Metabarcoding for use in Nordic routine aquatic biomonitoring

- a validation study

Nordic Council of Ministers

Contents

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1 Preface

Most European rivers and lakes are found in the Nordic countries; hence it is not surprising that freshwater assessments are an essential and mandatory part of Nordic environmental monitoring programs. For inland and coastal waters, monitoring requirements are largely determined by requirements of the European Water Framework Directive (WFD) (2000/60/EC), adopted by all Nordic countries. The WFD aims to protect and enhance the status of aquatic ecosystems and to promote sustainable water use in rivers, lakes, transitional and coastal waters and groundwaters. Given the large amount of water bodies in the Nordic countries, the demands of the WFD for biological monitoring and subsequent taxonomical identification requires considerable expertise and financial resources. To deal with these financial burdens, agencies and environmental managers are currently considering options that could replace costly and time-consuming procedures such as morphological identification. Depending on the organisms, different molecular techniques have recently been suggested as viable alternatives to current identification methods.

Aquatic macroinvertebrates are frequently used in WFD monitoring of both rivers and lakes as their responses to environmental pressures such as eutrophication, acidification and hydro-morphological alterations are well known and predictable (Johnson et al. 1993). However, identification of specimens to species-level by morphology is often both time consuming and difficult due to challenging taxonomy and high diversity. As an alternative to morphological identification, a molecular technique termed "DNA metabarcoding" can be used to potentially identify all species in a bulk sample using standardized stretches of their DNA (so-called "DNA barcodes"). DNA metabarcoding has proven to be very effective for species detection and identification in many studies, if a well-developed reference library can be used in the identification process. More work is needed on reference library development as well as laboratory and bioinformatic methods to improve estimates of biomass and abundance. While individual case studies indicate the efficacy of metabarcoding in monitoring and assessment programs using macroinvertebrates, no concerted, large-scale tests on suitability and accuracy have thus far been performed. Moreover, no information is available concerning changes needed before adopting this approach in routine Nordic aquatic monitoring.

In this Nordic validation study, we assessed if DNA metabarcoding has the potential to produce the same level of taxonomic information as current methods based on traditional morphological identification. Specifically, we tested whether these new methods result in improved processing speeds, comparability and cost efficiency, and assessed whether the implementation of these new methods will affect ongoing assessment processes, i.e. the current metrics or classifications of ongoing assessment systems.

It is noteworthy, that the rapidly advancing field of molecular research currently lacks guidance documents or international standards for implementing molecular methods in routine monitoring. The Nordic members of the SCANDNAnet consortium consists of researchers involved with national WFD monitoring and/or international method standardization in their respective countries. This uniquely

positions the Nordic agencies participating in this validation effort as auditors of the metabarcoding approach also allowing them to advance the creation of joint, standardized protocols under the umbrella of the European Committee for Standardization (CEN). The need for guidance on molecular methods for use in aquatic biomonitoring has been identified by CEN. In 2019, the first dedicated workgroup on "DNA and eDNA methods" was established by the technical committee for Water Quality standards.

2 Executive summary

Over 75% of all lakes and 40% of all rivers in the EU are found in the Nordic countries. Freshwater biomonitoring according to the EU Water Framework Directive (WFD) has been adopted by all Nordic countries and forms an integral part of management efforts to preserve and restore the ecological quality of freshwaters and their ecosystem services.

Current identifications of organisms used in WFD biomonitoring are based on expert morphological identification; an approach that is time consuming and prone to errors. Molecular identification methods could alleviate many problems but thus far have not been rigorously tested for use in routine monitoring. Using a questionnaire, we consulted Nordic experts to assess opinions on the applicability of these methods in routine biomonitoring. Further, we validated the practical use of molecular metabarcoding identification for use in freshwater aquatic macroinvertebrate monitoring in all Nordic countries. A total of 297 waterbodies including both lakes and streams were sampled which constitutes the single largest validation test of the method so far. Experts in each country sampled macroinvertebrates according to their national protocols with only minor modifications and samples were analyzed using a standardized laboratory protocol.

The results of this study indicate that in most cases identifications using molecular DNA-based methods were highly congruent with traditional expert-based identifications. However, the study also revealed the importance of using unified guidance documents. Several samples showed signs of DNA degradation, affecting reliability of the method. Nordic experts generally recognized molecular identification methods as playing a major role in future biomonitoring, if issues associated with the current lack of unified methodology are resolved.

Based on this study, we suggest that concerted Nordic or European efforts towards implementation and standardization of DNA-based methodology should be undertaken to swiftly ensure the use of this promising tool into WFD compliant monitoring.

3 Introduction

3.1 Macroinvertebrate biomonitoring in the Nordic countries

Freshwater ecosystems are threatened by various anthropogenic activities, increasing the need for monitoring of their ecological status (e.g. Heino et at. 2020a, 2020b). Given the relatively high number of lakes and rivers in the Nordic countries novel approaches and methods are needed to implement robust and cost-effective monitoring programs All Nordic countries monitor benthic macroinvertebrates and other biological quality elements as well as supporting variables in lakes, rivers and coastal waters in accordance with the European Water Framework Directive, WFD, and the Marine Strategy Framework Directive, MSFD (Andersen et al. 2016). The timing of sampling varies between Nordic countries but is often conducted in autumn (note Norway). The status of rivers and lakes is assessed using over ten different macroinvertebrate-based indices in the Nordic countries. Similarly, around ten different indices are used to assess the status of coastal waters using macroinvertebrates. The information obtained through different macroinvertebrate indices, often combined into multimetric indices, is used in the assessment of status, and when combined with other quality elements it is used to infer the ecological status of a water body. Most macroinvertebrate indices used in Nordic countries do not require information on taxon abundance when estimating status at quality element level.

3.2. Taxonomic identification methods

3.2.1 Morphological identification

In all Nordic countries, morphological identifications of macroinvertebrates in biomonitoring are done by taxonomic experts. After sample collection, the macroinvertebrates and detritus are preserved in the field according to national guidelines, transported to the laboratory and sorted from debris (see 4.1.1). Macroinvertebrates are identified by microscopy to national minimum levels of taxonomic resolution. All Nordic experts keying macroinvertebrates use nationally defined minimum levels of identification which often include different levels taxonomic resolution, and which are specifically optimized for manual identification. To shorten processing times as well as due to limited taxonomic expertise, the standardized identification protocols often do not include the identification of certain groups to the species level, such as chironomids or oligochaetes in lake littoral or river habitats. Taxon groups usually keyed to species level include EPT-taxa (Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies)) as well as dragonflies and molluscs. EU Water Framework Directive compliant biomonitoring in the Nordic countries involves sampling many water body types, with each sample comprised of many specimens that need to be identified. For example, even in relatively species-poor regions like northern Finland, the calculation of the EU WFD related indices involves the identification of 44-113 lotic benthic macroinvertebrate taxa, depending on the water body type (Aroviita et al. 2019). Due to the inherent time-consuming identification process, traditional manual

identification constitutes a bottleneck in bioassessments often resulting in significant time lags between sampling and the data availability. The growing need for more biomonitoring combined with declines in funding and in the number of taxonomic experts necessitates the exploration of alternative processes for reliable and comparable species identification (e.g. Elbrecht et al. 2017, Ärje et al. 2020). In addition, the high abundance of specimens in a sample poses a bottleneck and financial constraint to the identification of taxa to the most precise taxonomic level. Hering et al. (2004) identified three commonly used approaches to address the issues when samples contain high numbers of specimens: (1) analysing only a subset of the sample (e.g. Norway), or (2) the use of a coarser than genus or species identification or (3) a combination of both approaches.

3.2.2 DNA metabarcoding

DNA metabarcoding potentially allows for the identification of most macroinvertebrate species in a bulk sample without the added cost of sorting (Taberlet et al., 2012, Hajibabaei et al. 2019, Pereira-da-Conceicoa et al. 2020). By sequencing a short, standardized gene fragment (i.e. DNA barcode, Hebert et al. 2003) of DNA extracted and amplified from a homogenized macroinvertebrate sample and comparing the resulting sequences to DNA reference sequences of morphologically identified species, species lists of the complete sample can be obtained. In this process, millions of sequences are generated by high throughput sequencing, which are typically quality filtered and clustered into Operational Taxonomic Units (OTUs) by similarity. One OTU roughly corresponds to one phylogenetic species that is associated with a Linnean name if the species is present in the reference library. However, the cluster can match several species if genetic divergence between species is low (rarely the case for the marker used here or for the WFD macroinvertebrate species identified), or conversely there can be multiple OTUs for the same species identification if there is high genetic divergence within a species. These OTUs, however, are normally assigned to only a single species. DNA metabarcoding has the advantage that it allows for rapid identification of hundreds of samples, when employing laboratory automatization like processing samples in parallel (96-well plate format) or utilising robotics. Additionally, as the same methods are used across samples, the results are more objective and thus more comparable than morphological identification by different taxonomists (Haase et al. 2010, Sweeney et al. 2011). With reliable reference databases, specimens in the sample are often identified to species level. Sometimes even population genetic analysis is possible (Elbrecht et al. 2018).

However, metabarcoding also has some methodological drawbacks and there are several variables that can potentially influence the results. These include laboratory methods and protocols used, for instance in how DNA is extracted from the sample. Several studies have shown that DNA metabarcoding using DNA isolated from homogenized samples provides a better estimate of the species composition in the sample than DNA isolated from the preservative (Erdozain et al. 2019; Zizka et al. 2018); although other studies have shown that the differences between the two methods are not substantial (Gauthier et al. 2019; Hajibabaei et al. 2012). Organisms that have a hard exoskeletons or exterior cases, such as some freshwater beetles, insects and mussels, leak less DNA into the preservative and therefore remain undetected or produce less sequences than expected due to their biomass (Carew et

al. 2018; Zizka et al. 2018; Martins et al. 2020). Likewise, terrestrial arthropods that have evolved hard exoskeletons to conserve water have also been shown to leak less DNA into the preservative (Marquina et al. 2019). However, in some cases, it may be important and necessary to keep vouchers for morphological identification as references for recorded biodiversity. In such instances, where homogenization of the collected samples is not possible, non-destructive DNA extraction of bulk samples using extraction buffer and the enzyme Proteinase K can be a viable alternative (Nielsen et al. 2019), as has been shown for freshwater macroinvertebrates (Carew et al. 2018). It is also worth noting that different types of DNA-extractions from homogenized samples can generate different results, especially if there are PCR-inhibiting substances originating from plants or sediments in the sample (Majaneva et al. 2018).

Sensitivity of the PCR DNA polymerases (Nichols et al. 2018; Taberlet et al. 2018), primer and marker choice (Elbrecht et al. 2018; Elbrecht & Leese 2017; Elbrecht et al. 2016), and even sequencing instrument (Braukmann et al. 2019) can influence the results of DNA metabarcoding. Studies have shown that metabarcoding cannot deliver precise specimen counts, due to variation in specimen biomass (Elbrecht et al. 2017) as well as inefficiencies in copying of the barcoding gene for some species (Elbrecht and Leese, 2015; Krehenwinkel et al., 2017; Piñol et al., 2015). There are, however, indications that read counts correlate to some extent with biomass (Elbrecht and Leese, 2017; Piñol et al. 2019; Schenk et al., 2020). Thus, read abundance can be used to compare the relative species abundance between samples, but this approach is currently not able to quantify the absolute abundance.

Many bioinformatic pipelines are used in analysing the output from high throughput sequencing instruments, both with regard to quality filtering and taxonomic assignments (e.g. Boyer et al. 2016; Callahan et al. 2019). Regardless of the methods chosen, it is important to have knowledge of your input data as naïve settings are likely to produce erroneous results (Majaneva et al. 2015).

3.3 Stakeholder survey

During the kickoff meeting on 27 June 2018, Steering committee members were asked to list key national stakeholders relevant to SCANDNAnet objectives. Stakeholders were divided into several categories: organization (Sector (11 levels), country, evaluation of opinion (4 levels) and stakeholder dissemination level (4 levels). Using this approach, 66 stakeholders belonging to over 30 different organizations were identified by September 2018.

3.3.1 Stakeholders

A questionnaire was created with a total of 6 background questions regarding the respondent and nine thematic questions designed to probe key stakeholder opinion on using genetic methods to identify aquatic macroinvertebrates in routine monitoring.

The questionnaire was distributed to all previously identified Nordic key stakeholders of the SCANDNAnet –project in September 2018. The link to the questionnaire was also distributed to non-Nordic experts. Altogether 20 respondents answered the

questionnaire. Most replies were received from the Nordic countries (n = 16), but we also received replies from several different network institutions from a total of seven countries (AU, CZ, FI, GE, GR, NO, SE):

- Federal Agency for Water Management - Institute for Water Ecology, Fisheries and Lake Research, Austria
- T.G. Masaryk Water Research Institution, p.r. i., Czech Republic
- Centre for Economic Development, Transport and Environment of South Eastern Finland
- Centre for Economic Development, Transport and Environment of South Savo, Finland
- Finnish Environment Institute, Finland
- KVVY Tutkimus Oy, Finland
- Bundesanstalt für Gewässerkunde, Germany
- Hellenic Centre for Marine Research, Greece
- Norwegian Environment Agency, Norway
- Norwegian Institute for Water Research, Norway
- County Administration Board of Jönköping, Sweden
- Lake Vättern Society of Water Conservation, Sweden
- Medins Havs och Vattenkonsulter AB, Sweden
- Stockholm university, Sweden
- Swedish University of Agricultural Sciences, Sweden

3.3.2 Design and results of the stakeholder analysis

The first four questions were used to collect general information about the respondents and their interest towards getting updates from the SCANDNAnet project and its activities. Replies were mainly provided by people familiar with macroinvertebrate taxonomy, with 65% (13 out of 20) of the respondents having a self-assessed intermediate level of expertise concerning traditional identification methods of aquatic macroinvertebrates (question 9, Appendix 1). Most of the participants (80%) had low or no experience with genetic methods for identification (question 10, Appendix 1).

Opinions on the use of genetic methods for identification of macroinvertebrate species were all highly positive. All except one respondent (95%) considered the implementation of genetic identification methods to be of intermediate or high necessity in future biomonitoring and assessment programs (question 11, Appendix 1), and to be of intermediate to superior reliability (95%) (question 12, Appendix 1).

There was larger spread of replies concerning opinions of the cost efficiency of genetic methods (question 13, Appendix 1). Half of the respondents see genetic methods as cost neutral or of higher cost efficiency when compared to traditional morphological methods. Two respondents view the method as more expensive than traditional methods and five respondents did not express an opinion.

Almost all respondents (95%) opined that the use of genetic methods will increase in taxa identification in the next 5–10 years (question 14, Appendix 1). Most respondents (75%) went so far as to view this as the definitive path, but respondents also commented that methodology still requires modifications (40%), if not totally new methodologies (50%) to assess ecological status of aquatic

environments. The use of genetic methods for ecological assessments is welcomed by most respondents, although with some reservations by a few (30%) (question 15, Appendix 1).

We also collected views on the major factors limiting the shift from traditional assessment methods to the use of genetic methods (question 16, Appendix 1). The main reasons (85% of the votes) concerned lack of standardized methods and of comparability to traditional methods. Half of the respondents rated also quality issues of accuracy and reliability as the third most important factor. In addition to answering pre-defined questions, respondents provided three alternative reasons that might limit or act as barriers to method changes, these were:

- the current need to also monitor size and age of fish, therefore any novel genetic methods will need to be complemented by other sampling and laboratory methods;
- the question of taxonomical resolution i.e. "the problem of species" identified based on morphological traits vs. genetic identification and;
- the necessity of well-informed policy makers who know the method well enough to be able to design projects that are tailored for use in ecosystem management.

4 A validation of metabarcoding for aquatic monitoring in the Nordic countries

4.1 Sample collection

4.1.1 Sample collection protocols

Iceland – Samples were collected from five streams which are monitored annually. Two of the streams are situated in the west of Iceland and three in the north-east. One to three sites were sampled within each stream, in total eight sites. For the sites in the north-east, a protocol that was established in the mid-1990s was followed, where rocks were removed from the streambed and rinsed to collect macroinvertebrates. The material retained was sieved through 125 µm sieve and preserved in 96% ethanol. For the sites in the west of Iceland, Surber samples were collected and processed in the same way as the stone samples. The ethanol was decanted within 24 h and replaced with fresh 96% ethanol. Samples were sorted and macroinvertebrates were identified to the lowest taxonomic unit feasible using a dissecting microscope. For each site, four to five replicate samples were processed.

Denmark – A total of 60 samples were collected from streams covering gradients in stream size and level of anthropogenic impact. Sampling was undertaken according to the guidelines of the Danish Stream Fauna Index (DSFI; Skriver, Friberg & Kirkegaard, 2000). The sampling procedure is standardized with a total of 12 samples collected along three transects (ca. 10 m apart) across the stream. Samples were taken using a hand net (mesh size 0.5 mm) supplemented with a 5-min qualitative sample taken by hand-picking from submerged stones and large woody debris. The samples were preserved in 80% ethanol and the sample was shaken to speed up the displacement of water with ethanol within the animals. The ethanol was decanted and replaced with 96% ethanol usually within two to three hours after sampling but always within a maximum of 24 hours. The samples were sorted in the lab using x 10 magnification and macroinvertebrates were identified to the lowest taxonomic unit feasible.

Sweden – Fifty benthic invertebrate samples were collected from littoral habitats of lakes (n=25 lakes) and riffle habitats of streams (n=25 streams) in the autumn (October–November) of 2017 according to Swedish guidelines. All lakes and streams are part of the national monitoring program. The study sites were chosen to reflect gradients in latitude and taxon diversity. Five kick samples were taken using a hand net (mesh size 0.5 mm) from hard-bottom (stony) substratum. Each replicate sample consisted of disturbing the substratum along a 1-m segment of lakeshore or stream reach for 20 s or 60 s, respectively. Samples were immediately preserved in 99% ethanol. On arrival to the lab (within 24-48 h) the ethanol was decanted and replaced with 99% ethanol. The samples were processed in the laboratory by sorting using x 10 magnification and macroinvertebrates were identified to the lowest taxonomic unit feasible (usually species) and counted using light and dissecting microscopes.

Norway – 139 benthic invertebrate samples were collected from littoral habitats/ outlets of lakes (n=31 lakes) and riffle habitats of streams (n=36 streams) in the autumn (September–October) of 2018. From some of the lakes, additional samples were taken in early summer (May–June). All lakes and streams are part of the national monitoring program. The study objects were chosen to reflect different lake- and river types (covering gradients in latitude, alkalinity and humic content) and taxon diversity. For lakes one sample was taken from the lakeshore and one from the outlet. For rivers, a single sample was taken. All samples were taken using a hand net (mesh size 0.25 mm) from hard-bottom (stony) substratum by disturbing the substratum along a segment of lakeshore or stream reach for 60 s (kick-sampling). Samples were immediately preserved in 96% ethanol. The ethanol was decanted and replaced with 96% ethanol within 24 h, either in the field or upon arrival to the lab. The samples were processed in the laboratory by sorting using x 10 magnification and macroinvertebrates were identified to the lowest taxonomic unit feasible (usually species) and counted using light and dissecting microscopes.

Finland – A total of 48 benthic samples were collected in the autumn (September–November) of 2017, consisting of 23 stream samples, 9 lake profundal samples and 16 lake littoral samples. Sampling sites, distributed across most of Finland, are part of the national monitoring program for effects of forestry and agricultural practices (Aroviita et al. 2014) and sampling followed national WFD biomonitoring guidelines. Each sample was a composite of 6 subsamples taken at each stream or site lake. In streams and lake littorals each subsample was taken with a hand net by moving upstream or upwind for 1m and for a duration of 30 s (littorals 20 s) while disturbing the substrate by kicking. For lake littoral habitats, depending on the presence of stony littoral habitat in each lake, sampling was conducted in two lakes at one littoral site (six subsamples from each site), in five lakes at two littoral sites (three subsamples from both sites) and in nine lakes at three littoral sites (two subsamples from each site). For lake profundal habitats, the lake sample consisted of a total of six Ekman grab subsamples taken at a depth of at least 90% of the lake's maximum depth. Benthic samples were sieved using a 0.5 mm mesh and preserved in the field using denatured 96% ethanol. The ethanol was decanted and replaced with 96% ethanol within 24 h. The samples were sorted in the laboratory with no magnification and the macroinvertebrates were identified and counted according to the national requirements mostly to species or genus (excluding identification of dipteran families and Oligochaeta) using light and dissecting microscopes.

4.1.2 Sample preparation

After morphological identification all samples were returned to vials, stored in 96% ethanol and sent to NTNU for laboratory processing. Samples were stored at 6°C on arrival to the laboratory until processed for DNA extraction explained in the next session.

4.2 Laboratory methods

To remove ethanol, samples were dried 24–48 hours in sterile disposable grinding chambers (MT 40.10, IKA®-Werke GmbH & Co. KG, Staufen, Germany). The dried specimens were homogenized by grinding at 10000 rpm for 3 min. in an IKA TUBE-MILL control. Small samples that did not homogenize well, were further grinded with a sterile pestle in the same grinding chamber. From each sample, three subsamples were taken with a sterile spoon. The subsamples contained on average 14.93 mg (SD = 5.69 mg) of homogenized tissues. Total DNA was extracted from each subsample, using DNeasy 96 Blood & Tissue Kit (Qiagen Hilden, Germany) following the manufacturer's instructions. Some of the samples were so small that there was only a sufficient amount (ca. 15 mg) of homogenized tissue for only one or two subsamples. In these cases, the DNA extract was divided into two or three aliquots. DNA was diluted with a 1:10 ratio to decrease the concentration of possible inhibitors. DNA quality was checked using a 1% agarose gel. The molecular protocol initially used is provided in Appendix 3. However, use of this protocol failed to provide (for undetermined reasons) a DNA library that could be successfully sequenced.

The metabarcoding process was therefore repeated. DNA was amplified using a two-step PCR protocol. All of the following steps were carried out on a Biomek FXP (Beckmann Coulter, Bread, CA, USA) liquid handling station. In the first PCR, all samples coming from the same plate were tagged with an inline tag (Elbrecht and Steinke 2019), while each individual well was tagged with unique 8 bp Illumina indexes at both ends (i5 and i7 index), allowing to multiplex all samples in one HiSeq Rapid sequencing run. For the first step, DNA was amplified using the Qiagen Multiplex PCR Plus Kit (Qiagen, Hilden, Germany) with a final concentration of 1x Multiplex PCR Master Mix, 1x CoralLoad Dye, 100 nM of each primer (BF3/BR2, (Elbrecht et al. 2019; Elbrecht and Leese 2017)), 2.5 µL of DNA filled up to a total volume of 25 µL using a touchdown PCR protocol with: 95 °C for 5 min initial denaturation, 10 cycles of 95 °C for 30 s denaturation, 60 - 51 °C for 90 s annealing (1 °C decrease per cycle) and 72 °C for 36 s elongation followed by 20 cycles with 50 °C as annealing temperature ending with 68 °C for 10 min as a final elongation step. In the second step, DNA was amplified 1x Multiplex PCR Master Mix, 1x CoralLoad Dye, 100 nM of each primer, 1 µL of PCR product filled up to a total volume of 25 µL. The PCR protocol was 95 °C for 5 min initial denaturation followed by 15 cycles of 95 °C for 30 s denaturation and 72 °C for 135 s for annealing and elongation followed by 68 °C for 10 min as a final elongation step. PCR success was checked on a 1% agarose gel. DNA concentrations were normalized using the SequalPrep 96-Well-Kit (Applied Biosystems, Foster City, CA, USA) with an elution volume of 20 µL. The full library volume of each 96 well plate was pooled in the final library. DNA was concentrated using the NucleoSpin Gel and PCR Clean-up kit (Macherey-Nagel, Düren, Germany) and checked for unspecific amplification (e.g. primer-dimers) using the Fragment Analyzer (Standard Sensitivity NGS Fragment Analysis Kit; Advanced Analytical, Ankeny, USA). To remove primer-dimers the library was size-selected using the NucleoMag NGS Clean-up and Size Select Kit (Macherey Nagel, Düren, Germany). Concentration of the cleaned-up library was measured using the Qubit 2.0 (Broad Range Kit; Thermo Fisher Scientific, Beverly, USA). Sequencing carried out by Macrogen (Seoul, South Korea) using both lanes of two Illumina HiSeq PE rapid runs with 250 bp paired end reads with 5% PhiX spike in to improve sequence diversity and therefore sequencing quality.

4.3 Bioinformatic analysis

Samples were demultiplexed by the sequencing provider using dual Illumina indexing on a total of 88 wells (8 wells per plate were empty, and thus not included). Additionally, each of the demultiplexed fastq files were split into the 12 individual samples based on inline tags used for each of the 12 plates, respectively. Demultiplexing was done for both HiSeq run A and B. Using a small subset of samples from both runs, it was verified that both sequencing runs returned the same results. Therefore, and also because sequencing depth of individual samples was very similar across both runs (Figure 1A), each respective sample from Run A and B were combined into a single file and processed together.

The 1056 samples (297 samples times three replicates, 33 positive controls and 132 negative controls) were processed using the JAMP v0.78 pipeline (https://github.com/VascoElbrecht/JAMP/) relying on Cutadapt v2.8 (Martin 2011) and Vsearch v2.14.2 (Rognes et al. 2016). Samples were paired-end merged using Vsearch, with fastq_maxdiffs = 99, and fastq_maxdiffpct = 25 to maximize the amount of sequences merged. Primers were removed using Cutadapt on default settings, and sequences below 408 bp and above 428 bp (+/- 10 bp of the target length) were discarded. Sequences with expected errors above 1 were discarded as well (Edgar and Flyvbjerg 2015). The remaining filtered sequences were denoised using Vsearch on a per sample basis, using the unoise3 module with a minimum size of 5 after dereliction. There was no additional filtering applied to the raw ESV table and ESVs grouped into OTUs using 3% clustering. The generated OTU table was filtered for spurious OTUs using LULU on default settings (Frøslev et al. 2017), with merging affected OTUs. The resulting OTU table was further filtered, by only keeping reads in each sample that were present in two out of the three replicates. After these filtering steps, all three replicates were merged into one sample for further processing. Taxonomy was assigned using https://www.gbif.org/tools/sequence-id, as well as BOLDigger (Buchner and Leese 2020) v1.1.10 using the JAMP setting. Resulting taxonomic assignment was manually consolidated. Unfortunately, there was not sufficient time to also taxonomically assign the OTUs against the NCBI database when writing this report. A sample was deemed to be metabarcoded successfully, when it had a minimum of 100,000 reads in the final OTU table. Samples were not rarefied to the same sequencing depth, to maximize the number of taxa detected. For taxonomic analysis, only OTUs matching to Annelida, Arthropoda, Mollusca, Nemertea and Platyhelminthes with at least 90% identity were considered.

5 Results

5.1 Sample and DNA extraction

A total of 297 samples were collected, covering all of the Nordic countries (Figure 1). For Denmark 60 samples were processed, 48 for Finland, eight for Iceland, 131 for Norway and 50 for Sweden. Amounts of DNA varied between samples (based on gel imaging). 92% of the samples showed clear DNA bands and only 8% of samples showed no visible DNA or only degraded DNA across all three replicates, with Denmark and Finland being most affected (12 or 8 samples, respectively). Especially Danish samples lacked a visible DNA band (Figure 1D). DNA quality across samples was only moderately consistent, with 45% of replicate samples showing deviating DNA quality across extraction replicates.

The whole laboratory analysis of 11 plates, i.e. from DNA to final library for sequencing took three working days with the Biomek FxP Dual hybrid, in comparison to approximately ten working days that one person initially used for the failed libraries. Unfortunately, a label mix-up that occurred when transferring the sample positions from the spreadsheet to the demultiplexing file affected two rows of one microplate in the demultiplexing-file. This issue was noticed and resolved by changing the layout map for that 96 well plate retrospectively. We noticed that one of the 11 negative controls showed a clearly visible band for this plate. This might be caused by cross contamination, although 97% of the 132 negative controls across all 12 plates did not show visible bands in the DNA gels, indicating that contamination between samples was not a serious issue. Due to the extensive use of negative controls (11 per plate) and replication the human error in plate one was detected.

Figure 1. *Map depicting the geographical distribution of the sampling sites in the Nordic countries.*

5.2 Metabarcoding success

The initial metabarcoding libraries did not sequence successfully, despite no dimers being visible on an agarose gel or fragment analyzer, and the bands having an expected size of around 600 bp and no visible dimers over 90% of the obtained reads were dimers (SRA: SRR12615112, SRR12615111). We cleaned up the library several times with SpriSelect but the problem remained, as was evident by two iSeq runs (SRA: SRR12615016, SRR12615005). As the problem could not be resolved, all PCRs and library preparation steps were repeated using a different library preparation method, and then sequenced successfully. Samples on all 12 plates were uniquely tagged on both sides using Illumina indexing for 96 wells and inline tagging for each plate and pooled into the same Library, which was sequenced on two HiSeq rapid runs (2x250 bp). The first run A yielded 296,210,273 PE reads, and the second run B 289,096,640 PE reads in total. The raw data is available under the SRA accession PRJNA662474 and the information on inline tags available as supporting information (Scripts S1). As both runs had a similar amount of reads per sample (Figure 2A) and generated the similar metabarcoding results (tested on a small subset, data not shown), reads from both runs were pooled for each sample and analyzed together. Additionally, 10 sample pairs from both sequencing runs were chosen at random, and processed with the full metabarcoding pipeline, to validate that they produced similar results. Results between both runs were consistent, except for sequences of lower abundance which are more affected by stochastic effects (Leray & Knowlton 2017).

An average of 370,794 reads were obtained per replicate (Figure 2B). Except for samples from Denmark, over 95% of samples were successfully metabarcoded for all three 3 replicates (over 33.000 reads remained after bioinformatic processing, Figure 1F). Six samples from Denmark (DK24, DK25, DK26, DK29, DK31, DK37) and one sample each from Norway (NO138) and Sweden (SE25) had under 100,000 sequences after bioinformatic analysis and pooling of all three replicates.

The number of taxa recovered using morphology and DNA metabarcoding differed by country (Figure 3). For Norway, Iceland and Finland, DNA metabarcoding recovered more taxa than morphology in almost all cases. For Denmark and Sweden, results where more mixed, with morphological methods detecting more taxa than metabarcoding in 28% or 38% of the samples.

When looking at the 200 most abundant taxa determined with morphological identification, metabarcoding was able to recover 133 of them based on our preliminary data. However, merging the DNA-based data is difficult due to synonyms and the incomplete DNA reference database, and therefore will require more manual work and curation. Thus, the exact number will likely increase with a more detailed analysis that includes taxonomic expert curation. When looking at the 200 most abundant taxa detected with metabarcoding, 63 were not detected with morphological identification and mostly belong to groups that have larval stages or are difficult if not impossible to identify for use in routine monitoring. These include taxa belonging to Diptera, EPT (Ephemeroptera, Plecoptera, Trichoptera), Haplotaxida, Trombidiformes and Rhynchobdellida.

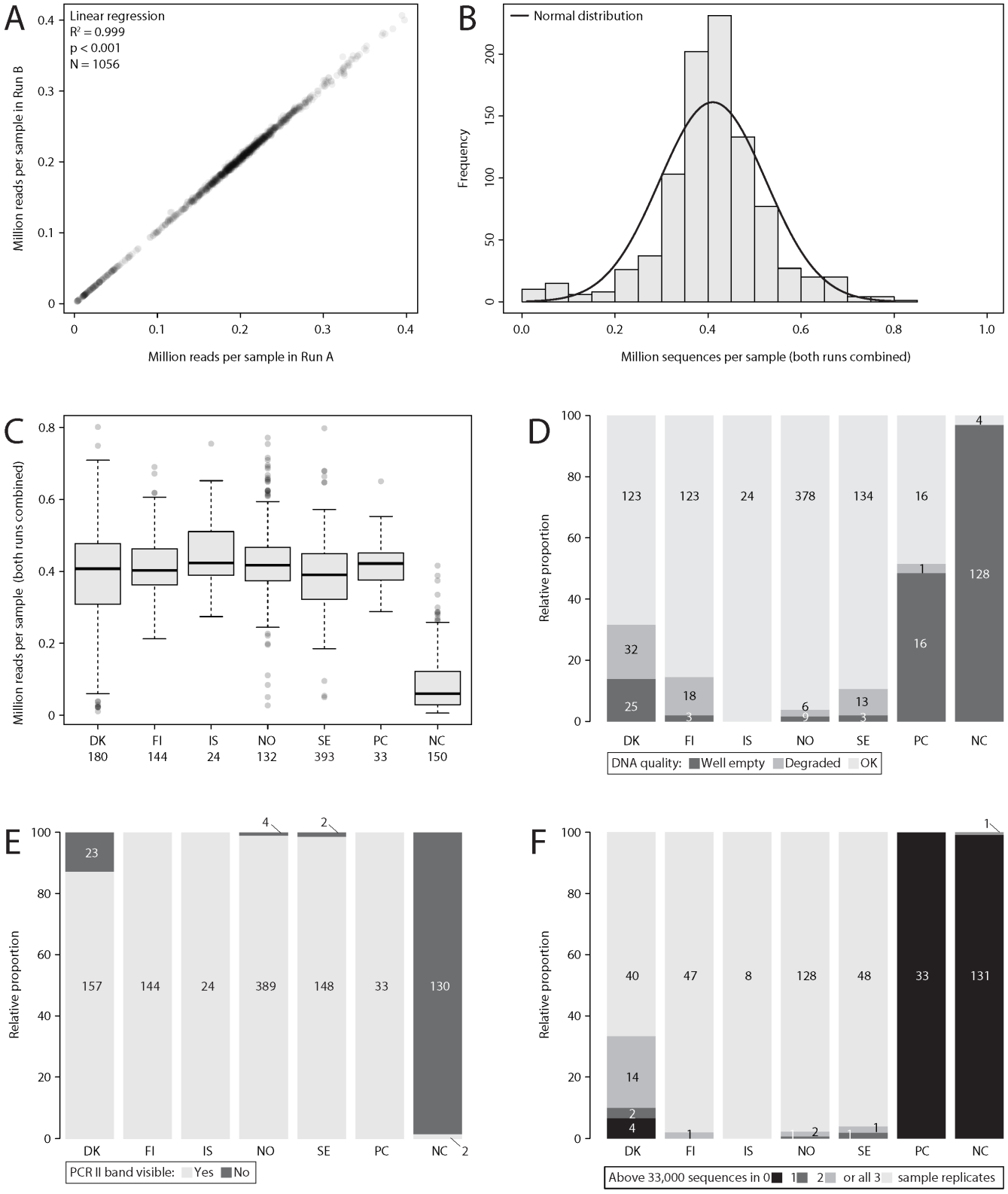

Figure 2: *Summary statistics of sequencing depth and DNA extraction, PCR and metabarcoding success across replicates.* ***A*** *Comparison of sequencing depth per sample in the two HiSeq sequencing runs (A and B).* ***B*** *Histogram showing sequencing depth across samples (both HiSeq runs combined).* ***C*** *Boxplot showing the sequencing depth of samples by country.* ***D*** *Assessment of DNA quality by country.* ***E*** *PCR success by country.* ***F*** *Number of replicates per sample containing more than 33,000 reads in the final Exact Sequence Variant (ESV) table. NC = negative control, PC = positive control.*

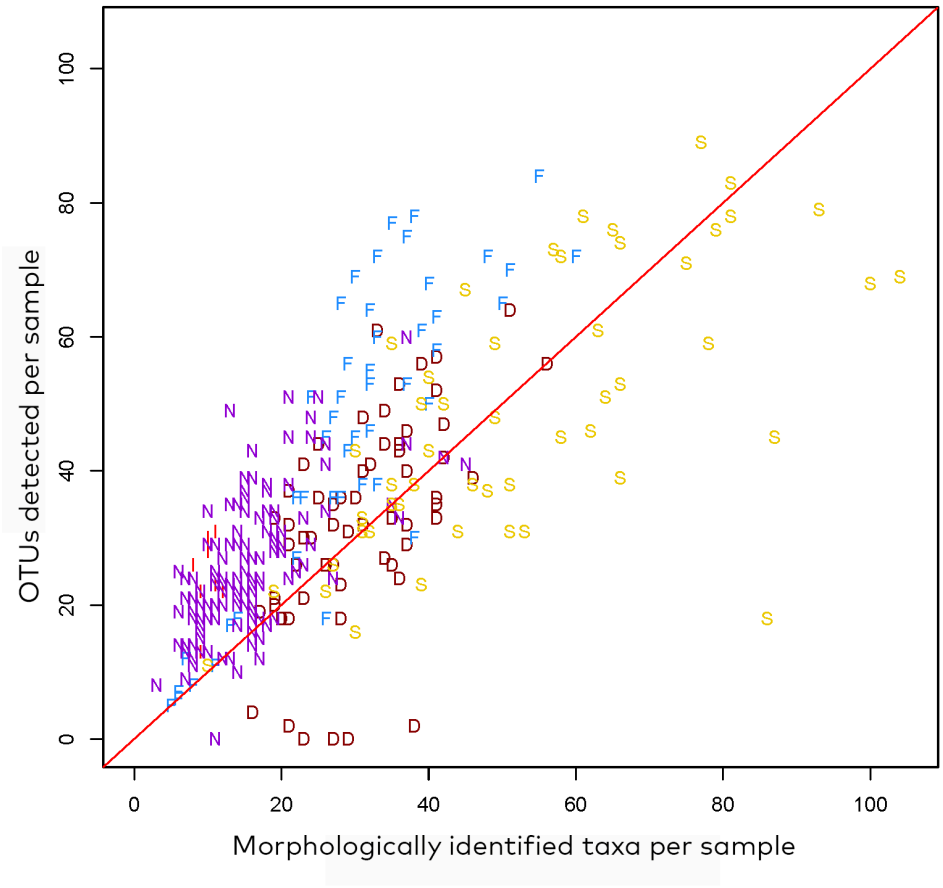

Figure 3: *Comparison of number of taxa detected with morphological determination and DNA metabarcoding (OTUs) across all 297 samples. The letters stand for the respective countries: I = Iceland, N = Norway, F = Finland, S = Sweden, D = Denmark. Note that this plot is made with preliminary data, which has not yet been manually checked for taxonomic validity.*

5.3 Iceland

All the eight sites from Icelandic streams were all spread well above the 1:1 line (Figure 3), which means that there are considerably more taxa identified by the DNA-based method than by traditional morphological methods. Number of taxa identified by morphology were 26–69% of the number of taxa that were identified by DNA-based method. This difference may possibly be explained by a low taxonomic resolution for some of the major taxa in Icelandic streams such as Chironomidae and Oligochaeta. If chironomids, identified by traditional methods, had been added to the matrix the number would have increased by 8–16 species, resulting in a closer fit to the 1:1 line in Figure 3. This demonstrates the need for including chironomid identifications in monitoring freshwaters at higher latitudes where chironomids often predominate.

5.4 Norway

To compare the overlap between morphological and DNA-based identification methods, results from four rivers (samples NO084-NO087) and four lakes (samples NO003-NO004, NO007, NO088-NO090, NO100-NO103) were checked manually. The number of aquatic macroinvertebrate taxa was higher using DNA-based identification than morphology-based identification, averaging 24 and 15 taxa, respectively (paired *t*-test, $p<0.01$). On average, 13 (rivers) and 11 (lakes) taxa were found with both identification methods per sample. On average three taxa per sample were found only with morphological identification, while 12 taxa per sample were found only with DNA-based identification in rivers and lakes.

The higher number of taxa with the DNA-based identification is mostly due to a species-level identification of Clitellata, Chironomidae and Simuliidae that were not identified further than class-level or family-level using morphology. In some samples, DNA-based identification also found two or three species of EPT from one genus, while morphology-based identification found only one. These results are as expected since Clitellata and larvae of Chironomidae, Simuliidae and EPT taxa within one genus can be difficult to separate morphologically. The taxa that were only found with morphology are more interesting. Two cases were somewhat expected: hard-shelled bivalves and gastropods as well as small copepods and branchiopods. The same bivalves and gastropods were found with both methods if the number of specimens in the samples was high (5–38% of total specimens for bivalves, 0.7–4% for gastropods) while they were found only with morphology if the number of specimens was low (1.5% for bivalves, 0.4% for gastropods). DNA-based detection of Mollusca has been shown to be lower than detection of other taxonomic groups in unsorted bulk samples (Beentjes et al. 2019). The number of copepods and branchiopods was very low in all samples, which may explain the lower success rate using DNA-based identification. Lysis of the whole sample may increase the chance of detecting rare species. Another reason may be slight primer mismatch or amplification efficiency, which is reported for this primer (Elbrecht and Leese 2017). More critical to current assessments are the few cases where Clitellata, Simuliidae or some EPT taxa were found with morphology but not with DNA-based identification. In these cases, the lack of taxa discovery in DNA-results cannot be attributed to low numbers of specimens. For example, species of Clitellata were found with both methods in one case when their proportion in the morphologically identified sample was as low as 0.2%; however not in another case when their proportion was 5% of the morphologically identified specimens. Such trends also were visible in sample NO103 for *Baetis rhodani* despite the fact that this species' DNA amplifies readily in other samples. It is likely that these patterns indicate considerable DNA degradation (e.g. visible in sample NO103), which would explain the incomplete discovery of taxa.

5.5 Sweden

The Swedish samples were dispersed along the 1:1 line of morphological determinations and DNA metabarcoding. However, one site (stream SE25) deviated markedly: only 18 OTUs were identified compared to 86 taxa by microscopy. This site was also an outlier in terms of yielded sequences (see 5.2) and thus technical reasons (e.g. DNA degradation) likely explain deviating results. Overall, the span in number taxa along the 1:1 line reflects the geographic distribution of lakes and streams and environmental gradients (e.g. latitude) studied here. The relatively high agreement between morphological and OTUs is likely due to the expertise and standardised protocols of the lab identifying samples collected in the national monitoring programs. Samples from the national lake and stream monitoring programs are sorted and taxonomically identified by only a few experts (three persons), resulting in high temporal continuity within the monitoring programs during the past 40 years. Currently, the standardised list of taxa required to be identified by the taxonomists comprises over 500 species, although higher resolution is also used in some projects. Furthermore, in the national monitoring programs chironomid midges collected from lake littoral or stream habitats are not usually identified to species. The lab routinely runs intercalibrations for consultants involved in regional monitoring and participates in international (ICP-Waters) calibrations. These activities likely result in the relatively high level of coherence reflected in Figure 2.

5.6 Denmark

Of all countries, Danish samples had the highest proportion of samples (i.e. 28%) with fewer OTUs assessed by DNA metabarcoding compared to Linnean taxa identified by morphology. This is likely due to the preservation scheme that used 80% ethanol in the initial preservation step of the sample. Given that the time span to changing the ethanol to 96% varied between 3-24h and due to the fact that the use 80% ethanol resulted in a lower than desired initial concentration in the specimen tissue this likely resulted in the degradation of specimens. Further support for this conjecture is the fact that in morphological identification many of these samples had considerable abundances of Chironomidae which likely would have been identified and thus would have increased the number of OTUs beyond the morphologically identified number of taxa.

5.7 Finland

In the preliminary data metabarcoding detected in large majority of cases (96%) more OTUs than were identified by morphology (Figure 3). Across stream and lake littoral samples, the number of taxa detected by morphology was about 2/3 of the number of OTUs detected by metabarcoding. One reason for the disagreement is that for stream and lake littoral samples dipteran families and e.g. Oligochaeta were not identified by morphology which followed the national target taxa lists for WFD assessment. The agreement in the number of taxa between the two detection methods was stronger in the samples from lake produndal (result not shown), where communities consist mainly of Chironomidae and Oligochaeta that indeed were also

identified by morphology. Only two Finnish samples (4%) had fewer OTUs identified by metabarcoding (Figure 3). Both of these were from streams and had considerable abundances of morphologically identified specimens belonging to the families Chironomidae and Simuliidae. Possible explanations for this mismatch can be morphological misidentification (higher intraspecific variation than accounted for) or partial DNA-degradation, which is supported by the molecular indicators of degradation in 18 subsamples (Figure 2D).

6. Discussion and recommendations

6.1 Conclusions of the stakeholder analysis

Stakeholder views towards the implementation of molecular identification methods for routine monitoring was positive amongst the respondents, even though most were not experts in the field. A general consensus was that these methods will be increasingly used in monitoring and assessment programs. However, most respondents also felt that some crucial issues need to be resolved before DNA methods can be used for genetic identification in routine monitoring. We conclude that the resoundingly positive response by respondents forms a strong foundation for the future implementation of these methods by the Nordic countries.

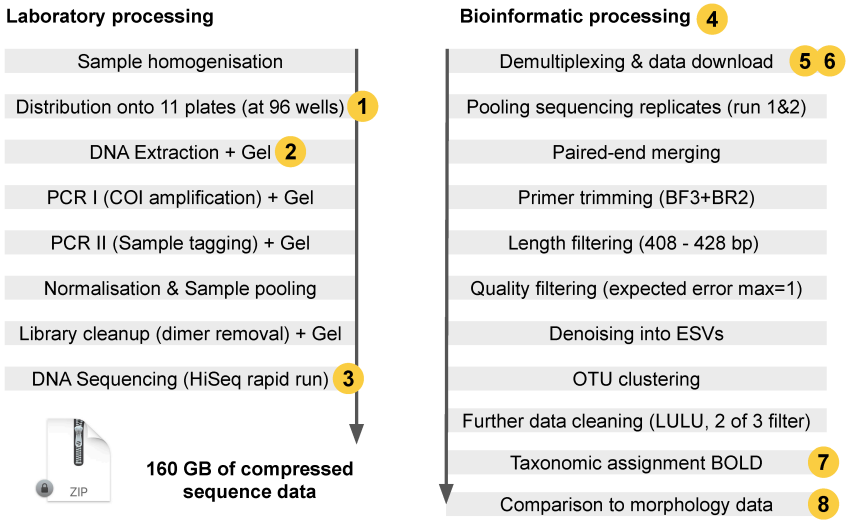

Figure 4: *Laboratory and bioinformatic workflow. Orange bubbles highlight encountered problems and challenges. (**1**) Two sample columns where swapped when setting up the sample position sheet DNA extraction. (**2**) Gel images and image scoring were not consistent (human bias), and some samples showed signs of DNA degradation (issue with sample taking / storage). (**3**) The sequencing run initially failed due to presence of primer dimers, even though non where visible. (**4**) Bioinformatic processing took around one week, which is exceptionally long, as no server was available. (**5**) Sequencing was done by a sequence provider, who had to ship the data as a hard drive because it was too much to download. (**6**) The raw data (not demultiplexed) provided by the sequencing provider was corrupted and could thus not be uploaded to the NCBI short read archive to make it publicly accessible. (**7**) The current database accessibility BOLD via API is incomplete, thus sequences had to be compared using the BOLD online taxonomic search, which reduces the verifiability of the results. (**8**) Comparison of morphology and DNA metabarcoding based taxa lists is not ideal, as synonyms and other potential errors like falsely assigned taxonomy were not manually resolved due to the lack of time.*

6.2. General findings of the method validation

Macroinvertebrate indices based on present-absence molecular data have been shown to largely correspond to those values based on traditionally keyed samples (Elbrecht et al. 2018; Beentjes et al. 2018). Due to time constraints and the difficulties with generating a reliable reference database (see 6.3 for details) we were not able to fully explore the congruence between morphological and DNA-based identification, including the patterns that would emerge when calculating national indices using either method, during the span of this project. This work will be conducted in-depth at a later stage.

6.3 Issues encountered in the metabarcoding process

We successfully metabarcoded 289 of 297 samples (97.3%) and in most samples more taxa were detected using metabarcoding than with the morphology-based determinations. However, we also encountered major obstacles and challenges that resulted in substantial delays of the project (see figure 4).

On the laboratory side, sample processing was carried out initially by a team that received the laboratory protocols, but that did not have extensive experience in the particular protocol. This led to errors in the bioinformatic sample assignment step (demultiplexing), where samples are separated based on the attached unique molecular indices. The position of each sample was planned using a spreadsheet, and on the first plate two rows were exchanged due to a copy paste error. This error was detected and mitigated retrospectively, due to use of negative controls on the plate and due to the fact that each sample was processed with three replicates distributed across 12 plates. Despite this, the possibility remains that other samples on plate 1 were erroneously put in the wrong wells or that there was true cross-contamination between samples, which was indicated by a negative control that contained many reads. Ideally, the entire DNA extraction and metabarcoding of the whole plate would have been repeated. The issue of sample cross-contamination could have been spotted when running a DNA gel of the DNA extraction or measuring the DNA concentration with digital methods. This is a critical step to assess DNA quality and quantity before DNA is used in PCR. In this step, a simple DNA gel picture or detection of a significant amount of DNA would have revealed that one of the negative controls contained a substantial amount of DNA, which would have allowed us to repeat the whole extraction. However, as gel pictures of the DNA extracts where only taken retrospectively, this mistake was not detected early in the process.

To minimize the risk of such errors early in the process chain, we recommend rigorous quality assurance training for the team carrying out sample processing, as well as taking photographs of the samples as they are placed in the extraction plates. This way, if for example a negative control is found to be positive, the photographic documentation can be checked to see if samples were misplaced. Also, the use of a dedicated laboratory information system (LIMS) is advised, as it allows tracking of samples through the entire work process. Further, the use of QR-code labeled vials and sampling tubes in combination with barcode scanners for sample intake, as well as automated processing of samples using robotics, would significantly reduce the risk of human error. Regardless of whether robotics is used, rigorous training and

auditing of personnel along with detailed written process documentation is paramount to reduce errors at this stage of the process. Similar certification exists for medical and commercial laboratories and adoption of such routines for environmental metabarcoding are possible.

We assessed DNA quality as well as PCR success using gel pictures. For DNA extractions we repeated this procedure independently twice but results of these assessments varied substantially in some cases. The DNA gel images were only consistent for 55% of the samples among the three replicates available for each sample. This might indicate issues with preparing the DNA extraction replicates from the ground tissue powder. However, it is also very likely that there are inconsistencies between the different gel documentation systems used by both institutes, especially because these laboratories only performed analyses within a very short time frame (3 days) and because initial attempts with library preparation failed by another lab. It should be pointed out that all these methods are usually very reliable. While gel pictures are sufficient for assessing PCR success, we would recommend using digital gel imaging methods (e.g. Fragment Analyzer, Agilent Technologies). Digital gel imaging allows to precisely assess and quantify DNA concentration and degradation by measuring DNA fragment length. This allows for a more precise identification of samples which have been affected by DNA degradation. DNA degradation can occur both when there are a lot of specimens in a sample, or when the ethanol is not replaced with fresh ethanol after collecting the samples. In both cases, the water in the specimens and detritus can dilute the 96% ethanol to 80–70% at which point DNA degradation can already occur. This can be problematic, as it might degrade the DNA from some or even all specimens in the sample, greatly reducing the chance for good amplification of the barcoding fragment in PCR or even leading to complete PCR failure. This might have been the case for some samples from Denmark, where over 30% of replicates had DNA quality issues. As a consequence, six samples did not work at all, with 14 additional samples showing dropouts in at least one replicate. A follow up study will determine if the Danish samples were collected according to protocol, or contained an unusual number of specimens, in which case the sampling protocol might need to be adapted by increasing the amount of ethanol or replacing the ethanol with fresh ethanol more than once.

An additional challenge that led to substantial delays was that the initial metabarcoding laboratory work carried out according to the protocol in appendix 3 did not result in a library that could be sequenced successfully. While we obtained sequences, over 90% of them where primer dimers, and only a small proportion were target sequences. These issues are puzzling, since the metabarcoding laboratory process partly functioned, as a small amount of sequences generated were of the expected length and assigned to macroinvertebrates. Additionally, the primer dimers were not visible in gel pictures or using digital gel imaging methods, but flooded the sequencing run regardless even after repeated cleanups as well as gel checks of that library after repeating the failed run. We were not able to determine or resolve the cause of these issues. Therefore, DNA samples were shipped to a different laboratory, where DNA was quantified and the whole procedure started again with small modification, i.e. the BF3 primer instead of BF2, as well as a touchdown PCR, even though touch down PCRs are usually not recommended for metabarcoding (Aylagas et al. 2016). We have to stress here, that the issues we encountered with sequencing are extremely rare (it has never happened in two of the three labs involved despite having processed over 100 sequencing runs) and could have been

caused by a handling issue when preparing the DNA libraries.

Bioinformatic processing (Figure 3) went well but did encountered a few logistical challenges. Data delivery and processing formed a bottleneck, as a server was not available at that time. Thus, processing of the almost 600 million sequences in this data set had to be carried out on a 2019 MacBook pro, which took about one week. Offline data processing of 160 GB compressed data on separate devices is prone to device error or malfunction and also presents challenges to long term data storage and to data up and download. Such issues can be circumvented with properly implemented scalable cloud computing solutions which are currently not readily available. Demonstrating the need for more streamlined workflows was also exemplified that even the external sequencing provider had issues delivering the data online and chose to send the sequenced raw data per mail on an unencrypted hard drive. While this is not only ineffective, it also poses data security risks and the challenge to reupload data back onto a server, whereas server to server transfers are usually fast. Thus, we recommend implementing an appropriate cloud-based bioinformatics pipeline, with dedicated long-term raw data storage strategies. For this project we decided to use the NCBI short read archive for long term storage of the data, which allows us to also make the data publicly accessible (SRA accession PRJNA662474). However, not all of the raw data could be uploaded, some files were delivered containing errors in the sequence order, and thus could not be accepted by SRA. The error in the raw data delivery format was due to an error on the sequencing provider site and should have been checked upon data delivery to us. We are currently working with the sequencing provider to resolve this issue. While there were some issues with the company that did the sequencing, we still recommend using an external sequencing provider. This is because sequencing technology is rapidly improving and evolving, and thus inhouse sequencing and investment costs of up to 1 million USD of sequencing machines which are likely obsolete within years are not economically feasible unless there is a huge throughput. Outsourcing of the sequencing to commercial providers is more cost effective, even though part of the process is not fully controllable.

Further bioinformatics challenges were encountered when assigning taxonomy to the resulting DNA sequences after bioinformatic processing. For the COI marker used there are two main sequence repositories for reference sequences, BOLD and NCBI. Since we are dealing with millions of reference sequences, generating a reliable reference database is not trivial. Some of the sequences uploaded to these databases might be annotated incorrectly, may contain errors or are from a misidentified organism, thus linking to the wrong taxon. An additional complication is that both databases might use synonymous species names and differ in taxonomy. With BOLD there is an additional complication, as around 50% of the data are not publicly accessible, and only can be queried using the website API. Even publicly available BOLD data cannot be easily downloaded. This complicates the data base situation and given the limited available time towards the end of this project taxonomy was assigned using the BOLD website. This has the advantage that it allowed us access private data as well. However, for long-term monitoring, we strongly recommend that Nordic/nation-wide reference databases for macroinvertebrates are generated using strictly quality controlled public data from BOLD and NCBI, as well as specimens collected in each country. In fact, at least Denmark and Norway have already started this process of generating national, curated reference databases (for Denmark see https://dnamark.ku.dk, for Norway

see discussion in Åström et al. 2020). An accurate and complete reference database will be key to a future monitoring program and needs to be thoroughly checked for errors and missing taxa with the aid of taxonomic experts. The web based BOLD reference database we used does not fully meet these quality criteria.

6.4. Assessing the applicability of the DNA-based identification

For the assessment of the applicability of any novel method, a number of criteria need to be investigated: method reliability, environmental impact, added value, limitations and required expertise as well as costs (Mack et al. 2020). DNA-metabarcoding scored "high applicability" in a recent assessment of metabarcoding viability in the context of Baltic marine monitoring (Mack et al. 2020) but this assessment did not entail a large-scale validation exercise like the one conducted in this study. Hering et al. (2018) discuss the implementation options of molecular methods in the context of the WFD in detail, dividing the different pathways into option 1 and option 2. In option 1, the "DNA-based identification" simply replaces traditional identification and the molecular information obtained is reverted to the Linnean taxa system. With DNA-based identification, current indices and the subsequent assessment systems could remain the same or adoption would necessitate only minor modifications. The advantages of this approach would primarily be in increased comparability, processing speed and cost efficiency. However, option 2 would make full use of the molecular data and allow for analyses utilizing taxonomy-free approaches and also functional gene assessments that could provide previously unattainable information on trends in response to single and multiple stressors not previously encountered (Beermann et al. 2018, Beermann et al. 2021, Cordier et al. 2020). While this prospect is tempting, option 2 is not likely to become a reality in the next 10 years. However, a switch from traditional identification to DNA-based identification and its extensions (e.g. the inclusion of taxa typically not identified in routine bioassessments, such as Chironomidae) it is possible and would have the potential to provide a much more accurate estimate of environmental conditions and enable the gradual progression towards option 2.

Reliability of a method is an important deciding factor when deciding on its implementation into routine use. Mack et al. (2020) rated reliability of novel methods as 'high', either when the resulting data had an improved reliability or when it was comparable but resulted in substantially greater amounts of data. With the design we used, a fully independent assessment of method reliability is not possible. This is because the samples used in metabarcoding were first subjected to manual morphological identification, which could have led to additional degradation of the DNA in samples during the identification process due to diluting the samples with water to avoid excessive vaporization of alcohol during manual keying. Our results strongly suggest that for most samples suffering from degradation, this occurred before samples went through the genetic pipeline, thereby likely reducing the reliability of the DNA-based identification. Levels of degraded samples in Denmark were much higher than what could be tolerated during routine operation. However, as the trends for sample degradation were not equally distributed among countries, we are confident that the poor preservation of DNA in the Danish samples was mainly due to an easily avoidable procedural error before sequencing, given that most other samples had good DNA quality. Similarly, the fact that much of the

laboratory work had to be repeated in this study may seem to indicate that metabarcoding is not ready for routine use yet. Indeed, it shows that the method can be sensitive to protocol violations. However, we argue that rather than pointing to a lack of reliability, the observed shortcomings emphasize the need for internationally agreed upon laboratory protocols and staff training. Laboratory automation as performed in this project is one step into this direction. With the Biomek FxP (Fig. 5) the over 1000 individual reactions were processed successfully within only three working days.

Work on developing existing European standards for sample preservation during macroinvertebrate sampling should also be revisited or the drafting of novel guidance considered. Nordic efforts for developing such guidance and providing training to laboratory and field personnel in the context of national reference laboratories must clearly be a future priority.

The need to assess the viability of molecular methods for routine use in identification is not unique to the use of metabarcoding in aquatic biomonitoring. In Norway, an extensive pilot study tested various practical methodologies for implementing a general insect monitoring scheme (Åström et al. 2020). The pilot study used flying insects collected by Malaise traps, later to be identified by DNA-metabarcoding in the lab and validated by traditional morphological identification. In addition to measuring the insect communities and comparing DNA metabarcoding techniques with morphological identifications, the report contains a cost-benefit analysis of a potential future general, nation-wide insect monitoring scheme.

Figure 5: *The liquid handling robot enabled standardized processing of samples in shortest time.*
Picture: *Till Macher*

There is no doubt that metabarcoding can provide additional value and a wealth of information that is not available at present. The full value of this method will only materialize over time when the method will move from DNA-based identification towards option 2 (i.e. utilizing also functional gene assessments and taxonomy-free approaches). But it is evident that the application of this metabarcoding will require an investment into recruiting and training until the expertise of staff involved in its application to acceptable and stable levels. Based on our findings we agree with the assessment of Mack et al. (2020), namely, that DNA-based identification using metabarcoding indeed has high applicability but also caution that work on unified guidance is paramount for routine implementation.

The existing momentum and enthusiasm about the prospect of DNA-based identification has led to several separate national initiatives that are developing the methodology. The authors of this report urge these developers to consider larger Nordic and European cooperation and method standardization as a priority. This will not only speed up the uptake of the methods beyond the pure research domain into routine monitoring, but also ensure method comparability and reliability. Like the respondents of our key stakeholder survey we are convinced that DNA-based identification and its future extension are the way forward. The development is now at an important crossroad and only through intense cooperation will we be able to avoid the same fate of method pluralism that is now used in biomonitoring and assessment in implementation of the WFD (Birk et al. 2012). Cooperation on method and index development but also agreement on metadata formats and database structures will be key to increase the overall benefit that can be gained from the adoption of this approach. Especially when working towards using the full potential of molecular methods, (i.e. "option 2", *sensu* Hering et al. 2018) such concerted Nordic efforts would set international examples of best practice which would greatly benefit both research and assessments alike.

7 Conclusions

This validation study took an in-depth look at the reliability of DNA-based taxonomic identifications for routine WFD compliant monitoring in the Nordic countries. The results are very encouraging but our study also identified areas that will require addressing before routine implementation into Nordic monitoring programs can be achieved. These are, in particular, quality assurance and training, especially when several labs are involved in the whole assessment process. A number of conditions will need to be met to adopt DNA-based identifications in all Nordic freshwater bioassessments. These include stronger international cooperation in method development as well as the development of standardized guidance documents which currently is lacking almost entirely.

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Appendix 1: Stakeholder survey questions

1. Please provide your full name.
2. Do you agree to the storage of your personal data (name, position and email address)? ***Yes, No***
3. Do you want to be informed of the progress made in the SCANDNAnet project regarding the validation of metabarcoding for taxa identification in the context of aquatic invertebrate bioassessment? ***Yes, No***
4. Do you want to be invited to a webinar discussion of the outcome of the project? ***Yes, No***
5. What is your current level of expertise concerning traditional (morphological) identification of aquatic macroinvertebrates ***None, Low, Intermediate, High, Expert***
6. What is your current level of expertise concerning genetic identification of aquatic macroinvertebrates? ***None, Low, Intermediate, High, Expert***
7. How necessary do you view the use of genetic identification in future aquatic bioassessments? ***Unnescessary, Low necessity, Intermediate necessity, High necessity***
8. Please provide your view on the reliability of genetic taxa identification compared to traditional identification ***No opinion, Unreliable, Low reliability, Intermediate reliability, High relialibility, Superior relialibility***
9. Please provide your view on the cost effectiveness of genetic taxa identification methods when compared to traditional methods ***No opinion, Not cost effective, Cost neutral, Highly cost effective***
10. How likely do you perceive the increased use of genetic taxa identification in the next 5-10 years? ***Will not increase, Unlikely to increase, Likely to increase, Will definitely increase***
11. Please provide your understanding on how genetic approaches can be used in current assessment methods of ecological status ***Directly, With few modifications, With several modifications, New methods will be required***
12. Do you welcome the development of new assessment methods to assess ecological status from genetic identification data? ***Yes, to some extent, No (Why?)***
13. In your opinion what are the major factors most limiting a shift towards an increased use of genetic identification methods? ***(Legislative requirements, Quality issues (accuracy and reliability), Cost of genetic methods, Lack of standardized methods, Lack of information for decision makers (i.e. policy briefs, reports), Lack of laboratories capable of conducting analysis, Lack of trained personnel, Lack of comparability to traditional methods, Other)***

Appendix 2: Taxa lists

	Order	Family	Genus	Species	Taxon	Morpho-Samples	Morpho-Abundance	DNA samples	DNA reads
1	Amphipoda	Gammaridae	Gammarus	alpinus	Amphipoda_Gammaridae_-Gammarus_alpinus	NA	NA	19	259801
2	Amphipoda	Gammaridae	Gammarus	duebeni	Amphipoda_Gammaridae_-Gammarus_duebeni	2	254	1	247574
3	Amphipoda	Gammaridae	Gammarus	lacustris	Amphipoda_Gammaridae_-Gammarus_lacustris	14	150,8	13	19730
4	Amphipoda	Gammaridae	Gammarus	NA	Amphipoda_Gammaridae_-Gammarus_NA	9	306,2	17	11946
5	Amphipoda	Gammaridae	Gammarus	pulex	Amphipoda_Gammaridae_-Gammarus_pulex	56	10114,93	46	37726
6	Amphipoda	Gammaridae	Gammarus	tigrinus	Amphipoda_Gammaridae_-Gammarus_tigrinus	NA	NA	3	4952
7	Amphipoda	Gammaridae	Gammarus	zaddachi	Amphipoda_Gammaridae_-Gammarus_zaddachi	NA	NA	2	66925
8	Amphipoda	Gammaridae	NA	NA	Amphipoda_Gammaridae_-Gammarus_NA_NA	1	1	2	124
9	Amphipoda	Pallaseidae	Pallasea	quadrispinosa	Amphipoda_Pallaseidae_Pallasea_quadrispinosa	1	2	NA	NA
10	Amphipoda	Pallaseidae	Pallaseopsis	quadrispinosa	Amphipoda_Pallaseopsis_quadrispinosa	1	1,6	NA	NA
11					Annelida_Clitellata	166	18367,52	NA	NA
12					Annelida_Clitellata	1	41	NA	NA
13					Annelida_Clitellata	38	1850	NA	NA
14	Anomopoda	Bosminidae	Bosmina	cf. longispina	Anomopoda_Bosminidae_Bosmina_cf. longispinaa	NA	NA	16	9937
15	Anomopoda	Bosminidae	Bosmina	NA	Anomopoda_Bosminidae_Bosmina_NA	NA	NA	1	74
16	Anomopoda	Chydoridae	Acroperus	cf. harpae	Anomopoda_Chydoridae_Acroperus_cf. harpae	NA	NA	12	12021
17	Anomopoda	Chydoridae	Alona	affinis	Anomopoda_Chydoridae_Alona_-affinis	NA	NA	4	2262
18	Anomopoda	Chydoridae	Alona	quadrangularis group	Anomopoda_Chydoridae_Alona_-quadrangularis group	NA	NA	3	18130
19	Anomopoda	Chydoridae	Alona	rustica	Anomopoda_Chydoridae_Alona_-rustica	NA	NA	3	356
20	Anomopoda	Chydoridae	Alonella	excisa	Anomopoda_Chydoridae_Alonella_excisa	NA	NA	1	37
21	Anomopoda	Chydoridae	Alonopsis	elongata	Anomopoda_Chydoridae_Alonopsis_elongata	NA	NA	6	799

22	Anomopoda	Chydoridae	Chydorus	cf. sphaericus	Anomopoda_Chydoridae_Chydorus_cf. sphaericus	NA	NA	1	307
23	Anomopoda	Chydoridae	Chydorus	sphaericus	Anomopoda_Chydoridae_Chydorus_sphaericus	NA	NA	3	1773
24	Anomopoda	Daphniidae	Daphnia	cristata	Anomopoda_Daphniidae_Daphnia_cristata	NA	NA	1	34
25	Anomopoda	Daphniidae	Daphnia	lacustris	Anomopoda_Daphniidae_Daphnia_lacustris	NA	NA	3	15662
26	Anomopoda	Daphniidae	Daphnia	laevis	Anomopoda_Daphniidae_Daphnia_laevis	NA	NA	3	2739
27	Anomopoda	Eurycercidae	Eurycercus	lamellatus	Anomopoda_Eurycercidae_Eurycercus_lamellatus	NA	NA	20	36166
28	Anomopoda	Ilyocryptidae	Ilyocryptus	sordidus	Anomopoda_Ilyocryptidae_Ilyocryptus_sordidus	NA	NA	1	45
29	Anomopoda	Macrothricidae	Macrothrix	hirsuticornis	Anomopoda_Macrothricidae_Macrothrix_hirsuticornis	NA	NA	2	1076
30	Anomopoda	Macrothricidae	Ophryoxus	gracilis	Anomopoda_Macrothricidae_Ophryoxus_gracilis	NA	NA	5	473
31	Anomopoda	Macrothricidae	Streblocerus	serricaudis	Anomopoda_Macrothricidae_-Streblocerus_serricaudis	NA	NA	1	204
32	Anomopoda	NA	NA	NA	Anomopoda_NA_NA_NA	NA	NA	1	13
33	Anthoathecata	Hydridae	Hydra	NA	Anthoathecata_Hydridae_Hydra_-NA	4	35	NA	NA
34	Araneae	Dictynidae	Argyroneta	aquatica	Araneae_Dictynidae_Argyroneta_-aquatica	14	9,67	8	323858
35	Araneae	Linyphiidae	Agyneta	rurestris	Araneae_Linyphiidae_Agyneta_rurestris	NA	NA	1	167
36	Araneae	Linyphiidae	Bathyphantes	NA	Araneae_Linyphiidae_Bathyphantes_NA	NA	NA	1	758
37	Araneae	Linyphiidae	Centromerita	bicolor	Araneae_Linyphiidae_Centromerita_bicolor	NA	NA	1	5197
38	Araneae	Linyphiidae	Drapetisca	socialis	Araneae_Linyphiidae_Drapetisca_-socialis	NA	NA	1	3232
39	Araneae	Linyphiidae	Tenuiphantes	cristatus	Araneae_Linyphiidae_Tenuiphantes_cristatus	NA	NA	2	221
40	Arhynchobdellida	Erpobdellidae	Dina	lineata	Arhynchobdellida_Erpobdellidae_-Dina_lineata	NA	NA	2	21423
41	Arhynchobdellida	Erpobdellidae	Dina	NA	Arhynchobdellida_Erpobdellidae_-Dina_NA	NA	NA	1	20824
42	Arhynchobdellida	Erpobdellidae	Erpobdella	monostriata	Arhynchobdellida_Erpobdellidae_-Erpobdella_monostriata	NA	NA	1	11113
43	Arhynchobdellida	Erpobdellidae	Erpobdella	NA	Arhynchobdellida_Erpobdellidae_-Erpobdella_NA	NA	NA	13	403794
44	Arhynchobdellida	Erpobdellidae	Erpobdella	octoculata	Arhynchobdellida_Erpobdellidae_-Erpobdella_octoculata	NA	NA	31	384155
45	Arhynchobdellida	Erpobdellidae	Erpobdella	testacea	Arhynchobdellida_Erpobdellidae_-Erpobdella_testacea	NA	NA	3	1190

46	Arhynchobdellida	Erpobdellidae	NA	NA	Arhynchobdellida_Erpobdellidae_-NA_NA	NA	NA	4	38978
47	Arhynchobdellida	Haemopidae	Haemopis	sanguisuga	Arhynchobdellida_Haemopidae_-Haemopis_sanguisuga	NA	NA	2	91412
48					Arthropoda_Arachnida	28	155	NA	NA
49					Arthropoda_Arachnida	14	163	NA	NA
50					Arthropoda_Collembola	1	1	NA	NA
51					Arthropoda_Hexanauplia	8	6336	NA	NA

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
53	Calanoida	Diaptomidae	Eudiaptomus	gracilis	Calanoida_Diaptomidae_Eudiaptomus_gracilis	NA	NA	4	570
54	Calanoida	Diaptomidae	Leptodiaptomus	minutus	Calanoida_Diaptomidae_Leptodiaptomus_minutus	NA	NA	1	9036
55	Calanoida	Diaptomidae	Mixodiaptomus	NA	Calanoida_Diaptomidae_Mixodiaptomus_NA	NA	NA	1	73
56	Calanoida	Diaptomidae	NA	NA	Calanoida_Diaptomidae_NA_NA	NA	NA	2	4098
57	Calanoida	NA	NA	NA	Calanoida_NA_NA_NA	10	90	NA	NA
58	Calanoida	Temoridae	Heterocope	NA	Calanoida_Temoridae_Heterocope_NA	1	1	NA	NA
59	Coleoptera	Brentidae	Betulapion	simile	Coleoptera_Brentidae_Betulapion_simile	NA	NA	1	16
60	Coleoptera	Cantharidae	Cantharis	thoracica	Coleoptera_Cantharidae_Cantharis_thoracica	NA	NA	1	103
61	Coleoptera	Chrysomelidae	Donacia	NA	Coleoptera_Chrysomelidae_Donacia_NA	1	4	NA	NA
62	Coleoptera	Chrysomelidae	Donacia	versicolorea	Coleoptera_Chrysomelidae_Donacia_versicolorea	NA	NA	1	839
63	Coleoptera	Chrysomelidae	Galerucella	lineola	Coleoptera_Chrysomelidae_Galerucella_lineola	NA	NA	1	39
64	Coleoptera	Chrysomelidae	NA	NA	Coleoptera_Chrysomelidae_NA_-NA	1	1	NA	NA
65	Coleoptera	Curculionidae	NA	NA	Coleoptera_Curculionidae_NA_NA	2	1,2	NA	NA
66	Coleoptera	Dryopidae	Dryops	luridus	Coleoptera_Dryopidae_Dryops_luridus	NA	NA	1	61
67	Coleoptera	Dryopidae	Dryops	NA	Coleoptera_Dryopidae_Dryops_-NA	1	0,2	NA	NA
68	Coleoptera	Dytiscidae	Agabus	arcticus	Coleoptera_Dytiscidae_Agabus_-arcticus	1	0,4	2	130546
69	Coleoptera	Dytiscidae	Agabus	bipustulatus	Coleoptera_Dytiscidae_Agabus_-bipustulatus	NA	NA	4	22798

70	Coleoptera	Dytiscidae	Agabus	guttatus	Coleoptera_Dytiscidae_Agabus_guttatus	NA	NA	4	7676
71	Coleoptera	Dytiscidae	Agabus	NA	Coleoptera_Dytiscidae_Agabus_NA	4	2,6	NA	NA
72	Coleoptera	Dytiscidae	Agabus	paludosus	Coleoptera_Dytiscidae_Agabus_paludosus	2	3	2	8070
73	Coleoptera	Dytiscidae	Boreonectes	multilineatus	Coleoptera_Dytiscidae_Boreonectes_multilineatus	1	0,2	NA	NA
74	Coleoptera	Dytiscidae	Graptodytes	granularis	Coleoptera_Dytiscidae_Graptodytes_granularis	NA	NA	2	3321
75	Coleoptera	Dytiscidae	Graptodytes	NA	Coleoptera_Dytiscidae_Graptodytes_NA	1	1	NA	NA
76	Coleoptera	Dytiscidae	Graptodytes	pictus	Coleoptera_Dytiscidae_Graptodytes_pictus	1	0,2	NA	NA
77	Coleoptera	Dytiscidae	Hydroporus	NA	Coleoptera_Dytiscidae_Hydroporus_NA	5	3,6	NA	NA
78	Coleoptera	Dytiscidae	Hydroporus	palustris	Coleoptera_Dytiscidae_Hydroporus_palustris	NA	NA	2	1525
79	Coleoptera	Dytiscidae	Hygrotus	quinquelineatus	Coleoptera_Dytiscidae_Hygrotus_quinquelineatus	NA	NA	2	1433
80	Coleoptera	Dytiscidae	Hygrotus	versicolor	Coleoptera_Dytiscidae_Hygrotus_versicolor	3	3,4	3	210752
81	Coleoptera	Dytiscidae	Ilybius	fenestratus	Coleoptera_Dytiscidae_Ilybius_fenestratus	NA	NA	2	211
82	Coleoptera	Dytiscidae	Ilybius	guttiger	Coleoptera_Dytiscidae_Ilybius_guttiger	NA	NA	1	965
83	Coleoptera	Dytiscidae	Ilybius	NA	Coleoptera_Dytiscidae_Ilybius_NA	1	1	NA	NA
84	Coleoptera	Dytiscidae	NA	NA	Coleoptera_Dytiscidae_NA_NA	2	2	4	12307
85	Coleoptera	Dytiscidae	NA	NA	Coleoptera_Dytiscidae_NA_NA	25	51,64	4	12307
86	Coleoptera	Dytiscidae	Nebrioporus	assimilis	Coleoptera_Dytiscidae_Nebrioporus_assimilis	2	0,6	NA	NA
87	Coleoptera	Dytiscidae	Nebrioporus	depressus	Coleoptera_Dytiscidae_Nebrioporus_depressus	9	19,4	7	32471
88	Coleoptera	Dytiscidae	Oreodytes	alpinus	Coleoptera_Dytiscidae_Oreodytes_alpinus	1	0,2	NA	NA
89	Coleoptera	Dytiscidae	Oreodytes	davisii	Coleoptera_Dytiscidae_Oreodytes_davisii	NA	NA	2	8282
90	Coleoptera	Dytiscidae	Oreodytes	NA	Coleoptera_Dytiscidae_Oreodytes_NA	1	1	NA	NA
91	Coleoptera	Dytiscidae	Oreodytes	sanmarkii	Coleoptera_Dytiscidae_Oreodytes_sanmarkii	10	104,6	12	230276
92	Coleoptera	Dytiscidae	Platambus	maculatus	Coleoptera_Dytiscidae_Platambus_maculatus	9	39,6	8	226947
93	Coleoptera	Dytiscidae	Porhydrus	lineatus	Coleoptera_Dytiscidae_Porhydrus_lineatus	1	0,4	2	734
94	Coleoptera	Dytiscidae	Scarodytes	halensis	Coleoptera_Dytiscidae_Scarody-	1	1	1	1172

					tes_halensis				
95	Coleoptera	Dytiscidae	Stictotarsus	duodecimpus-tulatus	Coleoptera_Dytiscidae_Stictotar-sus_duodecimpustulatus	2	2	2	900
96	Coleoptera	Dytiscidae	Stictotarsus	multilineatus	Coleoptera_Dytiscidae_Stictotar-sus_multilineatus	NA	NA	1	7488
97	Coleoptera	Elmidae	Elmis	aenea	Coleoptera_Elmidae_Elmis_aene	94	2928,74	96	413584
98	Coleoptera	Elmidae	Limnius	volckmari	Coleoptera_Elmidae_Limnius_-volckmari	53	2325,69	47	607494
99	Coleoptera	Elmidae	NA	NA	Coleoptera_Elmidae_NA_NA	6	177	23	3776
100	Coleoptera	Elmidae	Oulimnius	NA	Coleoptera_Elmidae_Oulimnius_-NA	35	227,28	17	3085
101	Coleoptera	Elmidae	Oulimnius	troglodytes	Coleoptera_Elmidae_Oulimnius_-troglodytes	NA	NA	9	29466
102	Coleoptera	Elmidae	Oulimnius	tuberculatus	Coleoptera_Elmidae_Oulimnius_-tuberculatus	41	1415,8	52	308486
103	Coleoptera	Elmidae	Riolus	cupreus	Coleoptera_Elmidae_Riolus_cup-reus	1	0,8	NA	NA
104	Coleoptera	Elmidae	Stenelmis	canaliculata	Coleoptera_Elmidae_Stenelmis_-canaliculata	2	30	2	33117
105	Coleoptera	Gyrinidae	Gyrinus	marinus	Coleoptera_Gyrinidae_Gyrinus_-marinus	NA	NA	1	86373
106	Coleoptera	Gyrinidae	Gyrinus	NA	Coleoptera_Gyrinidae_Gyrinus_NA	1	0,2	NA	NA
107	Coleoptera	Gyrinidae	NA	NA	Coleoptera_Gyrinidae_NA_NA	NA	NA	10	12908
108	Coleoptera	Gyrinidae	Orectochilus	villosus	Coleoptera_Gyrinidae_Orectochi-lus_villosus	15	99,6	14	80959
109	Coleoptera	Haliplidae	Brychius	elevatus	Coleoptera_Haliplidae_Brychius_-elevatus	2	2	1	44
110	Coleoptera	Haliplidae	Haliplus	confinis	Coleoptera_Haliplidae_Haliplus_-confinis	NA	NA	1	19
111	Coleoptera	Haliplidae	Haliplus	fluviatilis	Coleoptera_Haliplidae_Haliplus_-fluviatilis	NA	NA	1	52
112	Coleoptera	Haliplidae	Haliplus	immaculatus	Coleoptera_Haliplidae_Haliplus_-immaculatus	NA	NA	2	327
113	Coleoptera	Haliplidae	Haliplus	lineolatus	Coleoptera_Haliplidae_Haliplus_li-neolatus	NA	NA	6	2398
114	Coleoptera	Haliplidae	Haliplus	NA	Coleoptera_Haliplidae_Haliplus_-NA	14	28,6	NA	NA
115	Coleoptera	Haliplidae	Haliplus	ruficollis	Coleoptera_Haliplidae_Haliplus_-ruficollis	NA	NA	1	23
116	Coleoptera	Helophoridae	Helophorus	NA	Coleoptera_Helophoridae_Helo-phorus_NA	1	1	NA	NA
117	Coleoptera	Hydraenidae	Hydraena	gracilis	Coleoptera_Hydraenidae_Hydrae-na_gracilis	11	28,87	14	10224
118	Coleoptera	Hydraenidae	Hydraena	NA	Coleoptera_Hydraenidae_Hydrae-na_NA	33	200,47	NA	NA

119	Coleoptera	Hydraenidae	Hydraena	pulchella	Coleoptera_Hydraenidae_Hydraena_pulchella	NA	NA	2	68
120	Coleoptera	Hydraenidae	Hydraena	riparia	Coleoptera_Hydraenidae_Hydraena_riparia	7	19,04	6	1716
121	Coleoptera	Hydraenidae	Limnebius	NA	Coleoptera_Hydraenidae_Limnebius_NA	3	5	NA	NA
122	Coleoptera	Hydraenidae	Limnebius	papposus	Coleoptera_Hydraenidae_Limnebius_papposus	NA	NA	1	44
123	Coleoptera	Hydraenidae	NA	NA	Coleoptera_Hydraenidae_NA_NA	4	6,2	NA	NA
124	Coleoptera	Hydraenidae	Ochthebius	NA	Coleoptera_Hydraenidae_Ochthebius_NA	1	3	NA	NA
125	Coleoptera	Hydrophilidae	Anacaena	limbata	Coleoptera_Hydraenidae_Anacaena_limbata	NA	NA	1	139
126	Coleoptera	Hydrophilidae	Anacaena	NA	Coleoptera_Hydraenidae_Anacaena_NA	2	4	NA	NA
127	Coleoptera	Hydrophilidae	NA	NA	Coleoptera_Hydraenidae_NA_NA	4	3,2	NA	NA
128	Coleoptera	Latridiidae	Cortinicara	gibbosa	Coleoptera_Latridiidae_Cortinicara_gibbosa	NA	NA	1	28
129	Coleoptera	NA	NA	NA	Coleoptera_NA_NA_NA	1	1	NA	NA
130	Coleoptera	Scirtidae	Contacyphon	NA	Coleoptera_Scirtidae_Contacyphon_NA	1	1	NA	NA
131	Coleoptera	Scirtidae	Contacyphon	ochraceus	Coleoptera_Scirtidae_Contacyphon_ochraceus	NA	NA	1	118
132	Coleoptera	Scirtidae	Elodes	elongata	Coleoptera_Scirtidae_Elodes_-elongata	NA	NA	3	1686
133	Coleoptera	Scirtidae	Elodes	marginata	Coleoptera_Scirtidae_Elodes_-marginata	NA	NA	2	229
134	Coleoptera	Scirtidae	Elodes	minuta	Coleoptera_Scirtidae_Elodes_minuta	17	65	16	112029
135	Coleoptera	Scirtidae	Elodes	NA	Coleoptera_Scirtidae_Elodes_NA	11	42,5	NA	NA
136	Coleoptera	Scirtidae	NA	NA	Coleoptera_Scirtidae_NA_NA	2	9	NA	NA
137	Coleoptera	Scirtidae	Scirtes	hemisphaericus	Coleoptera_Scirtidae_Scirtes_hemisphaericus	NA	NA	1	56
138	Coleoptera	Staphylinidae	Anthobium	atrocephalum	Coleoptera_Staphylinidae_Anthobium_atrocephalum	NA	NA	1	150
139	Coleoptera	Staphylinidae	Gabrius	trossulus	Coleoptera_Staphylinidae_Gabrius_trossulus	NA	NA	1	95
140	Ctenopoda	Holopediidae	Holopedium	gibberum	Ctenopoda_Holopediidae_Holopedium_gibberum	NA	NA	7	4476
141	Ctenopoda	Sididae	Sida	NA	Ctenopoda_Sididae_Sida_NA	NA	NA	15	29815
142	Cycloneritida	Neritidae	Theodoxus	fluviatilis	Cycloneritida_Neritidae_Theodoxus_fluviatilis	2	1,4	1	4066
143	Cyclopoida	Cyclopidae	Acanthocyclops	capillatus	Cyclopoida_Cyclopidae_Acanthocyclops_capillatus	NA	NA	11	3519
144	Cyclopoida	Cyclopidae	Acanthocyclops	cf. vernalis	Cyclopoida_Cyclopidae_Acantho-	NA	NA	2	219

					cyclops_cf. vernalis				
145	Cyclopoida	Cyclopidae	Acanthocyclops	NA	Cyclopoida_Cyclopidae_Acanthocyclops_NA	NA	NA	2	166
146	Cyclopoida	Cyclopidae	Cyclops	abyssorum	Cyclopoida_Cyclopidae_Cyclops_abyssorum	NA	NA	2	972
147	Cyclopoida	Cyclopidae	Diacyclops	bicuspidatus	Cyclopoida_Cyclopidae_Diacyclops_bicuspidatus	NA	NA	2	165
148	Cyclopoida	Cyclopidae	Eucyclops	cf. serrulatus	Cyclopoida_Cyclopidae_Eucyclops_cf. serrulatus	NA	NA	5	1059
149	Cyclopoida	Cyclopidae	Macrocyclops	fuscus	Cyclopoida_Cyclopidae_Macrocyclops_fuscus	NA	NA	2	1186
150	Cyclopoida	Cyclopidae	Megacyclops	NA	Cyclopoida_Cyclopidae_Megacyclops_NA	NA	NA	11	13946
151	Cyclopoida	Cyclopidae	Megacyclops	viridis	Cyclopoida_Cyclopidae_Megacyclops_viridis	NA	NA	1	1397
152	Cyclopoida	Cyclopidae	Mesocyclops	leuckarti	Cyclopoida_Cyclopidae_Mesocyclops_leuckarti	NA	NA	4	266
153	Cyclopoida	Cyclopidae	Paracyclops	fimbriatus	Cyclopoida_Cyclopidae_Paracyclops_fimbriatus	NA	NA	2	121
154	Cyclopoida	NA	NA	NA	Cyclopoida_NA_NA_NA	29	321	NA	NA
	Order	**Family**	**Genus**	**Species**	**Taxon**	**Morpho Samples**	**Morpho Abundances**	**DNA samples**	**DNA reads**
155	Decapoda	Astacidae	Astacus	astacus	Decapoda_Astacidae_Astacus_astacus	4	1507	2	112333
156	Decapoda	Astacidae	Pacifastacus	leniusculus	Decapoda_Astacidae_Pacifastacus_leniusculus	2	1,2	1	333
157	Diplostraca	Bosminidae	Bosmina	NA	Diplostraca_Bosminidae_Bosmina_NA	10	59	NA	NA
158	Diplostraca	Chydoridae	NA	NA	Diplostraca_Chydoridae_NA_NA	26	288	NA	NA
159	Diplostraca	Daphniidae	Daphnia	NA	Diplostraca_Daphniidae_Daphnia_NA	3	26	NA	NA
160	Diplostraca	Eurycercidae	Eurycercus	lamellatus	Diplostraca_Eurycercidae_Eurycercus_lamellatus	20	246	NA	NA
161	Diplostraca	Holopediidae	Holopedium	gibberum	Diplostraca_Holopediidae_Holopedium_gibberum	4	36	NA	NA
162	Diplostraca	Macrotrichidae	NA	NA	Diplostraca_Macrotrichidae_NA_NA	19	265	NA	NA
163	Diplostraca	NA	NA	NA	Diplostraca_NA_NA_NA	7	5199	NA	NA
164	Diplostraca	Polyphemidae	Polyphemus	pediculus	Diplostraca_Polyphemidae_Polyphemus_pediculus	2	4	NA	NA
165	Diplostraca	Sididae	Sida	crystallina	Diplostraca_Sididae_Sida_crystallina	18	331	NA	NA
166	Diptera	Anthomyiidae	Egle	NA	Diptera_Anthomyiidae_Egle_NA	NA	NA	1	229

167	Diptera	Athericidae	Atherix	ibis	Diptera_Athericidae_Atherix_ibis	7	7,6	7	119131
168	Diptera	Athericidae	Atherix	NA	Diptera_Athericidae_Atherix_NA	NA	NA	6	18669
169	Diptera	Athericidae	Ibisia	marginata	Diptera_Athericidae_Ibisia_marginata	1	0,8	NA	NA
170	Diptera	Athericidae	NA	NA	Diptera_Athericidae_NA_NA	3	8	NA	NA
171	Diptera	Bibionidae	Bibio	clavipes	Diptera_Bibionidae_Bibio_clavipes	NA	NA	1	487
172	Diptera	Cecidomyiidae	NA	NA	Diptera_Cecidomyiidae_NA_NA	NA	NA	3	1941
173	Diptera	Ceratopogonidae	Bezzia	annulipes	Diptera_Ceratopogonidae_Bezzia_annulipes	NA	NA	10	21294
174	Diptera	Ceratopogonidae	Bezzia	NA	Diptera_Ceratopogonidae_Bezzia_NA	16	68	11	20446
175	Diptera	Ceratopogonidae	Bezzia	nobilis	Diptera_Ceratopogonidae_Bezzia_nobilis	NA	NA	7	1321
176	Diptera	Ceratopogonidae	Culicoides	festivipennis	Diptera_Ceratopogonidae_Culicoides_festivipennis	NA	NA	1	70
177	Diptera	Ceratopogonidae	Culicoides	NA	Diptera_Ceratopogonidae_Culicoides_NA	NA	NA	1	342
178	Diptera	Ceratopogonidae	Dasyhelea	modesta	Diptera_Ceratopogonidae_Dasyhelea_modesta	NA	NA	6	10776
179	Diptera	Ceratopogonidae	Dasyhelea	NA	Diptera_Ceratopogonidae_Dasyhelea_NA	NA	NA	1	20
180	Diptera	Ceratopogonidae	Mallochohelea	NA	Diptera_Ceratopogonidae_Mallochohelea_NA	NA	NA	4	1183
181	Diptera	Ceratopogonidae	NA	NA	Diptera_Ceratopogonidae_NA_NA	119	1127,17	9	3536
182	Diptera	Ceratopogonidae	Palpomyia	flavipes	Diptera_Ceratopogonidae_Palpomyia_flavipes	NA	NA	27	41962
183	Diptera	Ceratopogonidae	Palpomyia	lineata	Diptera_Ceratopogonidae_Palpomyia_lineata	NA	NA	25	220907
184	Diptera	Ceratopogonidae	Palpomyia	NA	Diptera_Ceratopogonidae_Palpomyia_NA	NA	NA	17	4202
185	Diptera	Ceratopogonidae	Palpomyia	nigripes	Diptera_Ceratopogonidae_Palpomyia_nigripes	NA	NA	2	1675
186	Diptera	Ceratopogonidae	Palpomyia	remmi	Diptera_Ceratopogonidae_Palpomyia_remmi	NA	NA	13	6614
187	Diptera	Ceratopogonidae	Probezzia	seminigra	Diptera_Ceratopogonidae_Probezzia_seminigra	NA	NA	3	5358
188	Diptera	Ceratopogonidae	Sphaeromias	fasciatus	Diptera_Ceratopogonidae_Sphaeromias_fasciatus	NA	NA	2	24726
189	Diptera	Chaoboridae	Chaoborus	flavicans	Diptera_Chaoboridae_Chaoborus_flavicans	13	1321,4	11	663403
190	Diptera	Chaoboridae	Chaoborus	obscuripes	Diptera_Chaoboridae_Chaoborus_obscuripess	1	0,2	NA	NA
191	Diptera	Chironomidae	Ablabesmyia	aspera	Diptera_Chironomidae_Ablabesmyia_aspera	NA	NA	4	313
192	Diptera	Chironomidae	Ablabesmyia	longistyla	Diptera_Chironomidae_Ablabesmyia_longistyla	7	16,53	12	20497

193	Diptera	Chironomidae	Ablabesmyia	monilis	Diptera_Chironomidae_Ablabesmyia_monilis	11	22,2	16	149383
194	Diptera	Chironomidae	Ablabesmyia	NA	Diptera_Chironomidae_Ablabesmyia_NA	4	2,6	11	62569
195	Diptera	Chironomidae	Ablabesmyia	phatta	Diptera_Chironomidae_Ablabesmyia_phatta	4	2,2	NA	NA
196	Diptera	Chironomidae	Acamptocladius	submontanus	Diptera_Chironomidae_Acamptocladius_submontanus	5	3,8	NA	NA
197	Diptera	Chironomidae	Apsectrotanypus	trifascipennis	Diptera_Chironomidae_Apsectrotanypus_trifascipennis	9	120	17	102576
198	Diptera	Chironomidae	Arctopelopia	barbitarsis	Diptera_Chironomidae_Arctopelopia_barbitarsis	NA	NA	52	131887
199	Diptera	Chironomidae	Brillia	bifida	Diptera_Chironomidae_Brillia_bifida	10	73	33	198837
200	Diptera	Chironomidae	Brillia	longifurca	Diptera_Chironomidae_Brillia_longifurca	NA	NA	5	747
201	Diptera	Chironomidae	Brillia	NA	Diptera_Chironomidae_Brillia_NA	1	0,2	NA	NA
202	Diptera	Chironomidae	Cardiocladius	capucinus	Diptera_Chironomidae_Cardiocladius_capucinus	NA	NA	2	21540
203	Diptera	Chironomidae	Chaetocladius	dissipatus	Diptera_Chironomidae_Chaetocladius_dissipatus	NA	NA	2	1952
204	Diptera	Chironomidae	Chaetocladius	laminatus	Diptera_Chironomidae_Chaetocladius_laminatus	NA	NA	3	4912
205	Diptera	Chironomidae	Chaetocladius	melaleucus	Diptera_Chironomidae_Chaetocladius_melaleucus	NA	NA	5	4888
206	Diptera	Chironomidae	Chaetocladius	NA	Diptera_Chironomidae_Chaetocladius_NA	NA	NA	3	749
207	Diptera	Chironomidae	Chaetocladius	piger	Diptera_Chironomidae_Chaetocladius_piger	NA	NA	3	224
208	Diptera	Chironomidae	Chironomus	agilis2	Diptera_Chironomidae_Chironomus_agilis2	NA	NA	1	50467
209	Diptera	Chironomidae	Chironomus	anthracinus	Diptera_Chironomidae_Chironomus_anthracinus	2	49	3	267280
210	Diptera	Chironomidae	Chironomus	cf. aprilinus	Diptera_Chironomidae_Chironomus_cf. aprilinus	NA	NA	1	16297
211	Diptera	Chironomidae	Chironomus	cf. tenuistylus	Diptera_Chironomidae_Chironomus_cf. tenuistylus	NA	NA	5	91665
212	Diptera	Chironomidae	Chironomus	cingulatus	Diptera_Chironomidae_Chironomus_cingulatus	NA	NA	1	56710
213	Diptera	Chironomidae	Chironomus	curabilis	Diptera_Chironomidae_Chironomus_curabilis	NA	NA	2	15696
214	Diptera	Chironomidae	Chironomus	mendax	Diptera_Chironomidae_Chironomus_mendax	NA	NA	1	46
215	Diptera	Chironomidae	Chironomus	NA	Diptera_Chironomidae_Chironomus_NA	1	4	16	220406
216	Diptera	Chironomidae	Chironomus	NA	Diptera_Chironomidae_Chironomus_NA	1	58	16	220406

217	Diptera	Chironomidae	Chironomus	plumosus	Diptera_Chironomidae_Chironomus_plumosus	7	207	10	1096568
218	Diptera	Chironomidae	Chironomus	plumosus	Diptera_Chironomidae_Chironomus_plumosus	3	17	10	1096568
219	Diptera	Chironomidae	Chironomus	storai	Diptera_Chironomidae_Chironomus_storai	NA	NA	1	2231
220	Diptera	Chironomidae	Cladopelma	NA	Diptera_Chironomidae_Cladopelma_NA	5	26,6	NA	NA
221	Diptera	Chironomidae	Cladopelma	viridulum	Diptera_Chironomidae_Cladopelma_viridulum	2	4	5	18707
222	Diptera	Chironomidae	Cladotanytarsus	atridorsum	Diptera_Chironomidae_Cladotanytarsus_atridorsum	NA	NA	3	9940
223	Diptera	Chironomidae	Cladotanytarsus	mancus	Diptera_Chironomidae_Cladotanytarsus_mancus	NA	NA	16	61180
224	Diptera	Chironomidae	Cladotanytarsus	NA	Diptera_Chironomidae_Cladotanytarsus_NA	14	282,4	10	5712
225	Diptera	Chironomidae	Cladotanytarsus	nigrovittatus	Diptera_Chironomidae_Cladotanytarsus_nigrovittatus	NA	NA	3	3503
226	Diptera	Chironomidae	Cladotanytarsus	nr. vanderwulpi	Diptera_Chironomidae_Cladotanytarsus_nr. vanderwulpi	NA	NA	1	1562
227	Diptera	Chironomidae	Cladotanytarsus	pallidus	Diptera_Chironomidae_Cladotanytarsus_pallidus	NA	NA	4	1364
228	Diptera	Chironomidae	Clinotanypus	nervosus	Diptera_Chironomidae_Clinotanypus_nervosus	5	11	7	81745
229	Diptera	Chironomidae	Conchapelopia	aagaardi	Diptera_Chironomidae_Conchapelopia_aagaardi	NA	NA	5	620
230	Diptera	Chironomidae	Conchapelopia	hittmairorum	Diptera_Chironomidae_Conchapelopia_hittmairorum	NA	NA	29	46908
231	Diptera	Chironomidae	Conchapelopia	melanops	Diptera_Chironomidae_Conchapelopia_melanops	NA	NA	59	103169
232	Diptera	Chironomidae	Conchapelopia	NA	Diptera_Chironomidae_Conchapelopia_NA	36	317,47	NA	NA
233	Diptera	Chironomidae	Constempellina	NA	Diptera_Chironomidae_Constempellina_NA	2	1,6	NA	NA
234	Diptera	Chironomidae	Corynocera	ambigua	Diptera_Chironomidae_Corynocera_ambigua	1	3,6	NA	NA
235	Diptera	Chironomidae	Corynoneura	arctica	Diptera_Chironomidae_Corynoneura_arctica	NA	NA	4	6055
236	Diptera	Chironomidae	Corynoneura	coronata	Diptera_Chironomidae_Corynoneura_coronata	NA	NA	1	22
237	Diptera	Chironomidae	Corynoneura	edwardsi	Diptera_Chironomidae_Corynoneura_edwardsi	NA	NA	8	4866
238	Diptera	Chironomidae	Corynoneura	fittkaui	Diptera_Chironomidae_Corynoneura_fittkaui	NA	NA	1	301
239	Diptera	Chironomidae	Corynoneura	lacustris	Diptera_Chironomidae_Corynoneura_lacustris	NA	NA	6	6553
240	Diptera	Chironomidae	Corynoneura	lobata	Diptera_Chironomidae_Corynoneura_lobata	NA	NA	5	764

241	Diptera	Chironomidae	Corynoneura	NA	Diptera_Chironomidae_Corynoneura_NA	17	23	7	4223
242	Diptera	Chironomidae	Cricotopus	annulator	Diptera_Chironomidae_Cricotopus_annulator	NA	NA	7	11663
243	Diptera	Chironomidae	Cricotopus	bicinctus	Diptera_Chironomidae_Cricotopus_bicinctus	NA	NA	21	78358
244	Diptera	Chironomidae	Cricotopus	cf. curtus	Diptera_Chironomidae_Cricotopus_cf. curtus	NA	NA	1	54
245	Diptera	Chironomidae	Cricotopus	coronatus	Diptera_Chironomidae_Cricotopus_coronatus	NA	NA	3	5594
246	Diptera	Chironomidae	Cricotopus	festivellus	Diptera_Chironomidae_Cricotopus_festivellus	NA	NA	4	1806
247	Diptera	Chironomidae	Cricotopus	fuscus	Diptera_Chironomidae_Cricotopus_fuscus	NA	NA	1	206
248	Diptera	Chironomidae	Cricotopus	intersectus	Diptera_Chironomidae_Cricotopus_intersectus	NA	NA	2	797
249	Diptera	Chironomidae	Cricotopus	laricomalis	Diptera_Chironomidae_Cricotopus_laricomalis	NA	NA	5	11760
250	Diptera	Chironomidae	Cricotopus	NA	Diptera_Chironomidae_NA	17	149,2	12	12507
251	Diptera	Chironomidae	Cricotopus	ornatus	Diptera_Chironomidae_Cricotopus_ornatus	NA	NA	1	52
252	Diptera	Chironomidae	Cricotopus	osellai	Diptera_Chironomidae_Cricotopus_osellai	NA	NA	2	905
253	Diptera	Chironomidae	Cricotopus	pallidipes	Diptera_Chironomidae_Cricotopus_pallidipes	NA	NA	4	4956
254	Diptera	Chironomidae	Cricotopus	patens	Diptera_Chironomidae_Cricotopus_patens	NA	NA	3	1738
255	Diptera	Chironomidae	Cricotopus	pulchripes	Diptera_Chironomidae_Cricotopus_pulchripes	NA	NA	8	18042
256	Diptera	Chironomidae	Cricotopus	reversus	Diptera_Chironomidae_Cricotopus_reversus	NA	NA	5	6417
257	Diptera	Chironomidae	Cricotopus	rufiventris	Diptera_Chironomidae_Cricotopus_rufiventris	NA	NA	6	2353
258	Diptera	Chironomidae	Cricotopus	similis	Diptera_Chironomidae_Cricotopus_similis	NA	NA	7	9353
259	Diptera	Chironomidae	Cricotopus	skirwithensis	Diptera_Chironomidae_Cricotopus_skirwithensis	NA	NA	18	38498
260	Diptera	Chironomidae	Cricotopus	sp.2ES	Diptera_Chironomidae_Cricotopus_sp. 2ES	NA	NA	3	139527
261	Diptera	Chironomidae	Cricotopus	sylvestris	Diptera_Chironomidae_Cricotopus_sylvestris	NA	NA	7	2492
262	Diptera	Chironomidae	Cricotopus	tibialis	Diptera_Chironomidae_Cricotopus_tibialis	NA	NA	1	5595
263	Diptera	Chironomidae	Cricotopus	tremulus	Diptera_Chironomidae_Cricotopus_tremulus	NA	NA	2	87
264	Diptera	Chironomidae	Cricotopus	triannulatus	Diptera_Chironomidae_Cricotopus_triannulatus	NA	NA	3	2107

265	Diptera	Chironomidae	Cryptochironomus	albofasciatus	Diptera_Chironomidae_Cryptochironomus_albofasciatus	NA	NA	4	4492
266	Diptera	Chironomidae	Cryptochironomus	NA	Diptera_Chironomidae_Cryptochironomus_NA	6	6,6	1	1899
267	Diptera	Chironomidae	Cryptochironomus	supplicans	Diptera_Chironomidae_Cryptochironomus_supplicans	NA	NA	3	21134
268	Diptera	Chironomidae	Demicryptochironomus	NA	Diptera_Chironomidae_Demicryptochironomus_NA	NA	NA	5	30791
269	Diptera	Chironomidae	Demicryptochironomus	vulneratus	Diptera_Chironomidae_Demicryptochironomus_vulneratus	9	12,6	13	31317
270	Diptera	Chironomidae	Diamesa	bertrami	Diptera_Chironomidae_Diamesa_bertrami	NA	NA	7	117341
271	Diptera	Chironomidae	Diamesa	bohemani	Diptera_Chironomidae_Diamesa_bohemani	NA	NA	8	196572
272	Diptera	Chironomidae	Diamesa	incallida	Diptera_Chironomidae_Diamesa_incallida	NA	NA	1	2770
273	Diptera	Chironomidae	Diamesa	insignipes	Diptera_Chironomidae_Diamesa_insignipes	3	15	3	10502
274	Diptera	Chironomidae	Diamesa	latitarsis	Diptera_Chironomidae_Diamesa_latitarsis	NA	NA	5	36927
275	Diptera	Chironomidae	Diamesa	NA	Diptera_Chironomidae_Diamesa_NA	NA	NA	5	156178
276	Diptera	Chironomidae	Diamesa	serratosioi	Diptera_Chironomidae_Diamesa_serratosioi	NA	NA	2	297
277	Diptera	Chironomidae	Dicrotendipes	lobiger	Diptera_Chironomidae_Dicrotendipes_lobiger	NA	NA	1	19
278	Diptera	Chironomidae	Dicrotendipes	modestus	Diptera_Chironomidae_Dicrotendipes_modestus	NA	NA	20	513847
279	Diptera	Chironomidae	Dicrotendipes	NA	Diptera_Chironomidae_Dicrotendipes_NA	10	60,13	4	22803
280	Diptera	Chironomidae	Dicrotendipes	nervosus	Diptera_Chironomidae_Dicrotendipes_nervosus	NA	NA	1	45
281	Diptera	Chironomidae	Dicrotendipes	tritomus	Diptera_Chironomidae_Dicrotendipes_tritomus	NA	NA	3	1747
282	Diptera	Chironomidae	Diplocladius	cultriger	Diptera_Chironomidae_Diplocladius_cultriger	1	14	5	2474
283	Diptera	Chironomidae	Einfeldia	NA	Diptera_Chironomidae_Einfeldia_NA	1	3	NA	NA
284	Diptera	Chironomidae	Endochironomus	NA	Diptera_Chironomidae_Endochironomus_NA	8	12,8	NA	NA
285	Diptera	Chironomidae	Endochironomus	tendens	Diptera_Chironomidae_Endochironomus_tendens	NA	NA	10	44383
286	Diptera	Chironomidae	Epoicocladius	ephemerae	Diptera_Chironomidae_Epoicocladius_ephemerae	4	10,4	2	923
287	Diptera	Chironomidae	Eukiefferiella	brevicalcar	Diptera_Chironomidae_Eukiefferiella_brevicalcar	NA	NA	4	4269
288	Diptera	Chironomidae	Eukiefferiella	claripennis	Diptera_Chironomidae_Eukiefferiella_claripennis	NA	NA	16	59477

289	Diptera	Chironomidae	Eukiefferiella	dittmari	Diptera_Chironomidae_Eukiefferiella_dittmari	NA	NA	1	70
290	Diptera	Chironomidae	Eukiefferiella	ilkleyensis	Diptera_Chironomidae_Eukiefferiella_ilkleyensis	NA	NA	7	6150
291	Diptera	Chironomidae	Eukiefferiella	minor	Diptera_Chironomidae_Eukiefferiella_minor	NA	NA	17	794849
292	Diptera	Chironomidae	Eukiefferiella	NA	Diptera_Chironomidae_Eukiefferiella_NA	5	31	NA	NA
293	Diptera	Chironomidae	Georthocladius	NA	Diptera_Chironomidae_Georthocladius_NA	1	0,53	NA	NA
294	Diptera	Chironomidae	Glyptotendipes	cauliginellus	Diptera_Chironomidae_Glyptotendipes_cauliginellus	NA	NA	11	9768
295	Diptera	Chironomidae	Glyptotendipes	lobiferus	Diptera_Chironomidae_Glyptotendipes_lobiferus	NA	NA	3	1624
296	Diptera	Chironomidae	Glyptotendipes	NA	Diptera_Chironomidae_Glyptotendipes_NA	8	16,93	2	832
297	Diptera	Chironomidae	Glyptotendipes	pallens	Diptera_Chironomidae_Glyptotendipes_pallens	NA	NA	18	698233
298	Diptera	Chironomidae	Glyptotendipes	paripes	Diptera_Chironomidae_Glyptotendipes_paripes	NA	NA	11	543487
299	Diptera	Chironomidae	Glyptotendipes	scirpi	Diptera_Chironomidae_Glyptotendipes_scirpi	NA	NA	1	380
300	Diptera	Chironomidae	Heleniella	NA	Diptera_Chironomidae_Heleniella_NA	NA	NA	1	62
301	Diptera	Chironomidae	Heterotanytarsus	apicalis	Diptera_Chironomidae_Heterotanytarsus_apicalis	8	106,8	6	1933
302	Diptera	Chironomidae	Heterotrissocladius	grimshawi	Diptera_Chironomidae_Heterotrissocladius_grimshawi	8	121,6	2	9109
303	Diptera	Chironomidae	Heterotrissocladius	marcidus	Diptera_Chironomidae_Heterotrissocladius_marcidus	8	119,2	26	13909
304	Diptera	Chironomidae	Hydrobaenus	lapponicus	Diptera_Chironomidae_Hydrobaenus_lapponicus	NA	NA	1	1981
305	Diptera	Chironomidae	Hydrosmittia	NA	Diptera_Chironomidae_Hydrosmittia_NA	NA	NA	8	58103
306	Diptera	Chironomidae	Hydrosmittia	ruttneri	Diptera_Chironomidae_Hydrosmittia_ruttneri	NA	NA	9	30958
307	Diptera	Chironomidae	Krenosmittia	halvorseni	Diptera_Chironomidae_Krenosmittia_halvorseni	NA	NA	1	40
308	Diptera	Chironomidae	Larsia	atrocincta	Diptera_Chironomidae_Larsia_atrocincta	NA	NA	1	69
309	Diptera	Chironomidae	Lauterborniella	agrayloides	Diptera_Chironomidae_Lauterborniella_agrayloides	8	27,6	3	530
310	Diptera	Chironomidae	Lauterborniella	NA	Diptera_Chironomidae_Lauterborniella_NA	1	27,8	NA	NA
311	Diptera	Chironomidae	Limnophyes	asquamatus	Diptera_Chironomidae_Limnophyes_asquamatus	NA	NA	3	1151
312	Diptera	Chironomidae	Limnophyes	NA	Diptera_Chironomidae_Limnophyes_NA	1	0,8	1	18

313	Diptera	Chironomidae	Limnophyes	natalensis	Diptera_Chironomidae_Limnophyes_natalensis	NA	NA	1	40
314	Diptera	Chironomidae	Limnophyes	pumilio	Diptera_Chironomidae_Limnophyes_pumilio	NA	NA	1	13
315	Diptera	Chironomidae	Macropelopia	adaucta	Diptera_Chironomidae_Macropelopia_adaucta	NA	NA	19	80388
316	Diptera	Chironomidae	Macropelopia	NA	Diptera_Chironomidae_Macropelopia_NA	2	4	NA	NA
317	Diptera	Chironomidae	Macropelopia	nebulosa	Diptera_Chironomidae_Macropelopia_nebulosa	2	52	10	125179
318	Diptera	Chironomidae	Macropelopia	notata	Diptera_Chironomidae_Macropelopia_notata	NA	NA	1	9098
319	Diptera	Chironomidae	Metriocnemus	albolineatus	Diptera_Chironomidae_Metriocnemus_albolineatus	NA	NA	1	10673
320	Diptera	Chironomidae	Metriocnemus	caudigus	Diptera_Chironomidae_Metriocnemus_caudigus	NA	NA	1	51
321	Diptera	Chironomidae	Micropsectra	appendica	Diptera_Chironomidae_Metriocnemus_appendica	NA	NA	5	646
322	Diptera	Chironomidae	Micropsectra	atrofasciata	Diptera_Chironomidae_Micropsectra_atrofasciata	NA	NA	31	131509
323	Diptera	Chironomidae	Micropsectra	contracta	Diptera_Chironomidae_Micropsectra_contracta	NA	NA	14	423928
324	Diptera	Chironomidae	Micropsectra	junci	Diptera_Chironomidae_Micropsectra_junci	NA	NA	12	21661
325	Diptera	Chironomidae	Micropsectra	lacustris	Diptera_Chironomidae_Micropsectra_lacustris	NA	NA	3	8005
326	Diptera	Chironomidae	Micropsectra	logani	Diptera_Chironomidae_Micropsectra_logani	NA	NA	18	20281
327	Diptera	Chironomidae	Micropsectra	NA	Diptera_Chironomidae_Micropsectra_NA	12	2001,4	NA	NA
328	Diptera	Chironomidae	Micropsectra	notescens	Diptera_Chironomidae_Micropsectra_notescens	NA	NA	11	5798
329	Diptera	Chironomidae	Micropsectra	pallidula	Diptera_Chironomidae_Micropsectra_pallidula	NA	NA	11	1881
330	Diptera	Chironomidae	Micropsectra	radialis	Diptera_Chironomidae_Micropsectra_radialis	NA	NA	4	16492
331	Diptera	Chironomidae	Micropsectra	recurvata	Diptera_Chironomidae_Micropsectra_recurvata	NA	NA	2	752
332	Diptera	Chironomidae	Micropsectra	roseiventris	Diptera_Chironomidae_Micropsectra_roseiventris	NA	NA	2	6014
333	Diptera	Chironomidae	Microtendipes	chloris	Diptera_Chironomidae_Microtendipes_chloris	NA	NA	4	100807
334	Diptera	Chironomidae	Microtendipes	NA	Diptera_Chironomidae_Microtendipes_NA	2	5	2	215
335	Diptera	Chironomidae	Microtendipes	nigellus	Diptera_Chironomidae_Microtendipes_nigellus	NA	NA	4	4045
336	Diptera	Chironomidae	Microtendipes	pedellus	Diptera_Chironomidae_Microtendipes_pedellus	7	24,8	28	104561

337	Diptera	Chironomidae	Microtendipes	rydalensis	Diptera_Chironomidae_Microtendipes_rydalensis	NA	NA	6	2476
338	Diptera	Chironomidae	NA	NA	Diptera_Chironomidae_NA_NA	67	1208,6	69	661396
339	Diptera	Chironomidae	NA	NA	Diptera_Chironomidae_NA_NA	6	154	69	661396
340	Diptera	Chironomidae	NA	NA	Diptera_Chironomidae_NA_NA	75	4621,86	69	661396
341	Diptera	Chironomidae	NA	NA	Diptera_Chironomidae_NA_NA	179	113267	69	661396
342	Diptera	Chironomidae	NA	NA	Diptera_Chironomidae_NA_NA	2	11,6	69	661396
343	Diptera	Chironomidae	NA	NA	Diptera_Chironomidae_NA_NA	84	3913,47	69	661396
344	Diptera	Chironomidae	NA	NA	Diptera_Chironomidae_NA_NA	20	41,06	69	661396
345	Diptera	Chironomidae	NA	NA	Diptera_Chironomidae_NA_NA	80	2112,49	69	661396
346	Diptera	Chironomidae	Nanocladius	dichromus	Diptera_Chironomidae_Nanocladius_dichromus	NA	NA	9	39450
347	Diptera	Chironomidae	Nanocladius	rectinervis	Diptera_Chironomidae_Nanocladius_rectinervis	NA	NA	1	27
348	Diptera	Chironomidae	Natarsia	punctata	Diptera_Chironomidae_Natarsia_punctata	NA	NA	11	7527
349	Diptera	Chironomidae	Nilotanypus	dubius	Diptera_Chironomidae_Nilotanypus_dubius	NA	NA	12	23881
350	Diptera	Chironomidae	Odontomesa	fulva	Diptera_Chironomidae_Odontomesa_fulva	2	6	3	7493
351	Diptera	Chironomidae	Omisus	caledonicus	Diptera_Chironomidae_Omisus_caledonicus	2	1,47	NA	NA
352	Diptera	Chironomidae	Orthocladius	cf. abiskoensis	Diptera_Chironomidae_Orthocladius_cf. abiskoensis	NA	NA	11	7197
353	Diptera	Chironomidae	Orthocladius	cf. dentifer	Diptera_Chironomidae_Orthocladius_cf. dentifer	NA	NA	2	5795
354	Diptera	Chironomidae	Orthocladius	consobrinus	Diptera_Chironomidae_Orthocladius_consobrinus	NA	NA	5	46932
355	Diptera	Chironomidae	Orthocladius	dentifer	Diptera_Chironomidae_Orthocladius_dentifer	NA	NA	22	35643
356	Diptera	Chironomidae	Orthocladius	frigidus	Diptera_Chironomidae_Orthocladius_frigidus	NA	NA	14	164877
357	Diptera	Chironomidae	Orthocladius	lignicola	Diptera_Chironomidae_Orthocladius_lignicola	1	1	NA	NA
358	Diptera	Chironomidae	Orthocladius	NA	Diptera_Chironomidae_Orthocladius_NA	14	2171,4	15	96986
359	Diptera	Chironomidae	Orthocladius	oblidens	Diptera_Chironomidae_Orthocladius_oblidens	NA	NA	16	91423
360	Diptera	Chironomidae	Orthocladius	rivicola	Diptera_Chironomidae_Orthocladius_rivicola	NA	NA	1	397
361	Diptera	Chironomidae	Orthocladius	rubicundus	Diptera_Chironomidae_Orthocladius_rubicundus	NA	NA	3	967
362	Diptera	Chironomidae	Orthocladius	saxosus	Diptera_Chironomidae_Orthocladius_saxosus	NA	NA	5	54766
363	Diptera	Chironomidae	Orthocladius	schnelli	Diptera_Chironomidae_Orthocladius_schnelli	NA	NA	3	314

364	Diptera	Chironomidae	Orthocladius	telochaetus	Diptera_Chironomidae_Orthocladius_telochaetus	NA	NA	1	62
365	Diptera	Chironomidae	Orthocladius	thienemanni	Diptera_Chironomidae_Orthocladius_thienemanni	NA	NA	14	94108
366	Diptera	Chironomidae	Pagastiella	orophila	Diptera_Chironomidae_Pagastiella_orophila	8	186,6	9	236318
367	Diptera	Chironomidae	Parachironomus	digitalis	Diptera_Chironomidae_Parachironomus_digitalis	NA	NA	2	2407
368	Diptera	Chironomidae	Parachironomus	gracilior	Diptera_Chironomidae_Parachironomus_gracilior	NA	NA	1	49
369	Diptera	Chironomidae	Parachironomus	siljanensis	Diptera_Chironomidae_Parachironomus_siljanensis	NA	NA	2	306
370	Diptera	Chironomidae	Parachironomus	varus	Diptera_Chironomidae_Parachironomus_varus	4	12,8	NA	NA
371	Diptera	Chironomidae	Paracladius	quadrinodosus	Diptera_Chironomidae_Paracladius_quadrinodosus	NA	NA	2	966
372	Diptera	Chironomidae	Paracladopelma	camptolabis	Diptera_Chironomidae_Paracladopelma_camptolabis	NA	NA	1	5871
373	Diptera	Chironomidae	Paracladopelma	laminatum	Diptera_Chironomidae_Paracladopelma_laminatum	NA	NA	2	4267
374	Diptera	Chironomidae	Paracladopelma	NA	Diptera_Chironomidae_Paracladopelma_NA	1	1	1	132
375	Diptera	Chironomidae	Paracladopelma	nigritula	Diptera_Chironomidae_Paracladopelma_nigritula	1	1	NA	NA
376	Diptera	Chironomidae	Paracladopelma	nigritulum	Diptera_Chironomidae_Paracladopelma_nigritulum	NA	NA	2	564
377	Diptera	Chironomidae	Paracricotopus	niger	Diptera_Chironomidae_Paracricotopus_niger	NA	NA	1	30
378	Diptera	Chironomidae	Parakiefferiella	bathophila	Diptera_Chironomidae_Parakiefferiella_bathophila	NA	NA	6	3725
379	Diptera	Chironomidae	Parakiefferiella	coronata	Diptera_Chironomidae_Parakiefferiella_coronata	NA	NA	4	478
380	Diptera	Chironomidae	Parakiefferiella	NA	Diptera_Chironomidae_Parakiefferiella_NA	13	124,47	9	13561
381	Diptera	Chironomidae	Parakiefferiella	scandica	Diptera_Chironomidae_Parakiefferiella_scandica	NA	NA	1	1775
382	Diptera	Chironomidae	Parakiefferiella	triquetra	Diptera_Chironomidae_Parakiefferiella_triquetra	1	0,2	NA	NA
383	Diptera	Chironomidae	Paramerina	NA	Diptera_Chironomidae_Paramerina_NA	7	19,47	NA	NA
384	Diptera	Chironomidae	Parametriocnemus	stylatus	Diptera_Chironomidae_Parametriocnemus_stylatus	1	5	9	3241
385	Diptera	Chironomidae	Paratanytarsus	austriacus	Diptera_Chironomidae_Paratanytarsus_austriacus	NA	NA	3	25389
386	Diptera	Chironomidae	Paratanytarsus	dissimilis	Diptera_Chironomidae_Paratanytarsus_dissimilis	NA	NA	6	1223
387	Diptera	Chironomidae	Paratanytarsus	inopertus	Diptera_Chironomidae_Paratanytarsus_inopertus	NA	NA	1	459

388	Diptera	Chironomidae	Paratanytarsus	laccophilus	Diptera_Chironomidae_Paratanytarsus_laccophilus	NA	NA	1	34
389	Diptera	Chironomidae	Paratanytarsus	lauterborni	Diptera_Chironomidae_Paratanytarsus_lauterborni	NA	NA	6	4809
390	Diptera	Chironomidae	Paratanytarsus	NA	Diptera_Chironomidae_Paratanytarsus_NA	10	227,93	8	16180
391	Diptera	Chironomidae	Paratanytarsus	penicillatus	Diptera_Chironomidae_Paratanytarsus_penicillatus	NA	NA	10	82349
392	Diptera	Chironomidae	Paratanytarsus	tenuis	Diptera_Chironomidae_Paratanytarsus_tenuis	NA	NA	9	9672
393	Diptera	Chironomidae	Paratendipes	albimanus	Diptera_Chironomidae_Paratendipes_albimanus	NA	NA	4	6484
394	Diptera	Chironomidae	Paratendipes	NA	Diptera_Chironomidae_Paratendipes_NA	1	26	NA	NA
395	Diptera	Chironomidae	Paratendipes	subaequalis	Diptera_Chironomidae_Paratendipes_subaequalis	3	13,6	3	8604
396	Diptera	Chironomidae	Phaenopsectra	flavipes	Diptera_Chironomidae_Phaenopsectra_flavipes	NA	NA	6	1553
397	Diptera	Chironomidae	Phaenopsectra	NA	Diptera_Chironomidae_Phaenopsectra_NA	6	23,4	NA	NA
398	Diptera	Chironomidae	Phaenopsectra	punctipes	Diptera_Chironomidae_Phaenopsectra_punctipes	NA	NA	4	2286
399	Diptera	Chironomidae	Polypedilum	arundineti	Diptera_Chironomidae_Polypedilum_arundineti	NA	NA	1	276
400	Diptera	Chironomidae	Polypedilum	convictum	Diptera_Chironomidae_Polypedilum_convictum	NA	NA	8	4416
401	Diptera	Chironomidae	Polypedilum	cultellatum	Diptera_Chironomidae_Polypedilum_cultellatum	NA	NA	3	360
402	Diptera	Chironomidae	Polypedilum	NA	Diptera_Chironomidae_Polypedilum_NA	18	65,2	8	2151
403	Diptera	Chironomidae	Polypedilum	nubeculosum	Diptera_Chironomidae_Polypedilum_nubeculosum	3	20	8	78166
404	Diptera	Chironomidae	Polypedilum	pedestre	Diptera_Chironomidae_Polypedilum_pedestrem	NA	NA	3	573
405	Diptera	Chironomidae	Polypedilum	pullum	Diptera_Chironomidae_Polypedilum_pullum	1	11	11	2116
406	Diptera	Chironomidae	Polypedilum	sordens	Diptera_Chironomidae_Polypedilum_sordens	NA	NA	7	2295
407	Diptera	Chironomidae	Potthastia	gaedii	Diptera_Chironomidae_Potthastia_gaedii	NA	NA	4	12224
408	Diptera	Chironomidae	Potthastia	longimanus	Diptera_Chironomidae_Potthastia_longimanus	5	3,6	22	51550
409	Diptera	Chironomidae	Potthastia	NA	Diptera_Chironomidae_Potthastia_NA	2	2,2	17	24915
410	Diptera	Chironomidae	Potthastia	pastoris	Diptera_Chironomidae_Potthastia_pastoris	NA	NA	2	368
411	Diptera	Chironomidae	Procladius	choreus-agg.1	Diptera_Chironomidae_Procladius_choreus-agg.1	NA	NA	3	1408

412	Diptera	Chironomidae	Procladius	fuscus	Diptera_Chironomidae_Procladius_fuscus	NA	NA	4	855
413	Diptera	Chironomidae	Procladius	imicola	Diptera_Chironomidae_Procladius_imicola	NA	NA	7	81877
414	Diptera	Chironomidae	Procladius	NA	Diptera_Chironomidae_Procladius_NA	24	380,27	5	41179
415	Diptera	Chironomidae	Procladius	nigriventris	Diptera_Chironomidae_Procladius_nigriventris	NA	NA	10	6782
416	Diptera	Chironomidae	Procladius	pectinatus	Diptera_Chironomidae_Procladius_pectinatus	NA	NA	3	91995
417	Diptera	Chironomidae	Prodiamesa	olivacea	Diptera_Chironomidae_Prodiamesa_olivacea	23	379	31	227335
418	Diptera	Chironomidae	Propsilocerus	jacuticus	Diptera_Chironomidae_Propsilocerus_jacuticus	3	72	NA	NA
419	Diptera	Chironomidae	Protanypus	NA	Diptera_Chironomidae_Protanypus_NA	1	0,2	NA	NA
420	Diptera	Chironomidae	Psectrocladius	barbimanus	Diptera_Chironomidae_Psectrocladius_barbimanus	NA	NA	1	206
421	Diptera	Chironomidae	Psectrocladius	calcaratus	Diptera_Chironomidae_Psectrocladius_calcaratus	NA	NA	12	2155
422	Diptera	Chironomidae	Psectrocladius	fennicus	Diptera_Chironomidae_Psectrocladius_fennicus	NA	NA	4	9595
423	Diptera	Chironomidae	Psectrocladius	limbatellus	Diptera_Chironomidae_Psectrocladius_limbatellus	NA	NA	3	1429
424	Diptera	Chironomidae	Psectrocladius	NA	Diptera_Chironomidae_Psectrocladius_NA	22	653,6	46	1130381
425	Diptera	Chironomidae	Psectrocladius	oligosetus	Diptera_Chironomidae_Psectrocladius_oligosetus	NA	NA	7	32201
426	Diptera	Chironomidae	Psectrocladius	oxyura	Diptera_Chironomidae_Psectrocladius_oxyura	NA	NA	15	389327
427	Diptera	Chironomidae	Psectrocladius	platypus	Diptera_Chironomidae_Psectrocladius_platypus	NA	NA	3	1918
428	Diptera	Chironomidae	Psectrocladius	psilopterus	Diptera_Chironomidae_Psectrocladius_psilopterus	NA	NA	14	32856
429	Diptera	Chironomidae	Psectrocladius	zetterstedti	Diptera_Chironomidae_Psectrocladius_zetterstedti	NA	NA	7	3568
430	Diptera	Chironomidae	Pseudochironomuss	prasinatus	Diptera_Chironomidae_Pseudochironomus_prasinatus	9	137,07	16	110677
431	Diptera	Chironomidae	Pseudodiamesa	branickii	Diptera_Chironomidae_Pseudodiamesa_branickii	NA	NA	1	826
432	Diptera	Chironomidae	Pseudodiamesa	nivosa	Diptera_Chironomidae_Pseudodiamesa_nivosa	NA	NA	2	10774
433	Diptera	Chironomidae	Pseudodiamesa	pertinax	Diptera_Chironomidae_Pseudodiamesa_pertinax	NA	NA	2	5420
434	Diptera	Chironomidae	Pseudorthocladius	filiformis	Diptera_Chironomidae_Pseudorthocladius_filiformis	NA	NA	2	495
435	Diptera	Chironomidae	Pseudorthocladius	NA	Diptera_Chironomidae_Pseudorthocladius_NA	1	1,07	NA	NA

436	Diptera	Chironomidae	Pseudosmittia	NA	Diptera_Chironomidae_Pseudosmittia_NA	4	23,6	NA	NA
437	Diptera	Chironomidae	Psuedochironomini	NA	Diptera_Chironomidae_Psuedochironomini_NA	1	7,2	NA	NA
438	Diptera	Chironomidae	Rheocricotopus	chalybeatus	Diptera_Chironomidae_Rheocricotopus_chalybeatus	NA	NA	1	498
439	Diptera	Chironomidae	Rheocricotopus	effusus	Diptera_Chironomidae_Rheocricotopus_effusus	NA	NA	8	14287
440	Diptera	Chironomidae	Rheocricotopus	fuscipes	Diptera_Chironomidae_Rheocricotopus_fuscipes	5	92	6	504
441	Diptera	Chironomidae	Rheocricotopus	NA	Diptera_Chironomidae_Rheocricotopus_NA	NA	NA	2	341382
442	Diptera	Chironomidae	Rheopelopia	maculipennis	Diptera_Chironomidae_Rheopelopia_maculipennis	NA	NA	1	125
443	Diptera	Chironomidae	Rheopelopia	NA	Diptera_Chironomidae_Rheopelopia_NA	NA	NA	7	2036
444	Diptera	Chironomidae	Rheotanytarsus	curtistylus	Diptera_Chironomidae_Rheotanytarsus_curtistylus	NA	NA	3	3475
445	Diptera	Chironomidae	Rheotanytarsus	distinctissimus	Diptera_Chironomidae_Rheotanytarsus_distinctissimus	NA	NA	2	7001
446	Diptera	Chironomidae	Rheotanytarsus	NA	Diptera_Chironomidae_Rheotanytarsus_NA	1	4	6	13170
447	Diptera	Chironomidae	Rheotanytarsus	pentapoda	Diptera_Chironomidae_Rheotanytarsus_pentapoda	NA	NA	9	3445
448	Diptera	Chironomidae	Rheotanytarsus	ringei	Diptera_Chironomidae_Rheotanytarsus_ringei	NA	NA	6	1050
449	Diptera	Chironomidae	Sergentia	coracina	Diptera_Chironomidae_Sergentia_coracina	1	0,2	NA	NA
450	Diptera	Chironomidae	Sergentia	prima	Diptera_Chironomidae_Sergentia_prima	NA	NA	4	1808
451	Diptera	Chironomidae	Smittia	NA	Diptera_Chironomidae_Smittia_-NA	1	0,27	NA	NA
452	Diptera	Chironomidae	Stempellina	bausei	Diptera_Chironomidae_Stempellina_bausei	NA	NA	1	303
453	Diptera	Chironomidae	Stempellina	NA	Diptera_Chironomidae_Stempellina_NA	3	0,6	NA	NA
454	Diptera	Chironomidae	Stempellinella	brevis	Diptera_Chironomidae_Stempellina_brevis	NA	NA	12	6531
455	Diptera	Chironomidae	Stempellinella	edwardsi	Diptera_Chironomidae_Stempellina_edwardsi	NA	NA	1	62
456	Diptera	Chironomidae	Stempellinella	NA	Diptera_Chironomidae_Stempellina_NA	4	23,8	NA	NA
457	Diptera	Chironomidae	Stenochironomus	gibbus	Diptera_Chironomidae_Stenochironomus_gibbus	NA	NA	5	4118
458	Diptera	Chironomidae	Stenochironomus	NA	Diptera_Chironomidae_Stenochironomus_NA	6	5,8	NA	NA
459	Diptera	Chironomidae	Stictochironomus	maculipennis	Diptera_Chironomidae_Stictochironomus_maculipennis	NA	NA	8	837437

460	Diptera	Chironomidae	Stictochironomus	NA	Diptera_Chironomidae_Stictochironomus_NA	5	26,6	2	434
461	Diptera	Chironomidae	Stictochironomus	rosenschoeldi	Diptera_Chironomidae_Stictochironomus_rosenschoeldi	1	1	13	121980
462	Diptera	Chironomidae	Stictochironomus	sticticus	Diptera_Chironomidae_Stictochironomus_sticticus	NA	NA	7	29139
463	Diptera	Chironomidae	Synorthocladius	semivirens	Diptera_Chironomidae_Synorthocladius_semivirens	2	0,8	12	5183
464	Diptera	Chironomidae	Tanypus	vilipennis	Diptera_Chironomidae_Tanypus_vilipennis	1	5	NA	NA
465	Diptera	Chironomidae	Tanytarsus	anderseni	Diptera_Chironomidae_Tanytarsus_anderseni	NA	NA	1	1226
466	Diptera	Chironomidae	Tanytarsus	brundini	Diptera_Chironomidae_Tanytarsus_brundini	NA	NA	8	17804
467	Diptera	Chironomidae	Tanytarsus	buchonius	Diptera_Chironomidae_Tanytarsus_buchonius	NA	NA	2	574
468	Diptera	Chironomidae	Tanytarsus	chinyensis	Diptera_Chironomidae_Tanytarsus_chinyensis	NA	NA	5	2211
469	Diptera	Chironomidae	Tanytarsus	curticornis	Diptera_Chironomidae_Tanytarsus_curticornis	NA	NA	2	763
470	Diptera	Chironomidae	Tanytarsus	debilis	Diptera_Chironomidae_Tanytarsus_debilis	NA	NA	1	733
471	Diptera	Chironomidae	Tanytarsus	ejuncidus	Diptera_Chironomidae_Tanytarsus_ejuncidus	NA	NA	3	5591
472	Diptera	Chironomidae	Tanytarsus	eminulus	Diptera_Chironomidae_Tanytarsus_eminulus	NA	NA	8	10537
473	Diptera	Chironomidae	Tanytarsus	glabrescens	Diptera_Chironomidae_Tanytarsus_glabrescens	NA	NA	1	150
474	Diptera	Chironomidae	Tanytarsus	gregarius	Diptera_Chironomidae_Tanytarsus_gregarius	NA	NA	2	2555
475	Diptera	Chironomidae	Tanytarsus	heusdensis	Diptera_Chironomidae_Tanytarsus_heusdensis	NA	NA	12	12435
476	Diptera	Chironomidae	Tanytarsus	inaequalis	Diptera_Chironomidae_Tanytarsus_inaequalis	NA	NA	3	1508
477	Diptera	Chironomidae	Tanytarsus	innarensis	Diptera_Chironomidae_Tanytarsus_innarensis	NA	NA	2	1914
478	Diptera	Chironomidae	Tanytarsus	lactescens	Diptera_Chironomidae_Tanytarsus_lactescens	NA	NA	1	21
479	Diptera	Chironomidae	Tanytarsus	lugens	Diptera_Chironomidae_Tanytarsus_lugens	1	4	NA	NA
480	Diptera	Chironomidae	Tanytarsus	mendax	Diptera_Chironomidae_Tanytarsus_mendax	NA	NA	1	234
481	Diptera	Chironomidae	Tanytarsus	NA	Diptera_Chironomidae_Tanytarsus_NA	24	585,07	6	7760
482	Diptera	Chironomidae	Tanytarsus	nemorosus	Diptera_Chironomidae_Tanytarsus_nemorosus	NA	NA	2	3387
483	Diptera	Chironomidae	Tanytarsus	palettaris	Diptera_Chironomidae_Tanytarsus_palettaris	NA	NA	1	489

484	Diptera	Chironomidae	Tanytarsus	pallidicornis	Diptera_Chironomidae_Tanytarsus_pallidicornis	NA	NA	3	4997
485	Diptera	Chironomidae	Tanytarsus	recurvatus	Diptera_Chironomidae_Tanytarsus_recurvatus	NA	NA	2	103
486	Diptera	Chironomidae	Tanytarsus	signatus	Diptera_Chironomidae_Tanytarsus_signatus	NA	NA	4	6660
487	Diptera	Chironomidae	Tanytarsus	striatulus	Diptera_Chironomidae_Tanytarsus_striatulus	NA	NA	15	19181
488	Diptera	Chironomidae	Tanytarsus	sylvaticus	Diptera_Chironomidae_Tanytarsus_sylvaticus	NA	NA	2	75487
489	Diptera	Chironomidae	Tanytarsus	telmaticus	Diptera_Chironomidae_Tanytarsus_telmaticus	NA	NA	1	204
490	Diptera	Chironomidae	Tanytarsus	thomasi	Diptera_Chironomidae_Tanytarsus_thomasi	NA	NA	15	21118
491	Diptera	Chironomidae	Tanytarsus	usmaensis	Diptera_Chironomidae_Tanytarsus_usmaensis	NA	NA	4	9657
492	Diptera	Chironomidae	Tanytarsus	verralli	Diptera_Chironomidae_Tanytarsus_verralli	NA	NA	1	1623
493	Diptera	Chironomidae	Thienemanniella	caspersi	Diptera_Chironomidae_Thienemanniella_caspersi	NA	NA	2	661
494	Diptera	Chironomidae	Thienemanniella	NA	Diptera_Chironomidae_Thienemanniella_NA	3	9	13	48336
495	Diptera	Chironomidae	Thienemanniella	vittata	Diptera_Chironomidae_Thienemanniella_vittata	NA	NA	2	754
496	Diptera	Chironomidae	Thienemanniella	xena	Diptera_Chironomidae_Thienemanniella_xena	NA	NA	3	462
497	Diptera	Chironomidae	Thienemannimyia	carnea	Diptera_Chironomidae_Thienemannimyia_carnea	NA	NA	7	1497
498	Diptera	Chironomidae	Thienemannimyia	fuscipes	Diptera_Chironomidae_Thienemannimyia_fuscipes	NA	NA	3	77
499	Diptera	Chironomidae	Thienemannimyia	lentiginosa	Diptera_Chironomidae_Thienemannimyia_lentiginosa	NA	NA	5	14453
500	Diptera	Chironomidae	Thienemannimyia	NA	Diptera_Chironomidae_Thienemannimyia_NA	NA	NA	5	701
501	Diptera	Chironomidae	Tokunagaia	excellens	Diptera_Chironomidae_Tokunagaia_excellens	NA	NA	2	44981
502	Diptera	Chironomidae	Tokunagaia	NA	Diptera_Chironomidae_Tokunagaia_NA	NA	NA	1	39
503	Diptera	Chironomidae	Tribelos	intextum	Diptera_Chironomidae_Tribelos_intextum	NA	NA	5	8138
504	Diptera	Chironomidae	Tribelos	NA	Diptera_Chironomidae_Tribelos_NA	2	64,2	NA	NA
505	Diptera	Chironomidae	Trissopelopia	cf. flavida	Diptera_Chironomidae_Trissopelopia_cf. flavida	NA	NA	10	31242
506	Diptera	Chironomidae	Trissopelopia	longimanus	Diptera_Chironomidae_Trissopelopia_longimanus	NA	NA	19	368559
507	Diptera	Chironomidae	Tvetenia	bavarica	Diptera_Chironomidae_Tvetenia_bavarica	NA	NA	6	96516

508	Diptera	Chironomidae	Tvetenia	calvescens	Diptera_Chironomidae_Tvetenia_-calvescens	NA	NA	31	20441
509	Diptera	Chironomidae	Tvetenia	discoloripes	Diptera_Chironomidae_Tvetenia_-discoloripes	1	1	NA	NA
510	Diptera	Chironomidae	Tvetenia	NA	Diptera_Chironomidae_Tvetenia_-NA	8	156	NA	NA
511	Diptera	Chironomidae	Tvetenia	tshernovskii	Diptera_Chironomidae_Tvetenia_-tshernovskii	NA	NA	2	1997
512	Diptera	Chironomidae	Tvetenia	verralli	Diptera_Chironomidae_Tvetenia_-verralli	NA	NA	14	2402
513	Diptera	Chironomidae	Virgatanytarsus	arduennensis	Diptera_Chironomidae_Virgatanytarsus_arduennensis	NA	NA	4	125
514	Diptera	Chironomidae	Xenochironomus	xenolabis	Diptera_Chironomidae_Xenochironomus_xenolabis	NA	NA	3	18644
515	Diptera	Chironomidae	Xenopelopia	nigricans	Diptera_Chironomidae_Xenochironomus_nigricans	NA	NA	1	344
516	Diptera	Chironomidae	Zalutschia	NA	Diptera_Chironomidae_Zalutschia_NA	NA	NA	1	27
517	Diptera	Chironomidae	Zalutschia	tornetraeskensis	Diptera_Chironomidae_Zalutschia_tornetraeskensis	1	227,2	5	2374
518	Diptera	Chironomidae	Zalutschia	zalutschicola	Diptera_Chironomidae_Zalutschia_zalutschicola	1	3	1	22486
519	Diptera	Chironomidae	Zavrelimyia	barbatipes	Diptera_Chironomidae_Zavrelimyia_barbatipes	NA	NA	1	878
520	Diptera	Chironomidae	Zavrelimyia	cingulata	Diptera_Chironomidae_Zavrelimyia_cingulata	NA	NA	1	276
521	Diptera	Chironomidae	Zavrelimyia	melanura	Diptera_Chironomidae_Zavrelimyia_melanura	NA	NA	3	1756
522	Diptera	Chironomidae	Zavrelimyia	NA	Diptera_Chironomidae_Zavrelimyia_NA	1	0,6	10	10709
523	Diptera	Culicidae	Culiseta	morsitans	Diptera_Culicidae_Culiseta_morsitans	NA	NA	2	1827
524	Diptera	Culicidae	NA	NA	Diptera_Culicidae_NA_NA	2	0,6	NA	NA
525	Diptera	Dixidae	Dixa	maculata	Diptera_Dixidae_Dixa_maculata	1	1	NA	NA
526	Diptera	Dixidae	Dixa	NA	Diptera_Dixidae_Dixa_NA	3	1,24	NA	NA
527	Diptera	Dolichopodidae	Rhaphium	riparium	Diptera_Dolichopodidae_Rhaphium_riparium	NA	NA	1	301
528	Diptera	Empididae	Chelifera	concinnicauda	Diptera_Empididae_Chelifera_-concinnicauda	NA	NA	8	106988
529	Diptera	Empididae	Chelifera	NA	Diptera_Empididae_Chelifera_NA	1	3	NA	NA
530	Diptera	Empididae	Chelifera	precatoria	Diptera_Empididae_Chelifera_precatoria	NA	NA	1	236
531	Diptera	Empididae	Chelifera	trapezina	Diptera_Empididae_Chelifera_trapezina	NA	NA	7	22024
532	Diptera	Empididae	Clinocera	NA	Diptera_Empididae_Clinocera_NA	1	1	NA	NA
533	Diptera	Empididae	Clinocera	stagnalis	Diptera_Empididae_Clinocera_-stagnalis	NA	NA	5	40222

534	Diptera	Empididae	Hemerodromia	adulatoria	Diptera_Empididae_Hemerodromia_adulatoria	NA	NA	16	38533
535	Diptera	Empididae	Hemerodromia	NA	Diptera_Empididae_Hemerodromia_NA	9	46	NA	NA
536	Diptera	Empididae	NA	NA	Diptera_Empididae_NA_NA	62	672,42	2	3195
537	Diptera	Empididae	Wiedemannia	bistigma	Diptera_Empididae_Wiedemannia_bistigma	NA	NA	5	10160
538	Diptera	Empididae	Wiedemannia	bohemani	Diptera_Empididae_Wiedemannia_bohemani	NA	NA	4	315
539	Diptera	Empididae	Wiedemannia	NA	Diptera_Empididae_Wiedemannia_NA	3	10	NA	NA
540	Diptera	Limoniidae	Antocha	NA	Diptera_Limoniidae_Antocha_NA	5	8,2	NA	NA
541	Diptera	Limoniidae	Antocha	vitripennis	Diptera_Limoniidae_Antocha_vitripennis	3	12,08	6	31632
542	Diptera	Limoniidae	Austrolimnophila	ochracea	Diptera_Limoniidae_Austrolimnophila_ochracea	NA	NA	1	2730
543	Diptera	Limoniidae	Dicranophragma	nemoralis	Diptera_Limoniidae_Dicranophragma_nemoralis	NA	NA	1	792
544	Diptera	Limoniidae	Eloeophila	mundata	Diptera_Limoniidae_Eloeophila_mundata	NA	NA	1	1139
545	Diptera	Limoniidae	Eloeophila	NA	Diptera_Limoniidae_Eloeophila_NA	53	177,68	28	63228
546	Diptera	Limoniidae	Eloeophila	trimaculata	Diptera_Limoniidae_Eloeophila_trimaculata	1	1	13	12413
547	Diptera	Limoniidae	Eutonia	barbipes	Diptera_Limoniidae_Eutonia_barbipes	1	2	NA	NA
548	Diptera	Limoniidae	Hexatoma	fuscipennis	Diptera_Limoniidae_Hexatoma_fuscipennises	NA	NA	2	1245
549	Diptera	Limoniidae	Hexatoma	NA	Diptera_Limoniidae_Hexatoma_NA	1	1	NA	NA
550	Diptera	Limoniidae	Lipsothrix	ecucullata	Diptera_Limoniidae_Lipsothrix_ecucullata	NA	NA	1	10638
551	Diptera	Limoniidae	Molophilus	NA	Diptera_Limoniidae_Molophilus_NA	1	1	NA	NA
552	Diptera	Limoniidae	NA	NA	Diptera_Limoniidae_NA_NA	14	60,6	7	4612
553	Diptera	Limoniidae	Neolimnomyia	batava	Diptera_Limoniidae_Neolimnomyia_batava	NA	NA	1	138
554	Diptera	Limoniidae	Neolimnomyia	filata	Diptera_Limoniidae_Neolimnomyia_filata	1	1	NA	NA
555	Diptera	Limoniidae	Neolimnomyia	NA	Diptera_Limoniidae_Neolimnomyia_NA	1	1	NA	NA
556	Diptera	Limoniidae	Ormosia	cf. depilata	Diptera_Limoniidae_Ormosia_cf. depilata	NA	NA	2	23081
557	Diptera	Limoniidae	Ormosia	fascipennis	Diptera_Limoniidae_Ormosia_fascipennis	NA	NA	1	115
558	Diptera	Limoniidae	Phylidorea	fulvonervosa	Diptera_Limoniidae_Phylidorea_fulvonervosa	NA	NA	1	78

559	Diptera	Limoniidae	Phylidorea	nervosa	Diptera_Limoniidae_Phylidorea_-nervosa	NA	NA	1	1231
560	Diptera	Limoniidae	Phylidorea	nigronotata	Diptera_Limoniidae_Phylidorea_-nigronotata	NA	NA	2	488
561	Diptera	Limoniidae	Phylidorea	squalens	Diptera_Limoniidae_Phylidorea_-squalens	NA	NA	1	1432
562	Diptera	Limoniidae	Pilaria	discicollis	Diptera_Limoniidae_Pilaria_discicollis	1	1	7	18732
563	Diptera	Limoniidae	Pilaria	NA	Diptera_Limoniidae_Pilaria_NA	3	28	8	8684
564	Diptera	Limoniidae	Pseudolimnophila	NA	Diptera_Limoniidae_Pseu_do_-lim_no_phi_la NA	13	17,6	NA	NA
565	Diptera	Limoniidae	Pseudolimnophila	sepium	Diptera_Limoniidae_Pseu_do_-lim_no_phi_la sepium	NA	NA	1	671
566	Diptera	Limoniidae	Rhypholophus	NA	Diptera_Limoniidae_Rhypholophus_NA	NA	NA	1	673
567	Diptera	Limoniidae	Scleroprocta	NA	Diptera_Limoniidae_Sclerocta_NA	1	0,2	2	4366
568	Diptera	Limoniidae	Scleroprocta	pentagonalis	Diptera_Limoniidae_Sclerocta_pentagonalis	1	7	NA	NA
569	Diptera	Muscidae	Coenosia	means	Diptera_Muscidae_Coenosia_-means	NA	NA	1	2780
570	Diptera	Muscidae	Limnophora	NA	Diptera_Muscidae_Limnophora_-NA	1	1	NA	NA
571	Diptera	Muscidae	Limnophora	NA	Diptera_Muscidae_Limnophora_-NA	14	124,28	NA	NA
572	Diptera	Muscidae	Limnophora	olympiae	Diptera_Muscidae_Limnophora_-olympiae	NA	NA	19	106439
573	Diptera	Muscidae	Limnophora	pandellei	Diptera_Muscidae_Limnophora_-pandellei	NA	NA	1	333
574	Diptera	Muscidae	Limnophora	riparia	Diptera_Muscidae_Limnophora_riparia	2	3	NA	NA
575	Diptera	Muscidae	NA	NA	Diptera_Muscidae_NA_NA	5	9	NA	NA
576	Diptera	Mycetophilidae	Exechiopsis	indecisa	Diptera_Mycetophilidae_Exechiopsis_indecisa	NA	NA	1	38
577	Diptera	NA	NA	NA	Diptera_NA_NA_NA	39	290,04	8	1764
578	Diptera	Odonata	Calopteryx	splendens	Diptera_Odonata_Calopteryx_-splendens	5	8	NA	NA
579	Diptera	Pediciidae	Dicranota	bimaculata	Diptera_Pediciidae_Dicranota_bimaculata	NA	NA	27	27441
580	Diptera	Pediciidae	Dicranota	exclusa	Diptera_Pediciidae_Dicranota_exclusa	NA	NA	7	55105
581	Diptera	Pediciidae	Dicranota	gracilipes	Diptera_Pediciidae_Dicranota_-gracilipes	NA	NA	9	8940
582	Diptera	Pediciidae	Dicranota	guerini	Diptera_Pediciidae_Dicranota_-guerini	NA	NA	13	39861
583	Diptera	Pediciidae	Dicranota	NA	Diptera_Pediciidae_Dicranota_NA	85	499,16	NA	NA
584	Diptera	Pediciidae	Dicranota	pavida	Diptera_Pediciidae_Dicranota_pa-	NA	NA	11	55397

					vida				
585	Diptera	Pediciidae	Dicranota	robusta	Diptera_Pediciidae_Dicranota_robusta	NA	NA	21	33215
586	Diptera	Pediciidae	Dicranota	subtilis	Diptera_Pediciidae_Dicranota_subtilis	NA	NA	1	66
587	Diptera	Pediciidae	NA	NA	Diptera_Pediciidae_NA_NA	6	83	NA	NA
588	Diptera	Pediciidae	Pedicia	NA	Diptera_Pediciidae_Pedicia_NA	3	4,6	3	4888
589	Diptera	Pediciidae	Pedicia	rivosa	Diptera_Pediciidae_Pedicia_rivosa	1	4	4	12879
590	Diptera	Pediciidae	Tricyphona	unicolor	Diptera_Pediciidae_Tricyphona_unicolor	NA	NA	1	696
591	Diptera	Psychodidae	Berdeniella	freyi	Diptera_Psychodidae_Berdeniella_freyi	NA	NA	4	772
592	Diptera	Psychodidae	NA	NA	Diptera_Psychodidae_NA_NA	19	103,46	1	37
593	Diptera	Psychodidae	Panimerus	albifacies	Diptera_Psychodidae_Panimerus_albifacies	NA	NA	1	60
594	Diptera	Psychodidae	Parabazarella	NA	Diptera_Psychodidae_Parabazarella_NA	NA	NA	2	2123
595	Diptera	Psychodidae	Pericoma	NA	Diptera_Psychodidae_Pericoma_NA	12	77	NA	NA
596	Diptera	Psychodidae	Pericoma	nielseni	Diptera_Psychodidae_Pericoma_nielseni	NA	NA	7	1022
597	Diptera	Psychodidae	Peripsychoda	auriculata	Diptera_Psychodidae_Peripsychoda_auriculata	NA	NA	3	1233
598	Diptera	Psychodidae	Pneumia	NA	Diptera_Psychodidae_Pneumia_NA	NA	NA	1	164
599	Diptera	Psychodidae	Pneumia	stammeri	Diptera_Psychodidae_Pneumia_stammeri	NA	NA	2	3216
600	Diptera	Psychodidae	Pneumia	trivialis	Diptera_Psychodidae_Pneumia_trivialis	NA	NA	5	2568
601	Diptera	Ptychopteridae	Ptychoptera	lacustris	Diptera_Ptychopteridae_Ptychoptera_lacustris	1	1	NA	NA
602	Diptera	Ptychopteridae	Ptychoptera	longicauda	Diptera_Ptychopteridae_Ptychoptera_longicauda	NA	NA	1	1706
603	Diptera	Ptychopteridae	Ptychoptera	paludosa	Diptera_Ptychopteridae_Ptychoptera_paludosa	6	23	6	11421
604	Diptera	Sciaridae	Dichopygina	nigrohalteralis	Diptera_Sciaridae_Dichopygina_nigrohalteralis	NA	NA	1	40
605	Diptera	Sciaridae	Lycoriella	sativae	Diptera_Sciaridae_Lycoriella_sativae	NA	NA	1	25
606	Diptera	Simuliidae	Cnephia	pallipes	Diptera_Simuliidae_Cnephia_pallipes	NA	NA	1	88
607	Diptera	Simuliidae	Helodon	ferrugineus	Diptera_Simuliidae_Helodon_ferrugineus	NA	NA	3	5878
608	Diptera	Simuliidae	Metacnephia	bilineata	Diptera_Simuliidae_Metacnephia_bilineata	NA	NA	1	30657
609	Diptera	Simuliidae	NA	NA	Diptera_Simuliidae_NA_NA	114	36065,14	NA	NA

610	Diptera	Simuliidae	Prosimulium	hirtipes	Diptera_Simuliidae_Prosimulium_-hirtipes	NA	NA	14	41378
611	Diptera	Simuliidae	Simulium	angustipes	Diptera_Simuliidae_Simulium_-angustipes	1	16	7	133111
612	Diptera	Simuliidae	Simulium	angustitarse	Diptera_Simuliidae_Simulium_-angustitarse	11	123	NA	NA
613	Diptera	Simuliidae	Simulium	aureum	Diptera_Simuliidae_Simulium_aureum	NA	NA	4	4152
614	Diptera	Simuliidae	Simulium	brevidens	Diptera_Simuliidae_Simulium_brevidens	NA	NA	3	10630
615	Diptera	Simuliidae	Simulium	costatum	Diptera_Simuliidae_Simulium_costatum	1	1	NA	NA
616	Diptera	Simuliidae	Simulium	cryophilum	Diptera_Simuliidae_Simulium_-cryophilum	1	1	11	7687
617	Diptera	Simuliidae	Simulium	curvans	Diptera_Simuliidae_Simulium_curvans	NA	NA	4	5706
618	Diptera	Simuliidae	Simulium	equinum	Diptera_Simuliidae_Simulium_-equinum	6	343	13	187442
619	Diptera	Simuliidae	Simulium	erythrocephalum	Diptera_Simuliidae_Simulium_-erythrocephalum	6	1400	8	157420
620	Diptera	Simuliidae	Simulium	intermedium	Diptera_Simuliidae_Simulium_intermedium	NA	NA	55	429733
621	Diptera	Simuliidae	Simulium	lineatum	Diptera_Simuliidae_Simulium_lineatum	NA	NA	1	7335
622	Diptera	Simuliidae	Simulium	lundstromi	Diptera_Simuliidae_Simulium_-lundstromim	5	67	16	153278
623	Diptera	Simuliidae	Simulium	monticola	Diptera_Simuliidae_Simulium_-monticola	NA	NA	18	32144
624	Diptera	Simuliidae	Simulium	murmanum	Diptera_Simuliidae_Simulium_-murmanum	NA	NA	7	189657
625	Diptera	Simuliidae	Simulium	NA	Diptera_Simuliidae_Simulium_NA	5	25	7	4987
626	Diptera	Simuliidae	Simulium	noelleri	Diptera_Simuliidae_Simulium_-noelleri	NA	NA	8	200464
627	Diptera	Simuliidae	Simulium	odagmia	Diptera_Simuliidae_Simulium_-odagmia	21	7659	NA	NA
628	Diptera	Simuliidae	Simulium	ornatum	Diptera_Simuliidae_Simulium_ornatum	27	2822	57	206324
629	Diptera	Simuliidae	Simulium	ornatum s.l.	Diptera_Simuliidae_Simulium_ornatum s.l.	NA	NA	10	23612
630	Diptera	Simuliidae	Simulium	reptans	Diptera_Simuliidae_Simulium_reptans	NA	NA	2	3287
631	Diptera	Simuliidae	Simulium	rostratum	Diptera_Simuliidae_Simulium_-rostratum	NA	NA	15	189421
632	Diptera	Simuliidae	Simulium	rubzovianum	Diptera_Simuliidae_Simulium_rubzovianum	NA	NA	3	2956
633	Diptera	Simuliidae	Simulium	spinosa	Diptera_Simuliidae_Simulium_spinosa	6	29	NA	NA

634	Diptera	Simuliidae	Simulium	truncatum	Diptera_Simuliidae_Simulium_-truncatum	NA	NA	4	13339
635	Diptera	Simuliidae	Simulium	tuberosum	Diptera_Simuliidae_Simulium_tuberosum	NA	NA	7	54384
636	Diptera	Simuliidae	Simulium	vernum	Diptera_Simuliidae_Simulium_vernum	21	773	62	205794
637	Diptera	Simuliidae	Simulium	vittatum	Diptera_Simuliidae_Simulium_-vittatum	NA	NA	9	1733856
638	Diptera	Simuliidae	Simulium	vulgare	Diptera_Simuliidae_Simulium_vulgare	NA	NA	9	25421
639	Diptera	Tabanidae	Chrysops	caecutiens	Diptera_Tabanidae_Chrysops_-caecutiens	NA	NA	2	72605
640	Diptera	Tabanidae	Chrysops	relictus	Diptera_Tabanidae_Chrysops_relictus	NA	NA	7	195340
641	Diptera	Tabanidae	NA	NA	Diptera_Tabanidae_NA_NA	14	12,6	NA	NA
642	Diptera	Tabanidae	Tabanus	cordiger	Diptera_Tabanidae_Tabanus_cordiger	NA	NA	1	70939
643	Diptera	Tachinidae	Siphona	geniculata	Diptera_Tachinidae_Siphona_geniculata	NA	NA	1	756
644	Diptera	Tipulidae	Angarotipula	NA	Diptera_Tipulidae_Angarotipula_-NA	1	4	NA	NA
645	Diptera	Tipulidae	Dolichopeza	albipes	Diptera_Tipulidae_Dolichopeza_albipes	NA	NA	1	92464
646	Diptera	Tipulidae	NA	NA	Diptera_Tipulidae_NA_NA	21	222	NA	NA
647	Diptera	Tipulidae	Prionocera	NA	Diptera_Tipulidae_Prionocera_NA	2	1,2	NA	NA
648	Diptera	Tipulidae	Prionocera	turcica	Diptera_Tipulidae_Prionocera_turcica	6	1,55	NA	NA
649	Diptera	Tipulidae	Tipula	coerulescens	Diptera_Tipulidae_Tipula_coerulescens	NA	NA	1	39314
650	Diptera	Tipulidae	Tipula	lateralis	Diptera_Tipulidae_Tipula_lateralis	NA	NA	15	121998
651	Diptera	Tipulidae	Tipula	luna	Diptera_Tipulidae_Tipula_luna	NA	NA	1	11802
652	Diptera	Tipulidae	Tipula	maxima	Diptera_Tipulidae_Tipula_maxima	NA	NA	4	284877
653	Diptera	Tipulidae	Tipula	NA	Diptera_Tipulidae_Tipula_NA	37	72,67	8	184300
654	Diptera	Tipulidae	Tipula	nubeculosa	Diptera_Tipulidae_Tipula_nubeculosa	NA	NA	1	151
655	Diptera	Tipulidae	Tipula	obscuriventris	Diptera_Tipulidae_Tipula_obscuriventris	NA	NA	8	104901
656	Diptera	Tipulidae	Tipula	salicetorum	Diptera_Tipulidae_Tipula_salicetorum	NA	NA	16	1339612
657	Diptera	Tipulidae	Tipula	submarmorata	Diptera_Tipulidae_Tipula_submarmorata	NA	NA	1	105
658	Diptera	Tipulidae	Tipula	variicornis	Diptera_Tipulidae_Tipula_variicornis	NA	NA	1	152662
659	Diptera	Trichoceridae	Trichocera	NA	Diptera_Trichoceridae_Trichocera_NA	NA	NA	1	2693

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
660	Embioptera	NA	NA	NA	Embioptera_NA_NA_NA	1	95	NA	NA
661	Enchytraeida	Enchytraeidae	Cernosvitoviella	ampullax	Enchytraeida_Enchytraeidae_Cernosvitoviella_ampullax	NA	NA	2	286
662	Enchytraeida	Enchytraeidae	Cernosvitoviella	cf. atrata	Enchytraeida_Enchytraeidae_Cernosvitoviella_cf. atrata	NA	NA	4	684
663	Enchytraeida	Enchytraeidae	Cernosvitoviella	NA	Enchytraeida_Enchytraeidae_Cernosvitoviella_NA	NA	NA	1	405
664	Enchytraeida	Enchytraeidae	Cernosvitoviella	pusilla	Enchytraeida_Enchytraeidae_Cernosvitoviella_pusilla	NA	NA	3	517
665	Enchytraeida	Enchytraeidae	Chamaedrilus	chalupskyi	Enchytraeida_Enchytraeidae_-Chamaedrilus_chalupskyi	NA	NA	11	4830
666	Enchytraeida	Enchytraeidae	Chamaedrilus	NA	Enchytraeida_Enchytraeidae_-Chamaedrilus_NA	NA	NA	1	323
667	Enchytraeida	Enchytraeidae	Chamaedrilus	varisetosus	Enchytraeida_Enchytraeidae_-Chamaedrilus_varisetosus	NA	NA	12	5395
668	Enchytraeida	Enchytraeidae	Cognettia	glandulosa B SM2014	Enchytraeida_Enchytraeidae_-Cognettia_glandulosa B SM2014	NA	NA	49	40146
669	Enchytraeida	Enchytraeidae	Cognettia	sphagnetorum A SM2014	Enchytraeida_Enchytraeidae_-Cognettia_sphagnetorum A SM-2014	NA	NA	15	55585
670	Enchytraeida	Enchytraeidae	Cognettia	sphagnetorum B SM2014	Enchytraeida_Enchytraeidae_-Cognettia_sphagnetorum B SM-2014	NA	NA	31	161156
671	Enchytraeida	Enchytraeidae	Cognettia	sphagnetorum C SM2014	Enchytraeida_Enchytraeidae_-Cognettia_sphagnetorum C SM-2014	NA	NA	5	22387
672	Enchytraeida	Enchytraeidae	Cognettia	sphagnetorum D SM2014	Enchytraeida_Enchytraeidae_-Cognettia_sphagnetorum D SM-2014	NA	NA	4	1596
673	Enchytraeida	Enchytraeidae	Cognettia	sphagnetorum L3	Enchytraeida_Enchytraeidae_-Cognettia_sphagnetorum L3	NA	NA	1	76
674	Enchytraeida	Enchytraeidae	Enchytraeidae-gen	NA	Enchytraeida_Enchytraeidae_-Enchytraeidaegen_NA	NA	NA	23	69343
675	Enchytraeida	Enchytraeidae	Enchytraeus	NA	Enchytraeida_Enchytraeidae_-Enchytraeus_NA	NA	NA	1	1220
676	Enchytraeida	Enchytraeidae	Fridericia	galba B	Enchytraeida_Enchytraeidae_Fridericia_galba B	NA	NA	1	2952
677	Enchytraeida	Enchytraeidae	Fridericia	magna	Enchytraeida_Enchytraeidae_Fridericia_magna	NA	NA	1	80924
678	Enchytraeida	Enchytraeidae	Fridericia	NA	Enchytraeida_Enchytraeidae_Fridericia_NA	NA	NA	1	32
679	Enchytraeida	Enchytraeidae	Fridericia	perrieri B	Enchytraeida_Enchytraeidae_Fridericia_perrieri B	NA	NA	7	34102
680	Enchytraeida	Enchytraeidae	Globulidrilus	riparius	Enchytraeida_Enchytraeidae_Glo-	NA	NA	1	255

					bulidrilus_riparius				
681	Enchytraeida	Enchytraeidae	Henlea	perpusilla	Enchytraeida_Enchytraeidae_-Henlea_perpusilla	NA	NA	4	4762
682	Enchytraeida	Enchytraeidae	Lumbricillus	arenarius	Enchytraeida_Enchytraeidae_-Lumbricillus_arenarius	NA	NA	1	10976
683	Enchytraeida	Enchytraeidae	Lumbricillus	scandicus	Enchytraeida_Enchytraeidae_-Lumbricillus_scandicus	NA	NA	1	1032
684	Enchytraeida	Enchytraeidae	Mesenchytraeus	NA	Enchytraeida_Enchytraeidae_Mesenchytraeus_NA	NA	NA	1	44
685	Enchytraeida	Enchytraeidae	NA	NA	Enchytraeida_Enchytraeidae_-NA_NA	3	3	6	1769
686	Enchytraeida	Randiellidae	Ilyodrilus	templetoni	Enchytraeida_Randiellidae_Ilyodrilus_templetoni	NA	NA	1	46
687	Entomobryomorpha	Entomobryidae	Entomobrya	nivalis	Entomobryomorpha_Entomobryidae_Entomobrya_nivalis	NA	NA	1	1482
688	Entomobryomorpha	Entomobryidae	NA	NA	Entomobryomorpha_Entomobryidae_NA_NA	NA	NA	1	44
689	Entomobryomorpha	Isotomidae	Agrenia	riparia	Entomobryomorpha_Isotomidae_-Agrenia_riparia	NA	NA	1	21
690	Entomobryomorpha	Isotomidae	Anurophorus	laricis	Entomobryomorpha_Isotomidae_-Anurophorus_laricis	NA	NA	1	275
691	Entomobryomorpha	Isotomidae	Isotoma	NA	Entomobryomorpha_Isotomidae_-Isotoma_NA	NA	NA	1	105
692	Entomobryomorpha	Isotomidae	Isotomurus	graminis	Entomobryomorpha_Isotomidae_-Isotomurus_graminis	NA	NA	1	746
693	Entomobryomorpha	Isotomidae	Isotomurus	palustris	Entomobryomorpha_Isotomidae_-Isotomurus_palustris	NA	NA	1	48
694	Entomobryomorpha	Isotomidae	Isotomurus	plumosus	Entomobryomorpha_Isotomidae_-Isotomurus_plumosus	NA	NA	1	451
695	Entomobryomorpha	Isotomidae	NA	NA	Entomobryomorpha_Isotomidae_-NA_NA	NA	NA	2	387
696	Entomobryomorpha	Isotomidae	Tetracanthella	brachyura	Entomobryomorpha_Isotomidae_-Tetracanthella_brachyura	NA	NA	1	342
697	Ephemeroptera	Ameletidae	Ameletus	inopinatus	Ephemeroptera_Ameletidae_-Ameletus_inopinatus	27	888,8	47	1043806
698	Ephemeroptera	Ameletidae	Ameletus	NA	Ephemeroptera_Ameletidae_-Ameletus_NA	11	48,2	NA	NA
699	Ephemeroptera	Ameletidae	NA	NA	Ephemeroptera_Ameletidae_NA_-NA	1	7	NA	NA
700	Ephemeroptera	Baetidae	Acentrella	lapponica	Ephemeroptera_Baetidae_Acentrella_lapponica	NA	NA	1	40
701	Ephemeroptera	Baetidae	Baetis	bundyae	Ephemeroptera_Baetidae_Baetis_bundyae	NA	NA	5	934
702	Ephemeroptera	Baetidae	Baetis	digitatus	Ephemeroptera_Baetidae_Baetis_digitatus	1	39	7	38322
703	Ephemeroptera	Baetidae	Baetis	fuscatus	Ephemeroptera_Baetidae_Baetis_fuscatus	1	20,8	6	3226

704	Ephemeroptera	Baetidae	Baetis	fuscatus	Ephemeroptera_Baetidae_Baetis_fuscatus	5	12,35	6	3226
705	Ephemeroptera	Baetidae	Baetis	fuscatus	Ephemeroptera_Baetidae_Baetis_fuscatus	1	0,4	6	3226
706	Ephemeroptera	Baetidae	Baetis	jaervii	Ephemeroptera_Baetidae_Baetis_jaervii	1	4	NA	NA
707	Ephemeroptera	Baetidae	Baetis	macani	Ephemeroptera_Baetidae_Baetis_macani	NA	NA	1	24078
708	Ephemeroptera	Baetidae	Baetis	muticus	Ephemeroptera_Baetidae_Baetis_muticus	16	459,29	28	210802
709	Ephemeroptera	Baetidae	Baetis	NA	Ephemeroptera_Baetidae_Baetis_NA	59	4740,07	8	49423
710	Ephemeroptera	Baetidae	Baetis	niger	Ephemeroptera_Baetidae_Baetis_niger	14	955	48	540581
711	Ephemeroptera	Baetidae	Baetis	niger	Ephemeroptera_Baetidae_Baetis_niger	23	1095	48	540581
712	Ephemeroptera	Baetidae	Baetis	rhodani	Ephemeroptera_Baetidae_Baetis_rhodani	136	23344,04	149	6542588
713	Ephemeroptera	Baetidae	Baetis	scambus	Ephemeroptera_Baetidae_Baetis_scambus	1	200	4	91197
714	Ephemeroptera	Baetidae	Baetis	subalpinus	Ephemeroptera_Baetidae_Baetis_subalpinus	1	1,47	11	272757
715	Ephemeroptera	Baetidae	Baetis	vernus	Ephemeroptera_Baetidae_Baetis_vernus	1	0,2	7	45883
716	Ephemeroptera	Baetidae	Baetis	vernus	Ephemeroptera_Baetidae_Baetis_vernus	17	380	7	45883
717	Ephemeroptera	Baetidae	Centroptilum	luteolum	Ephemeroptera_Baetidae_Centroptilum_luteolum	41	922,28	28	249799
718	Ephemeroptera	Baetidae	Centroptilum	NA	Ephemeroptera_Baetidae_Centroptilum_NA	1	4,8	NA	NA
719	Ephemeroptera	Baetidae	Cloeon	cf. schoenemundi	Ephemeroptera_Baetidae_Cloeon_cf. schoenemundi	NA	NA	5	12363
720	Ephemeroptera	Baetidae	Cloeon	dipterum	Ephemeroptera_Baetidae_Cloeon_dipterum	7	34,2	22	226407
721	Ephemeroptera	Baetidae	Cloeon	inscriptum	Ephemeroptera_Baetidae_Cloeon_inscriptum	5	6,6	NA	NA
722	Ephemeroptera	Baetidae	Cloeon	NA	Ephemeroptera_Baetidae_Cloeon_NA	7	65,8	NA	NA
723	Ephemeroptera	Baetidae	Cloeon	NA	Ephemeroptera_Baetidae_Cloeon_NA	6	18,53	NA	NA
724	Ephemeroptera	Baetidae	Cloeon	simile	Ephemeroptera_Baetidae_Cloeon_simile	2	1	2	4936
725	Ephemeroptera	Baetidae	NA	NA	Ephemeroptera_Baetidae_NA_NA	8	38,2	NA	NA
726	Ephemeroptera	Baetidae	Nigrobaetis	digitatus	Ephemeroptera_Baetidae_Nigrobaetis_digitatus	5	197,53	NA	NA
727	Ephemeroptera	Baetidae	Nigrobaetis	niger	Ephemeroptera_Baetidae_Nigrobaetis_niger	17	388	NA	NA

728	Ephemeroptera	Baetidae	Procloeon	bifidum	Ephemeroptera_Baetidae_Procloeon_bifidum	1	0,2	1	47
729	Ephemeroptera	Baetidae	Takobia	muticus	Ephemeroptera_Baetidae_Takobia_muticus	20	1287	NA	NA
730	Ephemeroptera	Caenidae	Caenis	horaria	Ephemeroptera_Caenidae_Caenis_horaria	44	7616,2	43	1195594
731	Ephemeroptera	Caenidae	Caenis	lactea	Ephemeroptera_Caenidae_Caenis_lactea	3	5	2	669
732	Ephemeroptera	Caenidae	Caenis	luctuosa	Ephemeroptera_Caenidae_Caenis_luctuosa	24	1883,4	22	892988
733	Ephemeroptera	Caenidae	Caenis	NA	Ephemeroptera_Caenidae_Caenis_NA	5	16	NA	NA
734	Ephemeroptera	Caenidae	Caenis	rivulorum	Ephemeroptera_Caenidae_Caenis_rivulorum	13	295,07	3	3668
735	Ephemeroptera	Caenidae	Caenis	robusta	Ephemeroptera_Caenidae_Caenis_robusta	NA	NA	2	5314
736	Ephemeroptera	Caenidae	Caenis	sp2	Ephemeroptera_Caenidae_Caenis_sp2	NA	NA	20	127271
737	Ephemeroptera	Caenidae	NA	NA	Ephemeroptera_Caenidae_NA_NA	NA	NA	9	48526
738	Ephemeroptera	Ephemerellidae	Ephemerella	aurivillii	Ephemeroptera_Ephemerellidae_-Ephemerella_aurivillii	25	577,01	29	1494820
739	Ephemeroptera	Ephemerellidae	Ephemerella	mucronata	Ephemeroptera_Ephemerellidae_-Ephemerella_mucronata	13	73,12	10	34347
740	Ephemeroptera	Ephemerellidae	Ephemerella	NA	Ephemeroptera_Ephemerellidae_-Ephemerella_NA	4	12,12	NA	NA
741	Ephemeroptera	Ephemerellidae	Serratella	ignita	Ephemeroptera_Ephemerellidae_-Serratella_ignita	11	45,2	11	142376
742	Ephemeroptera	Ephemeridae	Ephemera	danica	Ephemeroptera_Ephemeridae_-Ephemera_danica	24	327,24	17	69912
743	Ephemeroptera	Ephemeridae	Ephemera	NA	Ephemeroptera_Ephemeridae_-Ephemera_NA	8	8,87	NA	NA
744	Ephemeroptera	Ephemeridae	Ephemera	vulgata	Ephemeroptera_Ephemeridae_-Ephemera_vulgata	15	126	15	999129
745	Ephemeroptera	Heptageniidae	Heptagenia	dalecarlica	Ephemeroptera_Heptageniidae_-Heptagenia_dalecarlicaa	29	647,2	40	1392257
746	Ephemeroptera	Heptageniidae	Heptagenia	fuscogrisea	Ephemeroptera_Heptageniidae_-Heptagenia_fuscogrisea	2	35	NA	NA
747	Ephemeroptera	Heptageniidae	Heptagenia	NA	Ephemeroptera_Heptageniidae_-Heptagenia_NA	31	295,87	NA	NA
748	Ephemeroptera	Heptageniidae	Heptagenia	sulphurea	Ephemeroptera_Heptageniidae_-Heptagenia_sulphurea	48	762,28	43	329904
749	Ephemeroptera	Heptageniidae	Kageronia	fuscogrisea	Ephemeroptera_Heptageniidae_-Kageronia_fuscogrisea	47	1728,6	46	301733
750	Ephemeroptera	Heptageniidae	NA	NA	Ephemeroptera_Heptageniidae_-NA_NA	4	48,8	NA	NA
751	Ephemeroptera	Heptageniidae	Nixe	joernensis	Ephemeroptera_Heptageniidae_-Nixe_joernensis	NA	NA	1	14225

752	Ephemeroptera	Leptophlebiidae	Habrophlebia	lauta	Ephemeroptera_Leptophlebiidae_Habrophlebia_lauta	NA	NA	1	29
753	Ephemeroptera	Leptophlebiidae	Leptophlebia	marginata	Ephemeroptera_Leptophlebiidae_Leptophlebia_marginata	46	366,73	75	1989336
754	Ephemeroptera	Leptophlebiidae	Leptophlebia	NA	Ephemeroptera_Leptophlebiidae_Leptophlebia_NA	51	2687,76	NA	NA
755	Ephemeroptera	Leptophlebiidae	Leptophlebia	vespertina	Ephemeroptera_Leptophlebiidae_Leptophlebia_vespertina	55	1177,55	73	3535642
756	Ephemeroptera	Leptophlebiidae	NA	NA	Ephemeroptera_Leptophlebiidae_NA_NA	5	32,4	NA	NA
757	Ephemeroptera	Leptophlebiidae	Paraleptophlebia	cincta	Ephemeroptera_Leptophlebiidae_Paraleptophlebia_cincta	NA	NA	6	1575
758	Ephemeroptera	Leptophlebiidae	Paraleptophlebia	NA	Ephemeroptera_Leptophlebiidae_Paraleptophlebia_NA	13	145	NA	NA
759	Ephemeroptera	Leptophlebiidae	Paraleptophlebia	submarginata	Ephemeroptera_Leptophlebiidae_Paraleptophlebia_submarginata	5	14	3	18790
760	Ephemeroptera	Metretopodidae	Metretopus	borealis	Ephemeroptera_Metretopodidae_Metretopus_borealis	1	0,6	1	1384
761	Ephemeroptera	NA	NA	NA	Ephemeroptera_NA_NA_NA	NA	NA	15	1731
762	Ephemeroptera	Siphlonuridae	NA	NA	Ephemeroptera_Siphlonuridae_NA_NA	1	0,2	NA	NA
763	Ephemeroptera	Siphlonuridae	Siphlonurus	alternatus	Ephemeroptera_Siphlonuridae_Siphlonurus_alternatus	NA	NA	1	632
764	Ephemeroptera	Siphlonuridae	Siphlonurus	armatus	Ephemeroptera_Siphlonuridae_Siphlonurus_armatus	NA	NA	3	120486
765	Ephemeroptera	Siphlonuridae	Siphlonurus	croaticus	Ephemeroptera_Siphlonuridae_Siphlonurus_croaticus	NA	NA	2	24696
766	Ephemeroptera	Siphlonuridae	Siphlonurus	lacustris	Ephemeroptera_Siphlonuridae_Siphlonurus_lacustris	4	17,2	4	21315
767	Ephemeroptera	Siphlonuridae	Siphlonurus	NA	Ephemeroptera_Siphlonuridae_Siphlonurus_NA	2	6	NA	NA

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundnaces	DNA samples	DNA reads
768	Galeommatida	Lasaeidae	Mysella	bidentata	Galeommatida_Lasaeidae_Mysella_bidentata	NA	NA	3	570

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
769	Haplotaxida	Lumbricidae	Allolobophora	chlorotica	Haplotaxida_Lumbricidae_Allolobophora_chlorotica	NA	NA	3	9687
770	Haplotaxida	Lumbricidae	Aporrectodea	caliginosa	Haplotaxida_Lumbricidae_Aporrectodea_caliginosa	NA	NA	5	29114
771	Haplotaxida	Lumbricidae	Aporrectodea	cupulifera	Haplotaxida_Lumbricidae_Aporrectodea_cupulifera	NA	NA	1	20623
772	Haplotaxida	Lumbricidae	Dendrobaena	attemsi	Haplotaxida_Lumbricidae_Dendrobaena_attemsi	NA	NA	1	56370
773	Haplotaxida	Lumbricidae	Dendrobaena	octaedra	Haplotaxida_Lumbricidae_Dendrobaena_octaedra	NA	NA	4	331850
774	Haplotaxida	Lumbricidae	Dendrodrilus	NA	Haplotaxida_Lumbricidae_Dendrodrilus_NA	NA	NA	8	23714
775	Haplotaxida	Lumbricidae	Dendrodrilus	rubidus	Haplotaxida_Lumbricidae_Dendrodrilus_rubidus	NA	NA	20	1573734
776	Haplotaxida	Lumbricidae	Eiseniella	tetraedra	Haplotaxida_Lumbricidae_Eiseniella_tetraedra	20	36,93	52	955463
777	Haplotaxida	Lumbricidae	Helodrilus	oculatus	Haplotaxida_Lumbricidae_Helodrilus_oculatus	NA	NA	2	61792
778	Haplotaxida	Lumbricidae	Lumbricus	castaneus	Haplotaxida_Lumbricidae_Lumbricus_castaneus	NA	NA	2	773
779	Haplotaxida	Lumbricidae	Lumbricus	rubellus	Haplotaxida_Lumbricidae_Lumbricus_rubellus	NA	NA	6	260863
780	Haplotaxida	Lumbricidae	NA	NA	Haplotaxida_Lumbricidae_NA_NA	7	38	7	19629
781	Haplotaxida	Lumbricidae	Octolasion	tyrtaeum	Haplotaxida_Lumbricidae_Octolasion_tyrtaeum	NA	NA	1	999
782	Haplotaxida	Naididae	Aulodrilus	NA	Haplotaxida_Naididae_Aulodrilus_NA	NA	NA	1	2784
783	Haplotaxida	Naididae	Aulodrilus	pluriseta	Haplotaxida_Naididae_Aulodrilus_pluriseta	NA	NA	10	9946
784	Haplotaxida	Naididae	Bothrioneurum	vejdovskyanum	Haplotaxida_Naididae_Bothrioneurum_vejdovskyanum	NA	NA	3	54274
785	Haplotaxida	Naididae	Chaetogaster	diastrophus	Haplotaxida_Naididae_Chaetogaster_diastrophus	NA	NA	3	209
786	Haplotaxida	Naididae	Chaetogaster	NA	Haplotaxida_Naididae_Chaetogaster_NA	NA	NA	14	21394
787	Haplotaxida	Naididae	Dero	NA	Haplotaxida_Naididae_Dero_NA	NA	NA	1	201
788	Haplotaxida	Naididae	Limnodrilus	claparedianus	Haplotaxida_Naididae_Limnodrilus_claparedianus	NA	NA	12	8690
789	Haplotaxida	Naididae	Limnodrilus	hoffmeisteri	Haplotaxida_Naididae_Limnodrilus_hoffmeisteri	3	110	47	343539
790	Haplotaxida	Naididae	Limnodrilus	NA	Haplotaxida_Naididae_Limnodrilus_NA	NA	NA	6	22524

791	Haplotaxida	Naididae	NA	NA	Haplotaxida_Naididae_NA_NA	55	2162	52	124907
792	Haplotaxida	Naididae	NA	NA	Haplotaxida_Naididae_NA_NA	3	1406	52	124907
793	Haplotaxida	Naididae	Nais	alpina	Haplotaxida_Naididae_Nais_alpina	NA	NA	9	500
794	Haplotaxida	Naididae	Nais	barbata	Haplotaxida_Naididae_Nais_barbata	NA	NA	7	6232
795	Haplotaxida	Naididae	Nais	communis	Haplotaxida_Naididae_Nais_communis	NA	NA	10	10465
796	Haplotaxida	Naididae	Nais	elinguis	Haplotaxida_Naididae_Nais_elinguis	NA	NA	8	17875
797	Haplotaxida	Naididae	Nais	NA	Haplotaxida_Naididae_Nais_NA	NA	NA	9	4980
798	Haplotaxida	Naididae	Nais	stolci	Haplotaxida_Naididae_Nais_stolci	NA	NA	4	2305
799	Haplotaxida	Naididae	Nais	variabilis	Haplotaxida_Naididae_Nais_variabilis	NA	NA	1	104
800	Haplotaxida	Naididae	Ophidonais	serpentina	Haplotaxida_Naididae_Ophidonais_serpentina	NA	NA	15	105878
801	Haplotaxida	Naididae	Piguetiella	blanci	Haplotaxida_Naididae_Piguetiella_blanci	NA	NA	3	219
802	Haplotaxida	Naididae	Potamothrix	bavaricus	Haplotaxida_Naididae_Potamothrix_bavaricus	NA	NA	3	9180
803	Haplotaxida	Naididae	Potamothrix	hammoniensis	Haplotaxida_Naididae_Potamothrix_hammoniensis	2	15	1	1745
804	Haplotaxida	Naididae	Potamothrix	NA	Haplotaxida_Naididae_Potamothrix_NA	NA	NA	21	266061
805	Haplotaxida	Naididae	Psammoryctides	albicola	Haplotaxida_Naididae_Psammoryctides_albicola	NA	NA	8	38620
806	Haplotaxida	Naididae	Psammoryctides	barbatus	Haplotaxida_Naididae_Psammoryctides_barbatus	NA	NA	45	292723
807	Haplotaxida	Naididae	Rhyacodrilus	coccineus	Haplotaxida_Naididae_Rhyacodrilus_coccineus	NA	NA	19	23130
808	Haplotaxida	Naididae	Rhyacodrilus	subterraneus	Haplotaxida_Naididae_Rhyacodrilus_subterraneus	NA	NA	2	8158
809	Haplotaxida	Naididae	Ripistes	parasita	Haplotaxida_Naididae_Ripistes_parasita	6	124	15	16214
810	Haplotaxida	Naididae	Slavina	appendiculata	Haplotaxida_Naididae_Slavina_appendiculata	NA	NA	22	3698
811	Haplotaxida	Naididae	Specaria	josinae	Haplotaxida_Naididae_Specaria_josinae	NA	NA	3	216
812	Haplotaxida	Naididae	Spirosperma	ferox	Haplotaxida_Naididae_Spirosperma_ferox	12	262	66	392249
813	Haplotaxida	Naididae	Spirosperma	NA	Haplotaxida_Naididae_Spirosperma_NA	NA	NA	1	1126
814	Haplotaxida	Naididae	Stylaria	lacustris	Haplotaxida_Naididae_Stylaria_lacustris	7	842	34	182244
815	Haplotaxida	Naididae	Tubifex	ignotus	Haplotaxida_Naididae_Tubifex_ignotus	NA	NA	12	16508

816	Haplotaxida	Naididae	Tubifex	NA	Haplotaxida_Naididae_Tubifex_NA	3	32	5	36110
817	Haplotaxida	Naididae	Tubifex	smirnowi	Haplotaxida_Naididae_Tubifex_-smirnowi	NA	NA	7	4631
818	Haplotaxida	Naididae	Tubifex	tubifex	Haplotaxida_Naididae_Tubifex_tubifex	NA	NA	38	319024
819	Haplotaxida	Naididae	Uncinais	uncinata	Haplotaxida_Naididae_Uncinais_-uncinata	NA	NA	6	1522
820	Haplotaxida	Naididae	Vejdovskyella	comata	Haplotaxida_Naididae_Vejdovskyella_comata	NA	NA	5	344
821	Harpacticoida	Canthocamptidae	Bryocamptus	cuspidatus	Harpacticoida_Canthocamptidae_Bryocamptus_cuspidatus	NA	NA	3	238
822	Harpacticoida	Canthocamptidae	Epactophanes	NA	Harpacticoida_Canthocamptidae_Epactophanes_NA	NA	NA	1	30
823	Harpacticoida	Canthocamptidae	Moraria	brevipes	Harpacticoida_Canthocamptidae_Moraria_brevipes	NA	NA	1	200
824	Harpacticoida	NA	NA	NA	Harpacticoida_NA_NA_NA	2	3	NA	NA
825	Hemiptera	Aphelocheiridae	Aphelocheirus	aestivalis	Hemiptera_Aphelocheiridae_-Aphelocheirus_aestivalis	2	84,8	2	11832
826	Hemiptera	Aphididae	Euceraphis	betulae	Hemiptera_Aphididae_Euceraphis_betulae	NA	NA	1	1060
827	Hemiptera	Aphididae	Rhopalosiphum	nymphaeae	Hemiptera_Aphididae_Rhopalosiphum_nymphaeae	NA	NA	1	41
828	Hemiptera	Cicadellidae	Alnetoidia	NA	Hemiptera_Cicadellidae_Alnetoidia_NA	NA	NA	1	606
829	Hemiptera	Cicadellidae	Balclutha	punctata	Hemiptera_Cicadellidae_Balclutha_punctata	NA	NA	1	47
830	Hemiptera	Cicadellidae	Oncopsis	flavicollis	Hemiptera_Cicadellidae_Oncopsis_flavicollis	NA	NA	1	9726
831	Hemiptera	Corixidae	Callicorixa	alaskensis	Hemiptera_Corixidae_Callicorixa_-alaskensis	NA	NA	5	33760
832	Hemiptera	Corixidae	Callicorixa	NA	Hemiptera_Corixidae_Callicorixa_-NA	3	1,47	7	69005
833	Hemiptera	Corixidae	Callicorixa	producta	Hemiptera_Corixidae_Callicorixa_-producta	3	2,4	NA	NA
834	Hemiptera	Corixidae	Callicorixa	wollastoni	Hemiptera_Corixidae_Callicorixa_-wollastoni	1	4	7	227441
835	Hemiptera	Corixidae	Corixa	NA	Hemiptera_Corixidae_Corixa_NA	1	1	NA	NA
836	Hemiptera	Corixidae	Cymatia	bonsdorffii	Hemiptera_Corixidae_Cymatia_-bonsdorffii	1	7	NA	NA
837	Hemiptera	Corixidae	Cymatia	NA	Hemiptera_Corixidae_Cymatia_-NA	NA	NA	1	126057
838	Hemiptera	Corixidae	Glaenocorisa	propinqua	Hemiptera_Corixidae_Glaenocorisa_propinqua	1	1	1	120384
839	Hemiptera	Corixidae	Hesperocorixa	sahlbergi	Hemiptera_Corixidae_Hesperocorixa_sahlbergi	1	1	2	159523
840	Hemiptera	Corixidae	Micronecta	minutissima	Hemiptera_Corixidae_Micronec-	NA	NA	4	3368

				ta_minutissima					
841	Hemiptera	Corixidae	Micronecta	poweri	Hemiptera_Corixidae_Micronecta_poweri	NA	NA	8	56272
842	Hemiptera	Corixidae	NA	NA	Hemiptera_Corixidae_NA_NA	4	6,2	2	1005
843	Hemiptera	Corixidae	Sigara	falleni	Hemiptera_Corixidae_Sigara_falleni	NA	NA	3	24007
844	Hemiptera	Corixidae	Sigara	fossarum	Hemiptera_Corixidae_Sigara_fossarum	1	1	NA	NA
845	Hemiptera	Corixidae	Sigara	iactans	Hemiptera_Corixidae_Sigara_iactans	1	1	NA	NA
846	Hemiptera	Corixidae	Sigara	limitata	Hemiptera_Corixidae_Sigara_limitata	NA	NA	2	9589
847	Hemiptera	Corixidae	Sigara	NA	Hemiptera_Corixidae_Sigara_NA	5	6,4	NA	NA
848	Hemiptera	Corixidae	Sigara	semistriata	Hemiptera_Corixidae_Sigara_semistriata	1	2	NA	NA
849	Hemiptera	Corixidae	Sigara	striata	Hemiptera_Corixidae_Sigara_striata	3	4	3	37097
850	Hemiptera	Gerridae	Gerris	lacustris	Hemiptera_Gerridae_Gerris_lacustris	NA	NA	1	338
851	Hemiptera	Gerridae	Gerris	NA	Hemiptera_Gerridae_Gerris_NA	1	2	NA	NA
852	Hemiptera	Micronectidae	Micronecta	NA	Hemiptera_Micronectidae_Micronecta_NA	13	664,8	NA	NA
853	Hemiptera	Naucoridae	Ilyocoris	cimicoides	Hemiptera_Naucoridae_Ilyocoris_cimicoides	1	1	NA	NA
854	Hemiptera	Nepidae	Nepa	cinerea	Hemiptera_Nepidae_Nepa_cinerea	2	2	3	147950
855	Hemiptera	Notonectidae	Notonecta	glauca	Hemiptera_Notonectidae_Notonecta_glauca	1	1	2	6329
856	Hemiptera	Notonectidae	Notonecta	NA	Hemiptera_Notonectidae_Notonecta_NA	1	1	NA	NA
857	Hemiptera	Notonectidae	Notonecta	reuteri	Hemiptera_Notonectidae_Notonecta_reuteri	NA	NA	1	798
858	Hemiptera	Notonectidae	Notonecta	viridis	Hemiptera_Notonectidae_Notonecta_viridis	1	1	NA	NA
859	Hemiptera	Potamocoridae	Ilyocoris	cimicoides	Hemiptera_Potamocoridae_Ilyocoris_cimicoides	NA	NA	1	52054
860	Hemiptera	Veliidae	Velia	caprai	Hemiptera_Veliidae_Velia_caprai	3	1,6	2	29387
861	Hirudinida	Erpobdellidae	Dina	lineata	Hirudinida_Erpobdellidae_Dina_lineata	2	6	NA	NA
862	Hirudinida	Erpobdellidae	Erpobdella	NA	Hirudinida_Erpobdellidae_Erpobdella_NA	21	90,88	NA	NA
863	Hirudinida	Erpobdellidae	Erpobdella	octoculata	Hirudinida_Erpobdellidae_Erpobdella_octoculata	59	255,4	NA	NA
864	Hirudinida	Erpobdellidae	Erpobdella	testacea	Hirudinida_Erpobdellidae_Erpobdella_testacea	8	17,2	NA	NA

865	Hirudinida	Erpobdellidae	NA	NA	Hirudinida_Erpobdellidae_NA_NA	5	1,6	NA	NA
866	Hirudinida	Glossiphoniidae	Glossiphonia	complanata	Hirudinida_Glossiphoniidae_-Glossiphonia_complanata	49	131,4	NA	NA
867	Hirudinida	Glossiphoniidae	Glossiphonia	concolor	Hirudinida_Glossiphoniidae_-Glossiphonia_concolor	2	9	NA	NA
868	Hirudinida	Glossiphoniidae	Glossiphonia	NA	Hirudinida_Glossiphoniidae_-Glossiphonia_NA	3	3,52	NA	NA
869	Hirudinida	Glossiphoniidae	Helobdella	stagnalis	Hirudinida_Glossiphoniidae_Helobdella_stagnalis	42	183,04	NA	NA
870	Hirudinida	Glossiphoniidae	NA	NA	Hirudinida_Glossiphoniidae_NA_-NA	5	15,6	NA	NA
871	Hirudinida	Glossiphoniidae	Theromyzon	tessulatum	Hirudinida_Glossiphoniidae_Theromyzon_tessulatum	6	4,4	NA	NA
872	Hirudinida	Haemopidae	Haemopis	sanguisuga	Hirudinida_Haemopidae_Haemopis_sanguisuga	4	4,2	NA	NA
873	Hirudinida	Hirudinidae	NA	NA	Hirudinida_Hirudinidae_NA_NA	4	115	NA	NA
874	Hirudinida	Piscicolidae	Piscicola	geometra	Hirudinida_Piscicolidae_Piscicola_-geometra	11	43,2	NA	NA
875	Hymenoptera	Braconidae	NA	NA	Hymenoptera_Braconidae_NA_NA	NA	NA	1	327
876	Hymenoptera	Diprionidae	Neodiprion	sertifer	Hymenoptera_Diprionidae_Neodiprion_sertifer	NA	NA	1	43129
877	Hymenoptera	Ichneumonidae	Agriotypus	armatus	Hymenoptera_Ichneumonidae_Agriotypus_armatus	NA	NA	2	1939
878	Hymenoptera	Ichneumonidae	Atractodes	bicolor	Hymenoptera_Ichneumonidae_Atractodes_bicolor	NA	NA	1	139
879	Hymenoptera	Ichneumonidae	NA	NA	Hymenoptera_Ichneumonidae_-NA_NA	NA	NA	1	49
880	Hymenoptera	Platygastridae	NA	NA	Hymenoptera_Platygastridae_-NA_NA	NA	NA	1	376

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundnaces	DNA samples	DNA reads
881	Isopoda	Asellidae	Asellus	aquaticus	Isopoda_Asellidae_Asellus_aquaticus	113	7578,86	102	982514
882	Isopoda	Asellidae	Asellus	NA	Isopoda_Asellidae_Asellus_NA	NA	NA	58	39749
883	Isopoda	Asellidae	NA	NA	Isopoda_Asellidae_NA_NA	NA	NA	60	29368
884	Isopoda	Asellidae	Proasellus	coxalis	Isopoda_Asellidae_Proasellus_-coxalis	NA	NA	4	2436
885	Isopoda	Philosciidae	Philoscia	muscorum	Isopoda_Philosciidae_Philoscia_-muscorum	NA	NA	1	169
886	Isopoda	Trichoniscidae	Haplophthalmus	mengii	Isopoda_Trichoniscidae_Haplophthalmus_mengii	NA	NA	1	22

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
887	Julida	Julidae	Julus	scandinavius	Julida_Julidae_Julus_scandinavius	NA	NA	1	12299

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
888	Lepidoptera	Crambidae	Cataclysta	lemnata	Lepidoptera_Crambidae_Cataclysta_lemnata	5	11	NA	NA
889	Lepidoptera	Crambidae	Nymphula	nitidulata	Lepidoptera_Crambidae_Nymphula_nitidulata	NA	NA	3	1649
890	Lepidoptera	Geometridae	Abraxas	sylvata	Lepidoptera_Geometridae_Abraxas_sylvata	NA	NA	1	99
891	Lepidoptera	NA	NA	NA	Lepidoptera_NA_NA_NA	1	0,2	NA	NA
892	Lepidoptera	Nepticulidae	Stigmella	luteella	Lepidoptera_Nepticulidae_Stigmella_luteella	NA	NA	1	101
893	Lepidoptera	Noctuidae	Apamea	remissa	Lepidoptera_Noctuidae_Apamea_remissa	NA	NA	1	284
894	Lepidoptera	Notodontidae	Pheosia	gnoma	Lepidoptera_Notodontidae_Pheosia_gnoma	NA	NA	1	313343
895	Lepidoptera	Pyralidae	NA	NA	Lepidoptera_Pyralidae_NA_NA	4	4	NA	NA
896	Lepidoptera	Tortricidae	Pandemis	heparana	Lepidoptera_Tortricidae_Pandemis_heparana	NA	NA	1	390
897	Littorinimorpha	Bithyniidae	Bithynia	leachii	Littorinimorpha_Bithyniidae_Bithynia_leachii	2	1,6	NA	NA
898	Littorinimorpha	Bithyniidae	Bithynia	tentaculata	Littorinimorpha_Bithyniidae_Bithynia_tentaculata	14	72,6	13	29728
899	Littorinimorpha	Hydrobiidae	Marstoniopsis	insubrica	Littorinimorpha_Hydrobiidae_Marstoniopsis_insubrica	3	6,8	4	4321
900	Littorinimorpha	Tateidae	Potamopyrgus	antipodarum	Littorinimorpha_Tateidae_Potamopyrgus_antipodarum	19	356,8	9	5736
901	Lumbriculida	Lumbriculidae	Lumbriculus	NA	Lumbriculida_Lumbriculidae_Lumbriculus_NA	NA	NA	30	59283
902	Lumbriculida	Lumbriculidae	Lumbriculus	variegatus	Lumbriculida_Lumbriculidae_Lumbriculus_variegatus	5	14	121	1294875
903	Lumbriculida	Lumbriculidae	Lumbriculus	variegatus II	Lumbriculida_Lumbriculidae_Lumbriculus_variegatus II	NA	NA	13	270540
904	Lumbriculida	Lumbriculidae	NA	NA	Lumbriculida_Lumbriculidae_NA_NA	NA	NA	53	30791
905	Lumbriculida	Lumbriculidae	Rhynchelmis	tetratheca	Lumbriculida_Lumbriculidae_Rhynchelmis_tetratheca	NA	NA	10	2899
906	Lumbriculida	Lumbriculidae	Stylodrilus	heringianus	Lumbriculida_Lumbriculidae_Stylodrilus_heringianus	NA	NA	90	259423

907	Lumbriculida	Lumbriculidae	Tatriella	longiatriata	Lumbriculida_Lumbriculidae_Tatriella_longiatriata	NA	NA	6	1759

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
908	Megaloptera	Sialidae	NA	NA	Megaloptera_Sialidae_NA_NA	NA	NA	4	8810
909	Megaloptera	Sialidae	Sialis	fuliginosa	Megaloptera_Sialidae_Sialis_fuliginosa	15	84,2	12	49486
910	Megaloptera	Sialidae	Sialis	lutaria	Megaloptera_Sialidae_Sialis_lutaria	35	90,19	31	362005
911	Megaloptera	Sialidae	Sialis	lutaria	Megaloptera_Sialidae_Sialis_lutaria	1	0,4	31	362005
912	Megaloptera	Sialidae	Sialis	NA	Megaloptera_Sialidae_Sialis_NA	15	28,47	NA	NA
913	Mermithida	Mermithidae	NA	NA	Mermithida_Mermithidae_NA_NA	4	9	NA	NA
914					Mollusca_Bivalvia	1	0,2	NA	NA
915					Mollusca_Gastropoda	2	33,4	NA	NA
916	Monostilifera	Tetrastemmatidae	Prostoma	graecense	Monostilifera_Tetrastemmatidae_Prostoma_graecense	NA	NA	1	369
917	Mysida	Mysidae	Mysis	relicta	Mysida_Mysidae_Mysis_relicta	1	1	1	757
918	Mysida	Mysidae	NA	NA	Mysida_Mysidae_NA_NA	1	3	NA	NA
919	Mysida	Mysidae	Neomysis	integer	Mysida_Mysidae_Neomysis_integer	NA	NA	1	1836

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
920	NA	Acroloxidae	Acroloxus	lacustris	NA_Acroloxidae_Acroloxus_lacustris	10	12,24	NA	NA
921	NA	Ancylidae	Ancylus	fluviatilis	NA_Ancylidae_Ancylus_fluviatilis	19	58	NA	NA
922	NA	Lymnaeidae	Ampullaceana	balthica	NA_Lymnaeidae_Ampullaceana_balthica	55	359,4	NA	NA
923	NA	Lymnaeidae	Galba	truncatula	NA_Lymnaeidae_Galba_truncatula	3	6,8	NA	NA
924	NA	Lymnaeidae	Lymnaea	NA	NA_Lymnaeidae_Lymnaea_NA	1	4	NA	NA
925	NA	Lymnaeidae	Lymnaea	stagnalis	NA_Lymnaeidae_Lymnaea_stagnalis	3	3	NA	NA
926	NA	Lymnaeidae	Myxas	glutinosa	NA_Lymnaeidae_Myxas_glutinosa	2	2	1	13
927	NA	Lymnaeidae	NA	NA	NA_Lymnaeidae_NA_NA	4	3	NA	NA
928	NA	Lymnaeidae	Radix	balthica	NA_Lymnaeidae_Radix_balthica	15	67	41	28734
929	NA	Lymnaeidae	Radix	labiata	NA_Lymnaeidae_Radix_labiata	4	37	NA	NA
930	NA	Lymnaeidae	Radix	NA	NA_Lymnaeidae_Radix_NA	5	15,2	NA	NA

931	NA	Lymnaeidae	Stagnicola	palustris	NA_Lymnaeidae_Stagnicola_palustris	2	2	NA	NA
932	NA	NA	NA	NA	NA_NA_NA_NA	NA	NA	25	20436
933	NA	Physidae	Aplexa	hypnorum	NA_Physidae_Aplexa_hypnorum	NA	NA	1	34
934	NA	Physidae	Physa	fontinalis	NA_Physidae_Physa_fontinalis	13	41,2	NA	NA
935	NA	Planorbidae	Anisus	contortus	NA_Planorbidae_Anisus_contortus	2	2	NA	NA
936	NA	Planorbidae	Anisus	leucostomus	NA_Planorbidae_Anisus_leucostomus	1	1	NA	NA
937	NA	Planorbidae	Anisus	vortex	NA_Planorbidae_Anisus_vortex	4	7	NA	NA
938	NA	Planorbidae	Armiger	crista	NA_Planorbidae_Armiger_crista	3	17	NA	NA
939	NA	Planorbidae	Bathyomphalus	contortus	NA_Planorbidae_Bathyomphalus_contortus	12	27,4	2	97
940	NA	Planorbidae	Gyraulus	acronicus	NA_Planorbidae_Gyraulus_acronicus	15	367,05	NA	NA
941	NA	Planorbidae	Gyraulus	albus	NA_Planorbidae_Gyraulus_albus	20	113,84	NA	NA
942	NA	Planorbidae	Gyraulus	crista	NA_Planorbidae_Gyraulus_crista	4	9,4	1	212
943	NA	Planorbidae	Gyraulus	NA	NA_Planorbidae_Gyraulus_NA	9	53,4	13	21504
944	NA	Planorbidae	Gyraulus	riparius	NA_Planorbidae_Gyraulus_riparius	1	1,6	NA	NA
945	NA	Planorbidae	Hippeutis	complanatus	NA_Planorbidae_Hippeutis_complanatus	1	0,8	1	228
946	NA	Planorbidae	NA	NA	NA_Planorbidae_NA_NA	8	18	NA	NA
947	NA	Planorbidae	Planorbarius	corneus	NA_Planorbidae_Planorbarius_corneus	1	1	NA	NA
948	NA	Planorbidae	Planorbis	carinatus	NA_Planorbidae_Planorbis_carinatus	1	2	NA	NA
949	NA	Planorbidae	Planorbis	planorbis	NA_Planorbidae_Planorbis_planorbis	1	11	1	218
950	NA	Valvatidae	Valvata	cristata	NA_Valvatidae_Valvata_cristata	4	22,8	NA	NA
951	NA	Valvatidae	Valvata	macrostoma	NA_Valvatidae_Valvata_macrostoma	1	1	NA	NA
952	NA	Valvatidae	Valvata	NA	NA_Valvatidae_Valvata_NA	5	7	NA	NA
953	NA	Valvatidae	Valvata	piscinalis	NA_Valvatidae_Valvata_piscinalis	4	2	NA	NA
954	Nematoda_NA	Nematoda_NA	Nematoda_NA	Nematoda_NA	Nematoda_NA	51	509,4	NA	NA
955	Nematomorpha_NA	Nematomorpha_NA	Nematomorpha_NA	Nematomorpha_NA	Nematomorpha_NA	2	4	NA	NA
956	Neuroptera	Sisyridae	Sisyra	NA	Neuroptera_Sisyridae_Sisyra_NA	2	2,2	NA	NA
957	Neuroptera	Sisyridae	Sisyra	nigra	Neuroptera_Sisyridae_Sisyra_nigra	NA	NA	1	1241

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
958	Odonata	Aeshnidae	Aeshna	cyanea	Odonata_Aeshnidae_Aeshna_cyanea	1	0,2	NA	NA
959	Odonata	Aeshnidae	Aeshna	grandis	Odonata_Aeshnidae_Aeshna_grandis	5	4,4	7	18230
960	Odonata	Aeshnidae	Aeshna	juncea	Odonata_Aeshnidae_Aeshna_juncea	2	2	1	73267
961	Odonata	Aeshnidae	Aeshna	NA	Odonata_Aeshnidae_Aeshna_NA	1	0,2	NA	NA
962	Odonata	Aeshnidae	Brachytron	pratense	Odonata_Aeshnidae_Brachytron_pratense	1	0,2	NA	NA
963	Odonata	Anisoptera	NA	NA	Odonata_Anisoptera_NA_NA	7	27,84	NA	NA
964	Odonata	Calopterygidae	Calopteryx	NA	Odonata_Calopterygidae_Calopteryx_NA	8	8,6	NA	NA
965	Odonata	Calopterygidae	Calopteryx	NA	Odonata_Calopterygidae_Calopteryx_NA	2	2	NA	NA
966	Odonata	Calopterygidae	Calopteryx	splendens	Odonata_Calopterygidae_Calopteryx_splendens	1	1	5	174752
967	Odonata	Calopterygidae	Calopteryx	splendens	Odonata_Calopterygidae_Calopteryx_splendens	2	2,2	5	174752
968	Odonata	Calopterygidae	Calopteryx	virgo	Odonata_Calopterygidae_Calopteryx_virgo	3	0,8	7	452928
969	Odonata	Coenagrionidae	Coenagrion	hastulatum	Odonata_Coenagrionidae_Coenagrion_hastulatum	1	0,4	2	3632
970	Odonata	Coenagrionidae	Coenagrion	puella	Odonata_Coenagrionidae_Coenagrion_puella	NA	NA	2	47861
971	Odonata	Coenagrionidae	Enallagma	cyathigerum	Odonata_Coenagrionidae_Enallagma_cyathigerum	8	21,4	50	1636487
972	Odonata	Coenagrionidae	Enallagma	NA	Odonata_Coenagrionidae_Enallagma_NA	NA	NA	15	19551
973	Odonata	Coenagrionidae	Erythromma	najas	Odonata_Coenagrionidae_Erythromma_najas	17	29,8	16	278148
974	Odonata	Coenagrionidae	Ischnura	elegans	Odonata_Coenagrionidae_Ischnura_elegans	2	1,6	4	117965
975	Odonata	Coenagrionidae	NA	NA	Odonata_Coenagrionidae_NA_NA	5	3,8	NA	NA
976	Odonata	Coenagrionidae	Pyrrhosoma	nymphula	Odonata_Coenagrionidae_Pyrrhosoma_nymphula	4	4,2	6	78238
977	Odonata	Cordulegastridae	Cordulegaster	boltonii	Odonata_Coenagrionidae_Cordulegaster_boltonii	14	23,28	13	859628
978	Odonata	Corduliidae	Cordulia	aenea	Odonata_Corduliidae_Cordulia_aenea	6	5,14	9	131322
979	Odonata	Corduliidae	NA	NA	Odonata_Corduliidae_NA_NA	5	7,4	NA	NA
980	Odonata	Corduliidae	Somatochlora	metallica	Odonata_Corduliidae_Somatochlora_metallica	17	28,67	15	56976

981	Odonata	Gomphidae	NA	NA	Odonata_Gomphidae_NA_NA	1	1	NA	NA
982	Odonata	Gomphidae	Onychogomphus	forcipatus	Odonata_Gomphidae_Onychogomphus_forcipatus	8	43,84	5	464191
983	Odonata	Gomphidae	Ophiogomphus	cecilia	Odonata_Gomphidae_Onychogomphus_cecilia	1	1	NA	NA
984	Odonata	Libellulidae	Leucorrhinia	albifrons	Odonata_Libellulidae_Leucorrhinia_albifrons	NA	NA	1	1000
985	Odonata	Libellulidae	Leucorrhinia	dubia	Odonata_Libellulidae_Leucorrhinia_dubia	NA	NA	3	531
986	Odonata	Libellulidae	Leucorrhinia	NA	Odonata_Libellulidae_Leucorrhinia_NA	1	0,2	1	81
987	Odonata	Libellulidae	Libellula	quadrimaculata	Odonata_Libellulidae_Libellula_quadrimaculata	NA	NA	4	6851
988	Odonata	Libellulidae	NA	NA	Odonata_Libellulidae_NA_NA	3	4	5	14142
989	Odonata	Libellulidae	Orthetrum	coerulescens	Odonata_Libellulidae_Orthetrum_coerulescens	NA	NA	1	129
990	Odonata	Libellulidae	Sympetrum	sanguineum	Odonata_Libellulidae_Sympetrum_sanguineum	1	2	NA	NA
991	Odonata	Libellulidae	Sympetrum	striolatum	Odonata_Libellulidae_Sympetrum_striolatum	NA	NA	8	758765
992	Odonata	NA	NA	NA	Odonata_NA_NA_NA	8	73	9	9733
993	Odonata	NA	NA	NA	Odonata_NA_NA_NA	1	1	9	9733
994	Odonata	NA	NA	NA	Odonata_NA_NA_NA	13	10,6	9	9733
995	Odonata	Platycnemididae	Platycnemis	pennipes	Odonata_Platycnemididae_Platycnemis_pennipes	1	0,2	NA	NA
996	Onychopoda	Polyphemidae	Polyphemus	pediculus	Onychopoda_Polyphemidae_Polyphemus_pediculus	NA	NA	3	1756
997					Platyhelminthes_TurbellariaPlatyhelminthes_Turbellaria	18	142	NA	NA

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
998	Plecoptera	Capniidae	Capnia	atra	Plecoptera_Capniidae_Capnia_atra	7	44	31	135741
999	Plecoptera	Capniidae	Capnia	NA	Plecoptera_Capniidae_Capnia_NA	39	1616,71	2	452
1000	Plecoptera	Capniidae	Capnia	pygmaea	Plecoptera_Capniidae_Capnia_pygmaea	5	204	14	118106
1001	Plecoptera	Capniidae	Capnia	vidua	Plecoptera_Capniidae_Capnia_vidua	NA	NA	6	151839
1002	Plecoptera	Capniidae	Capnopsis	schilleri	Plecoptera_Capniidae_Capnopsis_schilleri	22	429,2	13	19202
1003	Plecoptera	Capniidae	Zwicknia	bifrons	Plecoptera_Capniidae_Zwicknia_bifrons	1	12	6	95677
1004	Plecoptera	Chloroperlidae	Isoptena	serricornis	Plecoptera_Chloroperlidae_Isoptena_serricornis	1	1	NA	NA

1005	Plecoptera	Chloroperlidae	Siphonoperla	burmeisteri	Plecoptera_Chloroperlidae_Siphonoperla_burmeisteri	26	188,03	24	173959
1006	Plecoptera	Leuctridae	Leuctra	digitata	Plecoptera_Leuctridae_Leuctra_digitata	1	1	29	99122
1007	Plecoptera	Leuctridae	Leuctra	fusca	Plecoptera_Leuctridae_Leuctra_fusca	9	32,4	NA	NA
1008	Plecoptera	Leuctridae	Leuctra	hippopus	Plecoptera_Leuctridae_Leuctra_hippopus	44	830,13	68	712876
1009	Plecoptera	Leuctridae	Leuctra	NA	Plecoptera_Leuctridae_Leuctra_NA	63	1218,03	2	354
1010	Plecoptera	Leuctridae	Leuctra	nigra	Plecoptera_Leuctridae_Leuctra_nigra	13	113,52	18	81855
1011	Plecoptera	Leuctridae	NA	NA	Plecoptera_Leuctridae_NA_NA	1	44	NA	NA
1012	Plecoptera	NA	NA	NA	Plecoptera_NA_NA_NA	14	2198	NA	NA
1013	Plecoptera	Nemouridae	Amphinemura	borealis	Plecoptera_Nemouridae_Amphinemura_borealis	46	1209,18	24	299130
1014	Plecoptera	Nemouridae	Amphinemura	NA	Plecoptera_Nemouridae_Amphinemura_NA	22	1309,6	NA	NA
1015	Plecoptera	Nemouridae	Amphinemura	standfussi	Plecoptera_Nemouridae_Amphinemura_standfussi	2	3	2	6699
1016	Plecoptera	Nemouridae	Amphinemura	sulcicollis	Plecoptera_Nemouridae_Amphinemura_sulcicollis	10	202,6	41	277132
1017	Plecoptera	Nemouridae	NA	NA	Plecoptera_Nemouridae_NA_NA	3	89,8	NA	NA
1018	Plecoptera	Nemouridae	Nemoura	avicularis	Plecoptera_Nemouridae_Nemoura_avicularis	31	87,67	40	898456
1019	Plecoptera	Nemouridae	Nemoura	cinerea	Plecoptera_Nemouridae_Nemoura_cinerea	47	836,2	59	712196
1020	Plecoptera	Nemouridae	Nemoura	dubitans	Plecoptera_Nemouridae_Nemoura_dubitans	NA	NA	1	1210
1021	Plecoptera	Nemouridae	Nemoura	flexuosa	Plecoptera_Nemouridae_Nemoura_flexuosa	13	57,97	25	377034
1022	Plecoptera	Nemouridae	Nemoura	NA	Plecoptera_Nemouridae_Nemoura_NA	63	1474,76	8	28456
1023	Plecoptera	Nemouridae	Nemoura	sahlbergi	Plecoptera_Nemouridae_Nemoura_sahlbergi	1	0,2	1	2968
1024	Plecoptera	Nemouridae	Nemurella	pictetii	Plecoptera_Nemouridae_Nemurella_pictetii	10	55,6	11	30847
1025	Plecoptera	Nemouridae	Protonemura	meyeri	Plecoptera_Nemouridae_Protonemura_meyeri	45	716,99	41	231688
1026	Plecoptera	Perlidae	Dinocras	cephalotes	Plecoptera_Perlidae_Dinocras_cephalotes	3	13,07	3	404587
1027	Plecoptera	Perlidae	Perlodes	microcephala	Plecoptera_Perlidae_Perlodes_microcephala	3	17	NA	NA
1028	Plecoptera	Perlodidae	Arcynopteryx	compacta	Plecoptera_Perlidae_Arcynopteryx_compacta	4	12	10	976461
1029	Plecoptera	Perlodidae	Diura	bicaudata	Plecoptera_Perlidae_Diura_bicaudata	10	71	61	4023446

1030	Plecoptera	Perlodidae	Diura	NA	Plecoptera_Perlidae_Diura_NA	12	92	35	8360
1031	Plecoptera	Perlodidae	Diura	nanseni	Plecoptera_Perlidae_Diura_nanseni	59	639,1	80	7341813
1032	Plecoptera	Perlodidae	Isogenus	nubecula	Plecoptera_Perlidae_Isogenus_nubecula	1	2	1	10517
1033	Plecoptera	Perlodidae	Isoperla	difformis	Plecoptera_Perlidae_Isoperla_difformis	6	10,2	18	242355
1034	Plecoptera	Perlodidae	Isoperla	grammatica	Plecoptera_Perlidae_Isoperla_grammatica	33	605,2	51	765204
1035	Plecoptera	Perlodidae	Isoperla	NA	Plecoptera_Perlidae_Isoperla_NA	42	290,52	NA	NA
1036	Plecoptera	Perlodidae	Isoperla	obscura	Plecoptera_Perlidae_Isoperla_obscura	2	45	19	208329
1037	Plecoptera	Perlodidae	NA	NA	Plecoptera_Perlidae_NA_NA	2	7	51	175768
1038	Plecoptera	Perlodidae	Perlodes	dispar	Plecoptera_Perlidae_Perlodes_dispar	1	3,2	NA	NA
1039	Plecoptera	Perlodidae	Perlodes	microcephalus	Plecoptera_Perlidae_Perlodes_microcephalus	NA	NA	3	485188
1040	Plecoptera	Taeniopterygidae	Brachyptera	risi	Plecoptera_Taeniopterygidae_Brachyptera_risi	32	677	15	41254
1041	Plecoptera	Taeniopterygidae	NA	NA	Plecoptera_Taeniopterygidae_NA_NA	NA	NA	2	2595
1042	Plecoptera	Taeniopterygidae	Taeniopteryx	nebulosa	Plecoptera_Taeniopterygidae_Taeniopteryx_nebulosa	76	1159,28	69	1563182
1043	Podocopida	Candonidae	Candona	candida	Podocopida_Candonidae_Candona_candidaa	NA	NA	10	7969
1044	Podocopida	Candonidae	Cyclocypris	ovum	Podocopida_Candonidae_Cyclocypris_ovum	NA	NA	1	505
1045	Podocopida	Candonidae	Fabaeformiscandona	lapponica	Podocopida_Candonidae_Fabaeformiscandona_lapponica	NA	NA	7	2133
1046	Podocopida	Cyprididae	Cypridopsis	vidua	Podocopida_Cyprididae_Cypridopsis_vidua	NA	NA	1	69
1047	Podocopida	Cyprididae	Eucypris	pigra	Podocopida_Cyprididae_Eucypris_pigra	NA	NA	3	1536
1048	Podocopida	Cyprididae	Eucypris	virens	Podocopida_Cyprididae_Eucypris_virens	NA	NA	1	390
1049	Podocopida	Cyprididae	Herpetocypris	reptans	Podocopida_Cyprididae_Herpetocypris_reptans	NA	NA	7	2709
1050	Podocopida	Cyprididae	Potamocypris	NA	Podocopida_Cyprididae_Potamocypris_NA	NA	NA	1	3514
1051	Podocopida	Cyprididae	Potamocypris	pallida	Podocopida_Cyprididae_Potamocypris_pallida	NA	NA	6	15794
1052	Podocopida	Cyprididae	Prionocypris	zenkeri	Podocopida_Cyprididae_Prionocypris_zenkeri	NA	NA	1	7565
1053	Podocopida	Limnocytheridae	Limnocythere	inopinata	Podocopida_Limnocytheridae_Limnocythere_inopinata	NA	NA	1	305
1054	Psocodea	Liposcelididae	Liposcelis	NA	Psocodea_Liposcelididae_Liposcelis_NA	NA	NA	1	34

1055	Psocodea	Peripsocidae	Peripsocus	subfasciatus	Psocodea_Peripsocidae_Peripsocus_subfasciatus	NA	NA	1	97
1056	Psocodea	Psocidae	Psococerastis	gibbosa	Psocodea_Psocidae_Psococerastis_gibbosa	NA	NA	1	11222
1057	Pulmonata	Acroloxidae	Acroloxus	lacustris	Pulmonata_Acroloxidae_Acroloxus_lacustris	NA	NA	1	28
1058	Pulmonata	Ancylidae	Ancylus	fluviatilis	Pulmonata_Ancylidae_Ancylus_fluviatilis	NA	NA	1	39

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundnaces	DNA samples	DNA reads
1059	Rhynchobdellida	Glossiphoniidae	Glossiphonia	complanata	Rhynchobdellida_Glossiphoniidae_Glossiphonia_complanata	NA	NA	33	727586
1060	Rhynchobdellida	Glossiphoniidae	Glossiphonia	concolor	Rhynchobdellida_Glossiphoniidae_Glossiphonia_concolor	NA	NA	2	123440
1061	Rhynchobdellida	Glossiphoniidae	Glossiphonia	nebulosa	Rhynchobdellida_Glossiphoniidae_Glossiphonia_nebulosa	NA	NA	3	6311
1062	Rhynchobdellida	Glossiphoniidae	Helobdella	NA	Rhynchobdellida_Glossiphoniidae_Helobdella_NA	NA	NA	15	15555
1063	Rhynchobdellida	Glossiphoniidae	Helobdella	stagnalis	Rhynchobdellida_Glossiphoniidae_Helobdella_stagnalis	NA	NA	25	117448
1064	Rhynchobdellida	Glossiphoniidae	NA	NA	Rhynchobdellida_Glossiphoniidae_NA_NA	NA	NA	6	2728
1065	Rhynchobdellida	Glossiphoniidae	Theromyzon	tessulatum	Rhynchobdellida_Glossiphoniidae_Theromyzon_tessulatum	NA	NA	2	760
1066	Rhynchobdellida	Piscicolidae	Piscicola	NA	Rhynchobdellida_Piscicolidae_Piscicola_NA	NA	NA	6	36502
1067	Rotaliida	Sphaeroidinidae	Sphaerioidea	NA	Rotaliida_Sphaeroidinidae_Sphaerioidea_NA	3	2042	NA	NA

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
1068	Sarcoptiformes	Crotoniidae	Neonothrus	humicola	Sarcoptiformes_Crotoniidae_Neonothrus_humicola	NA	NA	1	106
1069	Sarcoptiformes	Crotoniidae	Platynothrus	peltifer	Sarcoptiformes_Crotoniidae_Platynothrus_peltifer	NA	NA	1	19
1070	Sarcoptiformes	Hydrozetidae	NA	NA	Sarcoptiformes_Hydrozetidae_NA_NA	NA	NA	2	45
1071	Sarcoptiformes	Hypochthoniidae	Hypochthonius	NA	Sarcoptiformes_Hypochthoniidae_Hypochthonius_NA	NA	NA	1	238
1072	Sarcoptiformes	Limnozetidae	Limnozetes	rugosus	Sarcoptiformes_Limnozetidae_Limnozetes_rugosus	NA	NA	1	498
1073	Sarcoptiformes	Phthiracaridae	NA	NA	Sarcoptiformes_Phthiracaridae_NA_NA	NA	NA	1	172
1074	Sarcoptiformes	Trhypochthoniidae	Mucronothrus	nasalis	Sarcoptiformes_Trhypochthoniidae_Mucronothrus_nasalis	NA	NA	3	1612
1075	Sphaeriida	Sphaeriidae	Musculium	lacustre	Sphaeriida_Sphaeriidae_Musculium_lacustre	NA	NA	1	86
1076	Sphaeriida	Sphaeriidae	NA	NA	Sphaeriida_Sphaeriidae_NA_NA	NA	NA	4	5617
1077	Sphaeriida	Sphaeriidae	Pisidium	amnicum	Sphaeriida_Sphaeriidae_Pisidium_amnicum	NA	NA	6	2906
1078	Sphaeriida	Sphaeriidae	Pisidium	casertanum	Sphaeriida_Sphaeriidae_Pisidium_casertanum	NA	NA	10	4423
1079	Sphaeriida	Sphaeriidae	Pisidium	cf. nitidum UGSB 9064	Sphaeriida_Sphaeriidae_Pisidium_cf. nitidum UGSB 9064	NA	NA	10	874
1080	Sphaeriida	Sphaeriidae	Pisidium	ferrugineum	Sphaeriida_Sphaeriidae_Pisidium_ferrugineum	NA	NA	6	2873
1081	Sphaeriida	Sphaeriidae	Pisidium	henslowanum	Sphaeriida_Sphaeriidae_Pisidium_henslowanum	NA	NA	13	5248
1082	Sphaeriida	Sphaeriidae	Pisidium	milium	Sphaeriida_Sphaeriidae_Pisidium_milium	NA	NA	6	652
1083	Sphaeriida	Sphaeriidae	Pisidium	NA	Sphaeriida_Sphaeriidae_Pisidium_NA	NA	NA	16	9314
1084	Sphaeriida	Sphaeriidae	Pisidium	nitidum	Sphaeriida_Sphaeriidae_Pisidium_nitidum	NA	NA	12	8228
1085	Sphaeriida	Sphaeriidae	Pisidium	obtusale	Sphaeriida_Sphaeriidae_Pisidium_obtusale	NA	NA	4	1534
1086	Sphaeriida	Sphaeriidae	Pisidium	personatum	Sphaeriida_Sphaeriidae_Pisidium_personatum	NA	NA	3	387
1087	Sphaeriida	Sphaeriidae	Pisidium	subtruncatum	Sphaeriida_Sphaeriidae_Pisidium_subtruncatum	NA	NA	35	17464
1088	Sphaeriida	Sphaeriidae	Pisidium	ventricosum	Sphaeriida_Sphaeriidae_Pisidium_ventricosum	NA	NA	12	5952
1089	Sphaeriida	Sphaeriidae	Sphaerium	corneum	Sphaeriida_Sphaeriidae_Sphaerium_corneum	NA	NA	35	88372

1090	Stylommato-phora	Arionidae	Arion	fuscus	Stylommatophora_Arionidae_-Arion_fuscus	NA	NA	1	23
1091					Tardigrada_NA	1	10	NA	NA

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
1092	Trichoptera	Apataniidae	Apatania	crymophila	Trichoptera_Apataniidae_Apatania_crymophila	NA	NA	4	13798
1093	Trichoptera	Apataniidae	Apatania	hispida	Trichoptera_Apataniidae_Apatania_hispida	1	2	5	88110
1094	Trichoptera	Apataniidae	Apatania	NA	Trichoptera_Apataniidae_Apatania_NA	12	85,8	NA	NA
1095	Trichoptera	Apataniidae	Apatania	stigmatella	Trichoptera_Apataniidae_Apatania_stigmatella	NA	NA	11	78814
1096	Trichoptera	Apataniidae	Apatania	wallengreni	Trichoptera_Apataniidae_Apatania_wallengreni	5	5,6	NA	NA
1097	Trichoptera	Apataniidae	Apatania	zonella	Trichoptera_Apataniidae_Apatania_zonella	1	1	NA	NA
1098	Trichoptera	Beraeidae	Beraeodes	minutus	Trichoptera_Beraeidae_Beraeodes_minutus	1	0,2	NA	NA
1099	Trichoptera	Brachycentridae	Brachycentrus	maculatus	Trichoptera_Brachycentridae_Brachycentrus_maculatus	4	664	4	36075
1100	Trichoptera	Brachycentridae	Brachycentrus	subnubilus	Trichoptera_Brachycentridae_Brachycentrus_subnubilus	4	35	4	18859
1101	Trichoptera	Brachycentridae	Micrasema	gelidum	Trichoptera_Brachycentridae_Micrasema_gelidum	11	78,55	NA	NA
1102	Trichoptera	Brachycentridae	Micrasema	NA	Trichoptera_Brachycentridae_Micrasema_NA	1	1	NA	NA
1103	Trichoptera	Brachycentridae	Micrasema	primoricum	Trichoptera_Brachycentridae_Micrasema_primoricum	NA	NA	8	24564
1104	Trichoptera	Brachycentridae	Micrasema	setiferum	Trichoptera_Brachycentridae_Micrasema_setiferum	12	68,2	4	6838
1105	Trichoptera	Brachycentridae	NA	NA	Trichoptera_Brachycentridae_-NA_NA	1	1	NA	NA
1106	Trichoptera	Chaetopterygini	NA	NA	Trichoptera_Chaetopterygini_-NA_NA	4	2,2	NA	NA
1107	Trichoptera	Ecnomidae	Ecnomus	tenellus	Trichoptera_Ecnomidae_Ecnomus_tenellus	14	31,58	3	246
1108	Trichoptera	Glossosomatidae	Agapetus	fuscipes	Trichoptera_Glossosomatidae_-Agapetus_fuscipes	1	1,6	1	275
1109	Trichoptera	Glossosomatidae	Agapetus	NA	Trichoptera_Glossosomatidae_-Agapetus_NA	2	14	NA	NA
1110	Trichoptera	Glossosomatidae	Agapetus	ochripes	Trichoptera_Glossosomatidae_-Agapetus_ochripes	16	154,24	12	3603
1111	Trichoptera	Glossosomatidae	Glossosoma	intermedium	Trichoptera_Glossosomatidae_-	2	3,2	1	1358

					Glossosoma_intermedium				
1112	Trichoptera	Goeridae	Goera	pilosa	Trichoptera_Goeridae_Goera_pilosa	9	9,4	7	2727
1113	Trichoptera	Goeridae	NA	NA	Trichoptera_Goeridae_NA_NA	1	1	NA	NA
1114	Trichoptera	Goeridae	Silo	NA	Trichoptera_Goeridae_Silo_NA	2	5	NA	NA
1115	Trichoptera	Goeridae	Silo	nigricornis	Trichoptera_Goeridae_Silo_nigricornis	12	43	9	169050
1116	Trichoptera	Goeridae	Silo	pallipes	Trichoptera_Goeridae_Silo_pallipes	17	78,17	12	6949
1117	Trichoptera	Hydropsychidae	Arctopsyche	ladogensis	Trichoptera_Hydropsychidae_Arctopsyche_ladogensis	9	133,6	8	152141
1118	Trichoptera	Hydropsychidae	Ceratopsyche	newae	Trichoptera_Hydropsychidae_Ceratopsyche_newae	2	16,4	NA	NA
1119	Trichoptera	Hydropsychidae	Ceratopsyche	silfvenii	Trichoptera_Hydropsychidae_Ceratopsyche_silfvenii	5	3,6	NA	NA
1120	Trichoptera	Hydropsychidae	Cheumatopsyche	lepida	Trichoptera_Hydropsychidae_-Cheumatopsyche_lepida	10	134,73	7	18032
1121	Trichoptera	Hydropsychidae	Hydropsyche	angustipennis	Trichoptera_Hydropsychidae_Hydropsyche_angustipennis	35	759,2	16	29541
1122	Trichoptera	Hydropsychidae	Hydropsyche	contubernalis	Trichoptera_Hydropsychidae_Hydropsyche_contubernalis	1	1	NA	NA
1123	Trichoptera	Hydropsychidae	Hydropsyche	NA	Trichoptera_Hydropsychidae_Hydropsyche_NA	29	771,11	NA	NA
1124	Trichoptera	Hydropsychidae	Hydropsyche	newae	Trichoptera_Hydropsychidae_Hydropsyche_newae	NA	NA	2	8068
1125	Trichoptera	Hydropsychidae	Hydropsyche	pellucidula	Trichoptera_Hydropsychidae_Hydropsyche_pellucidula	46	594,15	58	2306071
1126	Trichoptera	Hydropsychidae	Hydropsyche	saxonica	Trichoptera_Hydropsychidae_Hydropsyche_saxonica	7	133,8	8	143563
1127	Trichoptera	Hydropsychidae	Hydropsyche	silfvenii	Trichoptera_Hydropsychidae_Hydropsyche_silfvenii	NA	NA	4	6264
1128	Trichoptera	Hydropsychidae	Hydropsyche	siltalai	Trichoptera_Hydropsychidae_Hydropsyche_siltalai	59	6478,37	62	2329533
1129	Trichoptera	Hydroptilidae	Agraylea	multipunctata	Trichoptera_Hydroptilidae_Agraylea_multipunctata	NA	NA	1	50
1130	Trichoptera	Hydroptilidae	Agraylea	NA	Trichoptera_Hydroptilidae_Agraylea_NA	8	20,2	NA	NA
1131	Trichoptera	Hydroptilidae	Agraylea	sexmaculata	Trichoptera_Hydroptilidae_Agraylea_sexmaculata	NA	NA	1	606
1132	Trichoptera	Hydroptilidae	Hydroptila	forcipata	Trichoptera_Hydroptilidae_Hydroptila_forcipata	NA	NA	3	504
1133	Trichoptera	Hydroptilidae	Hydroptila	NA	Trichoptera_Hydroptilidae_Hydroptila_NA	45	358,33	NA	NA
1134	Trichoptera	Hydroptilidae	Hydroptila	occulta	Trichoptera_Hydroptilidae_Hydroptila_occulta	NA	NA	1	62
1135	Trichoptera	Hydroptilidae	Hydroptila	sparsa	Trichoptera_Hydroptilidae_Hyd-	1	1	NA	NA

					roptila_sparsa				
1136	Trichoptera	Hydroptilidae	Hydroptila	tineoides	Trichoptera_Hydroptilidae_Hydroptila_tineoides	NA	NA	26	44431
1137	Trichoptera	Hydroptilidae	Ithytrichia	clavata	Trichoptera_Hydroptilidae_Ithytrichia_clavata	NA	NA	1	237
1138	Trichoptera	Hydroptilidae	Ithytrichia	lamellaris	Trichoptera_Hydroptilidae_Ithytrichia_lamellaris	6	179	15	77090
1139	Trichoptera	Hydroptilidae	Ithytrichia	NA	Trichoptera_Hydroptilidae_Ithytrichia_NA	20	135,36	NA	NA
1140	Trichoptera	Hydroptilidae	NA	NA	Trichoptera_Hydroptilidae_NA_NA	7	52,16	NA	NA
1141	Trichoptera	Hydroptilidae	Orthotrichia	costalis	Trichoptera_Hydroptilidae_Orthotrichia_costalis	NA	NA	3	1768
1142	Trichoptera	Hydroptilidae	Orthotrichia	NA	Trichoptera_Hydroptilidae_Orthotrichia_NA	5	44,4	NA	NA
1143	Trichoptera	Hydroptilidae	Oxyethira	distinctella	Trichoptera_Hydroptilidae_Oxyethira_distinctella	NA	NA	3	25388
1144	Trichoptera	Hydroptilidae	Oxyethira	flavicornis	Trichoptera_Hydroptilidae_Oxyethira_flavicornis	NA	NA	5	10648
1145	Trichoptera	Hydroptilidae	Oxyethira	frici	Trichoptera_Hydroptilidae_Oxyethira_frici	NA	NA	20	94553
1146	Trichoptera	Hydroptilidae	Oxyethira	NA	Trichoptera_Hydroptilidae_Oxyethira_NA	55	348,61	NA	NA
1147	Trichoptera	Hydroptilidae	Oxyethira	sagittifera	Trichoptera_Hydroptilidae_Oxyethira_sagittifera	NA	NA	5	7819
1148	Trichoptera	Hydroptilidae	Oxyethira	simplex	Trichoptera_Hydroptilidae_Oxyethira_simplex	NA	NA	3	2083
1149	Trichoptera	Lepidostomatidae	Lepidostoma	hirtum	Trichoptera_Lepidostomatidae_Lepidostoma_hirtum	76	1048,7	54	565823
1150	Trichoptera	Leptoceridae	Adicella	reducta	Trichoptera_Leptoceridae_Adicella_reducta	1	0,2	1	190
1151	Trichoptera	Leptoceridae	Athripsodes	albifrons	Trichoptera_Leptoceridae_Athripsodes_albifrons	1	1	2	4460
1152	Trichoptera	Leptoceridae	Athripsodes	aterrimus	Trichoptera_Leptoceridae_Athripsodes_aterrimus	9	9,6	9	8693
1153	Trichoptera	Leptoceridae	Athripsodes	bilineatus	Trichoptera_Leptoceridae_Athripsodes_bilineatus	2	7	NA	NA
1154	Trichoptera	Leptoceridae	Athripsodes	cinereus	Trichoptera_Leptoceridae_Athripsodes_cinereus	24	90,2	29	121009
1155	Trichoptera	Leptoceridae	Athripsodes	commutatus	Trichoptera_Leptoceridae_Athripsodes_commutatus	5	4,2	9	43799
1156	Trichoptera	Leptoceridae	Athripsodes	NA	Trichoptera_Leptoceridae_Athripsodes_NA	34	330,78	NA	NA
1157	Trichoptera	Leptoceridae	Ceraclea	annulicornis	Trichoptera_Leptoceridae_Ceraclea_annulicornis	10	51,4	8	69101
1158	Trichoptera	Leptoceridae	Ceraclea	dissimilis	Trichoptera_Leptoceridae_Ceraclea_dissimilis	2	1,2	5	31682

1159	Trichoptera	Leptoceridae	Ceraclea	excisa	Trichoptera_Leptoceridae_Ceraclea_excisa	2	11	3	1674
1160	Trichoptera	Leptoceridae	Ceraclea	fulva	Trichoptera_Leptoceridae_Ceraclea_fulva	1	1	NA	NA
1161	Trichoptera	Leptoceridae	Ceraclea	NA	Trichoptera_Leptoceridae_Ceraclea_NA	9	14,84	NA	NA
1162	Trichoptera	Leptoceridae	Ceraclea	nigronervosa	Trichoptera_Leptoceridae_Ceraclea_nigronervosa	6	14,4	6	286472
1163	Trichoptera	Leptoceridae	Ceraclea	perplexa	Trichoptera_Leptoceridae_Ceraclea_perplexa	1	1	3	22115
1164	Trichoptera	Leptoceridae	Erotesis	baltica	Trichoptera_Leptoceridae_Erotesis_baltica	1	0,2	NA	NA
1165	Trichoptera	Leptoceridae	Leptocerus	tineiformis	Trichoptera_Leptoceridae_Leptocerus_tineiformis	1	0,6	1	100
1166	Trichoptera	Leptoceridae	Mystacides	azureus	Trichoptera_Leptoceridae_Mystacides_azureus	25	122	18	21268
1167	Trichoptera	Leptoceridae	Mystacides	longicornis	Trichoptera_Leptoceridae_Mystacides_longicornis	4	10	4	239
1168	Trichoptera	Leptoceridae	Mystacides	longicornis	Trichoptera_Leptoceridae_Mystacides_longicornis	4	2,4	4	239
1169	Trichoptera	Leptoceridae	Mystacides	NA	Trichoptera_Leptoceridae_Mystacides_NA	25	134,67	NA	NA
1170	Trichoptera	Leptoceridae	Mystacides	niger	Trichoptera_Leptoceridae_Mystacides_niger	NA	NA	2	269
1171	Trichoptera	Leptoceridae	NA	NA	Trichoptera_Leptoceridae_NA_NA	16	48,88	NA	NA
1172	Trichoptera	Leptoceridae	Oecetis	lacustris	Trichoptera_Leptoceridae_Oecetis_lacustris	NA	NA	1	393
1173	Trichoptera	Leptoceridae	Oecetis	NA	Trichoptera_Leptoceridae_Oecetis_NA	15	14,56	NA	NA
1174	Trichoptera	Leptoceridae	Oecetis	ochracea	Trichoptera_Leptoceridae_Oecetis_ochracea	1	1	NA	NA
1175	Trichoptera	Leptoceridae	Oecetis	testacea	Trichoptera_Leptoceridae_Oecetis_testacea	16	35	16	46498
1176	Trichoptera	Leptoceridae	Setodes	argentipunctellus	Trichoptera_Leptoceridae_Setodes_argentipunctellus	1	0,2	NA	NA
1177	Trichoptera	Leptoceridae	Triaenodes	bicolor	Trichoptera_Leptoceridae_Triaenodes_bicolor	6	12,07	1	2511
1178	Trichoptera	Leptoceridae	Triaenodes	detruncatus	Trichoptera_Leptoceridae_Triaenodes_detruncatus	NA	NA	1	160
1179	Trichoptera	Leptoceridae	Triaenodes	NA	Trichoptera_Leptoceridae_Triaenodes_NA	3	4,2	NA	NA
1180	Trichoptera	Leptoceridae	Triaenodes	simulans	Trichoptera_Leptoceridae_Triaenodes_simulans	NA	NA	1	841
1181	Trichoptera	Leptoceridae	Ylodes	NA	Trichoptera_Leptoceridae_Ylodes_NA	1	3	NA	NA
1182	Trichoptera	Limnephilidae	Anabolia	furcata	Trichoptera_Limnephilidae_Anabolia_furcata	5	15	5	113549

1183	Trichoptera	Limnephilidae	Anabolia	NA	Trichoptera_Limnephilidae_Anabolia_NA	7	20	NA	NA
1184	Trichoptera	Limnephilidae	Anabolia	nervosa	Trichoptera_Limnephilidae_Anabolia_nervosa	2	19	9	30156
1185	Trichoptera	Limnephilidae	Chaetopteryx	sahlbergi	Trichoptera_Limnephilidae_Chaetopteryx_sahlbergi	NA	NA	16	598140
1186	Trichoptera	Limnephilidae	Chaetopteryx	villosa	Trichoptera_Limnephilidae_Chaetopteryx_villosa	6	7	12	187908
1187	Trichoptera	Limnephilidae	Ecclisopteryx	dalecarlica	Trichoptera_Limnephilidae_Ecclisopteryx_dalecarlica	4	61	6	312390
1188	Trichoptera	Limnephilidae	Glyphotaelius	pellucidus	Trichoptera_Limnephilidae_Glyphotaelius_pellucidus	13	17,6	18	224491
1189	Trichoptera	Limnephilidae	Halesus	digitatus	Trichoptera_Limnephilidae_Halesus_digitatus	1	25	5	257658
1190	Trichoptera	Limnephilidae	Halesus	NA	Trichoptera_Limnephilidae_Halesus_NA	16	66	NA	NA
1191	Trichoptera	Limnephilidae	Halesus	radiatus	Trichoptera_Limnephilidae_Halesus_radiatus	26	161	53	2901590
1192	Trichoptera	Limnephilidae	Halesus	tesselatus	Trichoptera_Limnephilidae_Halesus_tesselatus	1	1	NA	NA
1193	Trichoptera	Limnephilidae	Halesus	tessellatus	Trichoptera_Limnephilidae_Halesus_tesselatus	NA	NA	9	7682
1194	Trichoptera	Limnephilidae	Hydatophylax	infumatus	Trichoptera_Limnephilidae_Hydatophylax_infumatus	1	0,4	4	88719
1195	Trichoptera	Limnephilidae	Limnephilus	algosus	Trichoptera_Limnephilidae_Limnephilus_algosus	NA	NA	1	12080
1196	Trichoptera	Limnephilidae	Limnephilus	centralis	Trichoptera_Limnephilidae_Limnephilus_centralis	NA	NA	2	4119
1197	Trichoptera	Limnephilidae	Limnephilus	coenosus	Trichoptera_Limnephilidae_Limnephilus_coenosus	1	3	1	2016
1198	Trichoptera	Limnephilidae	Limnephilus	extricatus	Trichoptera_Limnephilidae_Limnephilus_extricatus	13	18	13	361848
1199	Trichoptera	Limnephilidae	Limnephilus	flavicornis	Trichoptera_Limnephilidae_Limnephilus_flavicornis	3	3	27	301784
1200	Trichoptera	Limnephilidae	Limnephilus	fuscicornis	Trichoptera_Limnephilidae_Limnephilus_fuscicornis	1	1	7	201221
1201	Trichoptera	Limnephilidae	Limnephilus	fuscinervis	Trichoptera_Limnephilidae_Limnephilus_fuscinervis	NA	NA	1	5251
1202	Trichoptera	Limnephilidae	Limnephilus	germanus	Trichoptera_Limnephilidae_Limnephilus_germanus	NA	NA	26	561070
1203	Trichoptera	Limnephilidae	Limnephilus	incisus	Trichoptera_Limnephilidae_Limnephilus_incisus	NA	NA	2	47942
1204	Trichoptera	Limnephilidae	Limnephilus	indivisus	Trichoptera_Limnephilidae_Limnephilus_indivisus	NA	NA	1	3521
1205	Trichoptera	Limnephilidae	Limnephilus	lunatus	Trichoptera_Limnephilidae_Limnephilus_lunatus	15	44	40	1294127
1206	Trichoptera	Limnephilidae	Limnephilus	marmoratus	Trichoptera_Limnephilidae_Limne-	3	2,2	9	925

					philus_marmoratus				
1207	Trichoptera	Limnephilidae	Limnephilus	NA	Trichoptera_Limnephilidae_Limnephilus_NA	27	72,8	26	15455
1208	Trichoptera	Limnephilidae	Limnephilus	pantodapus	Trichoptera_Limnephilidae_Limnephilus_pantodapus	1	0,2	3	75952
1209	Trichoptera	Limnephilidae	Limnephilus	rhombicus	Trichoptera_Limnephilidae_Limnephilus_rhombicus	21	40	38	403786
1210	Trichoptera	Limnephilidae	Limnephilus	vittatus	Trichoptera_Limnephilidae_Limnephilus_vittatus	NA	NA	2	8216
1211	Trichoptera	Limnephilidae	Micropterna	lateralis	Trichoptera_Limnephilidae_Micropterna_lateralis	1	0,8	NA	NA
1212	Trichoptera	Limnephilidae	Micropterna	NA	Trichoptera_Limnephilidae_Micropterna_NA	1	2	NA	NA
1213	Trichoptera	Limnephilidae	Micropterna	sequax	Trichoptera_Limnephilidae_Micropterna_sequax	5	27	NA	NA
1214	Trichoptera	Limnephilidae	NA	NA	Trichoptera_Limnephilidae_NA_NA	162	1281,22	25	27885
1215	Trichoptera	Limnephilidae	NA	NA	Trichoptera_Limnephilidae_NA_NA	1	2,2	25	27885
1216	Trichoptera	Limnephilidae	Nemotaulius	punctatolineatus	Trichoptera_Limnephilidae_Nemotaulius_punctatolineatus	4	1,6	5	123335
1217	Trichoptera	Limnephilidae	Potamophylax	cingulatus	Trichoptera_Limnephilidae_Potamophylax_cingulatus	17	89,28	42	992731
1218	Trichoptera	Limnephilidae	Potamophylax	latipennis	Trichoptera_Limnephilidae_Potamophylax_latipennis	12	29,4	41	2152539
1219	Trichoptera	Limnephilidae	Potamophylax	NA	Trichoptera_Limnephilidae_Potamophylax_NA	7	7,16	28	74935
1220	Trichoptera	Limnephilidae	Potamophylax	nigricornis	Trichoptera_Limnephilidae_Potamophylax_nigricornis	3	7,2	1	236787
1221	Trichoptera	Limnephilidae	Potamophylax	rotundipennis	Trichoptera_Limnephilidae_Potamophylax_rotundipennis	NA	NA	1	495
1222	Trichoptera	Limnephilidae	Stenophylax	permistus	Trichoptera_Limnephilidae_Stenophylax_permistus	1	1	2	43567
1223	Trichoptera	Limnephilidae	Stenophylax	sequax	Trichoptera_Limnephilidae_Stenophylax_sequax	NA	NA	13	709547
1224	Trichoptera	Molannidae	Molanna	albicans	Trichoptera_Molannidae_Molanna_albicans	1	0,2	2	37153
1225	Trichoptera	Molannidae	Molanna	angustata	Trichoptera_Molannidae_Molanna_angustata	15	19,2	13	91315
1226	Trichoptera	Molannidae	Molanna	NA	Trichoptera_Molannidae_Molanna_NA	2	2	NA	NA
1227	Trichoptera	Molannidae	Molannodes	tinctus	Trichoptera_Molannidae_Molannodes_tinctus	19	19,8	12	109819
1228	Trichoptera	NA	NA	NA	Trichoptera_NA_NA_NA	5	101	NA	NA
1229	Trichoptera	Philopotamidae	Chimarra	marginata	Trichoptera_Philopotamidae_Chimarra_marginata	2	22,44	2	13783
1230	Trichoptera	Philopotamidae	NA	NA	Trichoptera_Philopotamidae_NA_NA	1	3	NA	NA

1231	Trichoptera	Philopotamidae	Philopotamus	montanus	Trichoptera_Philopotamidae_Philopotamus_montanus	6	22,81	5	17372
1232	Trichoptera	Philopotamidae	Wormaldia	subnigra	Trichoptera_Philopotamidae_Wormaldia_subnigra	4	1,52	1	75
1233	Trichoptera	Phryganeidae	Agrypnia	czerskyi	Trichoptera_Phryganeidae_Agrypnia_czerskyi	NA	NA	1	96
1234	Trichoptera	Phryganeidae	Agrypnia	NA	Trichoptera_Phryganeidae_Agrypnia_NA	22	27,54	NA	NA
1235	Trichoptera	Phryganeidae	Agrypnia	obsoleta	Trichoptera_Phryganeidae_Agrypnia_obsoleta	5	9,2	11	58241
1236	Trichoptera	Phryganeidae	Agrypnia	varia	Trichoptera_Phryganeidae_Agrypnia_varia	NA	NA	8	75981
1237	Trichoptera	Phryganeidae	NA	NA	Trichoptera_Phryganeidae_NA_NA	6	10,4	NA	NA
1238	Trichoptera	Phryganeidae	Oligotricha	striata	Trichoptera_Phryganeidae_Oligotricha_striata	1	0,2	NA	NA
1239	Trichoptera	Phryganeidae	Phryganea	bipunctata	Trichoptera_Phryganeidae_Phryganea_bipunctata	11	19	7	180027
1240	Trichoptera	Phryganeidae	Phryganea	grandis	Trichoptera_Phryganeidae_Phryganea_grandis	1	1	5	354114
1241	Trichoptera	Phryganeidae	Phryganea	NA	Trichoptera_Phryganeidae_Phryganea_NA	3	3	NA	NA
1242	Trichoptera	Polycentropodidae	Cyrnus	flavidus	Trichoptera_Polycentropodidae_Cyrnus_flavidus	20	45,6	17	203623
1243	Trichoptera	Polycentropodidae	Cyrnus	insolutus	Trichoptera_Polycentropodidae_Cyrnus_insolutus	3	4,47	4	1417
1244	Trichoptera	Polycentropodidae	Cyrnus	NA	Trichoptera_Polycentropodidae_Cyrnus_NA	4	2,8	NA	NA
1245	Trichoptera	Polycentropodidae	Cyrnus	trimaculatus	Trichoptera_Polycentropodidae_Cyrnus_trimaculatus	20	103,2	14	30253
1246	Trichoptera	Polycentropodidae	Holocentropus	dubius	Trichoptera_Polycentropodidae_Holocentropus_dubius	8	32,94	4	9123
1247	Trichoptera	Polycentropodidae	Holocentropus	picicornis	Trichoptera_Polycentropodidae_Holocentropus_picicornis	1	0,2	NA	NA
1248	Trichoptera	Polycentropodidae	NA	NA	Trichoptera_Polycentropodidae_NA_NA	44	188,11	NA	NA
1249	Trichoptera	Polycentropodidae	Neureclipsis	bimaculata	Trichoptera_Polycentropodidae_Neureclipsis_bimaculata	18	1369,27	20	336678
1250	Trichoptera	Polycentropodidae	Plectrocnemia	conspersa	Trichoptera_Polycentropodidae_Plectrocnemia_conspersa	34	169	34	249110
1251	Trichoptera	Polycentropodidae	Plectrocnemia	NA	Trichoptera_Polycentropodidae_Plectrocnemia_NA	8	9,48	NA	NA
1252	Trichoptera	Polycentropodidae	Polycentropus	flavomaculatus	Trichoptera_Polycentropodidae_Polycentropus_flavomaculatus	112	2104,83	98	430624
1253	Trichoptera	Polycentropodidae	Polycentropus	irroratus	Trichoptera_Polycentropodidae_Polycentropus_irroratus	17	59,6	15	29585
1254	Trichoptera	Polycentropodidae	Polycentropus	NA	Trichoptera_Polycentropodidae_Polycentropus_NA	6	69,2	NA	NA

1255	Trichoptera	Psychomyiidae	Lype	NA	Trichoptera_Psychomyiidae_Lype_NA	6	6,8	NA	NA
1256	Trichoptera	Psychomyiidae	Lype	phaeopa	Trichoptera_Psychomyiidae_Lype_phaeopa	12	14,6	7	5459
1257	Trichoptera	Psychomyiidae	Lype	reducta	Trichoptera_Psychomyiidae_Lype_reducta	4	4,8	2	794
1258	Trichoptera	Psychomyiidae	Psychomyia	pusilla	Trichoptera_Psychomyiidae_Psychomyia_pusilla	8	122,6	4	19080
1259	Trichoptera	Psychomyiidae	Tinodes	NA	Trichoptera_Psychomyiidae_Tinodes_NA	3	0,8	NA	NA
1260	Trichoptera	Psychomyiidae	Tinodes	pallidulus	Trichoptera_Psychomyiidae_Tinodes_pallidulus	1	3	1	2090
1261	Trichoptera	Psychomyiidae	Tinodes	waeneri	Trichoptera_Psychomyiidae_Tinodes_waeneri	23	402,44	15	23704
1262	Trichoptera	Rhyacophilidae	Rhyacophila	fasciata	Trichoptera_Psychomyiidae_Rhyacophila_fasciata	21	67,97	18	24915
1263	Trichoptera	Rhyacophilidae	Rhyacophila	NA	Trichoptera_Psychomyiidae_Rhyacophila_NA	44	178,11	NA	NA
1264	Trichoptera	Rhyacophilidae	Rhyacophila	nubila	Trichoptera_Psychomyiidae_Rhyacophila_nubila	101	987,03	99	1284120
1265	Trichoptera	Sericostomatidae	NA	NA	Trichoptera_Sericostomatidae_NA_NA	2	9	NA	NA
1266	Trichoptera	Sericostomatidae	Notidobia	ciliaris	Trichoptera_Sericostomatidae_Notidobia_ciliaris	5	5,6	3	28266
1267	Trichoptera	Sericostomatidae	Sericostoma	personatum	Trichoptera_Sericostomatidae_Sericostoma_personatum	32	140,27	33	1070976
1268	Tricladida	Dendrocoelidae	Dendrocoelum	lacteum	Tricladida_Dendrocoelidae_Dendrocoelum_lacteum	13	25,2	NA	NA
1269	Tricladida	Dugesiidae	Dugesia	gonocephala	Tricladida_Dugesiidae_Dugesia_gonocephala	6	62	NA	NA
1270	Tricladida	Dugesiidae	Dugesia	lugubris	Tricladida_Dugesiidae_Dugesia_lugubris	2	3	NA	NA
1271	Tricladida	Dugesiidae	Dugesia	NA	Tricladida_Dugesiidae_Dugesia_NA	8	28	NA	NA
1272	Tricladida	Dugesiidae	NA	NA	Tricladida_Dugesiidae_NA_NA	NA	NA	6	39074
1273	Tricladida	NA	NA	NA	Tricladida_NA_NA_NA	32	33,67	NA	NA
1274	Tricladida	Planariidae	Polycelis	NA	Tricladida_Planariidae_Polycelis_NA	12	30,2	NA	NA
1275	Tricladida	Planariidae	Polycelis	nigra	Tricladida_Planariidae_Polycelis_nigra	8	33	NA	NA
1276	Tricladida	Planariidae	Polycelis	tenuis	Tricladida_Planariidae_Polycelis_tenuis	1	3	NA	NA
1277	Triganglionata	Valvatidae	Valvata	cristata	Triganglionata_Valvatidae_Valvata_cristata	NA	NA	1	414
1278	Triganglionata	Valvatidae	Valvata	NA	Triganglionata_Valvatidae_Valvata_NA	NA	NA	1	134

1279	Trombidiformes	Arrenuridae	Arrenurus	bicuspidator	Trombidiformes_Arrenuridae_-Arrenurus_bicuspidator	NA	NA	1	5824
1280	Trombidiformes	Arrenuridae	Arrenurus	crassicaudatus	Trombidiformes_Arrenuridae_-Arrenurus_crassicaudatus	NA	NA	1	165
1281	Trombidiformes	Arrenuridae	Arrenurus	NA	Trombidiformes_Arrenuridae_-Arrenurus_NA	NA	NA	1	46
1282	Trombidiformes	Arrenuridae	Arrenurus	pustulator	Trombidiformes_Arrenuridae_-Arrenurus_pustulator	NA	NA	3	3993
1283	Trombidiformes	Arrenuridae	Arrenurus	securiformis	Trombidiformes_Arrenuridae_-Arrenurus_securiformis	NA	NA	1	24842
1284	Trombidiformes	Arrenuridae	Arrenurus	suecicus	Trombidiformes_Arrenuridae_-Arrenurus_suecicus	NA	NA	1	614
1285	Trombidiformes	Arrenuridae	Arrenurus	tubulator	Trombidiformes_Arrenuridae_-Arrenurus_tubulator	NA	NA	1	160
1286	Trombidiformes	Aturidae	Aturus	NA	Trombidiformes_Aturidae_Aturus_NA	NA	NA	1	718
1287	Trombidiformes	Halacaridae	Soldanellonyx	chappuisi	Trombidiformes_Halacaridae_Soldanellonyx_chappuisi	NA	NA	1	159
1288	Trombidiformes	Hydrachnidae	Hydrachna	cruenta	Trombidiformes_Hydrachnidae_-Hydrachna_cruenta	NA	NA	1	1351
1289	Trombidiformes	Hydrodromidae	Hydrodroma	despiciens	Trombidiformes_Hydrodromidae_-Hydrodroma_despiciens	NA	NA	3	2115
1290	Trombidiformes	Hydrodromidae	Hydrodroma	NA	Trombidiformes_Hydrodromidae_-Hydrodroma_NA	NA	NA	4	5330
1291	Trombidiformes	Hydrodromidae	Hydrodroma	torrenticola	Trombidiformes_Hydrodromidae_-Hydrodroma_torrenticola	NA	NA	4	16781
1292	Trombidiformes	Hydrodromidae	NA	NA	Trombidiformes_Hydrodromidae_-NA_NA	NA	NA	1	29
1293	Trombidiformes	Hygrobatidae	Atractides	nodipalpis	Trombidiformes_Hygrobatidae_-Atractides_nodipalpis	NA	NA	7	2687
1294	Trombidiformes	Hygrobatidae	Hygrobates	fluviatilis	Trombidiformes_Hygrobatidae_-Hygrobates_fluviatilis	NA	NA	31	122202
1295	Trombidiformes	Hygrobatidae	Hygrobates	foreli	Trombidiformes_Hygrobatidae_-Hygrobates_foreli	NA	NA	21	913578
1296	Trombidiformes	Hygrobatidae	Hygrobates	longipalpis	Trombidiformes_Hygrobatidae_-Hygrobates_longipalpis	NA	NA	16	63075
1297	Trombidiformes	Hygrobatidae	Hygrobates	longiporus	Trombidiformes_Hygrobatidae_-Hygrobates_longiporus	NA	NA	4	6239
1298	Trombidiformes	Hygrobatidae	Hygrobates	NA	Trombidiformes_Hygrobatidae_-Hygrobates_NA	NA	NA	5	1740
1299	Trombidiformes	Hygrobatidae	Hygrobates	nigromaculatus	Trombidiformes_Hygrobatidae_-Hygrobates_nigromaculatus	NA	NA	7	3353
1300	Trombidiformes	Hygrobatidae	Hygrobates	norvegicus	Trombidiformes_Hygrobatidae_-Hygrobates_norvegicus	NA	NA	3	11199
1301	Trombidiformes	Hygrobatidae	Hygrobates	trigonicus	Trombidiformes_Hygrobatidae_-Hygrobates_trigonicus	NA	NA	1	85
1302	Trombidiformes	Lebertiidae	Lebertia	fimbriata	Trombidiformes_Lebertiidae_Le-	NA	NA	8	6895

					bertia_fimbriata				
1303	Trombidiformes	Lebertiidae	Lebertia	inaequalis	Trombidiformes_Lebertiidae_Lebertia_inaequalis	NA	NA	9	44381
1304	Trombidiformes	Lebertiidae	Lebertia	NA	Trombidiformes_Lebertiidae_Lebertia_NA	NA	NA	2	680
1305	Trombidiformes	Lebertiidae	Lebertia	porosa	Trombidiformes_Lebertiidae_Lebertia_porosa	NA	NA	26	164162
1306	Trombidiformes	Lebertiidae	NA	NA	Trombidiformes_Lebertiidae_NA_NA	NA	NA	10	92034
1307	Trombidiformes	Limnesiidae	Limnesia	maculata	Trombidiformes_Limnesiidae_Limnesia_maculata	NA	NA	1	3749
1308	Trombidiformes	Limnocharidae	Limnochares	aquatica	Trombidiformes_Limnocharidae_Limnochares_aquatica	NA	NA	5	20728
1309	Trombidiformes	Mideidae	Midea	orbiculata	Trombidiformes_Mideidae_Midea_orbiculata	NA	NA	4	9150
1310	Trombidiformes	NA	NA	NA	Trombidiformes_NA_NA_NA	106	3311,93	NA	NA
1311	Trombidiformes	Oxidae	Oxus	carpenteri	Trombidiformes_Oxidae_Oxus_carpenteri	NA	NA	1	164
1312	Trombidiformes	Pionidae	Forelia	variegator	Trombidiformes_Pionidae_Forelia_variegator	NA	NA	1	415
1313	Trombidiformes	Pionidae	NA	NA	Trombidiformes_Pionidae_NA_NA	NA	NA	1	267
1314	Trombidiformes	Pionidae	Piona	imminuta	Trombidiformes_Pionidae_Piona_imminuta	NA	NA	1	116
1315	Trombidiformes	Pionidae	Piona	longipalpis	Trombidiformes_Pionidae_Piona_longipalpis	NA	NA	2	12755
1316	Trombidiformes	Pionidae	Piona	paucipora	Trombidiformes_Pionidae_Piona_paucipora	NA	NA	2	163
1317	Trombidiformes	Sperchontidae	NA	NA	Trombidiformes_Sperchontidae_NA_NA	NA	NA	4	7582
1318	Trombidiformes	Sperchontidae	Sperchon	brevirostris	Trombidiformes_Sperchontidae_Sperchon_brevirostris	NA	NA	6	22557
1319	Trombidiformes	Sperchontidae	Sperchon	clupeifer	Trombidiformes_Sperchontidae_Sperchon_clupeifer	NA	NA	7	4232
1320	Trombidiformes	Sperchontidae	Sperchon	glandulosus	Trombidiformes_Sperchontidae_Sperchon_glandulosus	NA	NA	23	199283
1321	Trombidiformes	Sperchontidae	Sperchon	insignis	Trombidiformes_Sperchontidae_Sperchon_insignis	NA	NA	5	5566
1322	Trombidiformes	Sperchontidae	Sperchon	NA	Trombidiformes_Sperchontidae_Sperchon_NA	NA	NA	6	20141
1323	Trombidiformes	Sperchontidae	Sperchonopsis	NA	Trombidiformes_Sperchontidae_Sperchonopsis_NA	NA	NA	6	1798
1324	Trombidiformes	Sperchontidae	Sperchonopsis	verrucosa	Trombidiformes_Sperchontidae_Sperchonopsis_verrucosa	NA	NA	6	2921
1325	Trombidiformes	Teutoniidae	Teutonia	cometes	Trombidiformes_Teutoniidae_Teutonia_cometes	NA	NA	3	2257
1326	Trombidiformes	Torrenticolidae	Torrenticola	amplexa	Trombidiformes_Torrenticolidae_-	NA	NA	7	1206

					Torrenticola_amplexa				
1327	Trombidiformes	Unionicolidae	NA	NA	Trombidiformes_Unionicolidae_-NA_NA	NA	NA	2	256
1328	Trombidiformes	Unionicolidae	Neumania	vernalis	Trombidiformes_Unionicolidae_-Neumania_vernalis	NA	NA	4	2615
1329	Trombidiformes	Unionicolidae	Unionicola	crassipes	Trombidiformes_Unionicolidae_-Unionicola_crassipes	NA	NA	5	2864
1330	Trombidiformes	Unionicolidae	Unionicola	gracilipalpis	Trombidiformes_Unionicolidae_-Unionicola_gracilipalpis	NA	NA	1	121
1331	Trombidiformes	Unionicolidae	Unionicola	minor	Trombidiformes_Unionicolidae_-Unionicola_minor	NA	NA	1	3807
1332	Trombidiformes	Unionicolidae	Unionicola	NA	Trombidiformes_Unionicolidae_-Unionicola_NA	NA	NA	1	50

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
1333	Unionida	Margaritiferidae	Margaritifera	margaritifera	Unionida_Margaritiferidae_Margaritifera_margaritifera	1	0,2	NA	NA
1334	Unionida	Unionidae	Anodonta	NA	Unionida_Unionidae_Anodonta_-NA	2	1,2	NA	NA
1335	Unionida	Unionidae	NA	NA	Unionida_Unionidae_NA_NA	1	1	NA	NA
1336	Unionida	Unionidae	Pseudanodonta	complanata	Unionida_Unionidae_Pseudanodonta_complanata	NA	NA	1	1635
1337	Unionida	Unionidae	Unio	NA	Unionida_Unionidae_Unio_NA	2	0,25	NA	NA

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
1338	Veneroida	Sphaeriidae	NA	NA	Veneroida_Sphaeriidae_NA_NA	32	10146	NA	NA
1339	Veneroida	Sphaeriidae	Pisidium	amnicum	Veneroida_Sphaeriidae_Pisidium_-amnicum	4	11	NA	NA
1340	Veneroida	Sphaeriidae	Pisidium	henslowanum	Veneroida_Sphaeriidae_Pisidium_-henslowanum	1	6	NA	NA
1341	Veneroida	Sphaeriidae	Pisidium	NA	Veneroida_Sphaeriidae_Pisidium_-NA	137	2903,64	NA	NA
1342	Veneroida	Sphaeriidae	Sphaerium	corneum	Veneroida_Sphaeriidae_Sphaerium_corneum	10	49	NA	NA
1343	Veneroida	Sphaeriidae	Sphaerium	NA	Veneroida_Sphaeriidae_Sphaerium_NA	34	837,93	NA	NA

	Order	Family	Genus	Species	Taxon	Morpho Samples	Morpho Abundances	DNA samples	DNA reads
1344	Zygentoma	Lepismatidae	Ctenolepisma	NA	Zygentoma_Lepismatidae_Ctenolepisma_NA	NA	NA	1	391

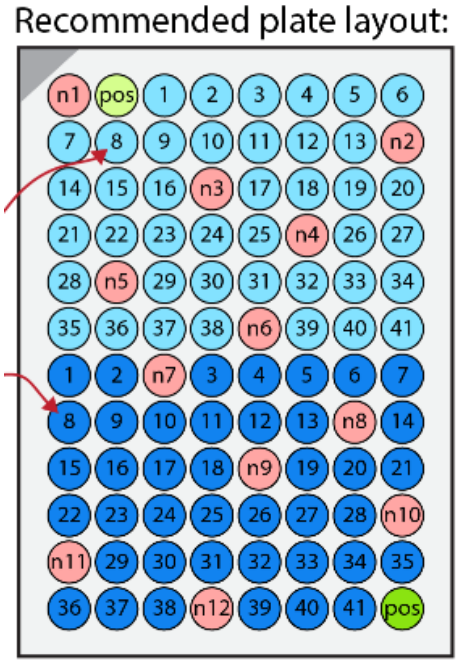
Appendix 3 Laboratory protocol

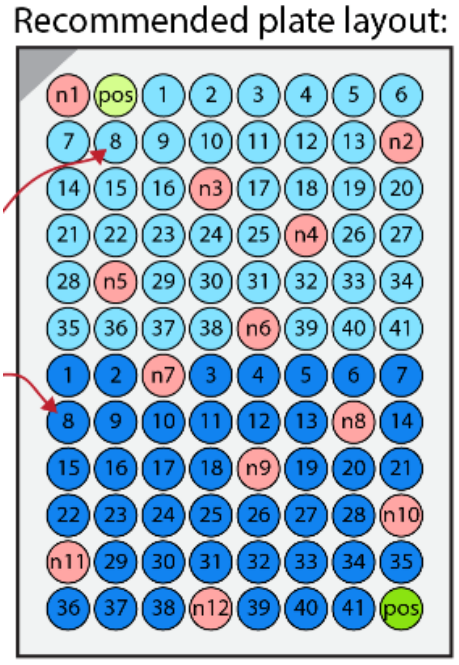
SCANDNAnet – Laboratory processing of samples

Macroinvertebrate samples are collected as part of the biomonitoring in each of the Nordic countries, specimens picked from debris (stones, leaves etc), and identified based on morphology for the national assessment. The specimens are collected and stored in 96% ethanol to facilitate DNA metabarcoding of each bulk sample and allow large scale comparison of DNA and morphology-based assessment results.

This larger scale study is a continuation from the pilot program by Elbrecht et al. 2017, and where possible, laboratory protocols are kept similar to ensure comparability but also ensure the success of this project (by relying on established protocols). However, to accommodate for the larger scale of the project, a few adjustments to the original protocols are anticipated:

- Samples are still dried to remove ethanol, but the **IKA Tube Mill control** ("kitchen blender") is used instead of the IKA ULTRA-TURRAX Tube Drive control ("tissue homogenisation with steal beats"). The tube mill can grind samples in 3 minutes instead of the 30 needed with the previously used methods.
- DNA extraction and successive PCR are carried out in **96 well plate format** due to the large number of samples processed. Additionally, 12 negative controls and one positive control is included in each extraction, and successively used in PCR and sequencing to detect contamination and other lab related issues (see also Elbrecht & Steinke 2018). Potential extraction e.g. DNeasy Blood & Tissue Kits (or cheaper alternatives).





- 41 samples can be run on one full plate (with replication etc). 12 plates can be used to sequence 492 samples (including replicates). With the current fusion primer set, 3 plates can be run on one lane. HiSeq has 2 lanes, =6 plates. => 2 HiSeq runs. Max 300 million reads per run, = 600/492/2 => ~400.000-500.000 reads per replicate.
- In the original study samples where RNase A digested to remove RNA, but this step can potentially be skipped (since it was more based on anecdotal evidence).
- A fusion primer system is still used for sample amplification and library preparation, but now a **2 step PCR** is used instead of one step PCR. The first PCR is used with untailed primers while 1 ul of PCR product is carried over into the second PCR, now containing full fusion primers for attaching sample tagging and adapters needed for illumina sequencing.
- Instead of "5PRIME HotMaster Taq DNA Polymerase" the **"QIAGEN Multiplex PCR *Plus* Kit"** is used, which works more efficiently with fusion primers. The master mix kit does not need additional components, and also **25 ul reactions** work well.
- Previously the **BF2+BR2 primer set** was used since it works excellent for macroinvertebrates, but potentially a better primer set might be available till the project start. However, also the fusion primers are needed for tagging, increasing costs should there be the need to order a new primer set (Florian Leese should be able to supply BF2+BR2 fusion primer aliquots).

Details in this protocol have to be discussed and are subject to change due to availability of laboratory equipment, time constraints of further methodological developments till start of the labwork.

1) Sample homogenisation

- Drying specimens to remove ethanol (can potentially be done in grinding chambers as long as specimens do not stick to the walls).
- Transfer of ~15 mg in 1.5 ml reaction tubes (under the fume hood, with cleaning of surfaces in between) + adding lysis buffer. 96 well rack for tubes helpful to avoid sample confusion. Transfer of lysate from 1.5 ml tubes into the extraction plates. Dipping tubes in water might also reduce electrostatically charging.
- DNA extraction according to manufacturer protocols.

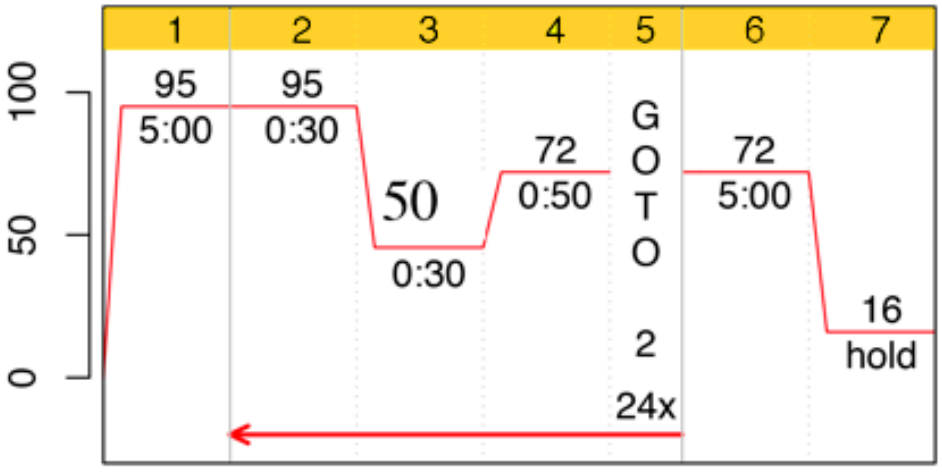
2) DNA quantification and normalisation to 25 ng/ul

- Checking DNA quality on gel (including negative controls).
- Quantification with Qubit (BR kit), normalisation to 25 ng/ul.
- Could be skipped but maybe not a good idea (all samples should have the same conditions / concentration for the PCRs).

3) PCR step 1

- Amplification of target fragment with standard primers (no tail or modification) in 96 well plates. Plate layout the same as in Elbrecht & Steinke 2018 based on the DNA extraction (1 ul DNA is simply transferred into the PCR plate with an 8 channel pipet).

			Vol je X µl	Master X fach
	Stock	soll	25	100
ddH20			9	900
Buffer	2	1	12.5	1250
Primer uM	10	0.5	1.25	125
Primer uM	10	0.5	1.25	125
DNA			1	100

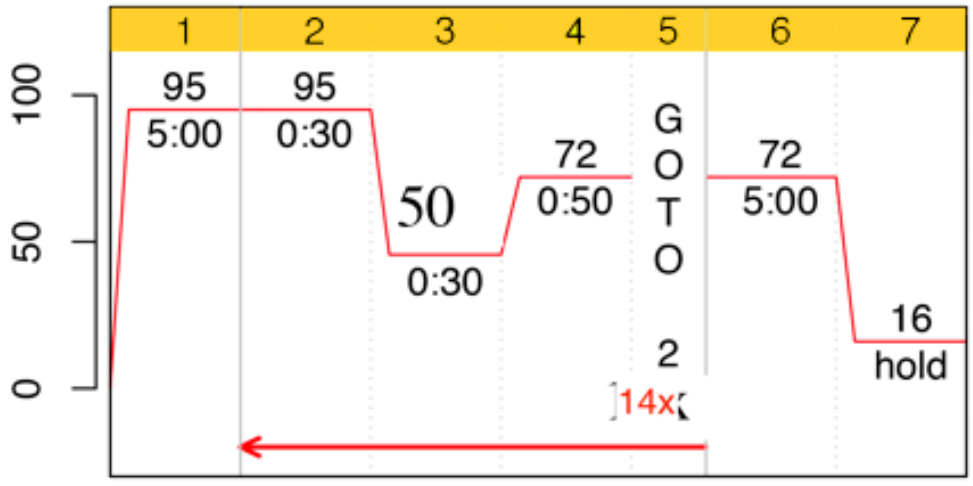


- Gel of all samples to check if negative controls are clean.

4) PCR step 2

- 1 ul amplified from PCR 1 with fusion primers (15 cycles).

			Vol je X µl	Master X fach
	Stock	soll	25	100
ddH20			9	900
Buffer	2	1	12.5	1250
Primer uM	10	0.5	1.25	125
Primer uM	10	0.5	1.25	125
DNA			1	100



- Overview of fusion primer combinations: https://peerj.com/preprints/3456v4/#supp-6
- Gel of all samples to check if negative controls are clean.

5) Reaction clean-up SPRIselect

*** If fragment analyser or tape station available, pooling and then clean-up of pooled library possible ***

- Reaction clean-up and size selection (left sided only). Ratio potentially 0.76x might be adjusted depending on primer set.
- Gel of a few samples per plate to check if size selection did work properly.

6) Quantification and library pooling

- Measurement of each sample (Qubit HS).
- Equimolar pooling of samples (+ negative control volume based on average volume used of samples).
- Gel of final library to check that no dimers are present.

Failed PCRs?

- Repeat steps 3-5 on NEW plate, to make sure that new negative controls are included.
- Potentially dilute samples or include additional clean up-steps (inhibition etc).

7) Sequencing run (2 HiSeq runs)

- Adding 5% phiX, parallel sequencing for diversity.
- Libraries have to be handled very carefully, since the same tags are being used for each lane (and 2 libraries are sequenced on the same machine). Here it would be good to use a different positive control to detect library cross contamination (since the layouts are identical). Additionally, the second library layout could be rotated by 180°C to help detect these contaminations.
- Cluster generation has to been carried out outside of the sequencer when 2 libraries are loaded (kit price for this ~500€ per sequencing run).

Required specialised equipment:

- IKA Tube Mill controller
- Plate centrifuge for DNA extraction
- 8 (or 12) channel pipets for sample handling and PCR setup in plate format
- Magnet plate for spriselect clean-up
- Qubit 4 fluorometer (Quantification)

Citations:

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- a validation study

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