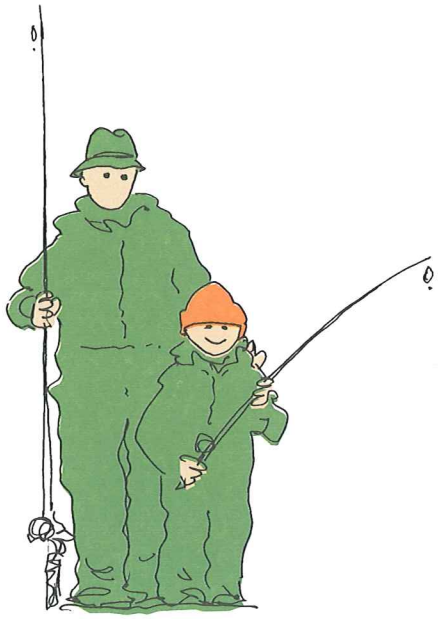
Convention on Long-range Transboundary Air Pollution

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

ICP-WATERS REPORT



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Intercalibration 0206:

Invertebrate fauna

Norwegian Institute for Water Research

REPORT

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Abstract

The 6th 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 testsamples, usually ≥ 90% of the total number of species. Short-coming identifications were consequently low. 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. The result was sufficient both for stating the acidity index, and for multivariate statistical analyses. Discrepancies between the number of larvae put into the test samples and the recorded number demonstrate that contamination of larvae occur either at the laboratory making the samples or at the participating laboratory.

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 0206:
Invertebrate fauna

ICP-Waters Programme Subcentre
Laboratory of Freshwater Ecology and Inland Fisheries
University of Bergen, January 2002

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 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 6th intercalibration on invertebrate fauna.

Bergen, January 2002

Gunnar G.Raddum

Contents

1. Introduction

The purpose of the biological intercalibration is to evaluate the quality of 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). 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). 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 Cooperative Programme on Assessment and Monitoring of Acidification of Rivers and Lakes (ICP Waters) 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 standardized 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 2001 five laboratories sent material from their home region to the Programme centre. For one participant we made samples based on material sampled and identified through an ongoing EU-project in the region of the laboratory.

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.

The programme subcentre at the Laboratory of Freshwater Ecology and Inland Fisheries, University of Bergen participates in the test every second year. The responsible partner for this exercise is Swedish University of Agricultural Sciences, Dept. of Environmental

Assessment. This laboratory prepared also the test samples for Paricipiant 2 this year (see Appendix A).

2.1.1 Identification

When preparing the biological test-samples we try to be so accurate as possible when composing the samples, concerning the species put in the sample as well as the number of individuals. To minimise possible fault, 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.

- 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.

Participant 6 received material from an EU-project and had not been involved in sampling and identification of the source material for 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. Except this, the same procedure as mentioned for the other laboratories is followed.

2.1.2 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.

2.1.3 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.

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 brought to the species level and will consequently reduce the value of the taxonomic work.

3. Results and discussion

Six laboratories participated in the intercalibration of invertebrates in 2001. The content of species in the test samples delivered - and the results of the identification by the different laboratories are shown in Appendix A Tables 1 - 6.

3.1 Mayflies

Laboratory 4 identified the mayflies (Ephemeroptera) without any faults (**Figure 1**). Also laboratory 6 did no faults, but they did not go to species level for all the individuals, due to damaged material. Laboratory 5 got one misidentification, but this can be questioned since the individual was not clearly identified from our side. For the other laboratories some of the identifications has been recorded as faults, but generally the work can be characterised as good - very good for all participants. The percent of identified individuals is between 90 and 100%. This is a high number since mayflies easily lose important parts used for identification.

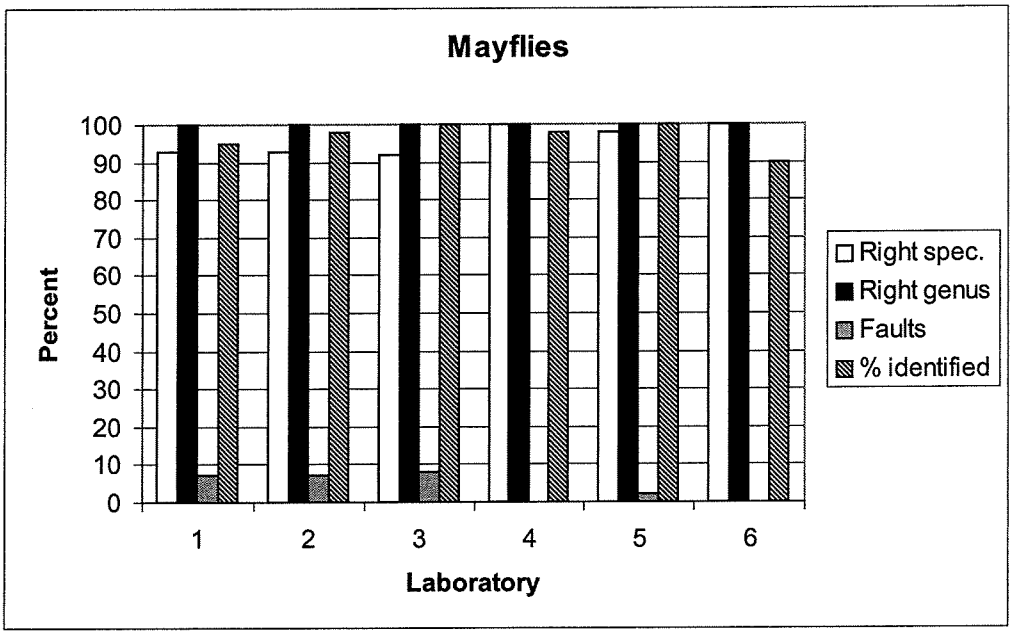

Figure 1. Results of the identification of mayflies.

3.2 Stoneflies

Laboratory 1, 2, 4 and 6 made no real misidentifications with respect to stoneflies (Plecopera), while laboratory 3 and 5 did some determinations recorded as faults (**Figure 2**). Laboratory 3 got only 6 individuals of stoneflies and one species was wrong identified. The percent faults should therefore be looked at with caution. Laboratory 1 and 6 did not go to the species level for all individuals. Laboratory 1 had the lowest number of identified species, evaluated to 75 %. We regard this as the lower limit for good quality of the taxonomic work. Laboratory 6 got reduced identification percent due to no record of a few species delivered. This could be due to contamination ether during preparation by us or during the identification. The recorded "short coming" identification by Laboratory 6 should therefore probably be neglected. Generally the identification of stoneflies were very good.

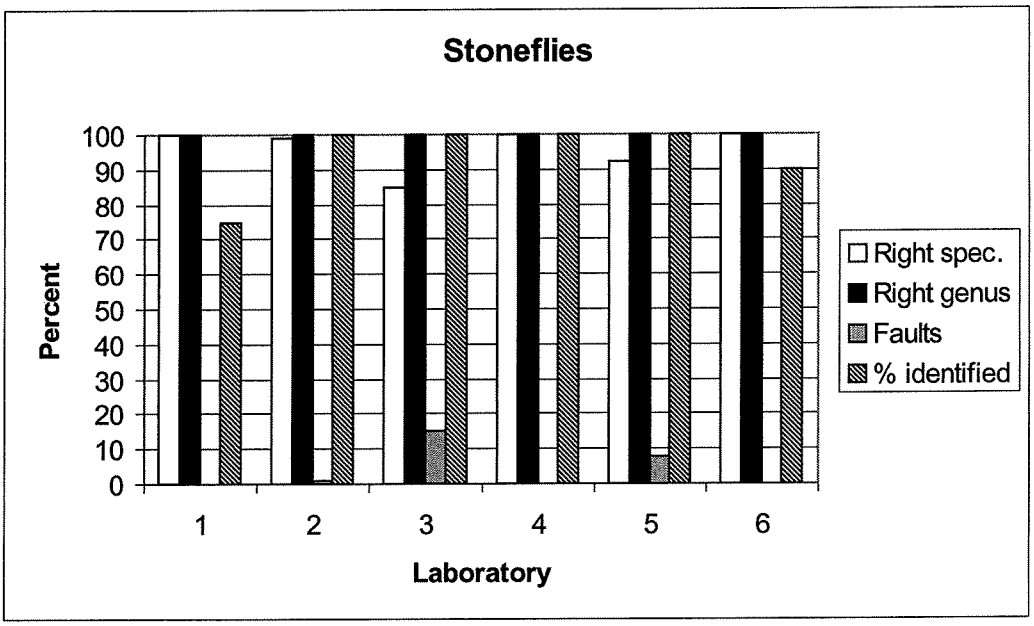

Figure 2. Results of the identification of stoneflies.

3.3 Caddis flies

The identification of caddisflies (Trichoptera) was also good (**Figure 3**). Misidentifications varied between 2 and 7%. Participants 2, 4 and 6 obtained the best result. However, the difference between the laboratories is small and should probably not be ranked. Percent identified was 100 % for all laboratories. The result is well above the limit for good taxonomic work and can be acceptable for all types of analyses.

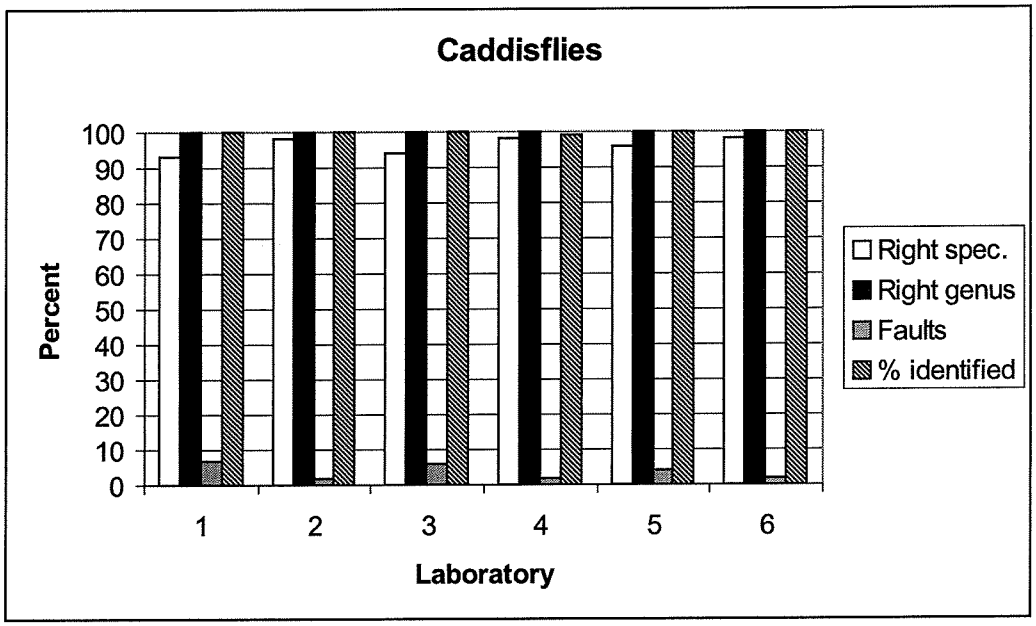

Figure 3. Results of the identification of caddis flies.

3.4 Other groups

In this intercalibration we have included Coleopta (water beetles), larger crustaceans, oligochaets, molluscs, chironomids 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, 4, 5 and 6 identified all individuals to the right species, while laboratory 2 and 3 did some fault compared to the delivery. However, the identification is regarded as very good for all laboratories.

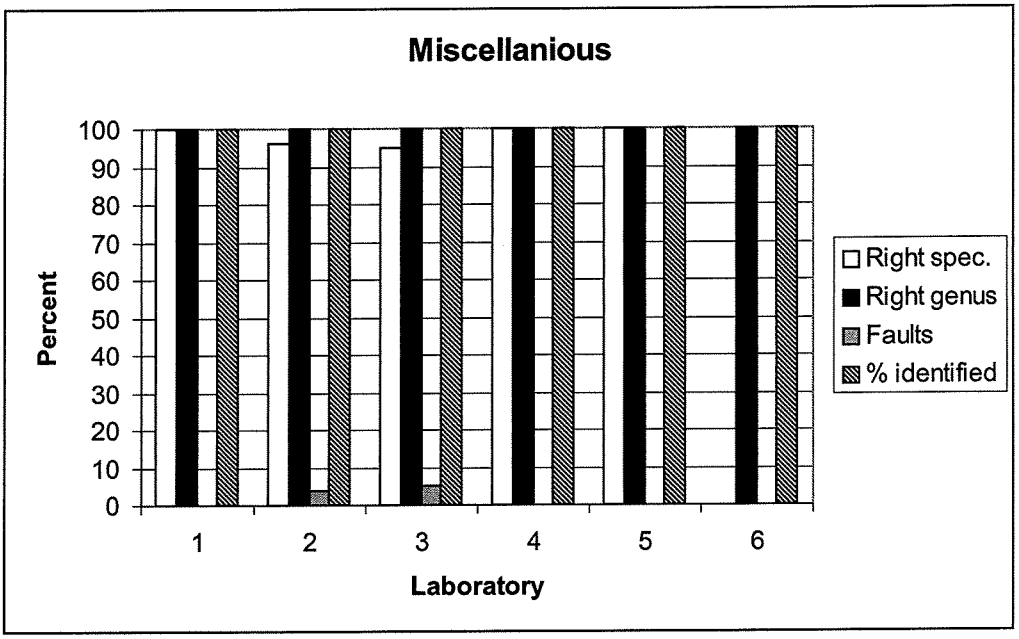

Figure 4. Results of the identification of miscellaneous groups

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 are identified as well as loss of larvae. This has to some degree been included in the percent of identified larvae. It can be questioned if this is fair since this probably is due to contamination either by us or by the participant.

4. Evaluation/conclusion

All laboratories identified in most cases a high portion of the total number of species in the test samples. Shortcoming identification was in most cases low and did not reduce the quality of the work. Misidentifications was < 10 %, which is regarded as good and above the limit of faults (10 %) proposed for intercalibration of biological material (Raddum 1993).

Non of the participants did misidentifications that could result in a wrong acidity index (**Figure 5**). The identifications were also within the demands for advanced statistical analyses. The results of the test are probably the best since this exercise started, since all laboratories showed a high taxonomic standard.

Most of the laboratories have participated in the ICP Waters for a long time and have experience in biological monitoring. Some of them have expressed the value of these tests. The reason is that they can use the time needed for their best identification and then enlarge their taxonomic knowledge. This is not always the situation in time limited investigations.

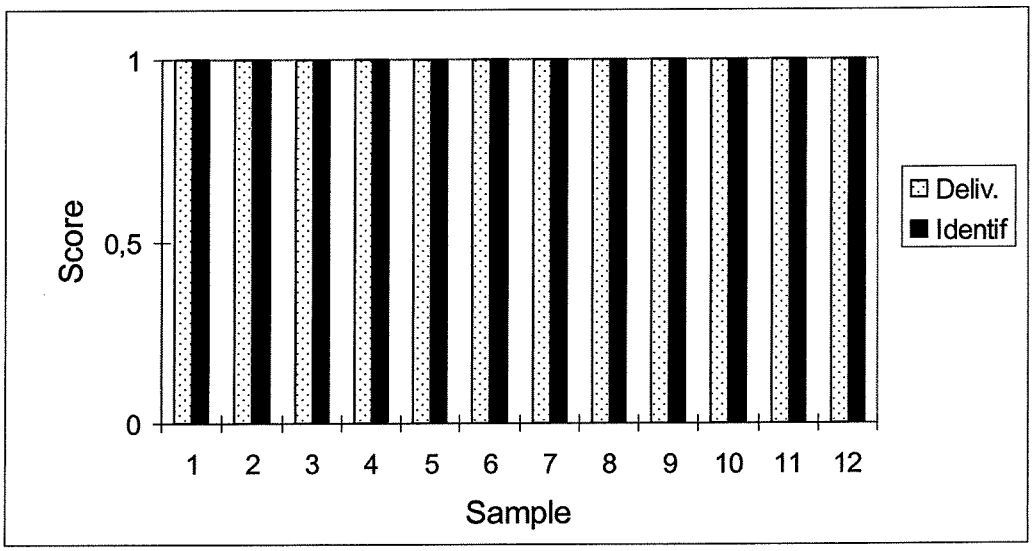

Figure 5. Acidification score in delivered and identified samples.

5. References

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Appendix A. Identified species/genus

Each participating laboratory is identified by a number that is identical with table number.

Laboratories participating in the intercalibration of invertebrates in 1996 and their code numbers are:

1. **Estonia:**
   Estonian Environment Information Centre, Tallinn, Estonia

2. **Finland:**
   Institute for Environmental Research, University of Jyväskylä, Finland

3. **Latvia:**
   Latvian Hydrometeorological Agency, EQOD, Environmental Quality Testing Laboratory, Latvia

4. **Norway:**
   Laboratory for Freshwater Ecology, Zool. Inst., Univiversity of Bergen, Norway

5. **Sweden:**
   Swedish University of Agricultural Sciences, Dept. of Environmental Assessment. Uppsala, Sweden

6. **UK:**
   School of Biological Sciences Queen Mary, University of London, UK

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

Laboratory 1	Sample 1 Identified	Sample 1 Delivered	Sample 2 Identified	Sample 2 Delivered
Ephemeroptera:				
Heptagenia sulphurea	1	1	2	2
Ecdyonurus lateralis	2	2	1	1
Baetis rhodani	2	2		
Baetidae sp.*	1			
Ephemerella ignita	2	2	1	1
Caenis luctuosa			1	2
Caenis rivulorum			1	
Caenis horaria	1	3	1	1
Caenis sp.	1			
Cloeon dipterum	1	1		
Ephemera vulgata				2
Ephemera danica	2	2	2	
Leptophlebia marginata		2		
Leptophlebiidae sp.	1			
Plecoptera:				
Leuctra digitata?	1			
Leuctra hippopus	1	2	1	1
Leuctra nigra	1	1	1	2
Leuctra nigra		1 adult		
Leuctridae sp. (adult)*	1			
Nemoura cinerea	2	2		1
Nemoura avicularis		1		1
Nemoura sp.	1		2	
Nemourella pictetii	1	1	1	1
Trichoptera:				
Athripsodes cinereus	1	1	1	1
Glyphotaelius pellicidus	2	2	1	1
Glyphotaelius pellicidus	2	2	1	1
Hydropsyche conturbernalis			1	1
Hydropsyche siltalai	2	1	1	1
Ryacophila fasciata				1
Rhyacophila nubila		2		
Rhyacophila dorsalis	2			
Rhyacophila septentrionalis			1	
Neureclipsis bimaculata	2	2	2	2
Chaetopteryx villosa	1	1	2	2
Plectrocnemia conspersa	1	1	2	2
Megaloptera:				
Sialis fuliginosa	2	2	2	2
Sialis lutaria	1	1	1	1
Hirudinea:				
Piscicola geometra	1	1		
Helobdella stagnalis	2	2	1	1
Gastropoda:				
Ancylus fluviatilis	2	2	1	1
Acroloxus lacustris	1	1	1	1
Bithynia tentaculata	1	1	1	1
Odonata:				
Calopteryx virgo:	2	2		

Laboratory 1		Sample 1 Identified	Sample 1 Delivered	Sample 2 Identified	Sample 2 Delivered
	Malacostraca:				
	Pallasea quadrispinosa	1	1	1	1
	Coleoptera:				
	Platambus maculatus	2	1+1 adult	1	1 adult

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

Laboratory 2	Taxa/species	Sample 1 Delivered	Sample 1 Identified	Sample 2 Delivered	Sample 2 Identified
	Gastropoda:				
	Planaria torva	1	1		
	Radix ovata			1	
	Radix auricularia		1		
	Valvata piscinalis	1	1		
	Dreissena polymorpha			1	1
	Physa fontinalis	1	1		
	Hirudinea:				
	Erpobdella octoculata	1	1	1	1
	Glossiphonia complanata			1	1
	Helobdella stagnalis	1	1		
	Crustacea:				
	Asellus aquaticus			2	1
	Pallasea quadrospinosa	1	1		
	Ephemeroptera:				
	Ameletus inopinatus/alpinus	1	1		
	Baetis digitatus			2	2
	Baetis fuscatus			1	1
	Baetis fuscatus/scambus	1			
	Baetis ?macani			1	
	Baetis muticus	2		1	
	Baetis niger	1	1		1
	Baetis rhodani	3	2	3	2
	Baetis subalpinus			1	
	Baetis ?subalpinus		1		1
	Baetidae (injured)		2		
	Caenis horaria			1	1
	Caenis luctuosa	1	1	1	1
	Caenis rivulorium	1	1		
	Ephemera danica			1	1
	Ephemera vulgata	1	1		
	Ephemerella aurivilli	1	1	2	2
	Ephemerella mucronata	1	1	1	1
	Heptagenia dalecarlica		1	1	1
	Heptagenia fuscogrisea			3	3
	Heptagenia sulphurea	2	1	1	1
	Leptophlebia marginata		1	3	2
	Leptophlebia sp.				1
	Paraleptophlebia submarginata	1			
	Rhitrogena germanica	1	1		
	Siphlonurus aestivalis		1	1	1

Laboratory 2	Taxa/species	Sample 1 Delivered	Sample 1 Identified	Sample 2 Delivered	Sample 2 Identified
	Siphlonurus lacustris	1			
	Plecoptera:				
	Amphinemura borealis		1	2	2
	Amphinemura standfussi	1			
	Amphinemura ? standfussi		1		
	Amphinemura sulcicollis	2	2		
	Brachyptera risi	3	3	2	2
	Diura bicaudata	1	1		
	Diura nanseni			1	1
	Leuctra hippopus	2	2	2	2
	Protonemura meyeri	1	1	1	1
	Siphonoperla burmeisteri			2	1
	Isoperla difformis			2	2
	Isoperla grammatica	1	1		
	Nemoura avicularis			2	2
	Nemoura cinerea	1	1	3	3
	Nemoura flexuosa			1	1
	Nemurella pictii	2	2		
	Taenopteryx nebulosa	3	2	3	3
	Coleoptera:				
	Elmis aenea	1	1	1	1
	Limnius volckmari	2	2	3	3
	Stenelmis canaliculata	2	2	1	1
	Hydraena gracilis	1		2	
	Hydraena sp.		1		2
	Oulimnius sp	2		1	
	Oulimnius tuberculatus		2		1
	Orectochilius villosus	2	1	1	1
	Oredytes sanmarkii			1	1
	Heteroptera:				
	Aphelocheirus aestivalis	1	1	2	2
	Micronecta sp	1			
	Megaloptera:				
	Sialis fulignosa - group			1	2
	Sialis lutaria - group			1	1
	Trichoptera:				
	Arctopsyche ladogensis	1	1		
	Brachycentus subnubilis	1	1	1	1
	Ceratopsyche silfvenii	1	1		
	Cheumatopsyche lepida	1	1	1	1
	Ecclisopteryx dalecarlia			1	
	Glyphotaleus pellucidus			1	1
	Gorea pilosa	1	1		
	Hydropsyche pellucidula	2	2	1	1
	Hydroptila sp			1	1
	Ithytrichia lamellaris			1	1
	Lepidostoma hirtum	1	1	3	2
	Lepidostoma ?hirtum				1
	Limnephilus extricatus	2			
	Limnephilus fuscicornis		2	1	1
	Micrasema gelidum	1	1		
	Micrasema setiferum	1	1		
	Molannodes tinctus			1	1

Laboratory 2	Taxa/species	Sample 1 Delivered	Sample 1 Identified	Sample 2 Delivered	Sample 2 Identified
	Neureclipsis bimaculata	1	1	1	1
	Oecetis notata	1	1		
	Philopotamus montanus			1	1
	Plectronemia conspersa	1	1		
	Polycentropus flavomaculatus	2	2	2	2
	Polycentropus irroratus	1	1		
	Rhyacophila nubila	1	1	3	3
	Rhyacophilia fasciata			2	2
	Sericostoma personatum			2	1
	Silo pallipes	2	2	1	1
	Tinodes waerneri			1	1
	Wormaldia subnigra	1	1		
	Diptera:				
	Ibisa marginata	1	1		
	Empididae			1	
	Dicranota sp	1	1		
	Brillia			1	1
	Diamesa insignipes	2			
	Sergentia coracina	3	3		
	Monodiamesa bathyphila	2	2		
	Prodiamesa	1			
	Prodiamesa olivacea		1	2	1
	Polypedium pullum	2	2		
	Diamesa sp.		1		
	Hemerodromia sp.		1		

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

Laboratory 3	Taxa/species	Sample 1 Delivered	Sample 1 Identified	Sample 2 Delivered	Sample 2 Identified
	Bivalvia:				
	Dreissena polymorpha	1	1	1	1
	Sphaerium corneum	1	1	1	1
	Coleoptera:				
	Agabus sp.	1		1	
	Ilybius spp.		1		1
	Platambus maculatus.	1	1	1	1
	Diptera:				
	Chrysops spp.	3	3	2	2
	Ephemeroptera:				
	Baetis rhodani	2	3	2	2
	Baetis vernes	1	0	1	1
	Brachycercus harrisella	1	1		
	Caenis horaria	1	1	1	1
	Caenis luctuosa		3		3
	Caenis macrura	3			
	Ephemera lineata	1	0	1	1
	Ephemera vulgata	2	3	2	2
	Heptagenia sulphurea	1	1	1	1

Laboratory 3	Taxa/species	Sample 1 Delivered	Sample 1 Identified	Sample 2 Delivered	Sample 2 Identified
	Potamanthus lutens		1		1
	Gastropoda:				
	Bithynia tentaculata	1	1	2	2
	Lithoglyphus naticoides	1	1		
	Theodoxus fluviatilis	2	2	2	2
	Viviparus contectus	1	1		
	Viviparus viviparus			1	1
	Heteroptera:				
	Aphelocheirus aestivalis	2	2	2	2
	Nepa cinerea	1	1	1	1
	Notonecta glauca	1	1	1	1
	Hirudinea:				
	Erpobdella nigricollis	2	2	1	1
	Erpobdella octoculata	2	2	2	2
	Glossiphonia complanata	1	1	1	1
	Piscicola geometra	2	2	1	1
	Megaloptera:				
	Sialis lutaria	1	1	1	
	Sialis sordida	2	2	2	3
	Plecoptera:				
	Leucra nigra	1	1		
	Nemoura cinerea				1
	Nemoura flexuosa	1		1	
	Nemoura dibitans		1		
	Taniopteryx nebulosa	2	2	1	1
	Trichoptera:				
	Anabolia soror	1	1		
	Cyrnus flavidus	1	1	2	1
	Goera pilosa	1	1	1	1
	Halesus digitatus	1	1	2	1
	Hydropsyche instabilis		0		2
	Hydropsyche angustipennis	1		1	
	Hydropsyche pellucidula	3	4	3	2
	Limnephilus spp.		1		
	Limnephilus nigriceps				
	Molanna angustata	2	2	2	2
	Mystacides azurea	2	2	1	1
	Mystacides longicornis	1	1	1	1
	Neureclipsis bimaculata	1	1	2	2
	Notobia ciliaris		2		2
	Sericostoma personatum	2		2	
	Plectrocnemia conspersa	2	2	1	1
	Polycentropus flavomaculatus	1		1	

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

Laboratory 4	Taxa/species	Sample 1 Delivered	Sample 1 Identified	Sample 2 Delivered	Sample 2 Identified
	Mollusca:				
	Bithynia tentaculata			1	
	Bithynia tentaculata/leachi				1
	Theodoxus fluviatilis	2	2		
	Hirudinea:				
	Erpobdella octoculata	1	1	1	1
	Glossiphonia complanata	1	1	1	1
	Crustacea:				
	Asellus aquaticus	2	2		
	Gammarus lacustris	5	5		
	Monoporeia affinis	3	3	6	6
	Pallasea quadrispinosa	1	1		
	Ephemeroptera:				
	Baetis fuscatus	2	2	2	2
	Baetis niger	3	2	1	1
	Baetis rhodani	1	1	1	1
	Baetis subalpinus	1		1	
	Baetis subalpinus/vernus		1		1
	Baetis sp.		1		
	Caenis horaria	1	1	2	3
	Caenis luctuosa	0		2	1(without leg)
	Centroptilum luteolum	1	1		
	Ephemera danica	1	1		
	Ephemerella aurivilli	3	3	2	
	Heptagenia dalecarlica	1	1	3	2
	Heptagenia fuscogrisea	0		1	1 ev. sp., liten u/cersi
	Heptagenia sulphurea	2	2		
	Heptagenia sp. (dalecarlica)				1
	Plecoptera:				
	Arcyniopteryx compacta	1	1	1	1
	Brachyptera risi			1	1
	Capnopsis shilleri	2	2		
	Dinocras cephalotes	1	1		
	Diura nanseni			2	2
	Leuctra fusca			1	1
	Protonemura meyeri	2	2	8	8
	Taeniopteryx nebulosa	1	2	3	3
	Odonata:				
	Onychogomphus forcipatus	1	1	1	1
	Coleoptera:				
	Platambus maculatus	1	1		
	Elmis aenea	2	2	1	1
	Aphilocheirus aestivalis	1	1		
	Trichoptera.				
	Arctopsyche ladogensis	1	1	1	1
	Brachycentrus subnubilus	2	2		
	Hydropsyche pellucidula	3	3	1	1
	Lepidostoma hirtum	3	3		
	Micrasema gelidum			1	
	Micrasema sp.				1

Laboratory 4	Taxa/species	Sample 1 Delivered	Sample 1 Identified	Sample 2 Delivered	Sample 2 Identified
	Neureclipsis bimaculata	1	1	1	1
	Oecetis testacea			2	2
	Philopotamus montanus			1	1
	Plectrocnemia conspersa		1	2	2
	Polycentropus flavomaculatus	2	1		
	Potamophylax latipennis			1	
	Potamophylax sp.				1
	Rhyacophila nubila	1	1		
	Diptera:				
	Chaoborus flavicans			1	1
	Chaoborus ochripes	1	1	1	1

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

Laboratory 5	Taxa/species	Sample 1 Delivered	Sample 1 Identifeid	Sample 2 Delivered	Sample 2 Identified
	Mollusca				
	Bithynia tentaculata	1	1		
	Radix peregra	1	1	1	1
	Radix peregra/ovata			1	1
	Hirudinea				
	Erpobdella octoculata	1	1	2	1
	Erpobdela cf testacea				1
	Crustacea				
	Asellus aquaticus	4	4	2	2
	Monoporeia affinis	3	3	4	4
	Ephemeroptera:				
	Baetis cf fuscatus	1	0	1	1
	Baetis subalpinus	0	1		
	Caenis horaria	1	1	1	1
	Caenis rivulorum	2	2	2	2
	Centroptilum luteolum			2	2
	Ephemera vulgata	1	1		
	Ephemerella aurivilli	5	5	4	4
	Ephemerella mucronata	1	1		
	Heptagenia dalecarlica	3	3	3	3
	Nigrobaetis niger	1	1		
	Plecoptera:				
	Amphinemura borealis	3	3	5	5
	Brachyptera risi	3	3	3	3
	Dinocras cephalotes			1	1
	Arcynopteryx compacta			1	
	Diura cf bicaudata				1
	Diura nanseni	3	3	2	2
	Nemurella picteti	1	0		
	Nemoura avicularis	2	5	2	2
	Nemoura cinerea	2	0	2	2
	Protonemura meyeri	3	3	7	7
	Taeniopteryx nebulosa	1	1	3	3
	Odonata:				
	Calopteryx virgo	2	2	1	1

Laboratory 5	Taxa/species	Sample 1 Delivered	Sample 1 Identifeid	Sample 2 Delivered	Sample 2 Identified
	Coleoptera:				
	Elmis aenea	3	3	4	4
	Limnius volkmari	2	2	2	2
	Stenelmis canaliculata	4	4	1	1
	Platambus maculatus	1	1	1	1
	Trichoptera:				
	Agapetus ochripes	3	3	1	1
	Brachycentrus subnubilus	2	2	1	1
	Cyrnus flavidus	2	2	1	1
	Hydropsyche pellucidula	1	3	1	0
	Hydropsyche saxonica			0	1
	Hydropsyche siltalai	2		2	2
	Lepidostoma hirtum	5	5	3	3
	Micrasema gelidum			1	1
	Neureclipsis bimaculata	3	3	3	3
	Philopotamus montanus			2	2
	Polycentropus flavomaculatus	3	3	4	4
	Sericostoma personatum			3	3
	Tinodes waeneri	1	1	2	2
	Diptera:				
	Chaoborus flavicans	2	2	3	3

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

Laboratory 6	Taxa/species	Sample 1 Delivered	Sample 1 Identifeid	Sample 2 Delivered	Sample 2 Identified
	Crustacea:				
	Gammarus lacustris			3	3
	Ephemeroptera:				
	Baetis rhodani			2	2
	Ameletus inopinatus	1	1	2	2
	Caenis luctuosa			1	1
	Centroptilum luteolum			1	1
	Heptagenia lateralis	1	1		
	Leptophlebia vespertina	2	2	2	
	L. marginata	1		1	
	Leptophlebia spp				1
	Leptophlebidae		1		2
	Paraleptophlebia submarginata	1		1	
	Paraleptophlebia spp.		1		1
	Plecoptera:				
	Amphinemura standfussi	2			
	Brachyptera risi	1	1	1	1
	Dinocras cephalotes			1	1
	Perlodes microcephala	1	1		
	Diura cf bicaudata			2	2
	Isoperla grammatica	2	3		
	I. obscura	1			
	Siphonoperla torrentium	5	5	1	1
	Leuctra hippopus	5	6	12	12
	L. fusca	1			
	Capnia atra			2	1

Laboratory 6	Taxa/species	Sample 1 Delivered	Sample 1 Identifeid	Sample 2 Delivered	Sample 2 Identified
	Nemoura cinerea	3	4		
	N. erratica	1			
	Protonemura meyeri	3	2	1	1
	P. praecox	1	2	1	1
	Taeniopteryx nebulosa			2	2
	Trichoptera:				
	Rhyacophila dorsalis			1	1
	Plectrocnemia conspersa	3	4		
	P. geniculata	2	2		
	Holocentropus sp.	1			
	Agrypnia obsoleta	1	1		
	Seriocostoma personatum	1	1	1	1
	Polycentropus flavomaculatus	2	2		
	Chaetopteryx villosa	1	1	2	2
	Potamophylax cingulatus	2	2	2	1
	P. latipennis	1	1		
	Drusus annulatus			3	2
	Limnephilidae			2	2

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

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20. Norwegian Institute for Water Research, 1992. Data Report 1990. Programme Centre, NIVA, Oslo.
21. Norwegian Institute for Water Research, 1992. Evaluation of the International Co-operative Programme on Assessment and Monitoring of Acidification in Rivers and Lakes. Programme Centre, NIVA, Oslo.

22. Hovind, H. 1993. Intercalibration 9307: pH, k_{25}, HCO_3, NO_3 + NO_2, Cl, SO_4, Ca, Mg, Na, K, total aluminium, reactive and non-labile aluminium, TOC and COD-Mn. Programme Centre, NIVA, Oslo. NIVA-Report 2948-93. ISBN 82-577-2370-3.

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