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Intercalibration:
Invertebrate fauna 0307

Norwegian Institute for Water Research

REPORT

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Abstract

The 7th intercalibration of invertebrates in the ICP-Water programme had contribution from 6 laboratories. All of the laboratories identified a high portion of the individuals in the test samples, usually ≥ 90% of the total number of species. One laboratory, however, stopped mostly at the genus level for stoneflies. Short-coming identifications were consequently high in that case. Of the identified species only few faults were made and the results were regarded generally as very good and well within the limit of good identification proposed for intercalibration of biological material. No faults were made on the genus level. The quality was sufficient for stating the acidity index, and in most cases sufficient for multivariate statistical analyses. One problem during the tests is damages of the material during preparation and handling of the individuals. This seems to be the reason for short coming identification in most cases.

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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CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

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

Intercalibration 0307: Invertebrate fauna

Prepared by the ICP Waters Programme Subcentre
Laboratory of Freshwater Ecology and Inland Fisheries
University of Bergen, March 2003

Preface

The International Cooperative Programme on Assessment and Monitoring of Acidification 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 has 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. The ICP-Waters programme has been lead by Berit Kvæven, Norwegian Pollution Control Authority.

The Programme objective is to establish an international network of surface water monitoring sites and promote international harmonization 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 clearly identified and controlled.

We here report the results from the 7th intercalibration on invertebrate fauna.

Bergen, January, 2003

Gunnar G.Raddum

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 put focus on the taxonomic work and through this be a basis for improving the quality and detect weak fields at the different laboratories.

The methods for intercalibration of biological material were outlined in 1991 at the 7th task force meeting of the International Co-operative Programme on Assessment and Monitoring of Acidification of Rivers and Lakes 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 receive 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-Water region. This material have to be collected, identified and send by the participating laboratories to the centre for making test samples. For the tests carried out in 2002 four laboratories got test material relevant for their home region, while two participants received material that was based on fauna outside their region.

2. Methods

2.1 Preparation of test-samples

Between 200 and 300 identified invertebrates have been received from the participating laboratories. In addition we had some surplus material from earlier exercises, which also was used for making the test samples. We have also used material from an EU-project.

When the programme subcentre participates in the test, the Swedish Agricultural University Uppsala, do the exercise and prepare the test samples.

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

- The participating country identify the source material for the test samples. Two experts at the Programme Centre in Bergen verify the identification of the species/taxa as far as possible.

- 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 participant 5 and 6 received material from Norway. They 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, which is not an ideal situation. Apart from this, the same procedure as mentioned for the other laboratories is 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, moth parts etc. can be lost/destroyed during handling connected with identification, sample composition and transportation. Contamination of larvae can also happen 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.

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 usually not the exact calculated percent of faults, but 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 samples for the test 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.

3. Results and discussion

Six laboratories participated in the intercalibration of invertebrates in 2002. 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 - 6.

3.1 Mayflies

Laboratory 3 identified the mayflies (Ephemeroptera) without any faults (**Figure 1**). The other laboratories did some faults, but none exceed the fault limit of 10%. In the results received from Laboratory 5 it was said that a large portion of the larvae had lost important parts that are necessary for identification. This explains the relative low *% identified*. Generally the work can be characterised as good - very good for all participants. Except for participant 5 the *% identified* was between 90 and 100 %. This is a high number since some damage will be put on the individuals from our side when preparing the samples in addition to the general loss of important parts used for identification. The genus level was 100% right identified for all individuals by all laboratories.

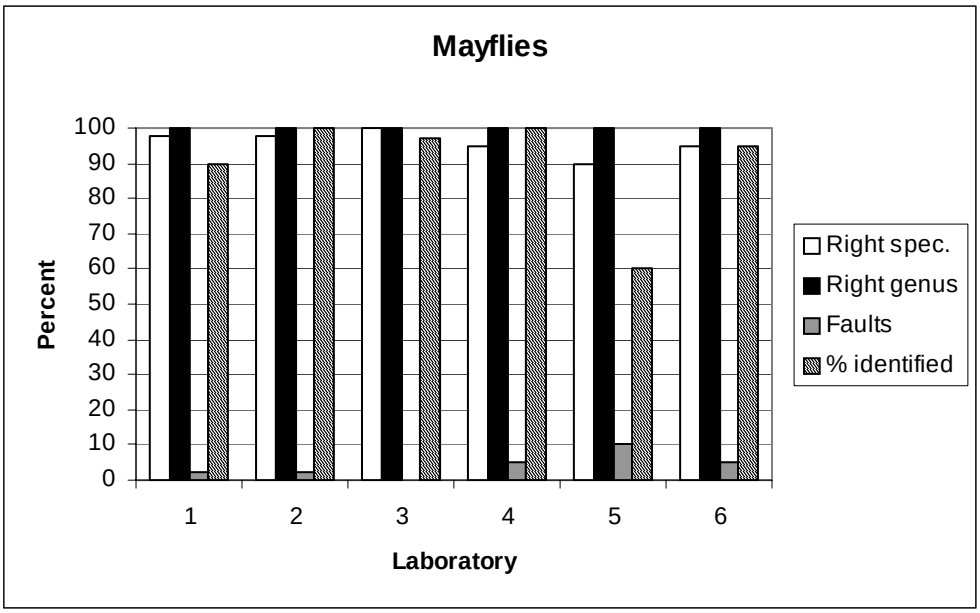

Figure 1. Results of the identification of mayflies.

3.2 Stoneflies

Laboratory 2, 4, 5 and 6 made no real misidentifications with respect to stoneflies (Plecopera), while laboratory 1 and 3 did determinations recorded as faults (**Figure 2**). All larvae were identified by laboratory 2, 3 and 4, while laboratory 1 and 6 identified 90 and 75 %, respectively, of the individuals to species. Laboratory 5 stopped, however, at the genus level for most of the stoneflies. The value of *% identified* is therefor not given in this case. Both laboratories 5 and 6 identified material that was not from their home region and explains why a large portion of the material only was identified to the genus level. Laboratory 6 identified Norwegian material for the second time and showed large improvements in the present test. Regarding the genus level all, laboratories did 100% right identifications.

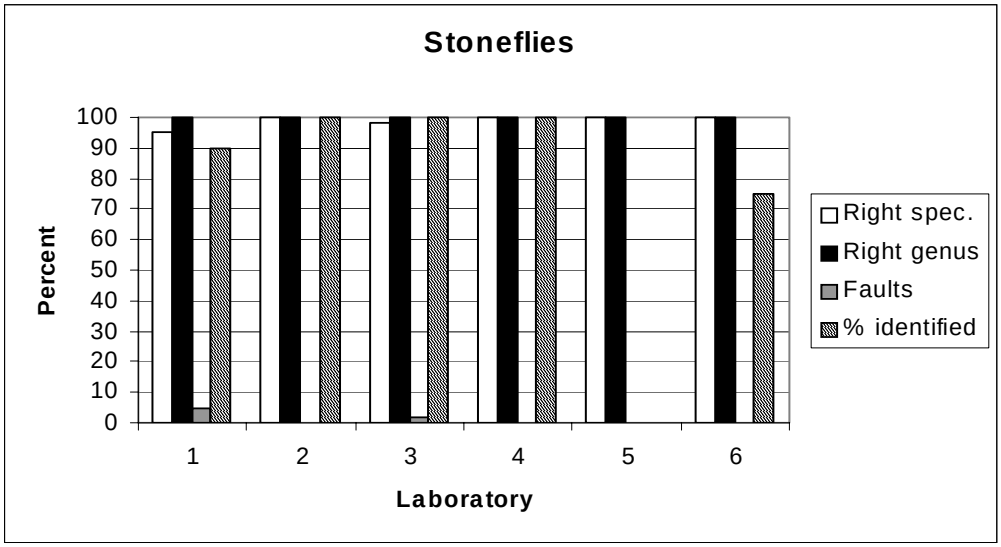

Figure 2. Results of the identification of stoneflies.

3.3 Caddis flies

The identification of caddis flies (Trichoptera) was very good (**Figure 3**). Laboratory 3, 4, 5, and 6 did all species identification right, while laboratory 1 and 2 did each a minor fault. The *% identified* was between 95 and 100 percent for all laboratories, a very high number. The differences between the laboratories were very small and should probably not be ranked. Due to this the result is well above the limit for good taxonomic work and can be acceptable for all types of analyses.

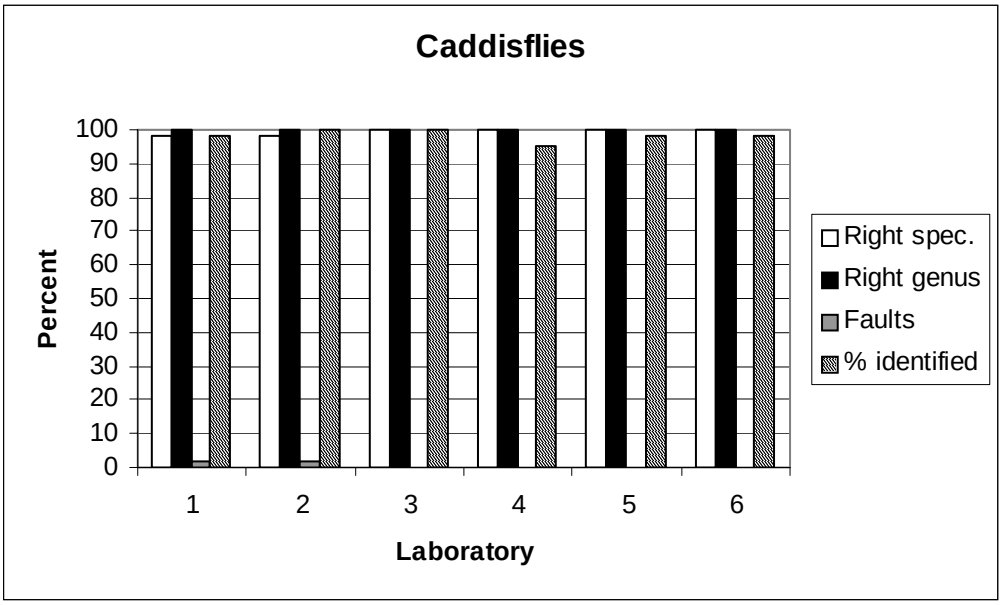

Figure 3. Results of the identification of caddis flies.

3.4 Other groups

In this intercalibration we have included Coleopta (water beetles), larger crustaceans, oligochaets, molluscs, diptera etc. Both larvae and imagos have been included for some of the groups. Molluscs, and larger crustaceans are sensitive to acid water, while the tolerance of many of the other invertebrates like coleoptera, diptera, odonats etc. are 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 of the whole community. **Figure 4** shows the results of the identification of these groups. Laboratory 1, 3, 5 and 6 identified all individuals to the right species, while laboratory 2 and 4 did some fault compared to the delivery. The *% identified* was 90 % for laboratory 5, the other identified 98 – 100 %. The identification of the mentioned group is therefore regarded as very good for all laboratories.

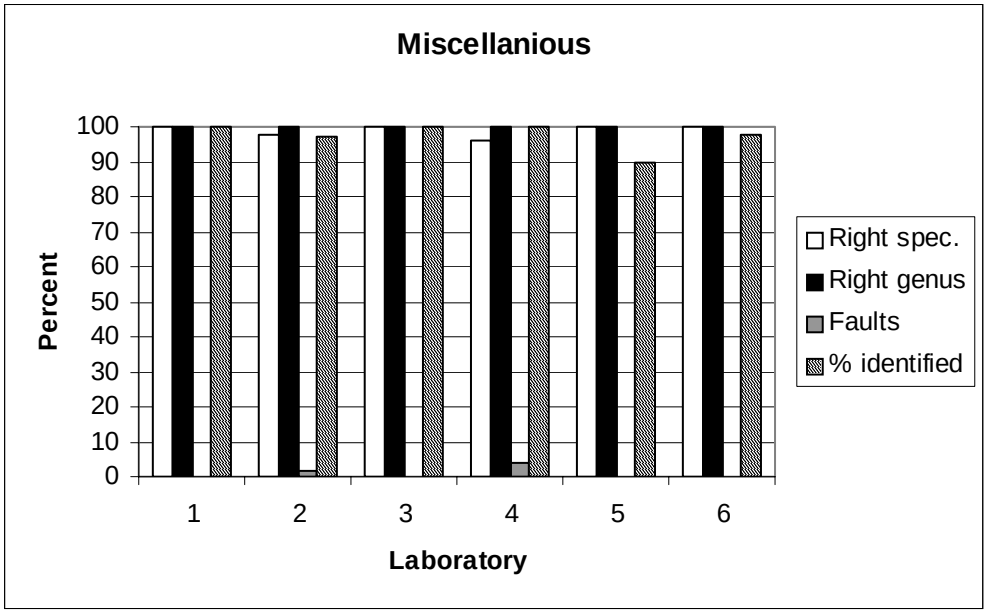

Figure 4. Results of the identification of miscellaneous groups

3.5 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, in a few cases records of species that should not be in the samples were identified. Also some larvae were missing. However, this has been a minor problem in the present test and small differences between delivered and identified number of individuals have not been taken into account.

4. Evaluation/conclusion

All laboratories identified in most cases a high portion of the total number of species in the test samples. Shortcoming identification occurred especially for one laboratory regarding determination of Stoneflies and to some degree also for Mayflies. However, the test samples were not from the home region of the laboratory and it was pointed out that many of the larvae were in a bad condition. We understand that this explain why the determinations stopped at genus level. Non of the laboratories did any fault at genus level. For species, misidentifications were < 10 %, which is regarded as good.

Non of the participants did misidentifications that could result in a wrong acidity index. The identifications were also within the demands for advanced statistical analyses except for the short coming identifications of the Stoneflies and Mayflies mentioned above. The results of the test are among the best since this exercise started and improvements is observed among laboratories that have participated several times. Some of them have expressed the value of these tests since they can use the time needed for their best identification and enlarge their taxonomic knowledge. This formalised exercise is also of high value for participation in other programmes where taxonomy is important, like EU's Water framework directive.

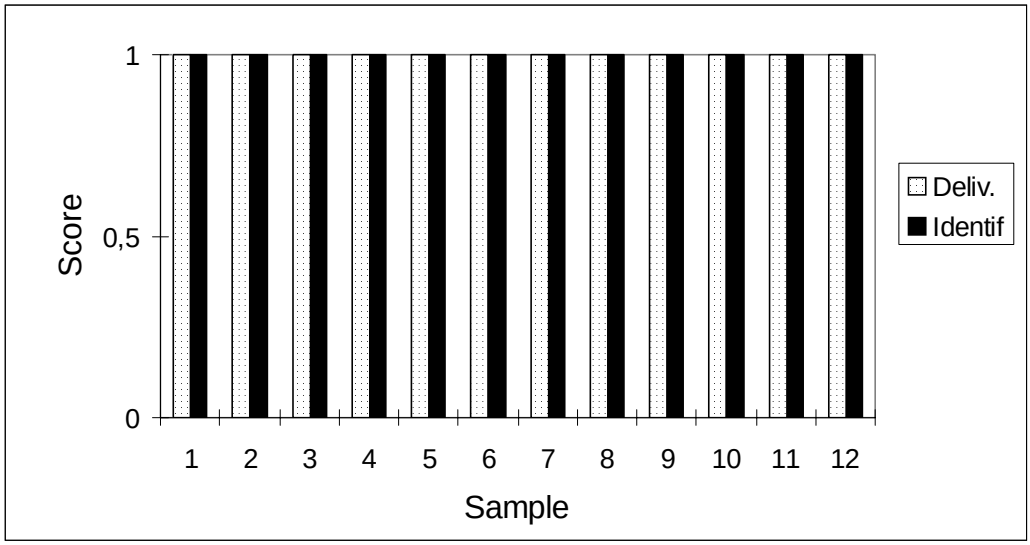

Figure 5. Acidification score in delivered and identified samples.

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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 1996 and their code numbers are:

1. Environmental Protection Agency, Laboratory Pottery Road, Dun Laoghaire, Ireland
2. Laboratory for Freshwater Ecology, Zool. Inst. Univ. of Bergen, Norway
3. Swedish Agricultural University, Inst. för miljödataanalys, Uppsala, Sweden
4. Charles University Dept. of Hydrobiology, Vinicna 7, CZ-128 44 Prague 2 - CZECH REPUBLIC
5. Landesamt für Wasserwirtschaft, Demollstr. 31, 82407 Wielenbach Germany
6. Div. Ambiente Canton Ticino, Laboratorio Studi Ambientali, Sez. Protezione Aria Acqua
7. Riva Paradiso 15, CH-6900 Lugano Paradiso, Switzerland

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

Laboratory 1	Sample 1		Sample 2	
Species	**Deliv.**	**Ident.**	**Deliv.**	**Ident.**
Mollusca				
Bithynia tentaculata	1	1		
Theodoxus fluviatilis			1	1
Plecoptera				
Amphinemura sulcicollis		2	1	3
A. borealis	2		1	
A. standfussi			1	
Brachyptera risi	1	1	1	1
Capnia sp.		1		1
C. bifrons	1		1	
Isoperla grammatica	1	1		
Diura bicaudata			1	1
D. nanseni	1			
Indet.spp.		1		1
Leuctra hippopus	1	1	1	1
L. inermis				1
L. fusca			1	
L. nigra			1	
Leuctra sp.				1
Nemoura cinerea	1			
Nemoura sp.		1		
Protonemoura meyeri	1	1	1	1
Siphonoperla (Chloroperla) torrentium		1		1
S. burmeisterei	1		1	
Taeniopteryx nebulosa	1	1	1	1
Ephemeroptera				
Ameletus inopinatus			1	1
Baetis rhodani	1	1	1	1
B. vernus			1	
B. fuscatus				
B.scambus	1	1		
B. muticus			1	
Baetis sp.				1
Caenis luctosa	1	1		
Ephemerella ignita		1		1
E. aurivilli	1		1	
Trichoptera				
Athripsodes cinereus	1	1	1	1
Chimara marginata			1	1
Cyrnus flavidus			1	1
Holocentropus dubius	1	1	1	1
Holocentropus picicornis	1	1		
Hydropsyche pellucidula	1	1	1	1
Hydropsyche siltalai			1	1
Lepidostoma hirtum			1	1
Neureclipsis bimaculata	1	1	1	2
Notidobia ciliaris			1	1
Oxyethira sp.	3	3		

Laboratory 1	Sample 1		Sample 2	
Species	**Deliv.**	**Ident.**	**Deliv.**	**Ident.**
Philopotamus montanus	1	1		
Plectrocnemia conspersa	1	1		
Polycentropus flavomaculatus	1	1	1	1
Rhyacophila dorsalis		1		1
R. nubila	1		1	
Sericostoma personatum	1	1		
Crustacea				
Gammarus lacustris	1		1	1
Gammarus duebeni		1		
Asellus aquaticus			1	1
Coleoptera				
Elmis aenea	2	2	2	2
Oulimnius tuberculatus	1	1		
Limnius volckmari	2	2	1	1
Oreodytes sanmarki	1	1	1	1
Hirudinea				
Eropbdella octulata	1	1		
Glossiphonia complanata			1	1
Megaloptera				
Sialis sp.	1	1		

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

Laboratory 2	Sampel 1		Sample 2	
Species	**Deliv.**	**Ident.**	**Deliv.**	**Ident.**
Turbellaria				
Dendrocoelum lacteum	1	1		
Dugesia lugubris				1
Dugesia sp.			1	
Hirudinea				
Helobdella stagnalis	1	1		
Gastropoda				
Ancylus fluviatilis			1	1
Lymnaea palustris		1		
Omphiscola glabra	1			
Bathyomphalus contortus	1	1	1	1
Acroloxus lacustris	1	1		
Bivalvia				
Sphaerium sp			1	1
Malacostraca				
Gammarus lacustris (hunn)	1	1	1	1
Pontoporeia affinis	1	1	1	1
Pallasea quadrispinosa			1	1
Plecoptera				
Protonemura meyeri	2	2		
Amphinemura borealis	2	2	1	1
Amphinemura standfussi	1		1	1
Amphinemura sulcicollis		1	1	1
Nemoura cinerea	3	3	2	1
Nemoura sp (cinerea)				1
Nemourella pictetii	1	1	1	1
Brachyptera risi	1	1		

Laboratory 2	Sampel 1		Sample 2	
Species	**Deliv.**	**Ident.**	**Deliv.**	**Ident.**
Capnia atra	2	2		
Isoperla grammatica			2	2
Diura nanseni			1	1
Siphonoperla burmeisteri			2	2
Ephemeroptera				
Caenis luctuosa	1	1	1	1
Ephemera danica	1	1		
Ephemera vulgata			1	1
Ameletus inopinatus			1	1
Baetis vernus				2
Baetis fuscatus/vernus gr.			1	
Baetis rhodani	2	2		
Baetis subalpinus			2	1
Acentrella lapponica (Baetis lapponica)	1	1		
Ephemerella ignita			2	2
Ephemerella aurivilli	2	2		
Heptagenia sulphurea			2	2
Heptagenia dalecarlica	2	2	1	1
Heptagenia fuscogrisea	1	1		
Rithrogena sp (semicolorata?)				1
Rithrogena germanica			1	
Leptophlebia marginata	1	1		
Trichoptera				
Ecnomus tenellus	1	1		
Cyrnus trimaculatus	2	2		
Cyrnus flavidus	2	2	1	1
Polycentropus irroratus	1	1		
Neureclipsis bimaculata			2	2
Holocentropus dubius			1	1
Oecetis ochracea	1	1		
Oecetis testacea			1	1
Silo pallipes	1	1		
Goera philosa			1	1
Ceraclea senilis				1
Ceraclea annulicornis			1	
Chimarra marginata	2	2	1	1
Artopsyche ladogensis	1	1		
Hydropsyche contubernalis	1	1	1	
Hydropsyche pellucidula	2	2		2
Hydropsyche saxonica			1	
Hydropsyche siltalai	2	2		
Micrasema sp		1		
Micrasema gelidum	1			
Micrasema setiferum			1	
Brachycentrus subnubilus				1
Nemotaulius punctatolineatus	1	1		
Tinodes waeneri			1	1
Sericostoma personatum			1	1
Diptera				
Athericidae sp		2		
Ibesia marginata	2			
Ptychoptera sp			2	2
Corixidae				
Sigara falleni	1	1		
Hespercorixia sahlbergi			1	1

Laboratory 2	Sampel 1		Sample 2	
Species	**Deliv.**	**Ident.**	**Deliv.**	**Ident.**
Megaloptera				
Sialis nigripes		1		
Sialis fuliginosa group	1			
Sialis lutaria			1	1
Coleoptera				
Elmis aenea - adult	1	1	1	1
Elmis aenea - larve			1	1
Dytiscidae indet (Platambus sp) - larve		1		
Platambus maculatus	1			
Elodes sp	1	1		
Stenelmis canaliculata			1	1
Limnius volckmari			2	2
Odonata				
Cordulegaster boltoni	1	1		
Somatochlora metallica			1	1

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

Laboratory 3	Sample 1		Sampe 2	
Species	**Deliv.**	**Ident.**	**Deliv.**	**Ident.**
Ephemeroptera:				
Cloeon dipterum	1		1	1
Cloeon sp.		1		
Caenis luctuosa			1	1
Caenis horaria	3	3	1	1
Centroptilum luteolum			1	1
Heptagenia fuscogrisea	2	2	1	1
Heptagenia dalecarlisa	1	1	1	1
Heptagenia sulphurea	1		2	1
Ephemerella aurivilli	1	1	2	2
Ephemera danica			2	2
Baetis rhodani	2	3	2	2
Baetis subalpinus			1	
Baetis niger (Nigrobaetis niger)	1	1	1	1
Baetis fuscatus	1			
Ameletus inopinatus	1	1	1	1
Plecoptera:				
Leuctra hippopus	2	1	1	1
Leuctra digitata		1		
Amphinemura borealis	1	1	2	2
Amphinemura sulcicollis	2	2		
Taeniopteryx nebulosa	1	1	1	1
Diura nanseni	1	1	1	1
Diura bicaudata			1	1
Acrynopteryx compacta			1	1
Dinocras cephalotes	1	1	1	1
Isoperla difformis		1		1
Isoperla gramma./ obscura	1		1	
Siphonoperla burmeisteri			1	1
Nemurella picteti			1	1

Laboratory 3	Sample 1		Sampe 2	
Species	**Deliv.**	**Ident.**	**Deliv.**	**Ident.**
Nemoura cinerea	2	2	1	1
Protonemura meyeri	2	2	3	3
Trichoptera:				
Cheumatopsyche lepida	1	1	1	1
Hydropsyche siltalai	1	1	1	1
Hydropsyche pellucidula	1	1	2	2
Hydropsyche saxonica	1	1		
Lepidostoma hirtum	2	2	2	2
Baerodes minutus	1	1	1	1
Sericostoma personatum	1	1	1	1
Chimarra marginata			1	1
Molanna angustata			1	1
Polycentropus irroratus	1	1	1	1
Neureclipsis bimaculata	1	1	2	2
Polycentropus flavomaculatus	1	1	1	1
Cyrnus trimaculatus	2	2	1	1
Odonata:				
Calopteryx virgo			1	1
Somatochlora metallica	1	1		
Corixidae :				
Hespercorixa sahlbergi	2	2	1	1
Limnius volchmari	1la + 1 ad	2	2 la + 1ad.	2
Elmis aenea	1ad	1	1la + 1 ad	3
Orectochilus villosus	1 la	1	1 la	1
Malacostraca:				
Monoporeia affinis	1	1		
Asellus aquaticus	1	1	1	1
Gammarus zaddachi	1	1	2	2
Gammarus lacustris	1	1	1	1
Gamarus pulex	1	1	1	1
Hirudinea:				
Erpobdella octoculata	1	1	1	1
Gastropoda:				
Lymnaea (Radix) peregra	1	1	1	1
Ancylus fluviatilis	1	1	1	1
Bithynia tentaculata	1	1	1	1
Bathymophalus (planorbis) contortus	1	1	1	1
Bivalvia:				
Sphaerius sp	1	1	1	1
Pisidium sp	1	1	1	1
Diptera:				
Chaoborus flavicans	2	1	1	1

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

Laboratory 4	Sampel 1		Sampel 2	
Species	**Deliv.**	**Ident.**	**Deliv.**	**Ident.**
Plecoptera:				
Leuctra nigra	2	2	2	2

Laboratory 4	Sampel 1		Sampel 2	
Species	**Deliv.**	**Ident.**	**Deliv.**	**Ident.**
Siphonoperla spp burmeisteriana	1	1	2	2
Amphin.sulcicollis (tysk materi.spp)			1	2
Diura bicaudata	1	1	3	3
B.risi	2	2	1	1
Trichoptera:				
Hydropsyche contubernalis			1	1
Hydropsyche (saxonica?)sp			2	2
Hydropsyche angustipennis	5	5		
Micrasema longilum	2	2	2	2
Ryacoph.fasciata/septentrionis	1		2	
Rhyacoph.dorsalis	2		1	
Rhyacophila sp.		3		3
N.bimaculata	4	4	1	1
P.flavomaculatus	1	1	1	1
P.conspersa	1	1	2	2
Ephemeroptera:				
Heptagenia sulphurea	1	1	1	1
Paraleptophlebia submarginata	1	1	1	1
Epeorus sylvicola	1	1		
Baetis rhodani	2	2	2	2
Centropt.luteolum	1		1	
Nigrobaetis niger		1		1
Malacostraca:				
Gammarus pulex	2	2	2	2
(Isopoda)				
Asellus aquaticus	2	2	3	3
Gastropoda:				
Ancylus fluviatilis	1		1	1
Lymnaea peregra	1			
Radix ovata		1		
Oligochaeta:				
Eseniella tetraeda			1	1
Diptera:				
Atherix ibis	1	1		

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

Laboratory 5	**Sample 1**		**Sample 2**	
	Deliv.	Ident.	Deliv.	Ident.
Gastropoda				
Bithynia tentaculata	1	1		
Theodoxus fluviatilis			1	1
Hirudinea				
Erpobdella octoculata	1	1		
Glossiphonia complanata			1	1
Amphipoda				
Gammarus pulex	1	1		
Isopoda				
Asellus aquaticus			1	1
Ephemeroptera				
Baetis rhodani	1	1	1	1
B. vernus	1		1	
B. fuscatus	1			
Baetis sp.		2		1
Caenis cf. luctuosa	1	1		
E. aurivilli	1		1	
Ephemerella ignita		1		
Ephemerella cf. notata				1
Siphlonuridae		1		1
Ameletus inopinatus	1	1	1	
Plecoptera				
Amphinemura sp.		2		3
A. standfussi			1	
A. borealis	2		1	
A. sulsicollis			1	
Brachyptera risi	1	1	1	1
C. bifrons	1			
Capnia sp.		1		
I. grammatica	1			
Isoperla sp.		1		1
Diura sp.			2	
Leuctra sp.		1		1
L. hippopus	1		1	
Nemoura sp.		1		
N. cinerea	1			
Protonemura meyeri	1		1	
Protonemura sp.		1		1
Taeniopteryx sp.		1		1
T. nebulosa	1		1	
Xantoperla apicalis		1		1
undeterminable Plecoptera (very small)				1
Coleoptera				
Elmis aena	2	1	1	
Elmis maugetii			1	1
Esolus sp.juv.		1		1
Limnius sp. juv.		1		1
Limnius volchmani	1		1	
Oulimnius tuberculata	1	1		
Oreodytes sanmarki	1	1	1	1

Laboratory 5	Sample 1		Sample 2	
	Deliv.	Ident.	Deliv.	Ident.
Trichoptera				
Athripsodes commutatus	1	1	1	1
Chimarra marginata			1	1
Cyrnus flavidus			1	1
Ecnomus tenellus	1	1		
Hydropsyche pellucidula	1	1		
H. angustipennis			1	1
Holocentropus dubius	1		1	1
Hydropsyche siltalai			1	1
Limnephilidae				1
Neureclipsis bimaculata	1	2	2	2
Oxethira flavicornis	2	1		
Philopotamus montanus	1	1		
Plectrocnemia conspersa	1	1		
Polycentropus flavomaculatus	1	1	1	1
Rhyacophila sp.		1		1
R. nubila	1		1	
Sericostoma personatum	1	1		
undeterminable Trichoptera				1
Megaloptera				
Sialis lutaria	1	1		

Table 6. Identified species/genus in sample 1 and 2 by Laboratory 6

Laboratory 6	SAMPLE 1		SAMPLE 2	
Species	Deliv.	Ident.	Deliv.	Ident.
Ephemeroptera				
Ameletus inopinatus			1	1
Baetis pavidus		2		
B. fuscatus	1			
B. vernus	1		1	1
B. rhodani	1	1	1	1
Caenis luctuosa	1	1		
Ephemerella aurivilli	1	1	1	
Ephemerella sp.				1
Plecoptera				
Amphinemura sp		2		1
A. sulcicollis			2	2
A. borealis	2		1	
Brachyptera risi	1	1	1	1
Diura bicaudata			1	1
Isoperla (difformis)	1	1		
Leuctra hippopus	1	1	1	
L. nigra	1			
L. fusca			1	
Leuctra sp.		1		2
Nemoura sp.		1		
N. cinerea	1			
Protonemura sp.		1		1
P. meyeri	1		1	
Siphonoperla burmeisteri	1	1	1	1

Laboratory 6	SAMPLE 1		SAMPLE 2	
Species	Deliv.	Ident.	Deliv.	Ident.
Taeniopteryx nebulosa	1	1	1	1
Trichoptera				
Athripsodes sp.		1		
A. aterimus	1			
Chimarra marginata			1	1
Ecnomus tenellus	1	1		
Holocentropus dubius	1	1	1	1
Hydropsyche pellucidula	1	1	1	1
Hydropsyche siltalai			1	1
Lepidostoma hirtum			1	1
Neureclipsis bimaculata	1	1	1	1
Oxyethira sp.	3	3		
Philopotamus montanus	1	1		0
Plectrocnemia conspersa	1	1		
Polycentropus flavomaculatus	1	1	1	1
Rhyacophila (dorsalis)			1	1
Rhyacophila sp.	1	1		
Sericostoma (personatum)	1	1		
Coleoptera				
Ditiscidae (Oleodytes sp.)	1	1	1	1
Elmis sp.	2	2	1	1
Esolus sp.	1	1		
Limnius sp.	1	1	1	1
Crustacea				
Asellus aquaticus			1	1
Gammarus pulex			1	
Gammarus sp.				1
Megaloptera				
Sialis sordida	1	1		
Mollusca				
Bithynia tentaculata	1	1		
Theodoxus fluviatilis			1	1
Hirudinea				
Erpobdella octuculata	1	1		
Glossiphonina complanata			1	1

Appendix B. Reports and publications from the ICP-Waters Programme

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