemoura cinerea	1	1	1	1
Nemoura flexuosa			1	1
Isoperla grammatica	1	1	1	1
Brachyptera risi	1	1		
Amphinemura borealis	1	1		
Trichoptera				
Hydropsyche pellucidula	1	1	1	1
Hydropsyche siltalai	1	1	1	1
Hydropsyche angustipennis	1	1	1	1
Cheumatopsyche lepida			1	1
Limnephilus rhombicus	1	1	1	1
Limnephilus flavicorns			1	1
Limnephilus extricatus			1	1
Limnephilus lunatus			1	1
Ironoquia dubia			1	1
Silo pallipes	1	1	1	1
Goera pilosa			1	1
Plectrocnemia conspersa	1	1	1	1
Polycentropus flavomaculatus			1	1
Holocentropus stagnalis			1	1
Sericostoma personatum	1	1		
Rhyacophila fasciata	1	1		
Rhyacophila nubila	1	1		
Micropterna lateralis	1	1		

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Ephemeroptera				
Halesus digitatus	1	1		
Potamophylax rotundipennis			1	1
Lype reducta			1	1
Oligostomis reticulata	1	1		
Athripsodes cinereus	1	1	1	1
Notodobia ciliaris	1	1		
Lepidostoma hirtum	1	1	1	1
Brachycentrus subnubilus			1	1
Micrasema setiferum	1	1	1	1
Miscellaneous				
Hirudinea:				
Erpobdella octoculata	1	1	1	1
Glossophonia complanata	1	1		
Helobdella stagnalis			1	1
Zygoptera:				
Caleopteryx virgo	1	1		
Anisoptera:				
Ophiogomphus cecilia	1	1		
Coenagrion pulchellum & puella			1	1
Hemiptera:				
Aphelocheirus aestivalis	1	1	1	1
Gastropoda:				
Theodoxus fluviatilis	1	1	1	1
Bithynia tentaculata	1	1	1	1
Bithynia leachi	1	1	1	1
Ancylus fluviatilis	1	1	1	1
Coleoptera:				
Limnius volckmari	1		1	
Limnius sp.		1		1
Elmis aenea	1	1	1	1
Olimnius tuberculatus			1	1
Brychius elevatus	1	1		
Corixidae:				
Sigara falleni	1	1	1	1

Appendix table 2. Identified species/genus in sample 1 and 2 by Laboratory 2

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Ephemeroptera				
Baetis rhodani	1	1	1	1
Ephemera vulgata	1	1	1	1
Ephemera danica			1	1
Caenis luctuosa	1	1		
Caenis horaria			1	1
Leptophlebia marginata	1	1		
Leptophlebia vespertina			1	1
Heptagenia dalecarlica	1	1		
Ameletus inopinatus	1	1	1	1
Heptagenia sulphurea	1	1	1	1
Heptagenia dalecarlica			1	1
Ephemerella aurivilli	1	1	1	1
Plecoptera				
Leuctra nigra	1	1	1	1
Dinocras cephalotes	1	1	1	1
Amphinemura sulcicollis			1	1
Nemurella pictetii	1	1	1	1
Diura nanseni	1		1	
Diura bicaudata		1		1
Isoperla grammatica	1	1	1	1
Isoperla sp.cf.grammatica			1	
Isoperla obscura				1
Arcynopteryx compacta			1	1
Protonemura meyeri	1	1	1	1
Brachyptera risi	1	1	1	1
Taeniopteryx nebulosa	1	1	1	1
Capnia bifrons	1	1	1	
Leuctra fusca				1
Siphonoperla burmeisteri	1	1	1	1
Trichoptera				
Polycentropus flavomaculatus	1	1		
Polycentropus irroratus			1	1
Neureclipsis bimaculata	1	1	1	1
Molannodes tinctus	1	1		
Molanna angustata			1	1
Hydropsyche pellucidula	1	2	1	1
Hydropsyche angustipennis	1	1	1	1
Artopsyche ladogensis			1	1
Ceratopsyche silfenii	1			
Lepidostoma hirtum	1	1	1	1
Philopotamus montanus	1	1	1	1
Wormaldia subnigra	1	1	1	1
Sericostoma personatum	1	1	1	1
Rhyacophila fasciata	1	1	1	
Rhyacophila nubila				1
Agapetus ochripes	1	1		

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Glossosoma intermedium			1	1
Mystacides longicornis/nigra			1	1
Oecetis testacea	1	1		
Miscellaneous				
Hirudinea				
Erpobdella octoculata	1	1	1	1
Helobdella stagnalis	1	1	1	1
Zygoptera				
Enallagma cyathigerum			1	
Erythroma najas				1
Malacostraca				
Gammarus lacustris			1	1
Gammarus pulex	2	2	1	1
Asellus aquaticus	1	1	1	1
Monoporeia affinis	1	1	1	1
Gastropoda				
Bithynia tentaculata	1	1	1	1
Gyraulus crista	1	1	1	1
Gyraulus acronicus	1		1	1
Gyraulus albus/acronicus		1		
Acroloxus lacustris	1	1	1	1
Physa fontinalis	1	1	1	1
Theodoxus fluviatilis	1	1		
Anisus vortex			1	1
Coleoptera				
Limnius volcmari	1	1	1	1
Elmis aenea	1	1	1	1
Orectochilus villosus	1	1	1	1
Hydraenea gracilis			1	1
Chironomidae				
Pseudochironomus prasinatus			1	1
Megaloptera				
Sialis lutaria	1	1		
Corixidae				
Hesperocorixa salhbergi			1	
Hesperocorixa moesta				1
Bivalvia				
Pisidium sp.	1	1		
Spaerium sp.			1	1
Oligochaeta				
Stylaria lacustris	1	1		

Appendix table 3. Identified species/genus in sample 1 and 2 by Laboratory 3

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Ephemeroptera				
Baetis rhodani	1	1	1	
Baetos buceratus				1
Baetis scambus			1	1
Baetris fuscatus/scambus			1	1
Baetis alpinus			1	1
Baetis lutheri	1	1		
Alainites muticus	1	1		
Ameletus inopinatus	1	1	1	1
Leptophlebia vespertina	1	1	1	
Leptophlebia sp.				1
Habrophlebia lauta			1	1
Kageronia fuscogrisea			1	1
Ephemera vulgata	1	1		
Ephemera danica			1	1
Cloeon dipterum	1	1		
Caenis luctuosa	1	1	1	1
Seratella ignita	1	1		
Ephemerella mucronata			1	1
Epeorus assimilis	1	1		
Plecoptera				
Diura bicaudata	1	1	1	
Diura sp.				1
Isoperla grammatica	1		1	1
Isoperla sp.		1		
Isoperla obscura			1	
Isoperla difformis				1
Dinocras cephalotes	1	1	1	1
Perla burmeisteriana			1	1
Brachyptera risi	1	1		
Brachyptera seticornis			1	1
Leuctra nigra	1	1		
Leuctra inermis	1	1	1	1
Taeniopteryx nebulosa	1	1	1	1
Amphinemura sulcicollis	1			
Amphinemura standfussi		1		
Amphinemra borealis	1	1		
Nemurella pictetii			1	1
Protonemura meyeri	1	1		
Protonemura aubertii			1	1
Siphonoperla torrentium	1	1	1	1
Trichoptera				
Sericostoma personatum	1		1	
Sericostoma sp.		1		1
Litax niger	1	1	1	1
Ecclisopteryx madida	1	1		
Ecclisopteryx guttulata			1	1

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Ephemeroptera				
Anomalopterygella chauviniana			1	1
Silo piceus	1			
Silo nigricornis		1		
Drusus discolor			1	1
Micropterna lateralis			1	
Micropterna nycterobia				1
Oligoplectrum maculatum	1	1		
Athripsodes cinereus	1	1		
Adicella reducta			1	1
Philopotamus ludificatus			1	
Philopotamidae cf.Wormaldia copiosa				1
Neureclipsis bimaculata	1	1		
Micrasema longulum	1	1		
Agapetus ochripes	1	1		
Glossosoma conformis			1	
Glossosoma boltoni				1
Polycentropus irroratus	1		1	
Plectrocnemis geniculata		1		1
Polycentropus flavomaculatus	1	1	1	1
Hydropsyche pellucidula	1	1	1	1
Hydropsyche tenuis			1	1
Hydropsyche dinarica			1	
Hydropsyche instabilis group.. cf.*saxonica*				1
Rhyacophila obliterata	1			
Rhyacophila dorsalis-nubila group		1		
Rhyacophila evoluta	1	1		
Psychomyia pusilla	1	1		
Rhyacophila tristis			1	1
Rhyacophila praemorsa			1	1
Lepidostoma hirtum	1	1		
Miscellaneous				
Diptera:				
Prodiamesa olivacea	1	1		
Hirudinea:				
Glossiphonia complanata			1	1
Turbellaria:				
Polycelis felina			1	1
Coleoptera:				
Agabus guttatus	1			
Agabus sp.		1		
Oreodytes sanmarki	1	1	1	1
Limnius perrisi	1	1		
Elmis latreillei	1		1	
Elmis sp.				1
Elmis aenea		1		
Anacaena globulus			1	1
Deronectes platynotus			1	1
Platambus maculatus			1	1

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Ephemeroptera				
Megaloptera:				
Sialis fuliginosa	1	1		
Malacostraca:				
Gammarus fossarum	1	1	1	1
Gastropoda:				
Bithynia tentaculata	1	1		
Bithynia leachii			1	1
Bathyomphalus contortus	1	1	1	1
Zygoptera:				
Enallagma cyathigerum	1	1		
Anisoptera:				
Gomphus vulgatissimus	1	1		
Aeshna grandis			1	
Aeshna viridis				1

Appendix table 4. Identified species/genus in sample 1 and 2 by Laboratory 4

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Ephemeroptera				
Ecdyonurus torrentis	1	1		
Ameletus inopinatus	1	1	1	1
Caenis horaria	1	1		
Caenis luctuosa	1	1	1	1
Baetis rhodani	1	1	1	1
Alainites muticus			1	1
Heptagenia sulphurea	1	1		
Kageronia fuscogrisea			1	1
Leptophlebia vespertina	1	1		
Ephemera danica			1	1
Seratella ignita			1	1
Plecoptera				
Leuctra geniculata	1	1		
Leuctra nigra	1	1	1	1
Leuctra digitata	1	1		
Leuctra hippopus	1	1	1	1
Leuctra inermis	1	1	1	1
Leuctra fusca			1	1
Protonemura meyeri	1	1	1	1
Amphinemura sp.	1	1		
Amphinemura sulcicollis			1	1
Nemoura cinerea			1	1
Siphonoperla torrentium	1	1		
Taeniopteryx nebulosa	1	1	1	1
Brachyptera risi	1	1	1	1
Isoperla obscura	1	1		
Dinocras cephalotes	1	1	1	1
Chloroperla tripunctata	1	1		
Isoperla grammatica			1	1
Perlodes microcephala			1	1
Trichoptera				
Cyrnus flavidus	1	1		
Cyrnus trimaculatus			1	1
Polycentropus irroratus	1	1		
Polycentropus flavomaculatus			1	1
Neureclipsis bimaculata	1	1		
Holocentropus stagnalis	1	1		
Holocentropus picicornis			1	1
Rhyacophila munda	1	1		
Rhyacophila dorsalis			1	1
Rhyacophila obliterata			1	1
Psychomyia pusilla	1	1		
Philapotamus montanus	1	1		
Sericostoma personatum	1	1		
Cheumatopsyche lepida	1	1		
Hydropsyche silatalai	1	1		

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Hydropsyche instabilis			1	1
Hydropsyche pellucidula			1	1
Potamophylax cingulatus	1	1		
Potamophylax latipennis			1	1
Ecclisopteryx guttulatus			1	1
Beraea maurus	1	1		
Brachycentrus subnubilus			1	1
Odontocerum albicorne	1	1		
Silo pallipes			1	1
Glossosoma intermedium	1	1		
Agapetus ochripes			1	
Agapetus fuscipes				1
Trianodes bicolor	1	1		
Oecetis testacea			1	1
Athripsodes(sp.cf)*cinereus*	1	1		
Mystacides azurea			1	1
Tinodes waeneri	1	1		
Molanna angustata			1	1
Lepidostoma hirtum			1	1
Miscellaneous				
Hirudinea				
Glossophonia complanata	1	1		
Helobdella stagnalis	1	1		
Megaloptera				
Sialis lutaria	1	1		
Malacostraca				
Gammarus lacustris	1	1	1	1
Asellus aquaticus			1	1
Corixidae				
Arctocorisa carinata	1	1		
Hesperocorixa sahlbergi			1	1
Gastropoda				
Bathyomphalus contortus	1	1		
Theodoxus fluviatilis	1	1		
Gyraulus sp.			1	1
Bithynia tentaculata			1	1
Potamopyrgus antipodarum			1	1
Coleoptera				
Oreodytes sanmarki	1	1		
Limnius volckmari			1	1
Hydraena gracilis			1	1
Elmis aenea			1	1
Esolus paralellepipedus			1	1

Appendix B. Reports and publications from ICP Waters

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