Convention on Long-range Transboundary Air Pollution

International Cooperative Programme on Assessment and Monitoring of Acidification of Rivers and Lakes

ICP Waters Report 85/2006

Biological intercalibration: Invertebrates 1006

NIVA Norwegian Institute for Water Research

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REPORT

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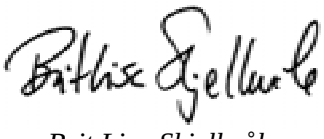
Abstract

The 10th intercalibration of invertebrates in the ICP Waters programme had contribution from 5 laboratories. The laboratories identified a high portion of the individuals in the test samples, usually > 95% of the total number of species, but shortcoming identifications below this limit were also noted. Misidentifications and low % identified were in general made on material coming from regions outside the home region of the laboratory. Few faults were recorded on genus level. The taxonomic quality was sufficient for stating the acidity index. The Quality assurance index was > 80 for all the laboratories, indicating good taxonomic work. One participant did no mistakes.

4 keywords, Norwegian	4 keywords, English
1. Interkalibrering	1. Intercalibration
2. Invertebrater	2. Invertebrates
3. Akvatisk fauna	3. Aquatic fauna
4. Overvåking	4. Monitoring



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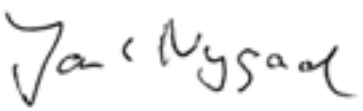

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CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

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

Intercalibration: Invertebrate fauna 1006

ICP Waters Programme Subcentre
Laboratory of Freshwater Ecology and Inland Fisheries
University of Bergen, December 2006

Preface

The International Cooperative Programme on Assessment and Monitoring of Rivers and Lakes (ICP Waters) was established under the Executive Body of the Convention on Long-Range Transboundary Air Pollution at its third session in Helsinki in July 1985. The Executive Body also accepted Norway's offer to provide facilities for the Programme Centre, which has been established at the Norwegian Institute for Water Research, NIVA. A programme subcentre is established at the Laboratory of Freshwater Ecology and Inland Fisheries at the University of Bergen. Berit Kvæven, Norwegian Pollution Control Authority (SFT), has led the ICP Waters programme. SFT provides financial support to the work of the Programme Centre.

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. Twenty-two countries in Europe and North America participate in the programme on a regular basis.

ICP Waters is based on existing surface water monitoring programmes in the participating countries, implemented by voluntary contributions. The monitoring sites are generally acid sensitive and representative of low acid neutralising capacity (ANC) and low critical load levels of the distributions for all the waters surveyed in the region. The ICP site network is geographically extensive and includes long-term data series (more than 25 years) for some sites.

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

We here report the results from the 10th intercalibration on invertebrate fauna.

Bergen, December, 2006

Gunnar G. Raddum and Arne Fjellheim

Contents

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 acidification index, 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 the acidification index 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). This type of data treatment is especially sensitive to the quality of the species identification. The intercalibration of biological material will in general have focus on the taxonomic work and through this be a basis for improving the quality, detect weak fields 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 samples of invertebrates from their own monitoring sites to the Programme centre. Based on this material each laboratory receives individual test samples composed of the fauna from their own monitoring region. One problem with this procedure is that the Programme centre needs material from the different areas in the ICP Waters region. This material has to be collected, identified and sent by the participating laboratories to the centre for making test samples. For the tests carried out in 2006 three laboratories got test material relevant for their home region, while one participant received material that was based on fauna sampled outside their 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

Between 200 and 300 identified invertebrates were received from two of the participating laboratories. In addition we had some surplus material from earlier exercises and from an EU-project which also was used for making the test samples. For one laboratory we did not have enough material from its home region. In this case the test sample was based on material from Scandinavia and material from other parts of Europe regarded as relevant for the participant.

Identification

When preparing the biological test-samples we try to be as accurate as possible, concerning the species and number of individuals put in the sample. To minimise possible faults the following procedure have been used for the laboratories that have sent us material:

- 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 right number and species is placed in the samples according to the list.

For the present test one participant received material mostly from Norway, but also from an EU-project. The laboratory had therefore not been involved in sampling and identification of the source material prior to the test. Due to this the content of the test samples will only relay on the skill of the Programme centre. This is not an ideal situation. Apart from this, the same procedure as mentioned for the other laboratories was followed.

Damages of the material

When handling invertebrates there is a risk of reducing the quality of the material with respect to taxonomic work. Important taxonomically parts as gills, legs, cerci, mouthparts etc. can be lost or destroyed during handling 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 can influence on the results of the identifications and disturb the results in a negative way.

Evaluation

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. For some species, in the same genus, the time of sampling is important for discrimination between them. Faults made on species where time of sampling is important for determination have been neglected. Misidentification of species where important taxonomic characters easily disappear during handling, are also neglected when 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 the circumstances mentioned above some subjective evaluation 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 to species level of the total number in the sample. This is named *% identified*. A low percent means that many individuals are not brought to the species level 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 between the laboratories. 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.

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 ≥80 is regarded as good taxonomical work.

3. Results and discussion

Five laboratories participated in the intercalibration of invertebrates in 2005/06. 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 - 5.

Mayflies

Laboratory 4 and 5 identified the mayflies (Ephemeroptera) without any faults, but laboratory 5 stopped at genus level for some individuals (Figure 1). Minor faults were recorded by laboratory 2 and 3, while laboratory 1 did more faults. The latter worked on material not sampled in their home region. Every specimen was, however, brought to species level and the Qi index was > 80, indicating high quality of the work. The genus level was 100% right identified by the laboratories 2 -5. Laboratory 1 also made some misidentifications on genus level, but they pointed out that some of the taxa did not belong to their fauna. In spite of normally high damages on mayflies in test samples, all laboratories except 5 finalised the species identification 100 %. In summary the taxonomic work was above the limit of good taxonomic work. Qi was 83 for laboratory 1, 95 for laboratories 2 and 3, 100 for laboratory 4 and 90 for laboratory 5.

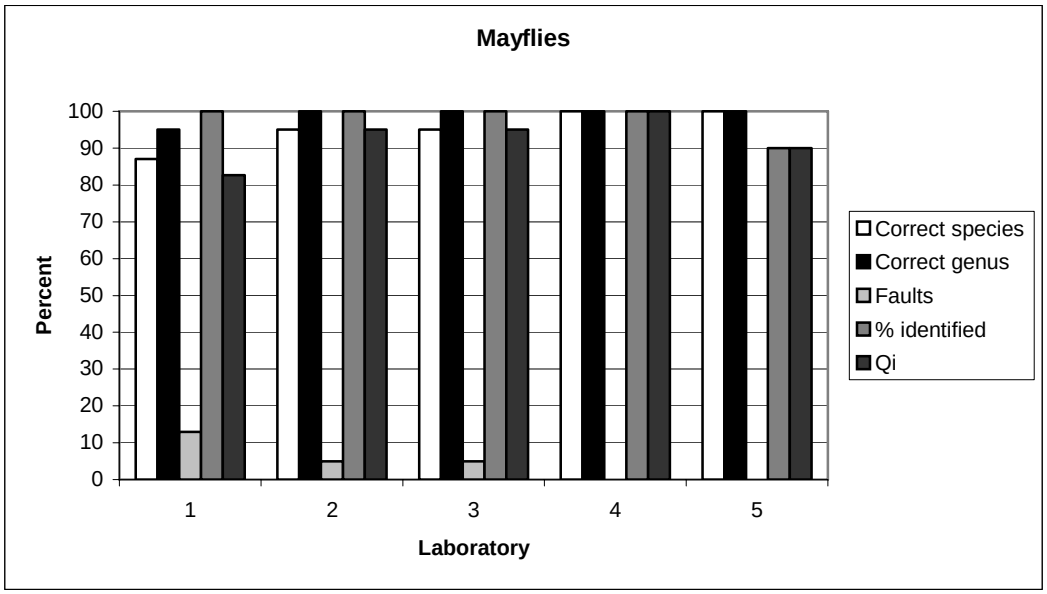

Figure 1. *Results of the identification of mayflies.*

Stoneflies

The identification of stoneflies was also generally good. The laboratories 1 – 3 and 5 did some faults (Figure 2), while one (Lab. 4) did no mistakes. All larvae were identified to species level by laboratory 2, 3 and 4, while laboratory 1 and 5 stopped at the genus level for a few specimens for them unknown taxa. Laboratory 1 and 5 identified 96% of the stoneflies to species level, but did 14 and 10 % mistakes, respectively. Participant 2 and 3 did 5- and 4 % faults, respectively, while laboratory 4 identified every thing right. On the genus level none of the participants did any faults. The Qi was calculated to 83, 95, 96, 100 and 86 for laboratories 1, 2, 3, 4 and 5, respectively.

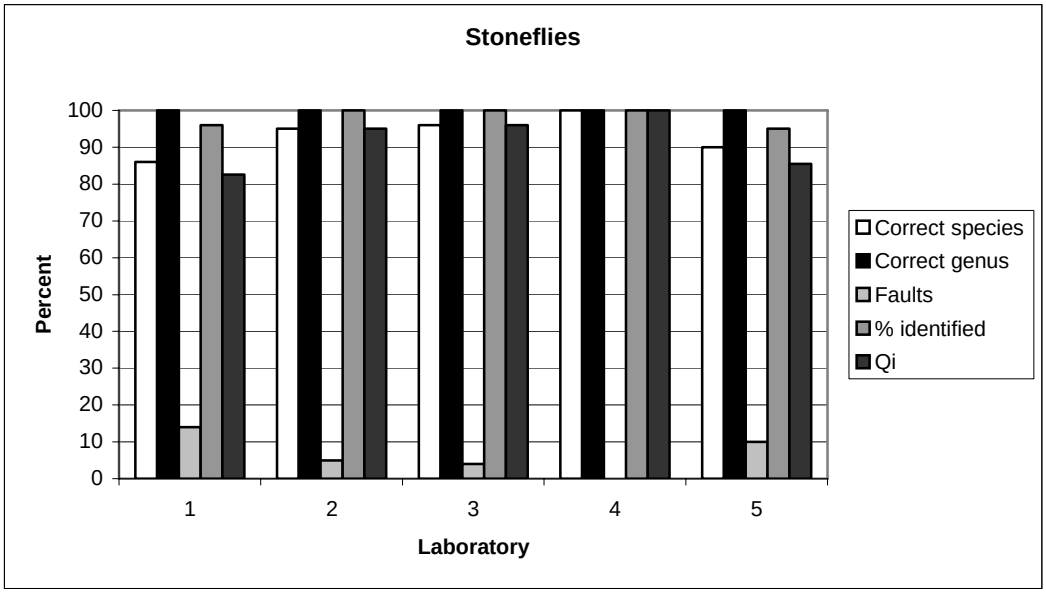

Figure 2. *Results of the identification of stoneflies.*

Caddisflies

The identification of caddis flies (Trichoptera) was also generally good (Figure 3). Some of the identifications were regarded as faults for Laboratory 1, 2 ,3 and 5, while laboratory 4 identified all specimen correct. Laboratory 1, 2, 3 and 5 did 9-, 3- ,8 and 3 % faults, respectively. On genus level no faults were recognised for any of the Laboratories. The *% identified* was 100% for laboratory 1, 3 and 4, while participant 2 and 5 identified 93 and 97 % of the individuals. The taxonomic work on caddisflies is also regarded as good with Qi values of 91, 90, 92, 100 and 94, respectively, for the participants.

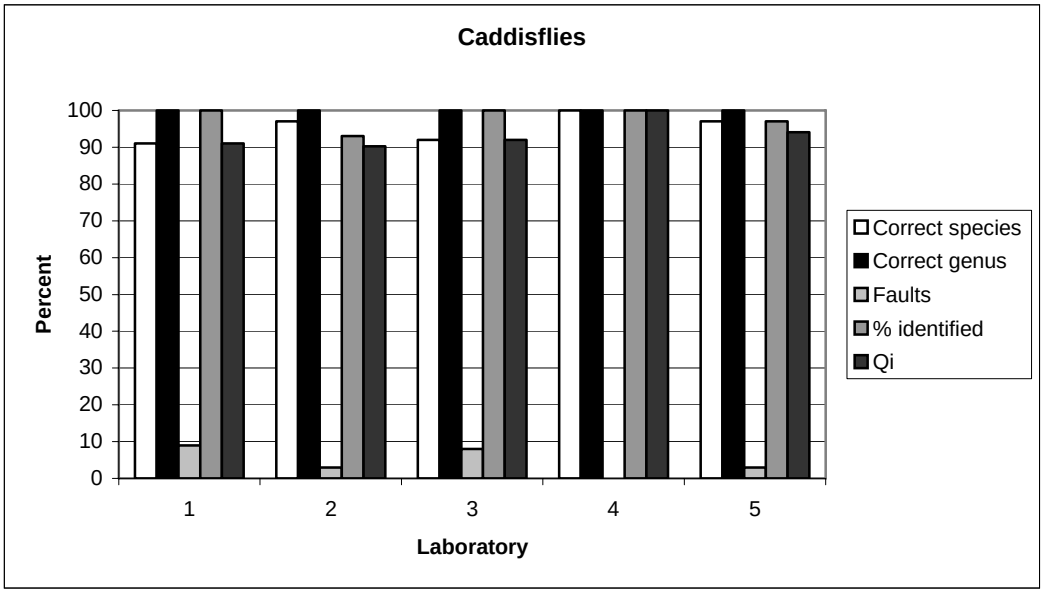

Figure 3. *Results of the identification of caddisflies.*

Other groups

In this intercalibration we have included Coleoptera (water beetles), larger crustaceans, Hirudinea, molluscs, Diptera etc. Both larvae and imagos have been included for some of the groups. Molluscs and larger crustaceans are sensitive to acid water and important for the evaluation of acidification. The tolerance of the invertebrates among Coleoptera, Diptera, Odonata etc. is little known. Due to this the species in the last mentioned groups is treated as tolerant to acid water and consequently have low importance for evaluation of the acidity index. However, all species will be important for statistical analysis, using the whole community. Figure 4 shows the results of the identification of these groups. Laboratory 1 did 10% mistakes, but % identified was 100. No faults were done on genus level and the participant obtained a Qi score of 90. Laboratory 2 did no faults, but % identified was 93. Qi will therefore also be 93. Participant 3 did 6% faults and identified 94% of the individuals to species level. On genus level they got 94% right. Qi was therefore calculated to 83. Participant 4 again did no mistakes and laboratory 5 obtained a Qi of 97.

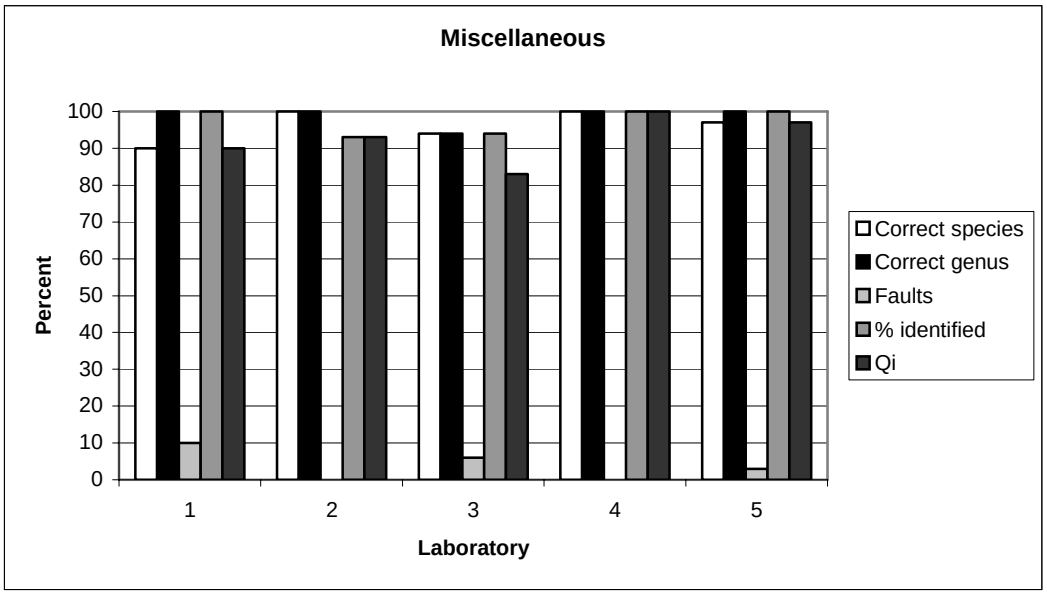

Figure 4. *Results of the identification of miscellaneous groups*

Total number of species in the sample

It was generally low discrepancy between the number of individuals put into the samples and the reported number of larvae. However, some differences have occurred between delivered and identified numbers of individuals. More species are sometimes identified than put into the sample, but this has been neglected in this test. Some small or juvenile larvae were also put in the samples. Such larvae can be impossible to identify if origin and time of sampling is unknown. This has also been taken into account during the evaluation.

4. Evaluation/conclusion

The laboratories generally identified a high portion (≥ 95%) of the total number of species in the test samples. Shortcoming identification was low and indicated a good taxonomic skill by all participants. None of the participants obtained a Qi score < 80. The mean skill of identifying species and genus and Qi score per laboratory is shown in Figure 5. Laboratory 1 to 5 got a mean Qi score of 87, 93, 92, 100 and 92, respectively. All tests were characterized as good 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's Water Framework Directive.

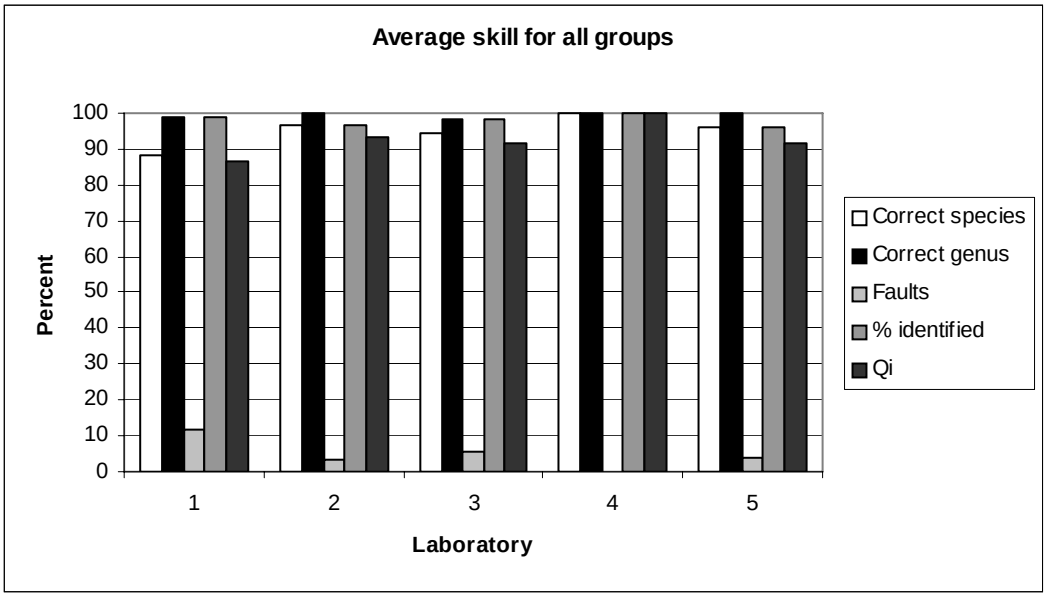

Figure 5. *Mean skill in percent of identifying species and genus and mean Qi for each laboratory.*

None of the participants did misidentifications that could result in a wrong acidity index, see Figure 6.

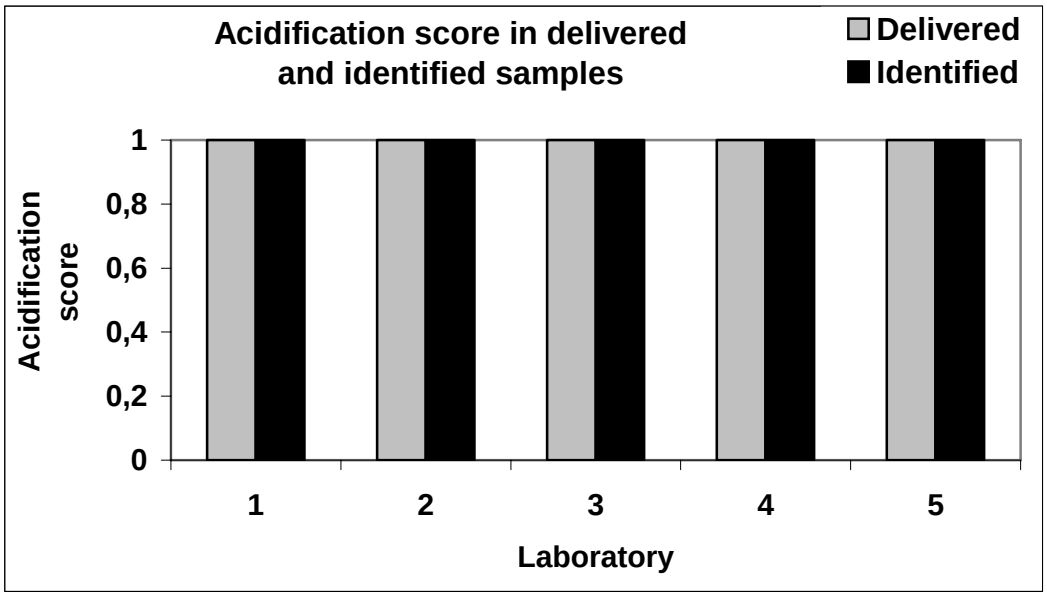

Figure 6. *Acidification score in delivered and identified samples.The calculation of the index were done according to Fjellheim and Raddum (1990) and Raddum (1999).*

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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 2006 and their code numbers are:

1. Charles University Department of Hydrobiology, Vinicna 7, CZ-128 44 Prague 2, ***Czech Republic***
2. Laboratory of Freshwater Ecology and Inland Fisheries, University of Bergen, ***Norway***
3. Swedish University of Agricultural Sciences, Dept. of Environmental Assessment, P.O. Box 7050, S-75007 Uppsala***, Sweden***
4. Latvian Hydrometeorological Agency, EQOD , Environmental Quality Testing Laboratory, Riga, ***Latvia***
5. Estonian Environment Information Centre, Mustamàe Tee 33, 10616 Tallinn, ***Estonia***

.

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

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Ephemeroptera				
Ameletus inopinatus	1	1	1	1
Baetis scambus	1	1		
Baetis niger	1			
Baetis muticus		1		
Baetis rhodani	1	1	1	1
Caenis horaria	1	1		
Caenis luctuosa			1	1
Centroptilum luteolum			1	1
Ephemerella aurivilli	1		1	
Ephemerella ignita		1		
Ephemerella notata				1
Heptagenia sulphurea	1	1	1	1
Leptophlebia vespertina	1			
Paraleptophlebia sp.		1		
Plecoptera				
Amphinemura borealis			1	1
Amphinemura sulcicollis	2	2		
Brachyptera risi	1	1		
Dinocras cephalotes	1	1		
Diura bicaudata	1		1	
Diura nanseni	1			
Diura sp.		2		1
Isoperla grammatica	1			
I. oxylepsis		1		
Leuctra nigra	2	2	2	2
Nemoura avicularis			1	1
Nemoura sp.	1	1		
Nemurella pictetii			1	1
Protonemura meyeri	1		1	
P. nitida		1		
P. auberti				1
Siphonoperla burmeisteri	1			
S. taurica		1		
Taeniopteryx nebulosa			1	1
Trichoptera				
Beraeodes minutus	1	1		
Ceratopsyche silvenii	1			
Ceratopsyche saxonica		1		
Ecnomus tenellus	1	1		
Hydropsyche angustipennis	1	1		
Hydropsyche pellucidula			1	1
Hydropsyche siltalai	1	1		
Lepidostoma hirtum	1	1		
Micrasema sp.			1	1
Neureclipsis bimaculata	1	1	1	1

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Oecetis testacea			**1**	**1**
Philopotamus montanus	**1**	**1**		
Plectrocnemia conspersa			**2**	**2**
Polycentropus flavomaculatus	**1**	**1**	**1**	**1**
Polycentropus irroratus	**1**	**1**		
Sericostoma personatum	**1**	**1**	**1**	**1**
Tinodes waeneri			**1**	**1**
Wormaldia subnigra	**1**	**1**	**2**	**2**
Malacostraca				
Asellus aquaticus	**1**	**1**		
Gammarus pulex	**1**	**1**		
Hirudinea				
Helobdella stagnalis	**1**	**1**		
Gastropoda				
Theodoxus fluviatilis			**1**	**1**
Lymnaea baltica			**1**	**1**
Gyraulus sp.	**1**	**1**		
Ancylus fluviatilis	**1**	**1**		
Bithynia tentaculata	**1**	**1**		
Coleoptera				
Elmis aenea larvae	**1**	**1**		
Limnius volckmari			**1**	**1**

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

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Ephemeroptera				
Ephemerella aurivilli	2	2	1	1
Baetis rhodani	2	2	2	2
Cloeon dipterum			1	
Cloeon sp.				1
Siphlonurus cf.aestivalis	1	1		
Heptagenia sulphurea	2	2	1	1
Heptagenia fuscogrisea	1	1	2	2
Caenis horaria	1	1		
Caenis luctuosa			2	2
Plecoptera				
Taeniopteryx nebulosa	1	1		
Nemurella pictetii	1	1		
Nemoura avicularis	1	1		
Nemoura cinerea	0	0	2	2
Protonemura meyeri	1	1	1	1
Siphonoperla burmeisteri	1	1		
Leuctra nigra	0	0	1	1
Capnopsis shilleri	1	1		
Amphinemura borealis	2	2	2	2
Amphinemura sulcicollis			2	2
Brachyptera risi			2	2
Diura nanseni	1	1		1
Diura bicaudata			1	
Trichoptera				
Sericostoma personatum	1	1	1	1
Rhyacophila nubila	2	2		
Rhyacophila fasciata/septentrionis			1	1
Polycentropus flavomaculatus	1	1	1	1
Polycentropus irroratus	2	2	1	1
Plectrocnemia conspersa	1	1		
Cyrnus flavidus			1	1
Agapetus ochripes	1	1	1	1
Crunoecia irrorata	1	1		
Lepidostoma hirtum			2	2
Ecclisopteryx dalecarlica	1	1	1	1
Micrasema sp.(cf.setiferum)		1		
Micrasema gelidum	1			
Lype phaeopa	1	1		
Psycomyia pusilla			1	1
Tinodes waeneri	1	1	1	1
Philopotamus montanus			1	1
Chimarra marginata			1	1
Wormaldia subnigra	1	1		
Ceraclea sp. (cf.senilis)		1		1
Ceraclea annulicornis	1		1	

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Hydropsyche pellucidula	**2**	**2**		
Hydropsyche siltalai	**1**	**1**	**1**	**1**
Hydropsyche angustipennis			**1**	**1**
Ceratopsyche silfvenii				**1**
Ceratopsyche nevae			**1**	
Coleoptera				
Platambus maculatus larve	**1**	**1**	**1**	**1**
Limnius volckmari	**2**	**2**		
Elmis aenea larve			**2**	**2**
Hirudinea				
Erpobdella octoculata	**1**	**1**		
Helobdella stagnalis			**1**	**1**
Malacostraca				
Gammarus lacustris	**1**	**1**		
Pallasea quadrispinosa	**1**	**1**	**1**	**1**
Gastropoda				
Lymnaea peregra	**1**	**1**	**1**	**1**
Gyraulus corneus	**1**			
Gyraulus acronicus			**1**	
Gyraulus sp.		**1**		**1**

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**	**3**	**3**
Baetis niger	**1**	**1**	**2**	**2**
Baetis muticus	**1**			
Baetis subalpinus		**1**		
Baetis vernus	**1**	**1**		
Ameletus inopinatus			**1**	**1**
Caenis luctuosa	**1**	**1**		
Ephemerella aurivilli	**1**	**1**	**1**	**1**
Plecoptera				
Amphinemura standfussi			**1**	**1**
Amphinemura borealis	**2**	**2**	**1**	**1**
Amphinemura sulcicollis			**1**	**1**
Leuctra hippopus	**1**	**1**	**1**	**1**
Leuctra nigra			**1**	
Capnosis schilleri				**1**
Leuctra fusca			**1**	
Leuctra hippopus/digitata				**1**
Capnia bifrons	**1**	**1**	**1**	**1**
Siphonoperla burmeisteri	**2**	**2**	**1**	**1**
Protonemura meyeri	**1**	**1**	**1**	
Protonemura intricata				**1**
Brachyptera risi	**1**	**1**	**1**	**1**
Taeniopteryx nebulosa	**1**	**1**	**1**	**1**
Diura sp.			**1**	
Diura nanseni			**1**	**1**
Isoperla grammatica	**1**	**1**		
Isoperla sp.				**1**
Nemoura cinerea	**1**	**1**		
Trichoptera				
Rhyacophila nubila	**1**	**1**	**1**	**1**
Micrasema longulum			**1**	
Micrasema gelidum				**1**
Lepidostoma hirtum			**1**	**1**
Sericostoma personatum	**1**	**1**		
Ecnomus tenellus	**1**	**1**		
Oxyethira sp.	**2**	**2**		
Athripsodes aterrimus	**1**		**1**	
Athripsodes cinereus		**1**		**1**
Holocentropus dubius			**2**	**2**
Cyrnus flavidus			**1**	**1**
Plectrocnemia conspersa	**1**	**1**		
Polycentropus flavomaculatus	**1**	**1**	**1**	**1**
Neureclipsis bimaculata	**1**	**1**	**2**	**2**
Philopotamus montanus	**1**	**1**		
Chimarra marginata			**1**	**1**

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Hydropsyche pellucidula	**1**	**1**		
Hydropsyche siltalai			**2**	**2**
Adicella sp.(reducta)	**2**	**2**		
Coleoptera				
Oreodytes sanmarki	**1**		**1**	
Oreodytes septentrionalis				**1**
Oreodytes sp.		**1**		
Elmis aenea larve	**1**	**1**		
Elmis aenea adult	**1**	**1**	**1**	**1**
Limnius volckmari	**1**	**1**		
Olimnius sp.	**1**	**1**		
Hirudinea				
Erpobdella octoculata	**1**	**1**		
Glossophonia complanata			**1**	**1**
Gastropoda				
Bithynia tentaculata	**1**	**1**		
Theodoxus fluviatilis			**1**	**1**
Megaloptera				
Sialis lutaria	**1**	**1**		
Malacostraca				
Asellus aquaticus			**1**	**1**
Gammarus lacustris	**1**	**1**		
Gammarus pulex			**1**	**1**

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

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Ephemeroptera				
Baetis rhodani	**1**	**1**	**1**	**1**
Caenis horaria	**1**	**1**		
Caenis luctuosa			**1**	**1**
Centroptilum luteolum	**2**	**2**	**2**	**2**
Heptagenia sulphurea	**2**	**2**	**1**	**1**
Ephemerella ignita	**1**	**1**	**1**	**1**
Ephemera danica	**2**	**2**		
Ephemera vulgata			**2**	**2**
Plecoptera				
Taeniopteryx nebulosa	**1**	**1**	**1**	**1**
Amphinemura borealis	**1**	**1**	**1**	**1**
Nemoura cinerea	**1**	**1**	**1**	**1**
Isoperla grammatica	**1**	**1**	**1**	**1**
Trichoptera				
Ironoquia dubia	**1**	**1**	**1**	**1**
Psychomyia pusilla	**1**	**1**	**2**	**2**
Ecnomus tenellus	**2**	**2**		
Cyrnus flavidus	**1**	**1**	**2**	**2**
Rhyacophila nubila	**1**	**1**	**1**	**1**
Neureclipsis bimaculata	**1**	**1**	**1**	**1**
Brachycentrus subnubilus	**1**	**1**	**1**	**1**
Leptocerus tineiformis	**1**	**1**	**1**	**1**
Silo pallipes	**1**	**1**	**2**	**2**
Polycentropus flavomaculatus	**2**	**2**	**1**	**1**
Hydropsyche siltalai	**1**	**1**	**1**	**1**
Cheumatopsyche lepida	**2**	**2**	**2**	**2**
Lepidostoma hirtum	**1**	**1**	**1**	**1**
Hydropsyche pellucidula	**0**	**0**	**1**	**1**
Hirudinea				
Erpobdella octoculata	**1**	**1**		
Gastropoda				
Lithoglyphus naticoides	**2**	**2**	**2**	**2**
Theodoxus fluviatilis	**1**	**1**	**1**	**1**
Ancylus fluviatilis	**1**	**1**	**1**	**1**
Bithynia tentaculata	**1**	**1**	**1**	**1**
Heteroptera				
Aphelocheirus aestivalis	**1**	**1**	**1**	**1**
Elmis aenea larver				
Limnius volckmari				

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Corixidae:				
Sigara falleni	**1**	**1**		
Coleoptera:				
Elmis aenea	**3**	**3**	**1**	
Olimnius tuberculatus	**1**	**1**	**1**	
Riolus cupreus	**1**	**1**	**1**	
Limnius volckmari	**2**	**2**	**1**	
Diptera:				
Chaoborus flavicans	**1**	**1**		

Table 5. Identified species/genus in sample 1 and 2 by Laboratory 5

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Trichoptera				
Agapetus ochripes	1		1	
Agapetus sp.		1		1
Brachyptera subnubilus	1	1	1	1
Cheumatopsyche lepida	1	1	1	2
Cyrnus flavidus	1	1	1	1
Ecnomus tenellus	1	1	1	1
Goera pilosa			1	1
Hydropsyche pellucidula	1	1	1	1
Hydropsyche siltalai	1	1	1	1
Ironoquia dubia	1	1	1	1
Lepidostoma hirtum	1	1	1	1
Leptocerus tineiformis			2	1
Mystacides sp.(azurea)			1	1
Neureclipsis bimaculata	1	1		
Plectrocnemia conspersa			1	1
Polycentropus flavomaculatus	2	2	1	1
Psychomyia pusilla	2	2		
Rhyacophila nubila	1		1	
Rhyacophila dorsalis		1		1
Sericostoma personatum	1	1	1	
Setodes agentipunctellus	1		1	
Leptoceridae indet.		1		1
Triaenodes bicolor			1	1
Silo pallipes	1	1	1	1
Tinodes waeneri	1	1	1	1
Plecoptera				
Amphinemura borealis	1	2	1	3
Amphinemura sulcicollis	1		2	
Brachyptera risi			1	
Brachyptera sp.				1
Capnia pygmea	1			
Diura nanseni			1	1
Isoperla grammatica	1	1		
Leuctra hippopus	2	2		
Leuctra digitata	2	2		
Leuctra nigra			2	2
Nemoura cinerea	1	1	1	1
Nemoura. sp. juv.		2		2
Nemurella pictetii			1	
Protonemura meyeri	1		1	
Protonemura intricata				1
Siphonoperla burmeisteri	1		1	
Taeniopteryx nebulosa			1	
Taeniopterygidae juv.				1
Rhabdiopteryx acuminata		1		

	Sample 1		Sample 2	
Taxa:	**Delivered**	**Identified**	**Delivered**	**Identified**
Ephemeroptera				
Ameletus inopinatus	**1**		**1**	
Baetis niger	**2**		**3**	
Baetis indet		**3**		**3**
Baetis rhodani	**1**	**1**	**2**	**2**
Caenis horaria			**1**	**1**
Caenis luctuosa	**1**	**1**	**1**	**1**
Caenis sp.	**1**	**1**		
Centroptilum luteolum			**1**	**1**
Ephemera danica			**1**	**1**
Ephemera lineata	**1**	**1**	**1**	**1**
Ephemera vulgata	**1**	**1**	**1**	**2**
Ephemerella ignita	**2**	**2**	**2**	**2**
Heptagenia sulphurea	**1**	**1**	**1**	**1**
Coleoptera				
Aphelocheirus aestivalis	**1**	**1**	**1**	**1**
Riolus cupreus	**1 ad**	**1**	**1 ad**	**1**
Oulimnius tuberculatus	**1 ad**	**1**	**1 ad**	**1**
Limnius volckmari	**1 lar**	**1**	**1 ad**	**1**
Elmis aenea	**1 lar**	**1**	**1 lar**	**2**
Gastropoda				
Theodoxus fluviatilis	**1**	**1**	**1**	**1**
Bithynia tentaculata	**1**	**1**	**1**	**1**
Ancylus fluviatilis	**1**	**1**	**1**	**1**
Hirudinea				
Glossophonia complanata			**1**	**1**
Piscicola geometra	**1**	**1**	**1**	**1**
Erpobdella octoculata	**1**		**1**	**1**
Corixidae				
Sigara falleni	**1**	**1**		
Nepa cinerea			**1**	**1**
Chaoboridae				
Chaoborus flavicans	**1**	**1**	**1**	**1**
Tabanidae	**1**	**1**	**1**	**1**
Chrysops sp.				
Megaloptera				
Sialis lutaria				**1**
Sialis morio		**1**		
Malacostraca				
Asellus aquaticus		**1**		**1**